

# SOCIOLOGICAL RESEARCH FOR THE CANADIAN NUCLEAR FUEL WASTE MANAGEMENT PROGRAM

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## ABSTRACT

Atomic Energy of Canada Limited (AECL) has been conducting sociological research in support of the Canadian Nuclear Fuel Waste Management Program since 1978. This research has consisted of a number of techniques, such as public opinion surveys and focus group discussions, with the purpose of monitoring and tracking public knowledge and opinion about the Canadian Nuclear Fuel Waste Management Program; identifying information requirements and concerns about the program; and analyzing emergent issues in nuclear fuel waste management. Recently sociological research has been conducted to supplement AECL's public consultation program, which was designed to identify social issues, and to provide the public with an opportunity to have input into the Canadian Nuclear Fuel Waste Management Program. Results from the sociological research studies provide an indication of public reaction to, and concerns about, different aspects of the Canadian Nuclear Fuel Waste Management Program. They also suggest conditions for public acceptance of the disposal concept and the ultimate implementation of the disposal technology. The results provide input to the development of public communications and interaction programs.

In 1989 October, a national study consisting of a public opinion survey and focus group research on public attitudes towards nuclear fuel waste management was completed. The study was designed to assess public perceptions of the waste management issue, to measure public reaction to the concept of deep geological disposal of nuclear fuel waste in Canada, and to determine public information needs and preferences.

The findings from this and previous sociological research studies indicate there are strongly held opinions about a number of issues that will likely play a role in public support for the nuclear fuel waste disposal concept and its eventual implementation. It appears that general public acceptance may be contingent upon providing information to the public of the safety of nuclear fuel waste disposal, and on physically demonstrating the safe disposal of nuclear fuel waste.

Generally speaking, there is a certain degree of public support in Canada for the concept of deep geological disposal of nuclear fuel waste. This support is based, in part, on a belief that Canada has the technological capability to develop a permanent method to safely manage nuclear fuel wastes, and a fair amount of trust and confidence in both the agencies involved in the research and development program, and in the review process by which the concept will be evaluated. However, it is apparent that the public desires more information, particularly related to health and safety, as well as on the nature, volume and hazard of nuclear wastes. In addition, information about the effectiveness of geological disposal, as well as commitments to long-term environmental monitoring, would help to lessen some of the concerns of the public.

## INTRODUCTION

Over the past 12 years Atomic Energy of Canada Limited (AECL) has been conducting sociological research to assist the Canadian Nuclear Fuel Waste Management Program by assessing public perspectives on the concept of deep geological disposal of nuclear fuel waste. It is clear to AECL that a nuclear fuel waste disposal technology must not only meet technical criteria, but must also have a degree of public support if it is to be judged as an acceptable method of managing Canada's nuclear fuel waste. In order to enhance the probability that informed public decisions will be made, extensive public communications and interaction programs have been an integral component of the

Canadian Nuclear Fuel Waste Management Program. Sociological research has been carried out to provide input to the development of these public communications and interaction programs.

The two most frequently used sociological research techniques have been public opinion surveys and focus group analysis. The purpose of these studies has been to monitor and track public awareness and opinion about the Canadian Nuclear Fuel Waste Management Program; to identify public information requirements and concerns about the program; and to analyze emergent issues in nuclear fuel waste management. Sociological research is also conducted to supplement AECL's public consultation program, which was designed to identify social issues, and to

provide the public with the opportunity to have input into the Canadian Nuclear Fuel Waste Management Program. Findings from these studies provide an indication of public reaction to, and concerns about the technical program, and suggest conditions for public acceptance of the disposal concept and the ultimate implementation of the disposal technology.

The sociological research results have provided assistance in the development of new public information materials and in the identification of the information required by the public, the key audiences that require information, and the means for most effectively reaching those audiences. They have also provided a mechanism for assessing the effectiveness of information programs and public interaction activities. The research results have also identified the need for specific studies such as research on siting processes and the ethical aspects of nuclear fuel waste management, and for the development of specific programs such as a public consultation program.

This paper will describe the results of the recent national public opinion survey and focus group research conducted on public attitudes towards nuclear fuel waste management. The study was designed to assess Canadians' perceptions of the waste management issue, to measure public reaction to the concept of deep geological disposal of nuclear fuel waste in Canada, and to determine public information needs and preferences. Where possible, a comparison with the results obtained from previous studies will be provided.

### METHODOLOGY

The study, carried out by Gallup Canada Inc., was conducted in two stages: a large-scale national public opinion survey, and focus group analysis. The survey consisted of a total of 1,684 telephone interviews with Canadian adults between 1989 September 21 and October 4. The sample covered all regions of Canada, including urban and rural areas, and both official languages. Respondents were selected using a multistage probability sampling procedure. For analytical reasons, oversampling took place in New Brunswick, Northern Ontario and Saskatchewan. The data was weighted to reflect the proportional geographical population distribution. All sample surveys are subject to sampling error, that is, the extent to which the results may differ from what would be obtained if the entire population from which the sample was drawn had been interviewed. For this survey, the sampling error is estimated to be 2.4%, that is, the results are accurate to plus or minus 2.4%, 19 times out of 20.

The survey included a series of questions to identify how the public perceives environmental issues, in particular hazardous waste management, vis-a-vis other important issues currently facing Canadians. The survey determined the ur-

gency with which the public feels a permanent method of managing nuclear fuel waste needs to be found, and its opinion on the likelihood of finding a solution. The questionnaire was also designed to clarify if and how Canadians differentiate between the "storage" and "disposal" of used fuel. Canadians' preference for various waste management options such as above ground on-site or centralized storage, monitored retrievable storage, or underground permanent disposal, was also probed, as well as whether or not the transportation of nuclear wastes affects these views.

Some specific questions were included to assess attitudes towards the Canadian concept of deep geological disposal, and to identify public issues and concerns associated with it. The study provides a measurement of public trust and confidence in the key players responsible for the safe management of used nuclear fuel. It also indicates the level of trust in the groups responsible for making decisions about nuclear fuel waste management, and the degree of confidence in the environmental review process that will evaluate the Canadian disposal concept. Finally, the survey provides data on public information needs and the preferred sources and methods of obtaining information on nuclear fuel waste management. The second stage of the study involved eight focus group discussions carried out between 1989 October 16 and 19 in four cities: Sudbury, Regina, Toronto and Montreal. Focus groups are small group discussions involving approximately 10 to 12 people and conducted by a professional moderator. Focus group research was conducted to provide qualitative insights to the issues investigated in the survey, and probed in greater detail public perceptions of nuclear waste management issues.

### INITIAL PERCEPTIONS OF WASTE MANAGEMENT

The 1989 October survey showed that Canadians were more concerned with environmental issues than with economic issues, social issues, the Canada-U.S. Free-Trade Agreement or energy issues. Over half (62%) of the sample ranked environmental issues as first or second in importance (1).

In top-of-mind recall of hazardous wastes, most Canadians think first of toxic/chemical wastes (46%) and PCBs (40%), followed by radioactive/nuclear wastes (23%) and municipal garbage (14%). Focus group research yielded similar results, but also revealed some public confusion between PCBs and nuclear wastes. The focus group participants in fact showed very little understanding or awareness of what nuclear fuel waste is, citing such examples as "green slimy glowing substance", "heavy water", or that it was "invisible but can kill you" (1).

Perceptions regarding the safe management of various wastes indicate that 24% of the survey respondents believe

that nuclear waste is managed the most safely, second only to municipal garbage (42%) and far ahead of PCBs (9%) and chemical/toxic wastes (6%). Although focus group participants indicated that used nuclear fuel is likely managed more safely than other hazardous materials, they grossly over-estimated the quantity of used nuclear fuel currently in existence, and expressed a belief that nuclear waste is the most dangerous of all toxic wastes and therefore the one most urgently in need of a disposal solution (1).

### PERCEPTIONS OF NUCLEAR FUEL WASTE MANAGEMENT

The focus group results were consistent with the survey findings, which showed most Canadians (90%) believe it is urgent that Canada implement a permanent method of managing nuclear fuel waste. There is also a high degree of public confidence (77%) that Canada has the technological capability to develop a permanent nuclear fuel waste management solution (1), a somewhat greater level of confidence than expressed in previous surveys (2,3).

On the basis of previous sociological research, it was believed that the public does not differentiate between the terms "storage" and "disposal", or if they did, that their perceptions of the two differed from those of the technical community. In the 1989 survey, respondents were asked to indicate if the terms "storage" and "disposal", when used in association with nuclear fuel waste management, meant the same thing or something different. A substantial number (68%) of those surveyed believe the terms are not synonymous, with 24% perceiving "storage" and "disposal" to be the same thing. When asked for the difference between the two terms, most respondents indicated storage to mean temporary containment, whereas disposal suggests elimination, destruction or neutralization of the waste (1).

The results of the focus groups were consistent with the survey findings. To most participants, storage is a temporary measure, used in the absence of a suitable permanent solution for disposing of used nuclear fuel. Disposal, on the other hand, for most, is believed to be possible only if the wastes are somehow neutralized, eliminated or otherwise rendered non-hazardous. For a few focus group participants, disposal is synonymous with storage except that disposal implies storage "far away" (1).

When provided with the scientists' definitions of storage and disposal, the majority (64%) of survey respondents indicated a preference for disposal as a method of managing nuclear fuel waste, while 25% preferred storage (1). Earlier surveys also showed public preference for disposal over storage, with support for geological disposal increasing when respondents are presented with the alternative of

continued storage in cooling bays at the nuclear reactor sites (2,3).

In order to further determine the public's preference for disposal or storage, the survey included a question that provided a variety of waste management options including on-site storage, above-ground centralized storage, an underground monitored retrievable storage facility, and an underground permanent disposal facility with long-term monitoring and eventual sealing. The survey results indicated that the most favoured option was an underground disposal facility (61%). Only 16% chose an underground storage facility, 13% on-site storage, and 5% an above-ground centralized storage facility. The focus group findings tend to support the survey data with respect to preferences for various waste management facilities. However, participants emphasized the optimum permanent solution would be to "neutralize" the waste, that is to render it harmless. Sealed geological disposal was viewed as the safest disposal method until science and technology develops a method to neutralize the waste (1).

Research results show there is a high level of concern about the transportation of nuclear fuel waste, with 87% of the respondents in a previous survey indicating they were very or somewhat concerned about this issue (2). The issue of transportation appears to have the propensity to influence public attitudes. For example, past studies have indicated a public preference for remote siting; however, when confronted with the issue of transportation, people surveyed were more likely to indicate that a disposal facility should be located near nuclear power plants to reduce the risks associated with transporting the wastes (2). Similarly, in the most recent survey, one-quarter of survey respondents stated they would change their mind about their preference for a centralized waste management facility when the issue of transportation is considered. Concerns about transportation focused on potential accidents and highway transport risks as well as a perceived lack of safety. Although transportation is of great concern to Canadians, the actual method of waste management was viewed as proportionately more important, with close to half of the respondents claiming they were more concerned about the management of the waste than they were about transporting it (1).

### ATTITUDES TOWARD THE NUCLEAR FUEL WASTE DISPOSAL CONCEPT

The results of the 1989 survey show that 53% of Canadians are in favor of the concept of deep geological disposal of nuclear fuel wastes compared to 37% who are opposed to the concept, and 10% who are undecided (1). In the 1988 December survey, there was a drop in support for the nuclear fuel waste management concept. Since support levels have returned to those found in previous studies

(53%)(2), it is assumed that either question placement or sample fluctuations accounted for the decrease in support in 1988.

Survey results have consistently shown that specific concerns about nuclear fuel waste management center around health and safety issues. The most frequently cited concerns include the effects on health, the safety of the disposal method, radiation and contamination due to accidents or leaks, and environmental effects (2). The most recent survey indicated a fairly sophisticated level of understanding of the issues relevant to geological disposal. In unprompted responses, Canadians expressed concern about such things as leakages of waste, geological stability of the Canadian Shield, responsibility to future generations, durability of disposal containers, and potential effects on groundwater (1).

Qualitative research results demonstrate that many of the concerns about nuclear fuel waste management stem from public perceptions about the ability to safely manage nuclear fuel waste that tend to be vastly different from those held by the technical community. These perceptions arise from misconceptions about the nature, volume and hazard of the waste, a lack of knowledge about the current method of managing the waste, the absence of proven evidence that geological disposal is "risk-free", the lack of absolute guarantees of the safety of disposal, inherent risks associated with transportation, and the belief that we are dealing with the "unknown".

It appears that public acceptance of the disposal concept may depend in part on a physical demonstration of the system's safety. A number of surveys have indicated that most people think scientific analysis alone is not sufficient to prove the disposal concept is safe. Most feel it is necessary to build a facility to test the concept before people will accept that nuclear fuel waste can be safely disposed of (2). Focus group research has indicated that public acceptability of the nuclear fuel waste management concept will depend largely on public confidence in the research program. The participants suggested that public confidence may be obtained by a physical demonstration or testing of the concept to give assurances of the safety of the disposal method (4).

In the 1989 survey, questions were included to determine the potential impact of providing additional information on public opinion. Thirty-six percent of those surveyed indicated they were more in favor of deep geological disposal after hearing that uranium ore has been naturally contained in the earth's crust for millions of years without any leakage. In addition, 30% of the survey group claimed to be more favorable toward the nuclear fuel waste disposal

concept after learning that other countries are developing similar disposal methods (1).

The questions of monitoring and retrievability have become very important issues for the general public. Sociological research results show a great deal of concern about the difficulty of monitoring and retrieving the wastes once the disposal vault has been sealed. The public is seeking reassurance of the safety of nuclear fuel waste disposal. In order to gain the confidence needed to make a decision about sealing the underground disposal vault, the public is asking for an extensive monitoring period during which the wastes containers would be retrievable (2). However, some people prefer permanent geological disposal over a variety of storage options mainly because of concerns about leaving the responsibility of monitoring to future generations, and also because they perceive that geological disposal is the safest available method of managing Canada's nuclear fuel waste (1).

In order to determine to what extent monitoring would be required for public acceptance of the disposal concept, respondents in the 1989 survey were presented with four possible options for monitoring nuclear fuel wastes in an underground disposal facility. A slight majority (52%) of the respondents preferred monitoring at source, deep underground in the disposal facility itself. Thirty-one percent favoured monitoring the groundwater and wells near the disposal facility. Only a few people felt comfortable with either surface (6%) or shallow subsurface (4%) monitoring (1). In the focus groups, at-source monitoring was the initial preference; however, after some discussion about the permanent nature of geological disposal, it appeared that monitoring in the vicinity of a disposal site would satisfy most participants' needs for assurance and comfort.

Public opinion surveys indicate that acceptance by the public of locating a waste disposal facility near their community remains low, even if siting would occur only after the research showed the concept to be safe. The public holds some strong positions on several issues associated with siting. A majority of survey respondents agree about the provision of compensation to host communities (68%), community veto in siting decisions (87%), and equity in selecting the location of a site (85%). In addition, the most important conditions for public acceptance of siting are independent monitoring of the facility and community control in siting decisions, with the provision of employment and economic development being a secondary consideration (2).

#### **PUBLIC TRUST AND CONFIDENCE**

Credibility and trust in the organizations involved in nuclear fuel waste management is one of the necessary conditions for public acceptance of the disposal concept. One of the objectives of the most recent study was to

determine the level of public trust and confidence in the key organizations responsible for the safe management of used nuclear fuel, the level of trust in the groups responsible for making decisions about nuclear fuel waste management, and the degree of confidence in the environmental review process that will evaluate the Canadian disposal concept.

Survey respondents were asked to indicate their level of trust and confidence in various organizations to safely manage used nuclear fuel in Canada. Public trust was highest for provincial electrical utilities and AECL. Respondents were much less trustful of federal, provincial and municipal governments to manage used nuclear fuel. Focus group participants also expressed skepticism toward government involvement in the management of nuclear fuel wastes; instead they placed the most trust and confidence in AECL. For them, AECL was perceived to be a research and development organization composed of scientists and highly skilled experts (1).

Respondents were also asked about the levels of trust they would have in a variety of organizations to make decisions about whether or not deep geological disposal is the best solution for managing Canada's nuclear fuel waste. The Canadian public places the highest amount of trust in scientists to decide on the feasibility of the Canadian waste disposal concept, as indicated by 78% of those surveyed. Other organizations considered trustworthy to decide on the suitability of the concept included special interest groups (66%), AECL (58%), an independent environmental assessment panel (57%), and provincial electrical utilities (54%). Similar views were expressed during the focus group discussions (1).

The Canadian nuclear fuel waste disposal concept will be subject to a review by a panel under the federal Environmental Assessment and Review Process (EARP). This review will include public hearings and a scientific and technical evaluation of the concept by an independent scientific review group that will assist the Environmental Assessment Panel. A vast majority of Canadians (72%) are confident that the EARP review can adequately evaluate the safety of the concept for deep geological disposal of nuclear fuel wastes in Canada (1), an increase from confidence levels expressed a year earlier (2). Those who indicated little or no confidence in the review expressed a concern about the possibility that the review will be subject to political influence or interference, pessimism that the review will not find a solution, skepticism about the qualifications of panel members, and concerns about possible bias of panel members (1).

#### **PUBLIC INFORMATION NEEDS AND PREFERENCES**

Respondents indicated interest in receiving information on all aspects of nuclear fuel waste management. Par-

ticular interest was expressed about receiving information on environmental monitoring and the potential impacts of nuclear fuel waste disposal on the environment. Other topics of interest included site selection, transportation of nuclear fuel waste, social impacts associated with disposal, the engineering and technical aspects of disposal, and job creation associated with the development of a disposal facility.

The channels through which most Canadians would like to receive information on nuclear waste management include TV documentaries, regular features in local and national newspapers, and pamphlets mailed with their electricity bills. Other information channels of interest include radio talk shows, magazine advertisements, speakers in local communities, community newsletters and a toll-free information line. The majority of survey respondents indicated a preference for receiving information on nuclear fuel waste management from special interest groups, scientists and AECL.

#### **CONCLUSIONS**

The sociological research results show there is a public preference for disposal as the method for managing Canada's nuclear fuel waste, and an sense of urgency to implement a permanent disposal method as soon as possible. There is a high degree of public confidence that the technological capability exists in Canada to develop a permanent waste management solution for nuclear fuel waste. Although the public desires that a permanent disposal method be developed and implemented soon, they expect this technology to eliminate or neutralize the hazardous nature of the waste.

The findings indicate there are a number of issues that will likely play a role in public support for the concept and its eventual implementation. It appears that general public acceptance may be contingent upon providing information to the public of the safety of nuclear fuel waste disposal, and on physically demonstrating the safe disposal of nuclear fuel waste.

Developing a clear understanding of public perceptions will assist AECL in addressing the issues and concerns raised by the public. It is apparent that the public desires more information, particularly related to health and safety, and to the nature, volume and hazard of nuclear wastes. In addition, information about the effectiveness of geological disposal to safely contain the waste and prevent the release of radioactivity to the environment, as well as commitments to long-term environmental monitoring, would help to address some of the concerns of the public.

The research results indicate there is a considerable degree of public support in Canada for the concept of deep geological disposal. This support is based, in part, on the belief that Canada has the technological capacity to develop a long-term waste management solution, and a fair amount

of trust and confidence both in the agencies involved in the research and development effort and in the review process by which the concept will be evaluated.

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