A Comparison of Social and Economic Engagement Approaches: Lessons from Recent International Radioactive Waste Projects – 17478

Eric Knox *, Rachel O'Donnell **, Marvin Stemeroff ***, Sean White *,
Cip Wingrove ****

*AECOM, United States
** AECOM, United Kingdom
*** AECOM, Canada
****AECOM, Australia

ABSTRACT

The central challenge of any proposed radioactive waste management project is securing not only regulatory permissions, but also a social license to operate. "Social license" generally refers to a community's acceptance or approval of a specific project. Oftentimes development of social license occurs outside of, or in parallel to, formal regulatory or permitting processes, and requires sustained commitment and proposed economic benefits to communities by proponents to acquire, build, and sustain social capital in the context of trust-based relationships. Historically, radioactive waste management projects have defaulted to demagoguery and "siege warfare" modes of thinking and action by both proponents and opponents. While radioactive waste management projects are always inherently controversial, it is only recently that project owners and developers have experimented with alternative forms of social engagement outside of, or in addition to, formal regulatory processes. This paper compares and contrasts recent projects in Canada, Australia, the United Kingdom, and the United States, by examining distinct approaches to social engagement, with a focus on new methods that have been used to promote mutual understanding, foster rational debate, build confidence, promote economic development, and secure social license. The projects examined span the life-cycle of radioactive waste management development, from ones that are purely aspirational, to ones in early planning stages, to ones seeking a host community, to one that is focused on sustainment of existing social license. Several notable lessons and innovative practices are identified that will be of interest to radioactive waste management project owners and developers, non-governmental organizations, potential host communities, and political decision-makers for such projects.

INTRODUCTION

It goes without saying that radioactive waste management facilities are controversial, and that securing public acceptance and licensure of such projects is an arduous process involving multiple layers of scrutiny within the realms of science, technology, economics, policy and politics. This paper examines five specific radioactive waste management-related projects in four English-speaking and culturally-similar countries, with a particular focus on the social engagement aspects of securing public approval for such projects. Our analysis provides comparative observations on various social engagement approaches, and conclusions about specific techniques and their outcomes.

METHODS

We examined publically available information, media reports, and our own personal work experience as radioactive waste management professionals related to several projects as the basis of our analysis. Table I provides a high-level summary of the projects examined in this paper.

TABLE I. Radioactive waste management projects compared

Country & Project	Project Type	Waste Type	Notable Social Engagement Techniques
CA APM[1]	• Aspirational facility	• SNF	• Volunteerism • Citizens helped design how they would be engaged in the process • Constructive community benefits • Indigenous peoples engagement
AU NRWMF[2]	• Aspirational facility	• LLW • ILW	• Volunteerism • Competitive siting process • Independent surveys of public sentiment • Self-definition of "community" • Independent advisory panel • Indigenous peoples engagement • Constructive community benefits
AU-SA NFCRC[3]	• Aspirational state policy • Economic development	• SNF	• Royal commission • Transparent stakeholder engagement • Extensive, web-accessible documentation • Citizen juries
UK LLWR[4]	• Operating facility	• LLW	• Legacy facility • National-level LLW strategy development • Local, regional, and national consultations for the facility's Environmental Safety Case
US DBFT[5]	• Research project to evaluate deep borehole disposal concept	• N/A[6]	• Volunteerism • Request for proposals directed at private-public sector collaboration • Competitive siting process • Constructive community benefits

1. Canada, Adaptive Phased Management (APM) Repository
2. Australia, National Radioactive Waste Management Facility (NRWMF)
3. Australia, South Australia Nuclear Fuel Cycle Royal Commission (NFCRC)
4. United Kingdom, Low-Level Waste Repository (LLWR)
5. United States, Deep Borehole Field Test (DBFT)
6. There is no radioactive waste involved in the DBFT, only drilling and testing of a deep borehole

DISCUSSION

Canadian Adaptive Phased Management Program

Canada's program for the long-term management of spent nuclear fuel formally began in 2002. At the core of the siting process for a deep geological repository for spent nuclear fuel (SNF) is the principal of an informed and willing host community. Fundamental to the siting process is the engagement of communities which has been ongoing for six years and is expected to continue for at least another six years leading to a joint decision by the "project owner," the Nuclear Waste Management Organization (NWMO), and the host community to enter into a long-term partnership agreement.

The concept of an informed and willing host community is not new. However, what is unique is the manner and style in which the NWMO has chosen to implement it in Canada. The overall approach to the preliminary design of the repository and the siting process is meant to be adaptive to changing social conditions and technology, hence the term "Adaptive Phased Management (APM)" which is the project name for the Canadian program [1].

All information, whether technical or social in nature, is published and open to anyone to comment on. Many of the technical studies are peer reviewed. More important, the process clearly describes all the stages and phases of its siting and decision processes and routinely comments on its milestone progress and any modifications it makes along the way. Since its inception, the NWMO has consulted with tens of thousands of Canadian citizens and continues its public outreach in an effort to capture evolving social values and considerations. This is critical to the ultimate success of the program in that it can demonstrate it has listened and continues to listen and learn from Canadians regarding the implementation of the APM Project.

Canadians have been consulted at large about how they wish to be engaged and their preferences for doing so. This means that the social engagement program for APM has been designed and tested by Canadians. Moreover, the social engagement process continues to be refined in response to community and broader points of interest. This is a major departure from traditional development projects in Canada where social engagement programs for developments have been "shoehorned" into canned processes. The APM social engagement program is custom built and is never too hardened that it cannot change to meet evolving social needs.

A myriad of safety and technical studies are being conducted in a parallel process with the community outreach and social engagement activities. If there is any indication of safety risk to people or the environment the interested candidate community is no longer considered a repository site although it may participate in the program in other less direct ways as appropriate. To date of the 21 communities that have raised interest in learning more about the APM project for their community some have been dropped as primary candidate sites because of a lack of confidence in the area geology. In the end, the siting process would in theory cease if confidence in geological safety in all interested community areas is lacking.

In Canada Indigenous Peoples have a certain rights enshrined in the Constitution. In all cases the DGR site will be on the Traditional Territory of one or more Indigenous Peoples community(s). Thus every effort is made to engage all relevant Indigenous communities to ensure their views and perspectives are part of the siting process and factored into selection process. This means that affected Indigenous communities are included in the all dialogues and partnership considerations with the candidate host community.

While safety of people and the environment is being assessed the siting process concurrently leverages aspects of the Sustainable Livelihoods Framework (UK, 1998) to assess the implications of the APM project on community well-being. Specifically, the APM siting process is seeking to understand community aspirations and the conditions which might enhance the social, economic, human, physical and environmental assets of that are key ingredients of any community. A primary condition of the siting process is that the APM Project must not leave any community worse off and more hopefully leave it better off using the metrics of this framework.

The current preliminary round of community engagement is loosely structured around a customized adaptation of the Sustainable Livelihoods Framework referred to in the Canadian siting process as the Community Well-Being Framework. Each of the communities involved in the siting process undergo comprehensive engagement and assessment to determine the social implications for the host community and its surrounding area. Working with communities for all to appreciate their current well-being status and how it might be impacted with the APM Project helped to focus community engagement activities.

Not all communities are equivalent in terms of ability or capacity to engagement in meaningful dialogue about an undertaking as large scale as the APM project. Some communities have limited human and physical resources that handicap their ability to engage with the NWMO and even within their own communities making it unreasonable for some to make informed decisions about their willingness to go forward in project. Consequently, the NWMO makes investments in relevant social and physical community infrastructure that enhances their capacity to understand, assess and choose a path forward with or without the project.

At some point in time a preferred site (community) must be able to demonstrate “informed and willing consent” to partner with the NWMO for the long term. Although the details of how this demonstration of consent might be brought about, many speculate that some form of plebiscite of eligibly community voters might be required. Some questions this raises include the following:

a) What percentage of the popular vote constitutes credible support?

b) What/who constitutes the host community?

c) How might support or lack of it in communities along a transportation corridor for spent fuel come into play?

Australian National Radioactive Waste Management Facility

Although Australia has no civil nuclear power program the country has a robust nuclear scientific research establishment, research reactors, and medical isotope production facilities, all producing radioactive wastes and falling under the umbrella of the Australian Nuclear Science and Technology Organization (ANSTO). The Australian government has charged the Department of Industry, Innovation, and Science (DIIS) with delivering a near-surface repository for disposal of low- and intermediate-level radioactive waste, called the National Radioactive Waste Management Facility (NRWMF). The Government has stated that it will not impose the NRWMF on an unwilling community, noting that no individual or group has a right of veto.

In 2015 DIIS solicited nominations from landowners who might be interested in hosting the NRWMF [2]. 28 nominations were made, of which DIIS down-selected to six sites meeting a multi-criteria site analysis. Over a 120 day period, DIIS conducted a public consultation process with the six down-selected sites to assess the level of community support. The Government's consultation process involved:

- Visits to each site - each site was visited a minimum of three times throughout the consultation process;
- Approximately 180 face to face meetings with key stakeholders including the local community, Indigenous groups, surrounding landowners, council members, and state agencies;
- 10 town hall meetings with approximately 1,900 overall attendees;
- Meetings with a range of other groups including financial and agricultural organizations;
- Delivery of around 35,000 information packs to the communities. Packs contained a booklet outlining the process the Government was following, and general information about radioactive waste in Australia;
- Responses to approximately 300 hotline calls from the general public; and
- Independent surveys at each of the six sites to assess community sentiment.

Similar to Canada's APM approach in which citizens were asked how they wanted to be consulted, in its consultation process DIIS explored how the population would like to define the extent of their community. There was a consistent view that the community should be limited to those living in close proximity to a nominated site, and those that are likely to be directly affected by the proposed NRWMF. Individuals' responses to the independent surveys of public sentiment were treated as anonymous and kept confidential. The surveys were conducted in accordance with the Australian Market and Social Research Society's Code of Professional Behavior and Australian Privacy Legislation. Aggregated results from the surveys were reported DIIS reports for the NRWMF.

Of the six finalist nominated sites, DIIS has selected one, Barndioota in South Australia, to proceed to the next phase of its process which will involve final site selection, facility design and licensing.

South Australia Nuclear Fuel Cycle Royal Commission

In 2015, partly in response to depressed economic conditions, the South Australian Government empaneled a Royal Commission to investigate the potential for increasing South Australia's participation in the nuclear fuel cycle in four areas of activity:

1. Expanded exploration, extraction and milling of minerals containing radioactive materials;
2. Further processing of minerals and the processing and manufacture of materials containing radioactive and nuclear substances;
3. Use of nuclear fuels for electricity generation; and
4. Establishment of facilities for the storage and disposal of radioactive and nuclear waste.

The Nuclear Fuel Cycle Royal Commission (NFCRC) conducted an independent, evidence-based process that was open and transparent, and spanned a fourteen month period from 2015 to 2016, and involved public sessions that included oral testimony and written submissions from a wide range of individuals and organizations in the private, public, and not-for-profit sectors. The NFCRC heard oral evidence from 132 expert witnesses from Australia and overseas, which was live-streamed over the internet.

Much like the Canadian APM program, the NFCRC took an open and high-volume approach to the sharing of and accessibility to information. Written submissions, public session videos and transcripts, financial assessment reports, and Tentative Findings responses were all published on the NFCRC's website. The level of transparency used by the NFCRC and the accessible body of work it produced and made available online offers a model for other radioactive waste project owners to pursue in terms of information sharing.

In May 2016 the NFCRC fulfilled its remit and published its final 320-page Final Report [3]. Interestingly, of the four topical fuel cycle areas the NFCRC investigated, the Commission recommended that the Government of South Australia conduct further Number 4, involving the concept of a multi-national repository for disposal spent nuclear fuel (SNF), concluding that: "Viability analysis undertaken for the Commission determined that a waste disposal facility could generate more than $100B income in excess of expenditure…over the 120-year life of the project."

After publication of the NFCRC Final Report, the South Australian Government established the Nuclear Fuel Cycle Royal Commission Consultation and Response Agency (CARA). In the summer of 2016 CARA used "citizen juries[1]" to further

[1] **Citizen juries** use a representative sample of citizens (usually selected in a random or stratified manner) who are briefed in detail on the background and current thinking relating to a particular

consult on the recommendations of the NFCRC Final Report. CARA empaneled two citizen juries to investigate the issues, and make recommendations to the South Australian Government.

The first Citizens' Jury marked the beginning of a comprehensive state-wide consultation program. A group of 50 randomly selected South Australian citizens were chosen to come together over two weekends to discuss South Australia's future role in the nuclear industry. Over four days, the jury examined the Royal Commission Report and called on expert witnesses to help them work through the issues and better understand the choices. After their deliberations, they produced a simple report identifying the key topics that need to be discussed during the state-wide consultation program [4]. The jury was facilitated by a private-sector consultancy at arm's length from Government. During the period of time that the Jury performed its work there was much media coverage of the NFCRC and the issues to be considered, much of the coverage was informed by CARA and investigative in nature including many graphical depictions of what was being proposed [5].

Citizens' Jury Two was held over three weekends during October and November, 2016. Members of the original Citizens' Jury One were joined by an additional 300 South Australians to answer the question: "Under what circumstances, if any, could South Australia pursue the opportunity to store and dispose of nuclear waste from other countries?" The Jury deliberated on the question using both the Nuclear Fuel Cycle Royal Commission Report and first Citizens' Jury report, with feedback from the community consultation and expert witnesses also used as important inputs. Citizen Jury Two concluded in its final report in November [6]:

> "The jury generally had a strong conviction in taking a position one way or another. Two thirds of the jury do not wish to pursue the opportunity under any circumstances and one third support a commitment to pursue under the circumstances outlined in this report."

Although the outcome of the citizen juries process did not result in a recommendation to Government to pursue the concept of a multi-national repository for SNF, recent reports have indicated the issue may be the subject of a referendum. Whatever may happen in the future, the body of work of the NFCRC holds some great lessons of effective public outreach, transparency, and accessibility to information.

United Kingdom Low Level Radioactive Waste Repository

The United Kingdom's Low Level Waste Repository is located in Cumbria in the North West of England. As with many UK nuclear sites, LLWR is located on a former Ministry of Supply factory site, which produced TNT during the Second World War. Following the development of the Pile reactors and fuel cycle plants at Windscale (now known as Sellafield) it became apparent that waste disposal capacity for lower level radioactive wastes was needed. The LLWR site is conveniently close to Sellafield, had

issue, and asked to discuss possible approaches, sometimes in a televised group, www.dse.vic.gov.au/effective-engagement/toolkit/tool-citizen-juries

rail access was already owned by the Ministry of Supply, which in 1959, made it an ideal candidate for a waste disposal facility.

Waste was tumble tipped into trenches, which over time became more sophisticated in design and operation until a House of Commons white paper in 1983 reviewed international best practice, ruling the simple near surface disposal of LLW in trenches, of which there are seven, was not best practice and the UK should use an engineered near surface disposal methodology. Vault 8 came on line in 1988, and Trench 7 was used in conjunction until 1995.

During the early years of operation, Plutonium Contaminated Material (PCM) was stored in the legacy munitions magazines on the site. The removal of the PCM started in the 1990's with the final demolition of the magazines now being undertaken.

The history of the site and the way in which it operated, created a difficult and complex relationship with the local community. Historically when the site was operated by a British state-owned enterprise, there was a track record of delays and stakeholder concerns not being addressed and there was little to no trust between the community and LLWR, which at that point was operated as part of Sellafield.

In 2008 there was a crisis point where LLWR was full, Vault 8 had little to no remaining capacity and Vault 9 had not received planning permission, in a large part due resistance from the local community. A new Parent Body Organization took over the Management and Operation of LLWR in 2008; with a huge challenge to rebuild trust between the community and LLWR.

This needed to be done quickly to enable planning permission to be granted to build the much needed Vault 9 facility. In order to achieve this there were a number of things that needed to be addressed quickly:

- Show that there was a credible plan for Vault 9, which included bringing most of the construction materials on to the site by train. The Village of Drigg, where LLWR is located, has narrow roads and is not suitable for large quantities of construction traffic to pass through on a regular basis.
- Engage in more regular and open communication, and standing by promises made.
- Start the development of the UK's Strategy for the Long Term Management of LLW, engaging with waste producers and the local community [7].
- Underpin the long term Environmental Safety Case (ESC) for the operation of the facility. In 2008 the safety case developed by the operator at the time in 2001 had not been accepted by the Environment Agency (EA) as underpinning that LLWR was suitable for the disposal of LLW.

It was accepted that a solution needed to be found, planning permission for Vault 9 was granted by the Cumbria County Council, to enable waste to flow as there was a backlog built up at generating sites. The basis of the planning was that Vault 9 was

to be used for storage while the ESC was developed and approved by the EA. Once the EA approved the ESC the waste stored in Vault 9 would then be considered disposed of, provided it complied with the Waste Acceptance Criteria (WAC) for the new facility. There was a risk that while waste may have complied with the old Conditions for Acceptance (CfA) there was potential for it to not comply with the WAC, which were still under development. To manage and mitigate this risk, wastes which were deemed to be normal or routine went for storage, while non-routine wastes were flagged and further consideration given on the acceptability for future disposal. In reality there were very few wastes which would not have complied and solutions were found.

The ESC was delivered to the EA in 2011, which was approved in 2013. Over 80 technical experts were involved in its production, and it took 85 man years of work to develop. It comprises of 2,000 pages and is made up of 17 reports and a non-technical summary. A further 100 underpinning reports make up a further 10,000 pages.

The ESC as part of the approval process was widely consulted on by the EA with local, regional, national and technical stakeholders. The EA then issued a draft permit to allow disposals at LLWR, for Vault 9 and future Vaults, which was then consulted upon ensure buy-in to the proposed authorization.

The engagement was conducted using a range of techniques, from writing to registered interested parties, holding open days and evening events for the community to attend, and publishing documents on line. All communications and interactions were done, against a plan in an open and honest manner to build trust and credibility.

This is an ongoing process as the site develops stakeholder approval for the development and remediation of LLWR is crucial.

United States Deep Borehole Field Test

The final project we examined was the US DOE's deep borehole filed test (DBFT). Deep boreholes as a possible technology for geologic isolation of radioactive waste, while not new in an international context, was recommended by US President Obama's administration in 2012 as a technology warranting further research[8].

In 2015, the DOE solicited bidders to carry out a DBFT research project that called for drilling a 5 km deep borehole into at least 3 km of crystalline basement rock, and making various scientific measurements of the subsurface environment; no radioactive waste was to be utilized in the research effort. The DBFT contract awardee initially proposed a site in the State of North Dakota, but faced a public backlash over its drilling plans, and had to propose an alternative site. Like the first site, the second proposed drilling site, located in the State of South Dakota, also faced fierce public backlash characterized by a distrust of the DOE's plans, and fear that the research project would ultimately lead to disposal of radioactive waste at the drilling site location.

In 2016, DOE cancelled the DBFT contract and issued a new Request for Proposals (RFP) with the same DBFT research drilling and testing scope combined with a new public outreach component that required bidders to conduct public outreach and partnering efforts as part of the DBFT [9]. DOE's RFP also indicated that DOE intended to make multiple awards of contracts to bidding teams, and allow those teams to carry out public outreach efforts to secure a publically-supported drilling site, but then DOE would down-select to only one team to carry out the DBFT drilling and testing activities at a single site. Moreover, DOE indicated in its RFP that it was: a) willing to negotiate constructive benefits for a willing host community of the DBFT, for example science, technology, engineering, and mathematics (STEM) research grants; and b) agree to enter into a Memorandum of Understanding with a DBFT host community explicitly stating that DOE would not store or dispose of any radioactive waste on any land leased for the DBFT.

In late 2016, DOE made contract awards to four teams that had bid for the DBFT, with two sites being proposed in New Mexico, one site in South Dakota, and another in Texas. In 2017, the four teams will conduct outreach activities with candidate host communities for the research project, and DOE will ultimately down-select to a single team/site for the DBFT using these criteria:

1. The degree of public acceptance of the project;
2. How well the proposed drilling Site meets geological, hydrogeological and other characteristics;
3. All permitting and other regulatory requirements have been met; and,
4. The adequacy of the contractor's Drilling and Test Plan.

CONCLUSIONS

In western, representative democracies, securing social license for long-term management of radioactive waste is always difficult, and typically takes many years, if not decades. Trying to achieve public acceptance without sacrificing technical suitability is a lofty goal. Addressing technical suitability, national interests and public concerns while meeting a national need to provide a publicly acceptable solution to a complex and controversial problem is not an easy task. Rarely, if ever, is the public so thoroughly engaged in an attempt to increase the public understanding of the potential risks and benefits of repository development while simultaneously trying to place those risks and benefits in a meaningful local or national context. Finding a site that is publicly acceptable is certainly preferable to the contention that nuclear waste should remain where it is currently stored in temporary containers and facilites. This must be evaluated in the context of the real-world necessity of managing spent nuclear fuel and high-level waste and means that some action must be taken, with attendant risks and consequences. Waste may be left to accumulate in temporary facilities near cities and towns, or it may be transported on an ad-hoc basis to new temporary storage areas; or ultimately to a final disposal facility.

There are two primary drivers for this. First, radioactive waste management comes with an inherent time dimension that is unique; the half-lives of the materials in question can span into the tens of thousands of years. Second, political leaders, and increasingly electorates directly through referenda, are called upon to make tough policy decisions that could have impacts to downstream generations; oftentimes it is just easier to "kick the can down the road" and not make a decision. The bottom line takeaway from the projects surveyed in this paper, and many others, is that the successful ones are characterized by proactive stakeholder engagement initiatives combined with sound political leadership and most importantly a solid technical safety case that is appropriately and consistently communicated to and understood by the public.

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