

SOCIO-POLITICAL CONDITIONS CONDUCTIVE TO SITING OF NUCLEAR WASTE MANAGEMENT FACILITIES

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ABSTRACT

This paper reports on findings of a review of historic issues and concerns raised by the public, affected communities and key stakeholders during environmental assessment and planning studies for Canadian nuclear research and power plants, uranium mining and radioactive waste and used fuel management projects dating back to 1996. It then goes on to compare these findings to those of recent research reports on the social and ethical dimensions of nuclear waste management to identify common elements. It concludes with some observations about the conditions that facilitate successful siting of nuclear waste management facilities.

1. INTRODUCTION

In the fall of 2003 Haussmann Consulting Inc. (HCI) reviewed 67 documents from 17 environmental assessment studies reporting on public consultation input to nuclear projects between 1996 and 2003 for the Nuclear Waste Management Organization (NWMO)ⁱ.

Most of the 67 documents relate to nuclear power plants – either the reactors themselves or related nuclear waste and used fuel storage projects. The exceptions are the reports of the Saskatchewan uranium mining projects, the Iter fusion project and the two Port Hope Area Initiative (PHAI) environmental assessments of long-term low-level radioactive waste management facilities. The latter are only projects reviewed that deal with long-term (as opposed to interim) management (but not disposal) of radioactive waste. The resulting report documents and categorizes the public comments, questions and concerns raised during the course of the EAs. Our review did not include the so-called Seaborn Report that had already been reviewed by Mark Stevenson.ⁱⁱ

Since our report was prepared, the PHAI has progressed to the draft EA Study Report stage and a number of research reports have been prepared for the NWMO that address the social and ethical dimensions of nuclear waste disposal:

- Watling J., Maxwell J., Saxena N. & Taschereau S., *Responsible Action – Citizens' Dialogue on the Long-term Management of Used Nuclear Fuel*, Canadian Policy Research Networks, July 2004.
- Paez-Victor M., *Key Issues Related to Nuclear Waste, or What Do Canadians Want to Do About Nuclear Waste?* Nuclear Waste Management Organization, November 2003.
- Pollara Inc., *Public Attitudes Related to NWMO's First Discussion Document*, Nuclear Waste Management Organization, July 2004.
- Ontario Metis Aboriginal Association, *Position Paper*, Nuclear Waste Management Organization, 2004.

Our purpose in this paper is to compare the historic public perceptions and concerns with those identified more recently through social research, to assess their consistency and durability over

time, to draw some conclusions about what conditions are conducive to the siting and development of long-term nuclear waste management facilities, and to identify the challenges facing the nuclear industry in creating those favourable conditions.

2. HISTORIC PUBLIC AND STAKEHOLDER CONCERNS RELATED TO NUCLEAR ACTIVITIES

Our review of past public/stakeholder commentary identified eight categories of concern. Stevenson's review of the Atomic Energy of Canada Limited Nuclear Fuel Waste Management and Disposal Concept [ref.#2] identified 21 social/ethical issues. A comparison of the two lists resulted in the following aggregated list of historic public/stakeholder categories of concern related to nuclear activities:

1. Issues focused on the unique technical aspects of projects;
2. Human health and safety and environmental integrity;
3. Confidence in the decision-making process;
4. Trust in the proponent, regulator and government;
5. Ethical and social aspects;
6. Risk and uncertainty assessments;
7. Financial and liability considerations;
8. Aboriginal interests; and
9. Documentation of the decision process.

It must be noted that these categories are not entirely discreet; issues raised in one often overlap with issues raised in another category. It is worth taking a moment to expand on what is included in each category of concern.

Technical Aspects of the Project

This category includes issues raised about the technical nature of the projects, in terms of: determination of:

- The need for the project, project life and ability of the concept to adapt to technological and environmental change over time including global climate change;
- Sufficiency of site-specific and transportation route data to determine feasibility and safety;
- Assessment of a full range of alternatives to and alternative means of carrying out the project;
- Management and funding of the project over extremely long timeframes (perpetual care); and
- Incorporation of international experience in the design.

People were unwilling to give approval to a concept that was proposed in a vacuum of information about the location where it would be implemented, the long-term institutional management of the facility, and without evidence that it met the highest international standards.

Human Health and Safety and Environmental Integrity

Concerns about human health and safety and protection of the environment were, not unexpectedly, the concerns most frequently and universally voiced in relation to nuclear activities. Besides the general concerns about protection of people's (including workers') health and preservation of the quality of the environment, comments in this category indicate that people want: demonstrated knowledge of the radiological effects of low-level radioactivity to understand very long-term effects; the opportunity to participate in the determination of acceptable levels of risk and effect-significance thresholds; adequate data to establish baseline conditions and to identify changes in the environment over time, especially health data on chronic effects of long-term exposures; a methodology for assessing likely health effects, with particular concern about most vulnerable members of the population (infants, expectant mothers); regulations and standards to protect human health and the environment that are forward-looking and compare favourably with those at the international level; recognition of the effects of stress and insecurity resulting from uncertainty and exposure to risks they deem unacceptable; effective and visible environmental and health monitoring programs; and comprehensive emergency preparedness plans.

Confidence in the Decision-making Process

The most frequently heard comments about confidence in the decision-making process, are that the review and approvals process must be carried out at arms-length from the proponent industry, and that it must provide complete and open access to the public and stakeholders with sufficient resources and time to allow for meaningful participation. EA panel reviews were often cited as meeting these tests. In our view, this is not because the panel process requires a greater level of diligence by proponents. Rather, it is because it provides an arms-length process for the public and interveners to review and comment with access to resources. Certainly, the panel review mirrors the judicial arbitration that this society holds up as a model of justice, and gives people the feeling that, even if their viewpoint does not prevail, they've "had their day in court" and been heard.

Public involvement in both the initial decision-making process and the ongoing monitoring and related decision-making process is essential. This was perhaps best stated by the Joint Federal-Provincial Panel on Uranium Mining Developments in Northern Saskatchewan in the following words:

"Even if the monitoring program were carefully designed and executed, its results might fail to convince the people of the region of its validity. Local participation in the monitoring protocols is essential. Without local participation, distrust of the monitoring data is likely to result in a continued misunderstanding of the state of the environment. Residents must be involved, especially in the implementation of the program, before they will trust the results." ⁱⁱⁱ

Trust in the Proponent, Regulator and Government

Underlying many of the issues cited above is the lack of trust people said they feel in the authorities that undertook the project and that were charged with the responsibility to review and approve it. There was often a suspicion of collusion between proponent and regulator, and a sense of alienation from elected officials. This is fuelled by a perception of secrecy on the part of the industry and regulators about nuclear affairs (e.g. incident reports), and by what some consider less than adequate public access to and participation in the decision-making process.

The political distance between local communities and the regulation of the nuclear industry at the federal level, as opposed to municipal or provincial levels, may also be a contributing factor in undermining trust. Public attitude research^{iv} suggests that greater familiarity with nuclear industry organizations tends to reduce mistrust.¹ The complexity of nuclear science combined with the fear of radiation and general lack of awareness of the place of radiation in people's day-to-day lives further promote lack of trust when people are suddenly asked to consider the prospect of a nuclear project in their community.

Ethical and Social Aspects

Ethical concerns often focused on power imbalances (between the industry, government and small, relatively powerless communities) and inequitable distribution of risks and benefits between those benefiting from nuclear power in terms of jobs and electricity, and those bearing the risk of nuclear waste management facilities, and between current and future generations. They also included the need to consider the larger energy policy picture. Many feel that decisions about managing used nuclear fuel should not be isolated from decisions about energy use, conservation and the entire nuclear fuel cycle from mining through refining, use and disposal. Another ethical consideration raised was the question, 'who decides'? Is it right to impose a facility of this nature on a community without its consent? The notion of simply compensating host communities with financial incentives was rejected as unethical.

Social concerns beyond health and safety focused on disruption of lifestyles and economic activity, the stigma that might attach to their communities if they receive nuclear waste and the attendant loss of community character resulting in possible reduced community cohesion and a decline in social infrastructure. These concerns relate to the issue of community participation in the development and acceptance of a holistic policy framework about nuclear energy and waste management, and the waste management site selection process. One of the most durable principles found in debates about waste management facilities, is many communities' unwillingness to manage waste from other communities. This presents a major challenge to any organization seeking to establish a centralized facility to manage waste from a variety of sources and locations. Other social concerns identified include:

- The need for community oversight of the planning and long-term monitoring of the facilities with access to independent expertise;
- Concern about risks associated with transportation of radioactive waste to long-term facilities; and
- Concern about the proximity of facilities to population centres and water resources.

Risk and Uncertainty Assessment

One of the more challenging aspects of assessing nuclear waste management proposals, is the determination of appropriate risk factors to be applied over a very long timeframe. Nevertheless, people demanded as much rigour and comprehensiveness in this aspect of the assessments as in more traditional and familiar areas of inquiry. Risk and uncertainty must be clearly and realistically characterized and addressed in terms of the provision of stewardship and funding

¹ Public attitude research conducted for the PHAI found that there is a direct correlation between familiarity with a nuclear operator [AECL, Cameco, OPG, Zircotec and LLRWMO were tested] and how well people feel the operator is performing in terms of managing its responsibilities to protect public health, safety and the environment.

over thousands of years; there must be openness and consultation in developing and characterizing risk factors and scenarios; there must be physical testing of the proposed engineering components of a facility to demonstrate durability; and there must be realistic application and assessment of worst-case scenarios. This latter consideration includes assessment of the security risk in a post 9-11 world.

Financial Issues

The issue of long-term stewardship also included a financial dimension. People sought certainty that the necessary financial resources for indefinite stewardship of waste would be available. Concerns include questions about the reliability of the cost estimates provided, the establishment and management of segregated and dedicated funds for nuclear waste management, assessment of a full range of future costs to all sectors of society and, under some scenarios, the effects of privatization of nuclear operators and sites where waste is stored. In general, people are not comfortable with the notion of private sector ownership and operation of a hazardous waste management facility.

Aboriginal Interests

If nuclear waste facilities are to be located on lands where Aboriginal land claims or traditional use claims are extant, then the interests of First Nations people and other Aboriginals must be addressed. This presents a cross-cultural as well as diplomatic challenge. Aboriginal people wish to be treated as nations in their own right. This requires full participation in project development from concept to construction and operation. The issues are not dissimilar to those for other stakeholders: equity, protection of human health and safety and environmental integrity, trust in decision-making, etc. However, these issues must be addressed in a different cultural and political context for Aboriginal people. Assessments must integrate traditional ecological knowledge, and they must understand and incorporate Aboriginal values about how consultation is carried out.

Documentation

Decisions and judicial reviews of decisions may take place many months after the formal EA process is completed. It is, therefore, important to properly and carefully document not only the technical information (e.g., project descriptions, baseline characterizations, effects assessments, methodologies, etc.) of project applications, but also the public consultation components. The documentation should include: number of meetings held, what was discussed, how information obtained was used to modify the project design, the efforts at informing potentially affected communities, and so on. Documentation of such details are important so that the deficiencies in the consultation process that people complain about can be put to the strictest test. It is known that EAs can be rejected on the grounds that the process followed was not sufficient, as well as on technical grounds. Methodologies must be shown to be consistent with best practice and coherent throughout. Effects assessments must be comprehensive including consideration of a reasonable range of malfunctions and accidents. Cumulative effects and effects of the environment on the project also must be assessed and documented.

Case Study Conclusions

From our review of public and stakeholder comments in EA proceedings over the past ten years, we concluded that the development of long-term waste management approaches for the care of

Canada's used nuclear fuel should be informed by at least the following considerations:

- Communities that are currently hosts to interim storage of used nuclear fuel have the understanding and expectation that interim storage truly means interim, and that:
- Used nuclear fuel will be stored on-site only until an off-site long term used nuclear fuel management facility becomes available, and certainly not longer than 50 years (the design life of storage containers);
- Only used nuclear fuel generated at that location would be accepted for interim storage; and
- Extensions and expansions of used nuclear fuel interim storage facilities will not go on indefinitely.
- Transparency, opportunity for full public engagement and the potential to have real influence on decision-making will be critical factors influencing the social acceptability and sense of public ownership of management approaches.
- Many non-governmental organizations and members of the public lack trust in nuclear organizations and regulatory agencies.
- First Nations people want to be acknowledged as a unique stakeholder by virtue of their Aboriginal and Treaty Rights, their traditional relationship to "mother earth" and their spiritual, cultural and social values.
- Canadians want to be assured that deregulation and privatization in the electricity sector will not result in the transfer of responsibility for nuclear waste to profit-oriented private sector organizations.
- Used nuclear fuel will need to be isolated and contained for millennia, during which time the institutional, governance and biophysical environments could change significantly. The public and host communities want to be assured that current and future generations will have the technical and financial resources required to implement and sustain the management approach, to provide for long-term monitoring and to fund mitigation, should it be required.
- Management approaches need to ensure that the economic viability of a host community is maintained and enhanced, that property and business values are protected and that the residents of the host community benefit in an equitable way from the economic opportunities generated by the management approach.
- To be acceptable to host communities and the wider public, management approaches must be based on state-of-the-art technologies and best practices designed to safeguard human health and environmental integrity now and in the long term. At the same time, innovation must be balanced with evidence that the technologies adopted are proven, reliable and durable. Flexibility to incorporate new advances in technology, whether for materials recycling, containment or monitoring is seen as a valued feature in facility design. For now at least, disposal is not an option.
- Public anxiety about their health or radionuclides in the air, drinking water and the food chain may not be calmed by technical and scientific studies or risk analyses suggesting negligible impact on the ecosystem and human populations. Significant efforts to better educate people are needed, and this could take considerable time.

These then are the high-level findings about communities' and stakeholders' concerns from a review of recent EAs of nuclear facility proposals.

3. NWMO RESEARCH FINDINGS ON COMMUNITY PERCEPTIONS OF NUCLEAR WASTE FACILITY SITING DYNAMICS

Let us now turn our attention to the findings of some of the other research undertaken recently for the Nuclear Waste Management Organization (NWMO); research that is more academic in its nature, i.e. not rooted in actual facility siting or approvals processes.

***Ontario Métis Aboriginal Association Position Paper*^v**

The OMAA position echoes many of the concerns and issue statements noted in our case study research, namely:

- A call for holistic decision-making, considering the entire nuclear fuel cycle in the context of energy policy and conservation;
- A need for comprehensive consultation with all elements of society potentially affected by the decisions, and with Aboriginal people as defined by them;
- A call for action within current limits of knowledge and capability, in the context of the 'seven generations' principle and remaining open to new knowledge and technological developments. This supports the option of long-term management of nuclear waste rather than disposal.

OMAA also makes some additional interesting suggestions for consideration:

- Let the wisest and the elders be given precedence to be heard, before others venture their opinions;
- Let not the wishes of the few override the authority of the majority;
- Explain the issues in terms that can be understood by the average citizen; and
- Empower communities and ensure people's rights are not breached.

***Key Issues Related to Nuclear Waste OR, What Do Canadians Want To Do About Nuclear Waste?*^{vi}**

This research report reviews some literature and extracts issue statements relevant to the discussion of used nuclear fuel management. Paez-Victor reports, among other findings that the public distrust of the nuclear industry and its regulators and government overseers is fuelled by a perception of secrecy about safety incidents and other communication deficiencies over the past decades. Paez-Victor concludes that to gain broad public support for a nuclear waste management facility, it will be necessary to:

- Have an innovative, representative and iterative process for identifying Canadian social values relevant to nuclear management;
- Include as part of any management scheme the need to, and the means to reduce or stop the production of nuclear waste;
- Face scientific uncertainty from the perspective of complex systems thinking; and

- Obtain broad, representative, clear, participation of Canadian citizens in a reflexive dialogue on the issue that can dovetail into a democratic, institutional, politically sound decision-making process, that may, ideally, include a referendum (i.e. broad public participation in the decision-making process).

National Stakeholders and Regional Dialogue Sessions Regarding NWMO Discussion Document #1 – Asking the Right Questions^{vii}

This document reports on a series of dialogues with stakeholders from across Canada selected on the basis of past participation in nuclear facility review processes and demonstrated interest in the work of the NWMO. These stakeholders were selected to represent interests from a broad range of categories:

- Local/Municipal Government • Professional Societies • Education/Academic • Labour
- Environment • Youth • Health • Emergency Preparedness
- Social/Cultural and Faith Perspectives • Consumer • Industry/Economic

The debates reported cover familiar ground:

- The very nature and scope of the challenge of used nuclear fuel management and related policy are embedded in the larger policy questions around energy policy, conservation and the future of nuclear energy;
- Radiation exposure risks must be explained in layman's language to Canadians if a consensus solution is to be found;
- Used nuclear fuel should be stored in a retrievable manner so that it may be either destroyed, de-toxified or reprocessed if future technological advances provide the means to do so;
- All of Canada's diverse social, cultural and religious interests should be represented in the deliberations establishing the ethical framework that will guide the nuclear used nuclear fuel management approach;
- A broad information and consultation process is required to engage all interested Canadians in the planning and decision-making process, using language understandable to the layman; and
- Those most directly affected by a management approach must have a voice in determining the acceptability of the proposals.

Public Attitudes Related to NWMO's First Discussion Document^{viii}

Findings of a nation-wide survey of Canadians' knowledge and attitudes about nuclear waste management included the following:

- Protection of public health and safety and the environment were the highest priorities in developing a program for nuclear waste management;
- Action is needed now, but in a manner that allows for adjustment in the light of future new learning and that respects the needs of future generations, i.e. the approach selected must be flexible and reversible;
- There is a widespread lack of knowledge among Canadians about the issues related to

nuclear waste management;

- Communities most affected by the waste management proposals should be involved in the decision-making process;
- There is a need for financial structures that guarantee sufficient resources will be available for the long-term stewardship of the waste; and
- A majority of Canadians prefer a management option that removes the waste to a remote location.

With the exception of the preference for waste management in a remote location, these findings clearly reflect and reinforce the comments noted from the review of public and stakeholder comments from past environmental assessment processes reported above.

The latter finding of this research perhaps indicates some understandable cognitive dissonance among people when it comes to hazardous waste management. On the one hand, it is desirable to remove it as far as possible from where it may harm us. On the other, people are concerned about the 'out of sight, out of mind' phenomenon that undermines the ethical and social directives to retain responsibility for these wastes squarely on our shoulders.

Responsible Action – Citizen's Dialogue on the Long-term Management of Used Nuclear Fuel^{ix}

The findings of the *Citizens' Dialogue* also uncovered a high degree of consistency between the values expressed by stakeholders during past consultations and those of Canadians selected randomly from 12 communities across Canada. Citizens' guiding values were identified to include:

- Responsibility to deal with the problems we have created;
- Adaptability to incorporate continuous improvement as new knowledge emerges;
- Careful stewardship of resources to ensure an honourable legacy is left to future generations;
- Accountability and transparency to rebuild public trust;
- Building and disseminating knowledge to ensure better decisions now and in the future; and
- Inclusion of a broad spectrum of Canadians and their varied perspectives in the decision-making process.

Drilling down into the details of the *Citizens' Dialogue* report uncovers remarkably similar comments from the average Canadians who participated in these dialogues to those from local communities where nuclear projects were being proposed, as reported above. Some examples are instructive:

"Participants also wanted governments and industry to be more transparent about what is being done and more inclusive of citizens and other stakeholders, both in how decisions are made and in the ongoing management of the used fuel." (page 18)

"Some participants spoke of the 'cradle-to-grave' approach to production and called on those who mine and sell uranium to play a role in the long-term management... Some expressed the view that the scope of the dialogue was too narrow to grapple with all of the

issues that must be addressed, and wanted to look at the issues in the context of a broader discussion on energy policy.” (page 21)

“Increasingly they are looking to independent oversight bodies to monitor government and industry, and to provide reliable information to citizens.” (page 23)

“Citizens repeatedly expressed their lack of trust and confidence in government and industry...” (page 24)

“There must be real engagement of experts, citizens and communities and other stakeholders before any decision is made... People must be told the truth... They want to know if standards are being met or not. They want full disclosure of financial and management information.” (page 24)

“They called for accessible, meaningful and reliable information for all Canadians so that they can engage in an informed way to support better decisions and to be better able to hold decision-makers to account.” (page 25)

“Communities most affected have a special role... (to) understand all the implications of hosting a used fuel facility... they (should) have access to expert advice and knowledge... (and) play a significant role in decision-making and in the ongoing management.” (page 27)

The high degree of commonality between current research findings about Canadians' values and perceptions about nuclear waste and nuclear energy, and the comments and concerns expressed by residents and stakeholders in the vicinity of nuclear projects through the EAs reviewed, takes many of the stakeholders' views out of the realm of “not in my backyard”, and validates their issues at a higher level of societal consciousness.

4. THE PORT HOPE AREA INITIATIVE EXPERIENCE

Before drawing conclusions, a few observations about the experience of the team preparing the EAs for the Port Hope Area Initiative (PHAI) are in order. The PHAI is the only current proposal for a nuclear waste management facility in an advanced planning stage. This initiative is comprised of two projects to clean up low-level radioactive waste and marginally contaminated soils in the municipalities of Port Hope and Clarington, known as the Port Hope Project and the Port Granby Project respectively. Other speakers at this conference have gone into considerable detail to describe these projects. My focus will be on the conditions that have, in my view, allowed these two projects to proceed without undue controversy to the completion of the draft EA Study Report, albeit more smoothly in one case than the other.

In relation to the key issues identified in the literature review, conditions that have allowed the PHAI to proceed relatively smoothly are as follows:

- **The PHAI is a community-initiated effort.** After some 30 years of unsuccessfully seeking a resting place outside the community for secure management of the low-level radioactive waste, these communities chose to accept responsibility for hosting the waste management facility in their own communities. Thus, the communities were intimately involved in the decision to develop the facilities and, through the agreement signed with the federal government, to maintain control over the final design and location of the facility.

- **There are clear benefits of the project to the community.** In the case of Port Hope, the community had benefited economically from the operation of the plant that originally created the waste, and continues to benefit from the operation of its successor company, Cameco. The community stands to benefit further from the cleanup, which will eliminate the stigma associated with the radioactive contamination that remains despite earlier cleanup efforts, and will provide new opportunities to develop previously contaminated lands for unrestricted future uses. The community was able to negotiate a further benefit by including certain non-radioactive contaminated sites in the cleanup effort. The \$20 million hosting fee (\$10 million to each of the two wards of the community that were separate municipalities at the time the agreement with the federal government was signed, prior to their amalgamation) will benefit all residents. In Ward 2 (former Hope Township), the hosting fee will be applied directly to reduce their property taxes. Ward 1 (former Town of Port Hope), is an urbanized area so all residents should realize a benefit from the hosting fee that will add substantially to the financial base of the municipality.

In the case of the Port Granby Project, located in the southeast corner of the Municipality of Clarington, the benefits are limited to amelioration of an unsustainable environmental condition in which the waste is currently placed very near the lakeshore and leachate is contaminating the lake. However, the surrounding farming community has never benefited from the industry that produced the waste placed there, and there are no other evident benefits to offset the negative side effects of the cleanup that will be experienced over a period of some four or five years. Furthermore, the seat of local government is located some distance away, and the local residents do not feel confident that they will receive compensation for their troubles from the \$10 million hosting fee provided by the federal government if the facility is approved and constructed.

- **The community has been involved from the outset.** The facility designs are based on an original concept of fully contained aboveground mounds developed by the communities themselves. This design concept allows for future retrieval if new technologies warrant, and provides for ready monitoring of facility performance. In the Port Granby case, it should be noted that the proposed design represents an option considered but originally rejected by the local citizens' committee in favour of an option that isolated the waste in its current location. The EA determined that this was not a preferred option, and this has fostered criticism from the residents in the vicinity of the facility.
- **Distrust of industry, regulators and government is mitigated.** While distrust of the industry, regulators and government are as common in these communities as elsewhere, in the case of Port Hope at least, this distrust is significantly mitigated by the leadership and staff of the AECL project team, many of whom are long-time residents of Port Hope and the surrounding community. Not only are they well known faces, but they themselves will be subject to the effects of the project. In Port Granby, the project team, while well known, are nevertheless outsiders to the farming community immediately surrounding the proposed facility site.
- **Experienced team conducting rigorous environmental assessments.** The EAs being conducted have been extremely comprehensive, including a detailed health and safety study, consideration of cumulative effects, malfunctions and accidents, and effects of the environment on the projects. Cleanup criteria were set at very conservative levels relative to

current standards. Aboriginal people with even a remote chance that they may have a traditional use of lands in the affected study areas were consulted and a survey of their band members was undertaken to identify traditional land uses. Also, the extensive public information and consultation program has included public attitude research and workshops to: identify and evaluate alternative means of carrying out the projects; select valued ecosystem components; and identify effects mitigation measures. Venues were provided for stakeholders and interest groups to present their viewpoints alongside those of the project team, and technical input was sought from outside agencies and experts on the EA study workplans. The communities will be asked to participate in the construction, development and long-term monitoring of the facility. Finally, the municipalities contracted an entirely separate team of experts to carry out a comprehensive peer review of the project design and EA documents. These steps have satisfied most observers and participants in the process that their health and safety and the environment will be protected, and that risk levels are acceptable.

In sum, without the benefits of a literature review or research such as that reported here, the PHAI proponent has done essentially everything that these findings suggest should be done in order to attain success in siting a nuclear waste facility. However, it should be noted that this is in part due to a fortunate confluence of circumstances that it would be difficult to reproduce elsewhere (n.b. community-initiated project, local leadership and staffing, local benefits with cost/benefit equity, a community relatively familiar with the nuclear industry).

5. CONCLUSIONS

Table 1 illustrates the commonality of social issues identified by interveners in the context of actual nuclear facility proposals, and those identified by dispassionate participants in academic research and dialogues sponsored by the NWMO. The high degree of congruence elevates interveners' concerns beyond those of the 'not in my backyard' variety, and imbues them with a high level of credence, not to be dismissed lightly.

This review has identified a number of challenges facing the nuclear industry as it seeks to develop solutions to nuclear waste management issues. We conclude here with those that, in the author's opinion, are the most critical challenges and perhaps also the most difficult to address.

Education: One of the first challenges is to address the public's relatively low level of understanding of radiation and radioactivity in our everyday lives. This ignorance breeds fear and distrust, and represents a major hurdle in efforts to reach societal consensus on the management of nuclear waste. Overcoming this hurdle is a big challenge given the complexity of the subject matter, but the industry must redouble its efforts at a time when the cheaper hydrocarbon fuel sources are becoming more scarce and, at least in the near to mid future, our reliance on nuclear energy will more likely grow than diminish. The objective must be for people to become familiar with their day-to-day encounters with radioactivity and its effects. Governments and the educational system have a responsibility in this regard as well.

Community Ownership: All the research emphasizes the need for a high level of participation in the facility design and siting decision-making process from the outset, by those communities most likely to be affected. In this author's view, this is perhaps the most important condition determining success in the facility siting process. The low-level radioactive waste siting task

Table 1: CONGRUENCE OF ISSUES IDENTIFIED IN PAST PROJECT EAs AND NWMO RESEARCH REPORTS

Issues Identified	Historic EAs	OMAA Position Paper	Paez-Victor Paper	NWMO Regional Dialogues	POLLARA Public Attitude Research	CPRN Citizen Dialogues	PHAI
Technical Issues – demonstrate need, must be adaptable to future learning, assess alternatives, demonstrate sound management, apply international experience							
Human Health & Safety and Environmental Protection are Priority #1							
Need to improve confidence in the decision-making process through openness, transparency, consultation							
Need to rebuild trust in the proponent, regulator and government							
Ethical and Social Considerations – balance risks/benefits; consider larger policy context; consider stigma; engage host community in decision-making							
Inadequate Treatment of Risk and Uncertainty – need more openness and inclusiveness in risk determination							
Financial Stewardship Issues							
Respect for knowledge and experience							
Need to educate Canadians on nuclear energy, waste and science							

force demonstrated that communities unfamiliar with nuclear facilities and not involved in the initial conceptualization of the project are not willing to entertain hosting them.^x Subsequently, the Port Hope Area Initiative demonstrated that communities already dealing with nuclear waste and benefiting from nuclear facilities can take on the challenge of initiating and managing the waste, and can actually take some pride in doing the job well. However, the conditions leading to success are difficult to find:

- Community-initiated project, or at least community acceptance of the concept from the outset;
- Demonstrable benefits to the community;
- Local leadership of project planning and development.

In this regard, it should be noted that the Municipality of Kincardine has taken an important first step in the proposal by Ontario Power Generation to site a low-level and medium-level radioactive waste management facility in that community, by conducting a referendum on the question. With a solid majority in favour of the project, the community has taken ownership of the proposal. It should also be noted, that this is another community that is very familiar with the nuclear industry.

This conclusion suggests that the industry is more likely to find solutions to its long-term waste management challenges in communities that already are familiar with nuclear facilities, as opposed to seeking remote locations where experience has taught that the same issues arise notwithstanding the sparse population base affected.^{xi}

Trust and Confidence in the Decision-Making Process: These issues are clearly linked. It is difficult for people to have confidence in the decision-making process if they do not trust the key actors involved. Research has identified openness about all information and full participation by interested and affected persons and stakeholders in the decision-making process as requirements to building trust and confidence. The challenge here is for the industry to overcome its fear of losing competitive advantage by being open about its operations, and to balance the need for confidentiality for security reasons against the need for openness to promote trust and confidence among the public and stakeholders.

There is also a challenge to public policy-makers in this regard. The research has identified a desire for a comprehensive energy policy framework within which to discuss and develop nuclear waste management policy. People are frustrated by efforts to tease out one component of energy policy in the absence of discussion and decisions about important issues such as the relative benefit/cost of various fuel cycles and how conservation will be achieved to reduce energy consumption and waste production. It will be necessary to address these issues with public involvement to revive public trust and confidence in the decision-making process.

Research and Development: The research indicates that Canadians are not yet satisfied with the technological solutions available today to deal with nuclear waste, and expect the industry to continue to research new technologies that may one day either reuse the waste or neutralize its toxicity. They also expect research to develop a better understanding of the long-term effects of low-level radiation on human health and the environment, so that they may have greater confidence in the health and environmental standards that govern the industry to protect us all. These challenges should be pursued at the international level with multi-national co-operation to expedite the learning process, so that all people may benefit from the results.

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