

Wasting Time?

International lessons for managing Australia's radioactive waste

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Anica Niepraschk

Overview: For over two decades successive Australian governments have floundered when faced with how best to handle Australia's radioactive waste. They consistently tried – and consistently failed - to impose a national dump site on unwilling communities in South Australia and the Northern Territory. Now the federal government has a revised approach based on a foundation principle of volunteerism. Industry Minister Ian Macfarlane has called for nominations from around the country and is soon to release a short-list of possible sites where Australia's low level waste can be buried and longer-lived material stored above ground.

In her paper *Wasting time? International lessons for managing Australia's radioactive waste*, researcher Anica Niepraschk looks at how other countries have approached this challenge and what lessons might help Australia move away from a search for an 'out of sight – out of mind' dump site in favour of a responsible and effective management regime.

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List of Abbreviations

ANSTO	Australian Nuclear Science and Technology Organisation
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
CNSC	Canadian Nuclear Safety Commission
CoRWM	Committee on Radioactive Waste Management
DGR	Deep Geological Repository
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
GDF	Geological Disposal Facility
HLW	High-Level Waste
IAS	Independent Assessment Study
ILW	Intermediate-Level Waste
LILW	Low and Intermediate-Level Waste
LLW	Low-Level Waste
MOU	Memorandum of Understanding
MRWS	Managing Radioactive Waste Safely
MLT	Muckaty Land Trust
NGO	Non-Governmental Organisation
NLC	Northern Land Council
NRWF	National Radioactive Waste Facility
NRWMP	National Radioactive Waste Management Project
NT	Northern Territory
ONDRAS/ NIRAS	Belgium National Agency for Radioactive Waste and Enriched Fissile Material
OPG	Ontario Power Generation
SA	South Australia
SKB	Swedish Nuclear Fuel and Waste Management Company
SKI	Swedish Nuclear Inspectorate
SSI	Swedish Radiation Protection Authority
SSM	Swedish Radiation Safety Authority
WA	Western Australia
WWMF	Western Waste Management Facility

1 Introduction

Finding technically, geologically and socially accepted sites for the storage or disposal of all forms of radioactive wastes has proven an international challenge for decades. Many countries have chosen to engage in various voluntary siting processes after having failed to site facilities on solely technical and/or political grounds due to community opposition and public contest. Australia is the most recent country to develop a voluntary approach after the failure of earlier approaches to realise a site.

For two decades Australia has been trying to find a solution to the disposal and storage of its low and intermediate-level radioactive waste (LILW). Attempts to impose a national repository on communities in South Australia (from 1998 to 2004) and subsequently the Northern Territory (2005 to 2014) have failed amid Federal Court trials, leaving the Australian government needing to engage in a different approach to the challenge of siting a repository. The federal Department of Industry and Science has therefore started looking into alternatives to the previous approach of imposing a facility. In December 2014 it opted for a voluntary process, as this is currently the most common and successful international approach.

There are differences in how countries go about implementing such an approach, particularly in relation to timeframes and participatory components. After exploring previous siting attempts in Australia this paper outlines the current Australian National Radioactive Waste Management Project (NRWMP). It further looks at other international siting processes for radioactive waste facilities, providing an insight into how they can be staged and implemented and which of their features are most relevant in the Australian context.

Belgium, Sweden, the UK and Canada were chosen since they are all democratic countries with a long nuclear history and, as is the case in Australia, they all initially failed to find suitable and accepted sites to host repositories before engaging in a voluntary process. These examples highlight some lessons learnt during these often very lengthy processes and offer insights into key features of effective siting processes. These will be synthesised in a summarising chapter where the findings are applied to the Australian context to inform the NRWMP to improve the current process to increase its chance of succeeding and live up to its promised – and welcome – commitment to a voluntary process.

As this paper is going to focus on the inclusion of socio-economic aspects for the siting of radioactive waste facilities, it is not going to judge any technical features of the repository designs. Finding the technically safest and most suitable design is site-specific and a matter to be resolved by expert engineers in the context of the highest level of public accountability and scrutiny. This paper solely focuses on the different strategies pursued in finding suitable and accepted sites for radioactive waste management facilities in relation to aspects of good governance and participatory democracy.

2 The Australian National Radioactive Waste Management Project

The issue

High-level radioactive waste (HLW) in the form of spent (used fuel) from nuclear reactors or waste materials remaining from reprocessing, generates a lot of heat and ionising radiation for extremely long periods. It requires specialised and sophisticated management and this has been a very controversial and challenging issue in most countries that produce HLW.

Australia does not produce any HLW – or rather - it does in the form of spent fuel from the ANSTO Lucas Heights nuclear research reactor in southern Sydney, but this is not classified as waste as it is sent overseas for reprocessing, which counts as an economic activity. The reprocessed materials return as intermediate-level radioactive waste (ILW), with return shipments from France (and later the UK) starting in 2015.

The returning waste adds to the moderate amounts (4906m²) of radioactive waste, primarily produced through the manufacture of radioisotopes in medicine, research and industry.¹ The vast majority of this is low-level waste (LLW). This is planned to be disposed of in a shallow burial site designed to be monitored for one hundred years.² There are further small amounts of long-lived ILW that will need to be carefully managed for much longer periods. This involves the stabilisation of the radioactive materials followed by packaging in steel drums and storage in purpose-built concrete and steel chamber facilities, which can be either below or above ground.³

Australia's radioactive waste is currently managed and stored, mainly above ground or near surface, in over one hundred centralised and decentralised storage facilities near the sites that produce or use it. However over 90% of the waste is stored at two secured federal sites at Lucas Heights in NSW and Woomera in South Australia.

Historical background

The attempts to find suitable sites for a centralised national facility have been a series of failures for over twenty years. In 1992 the Australian government first initiated a nation-wide survey to site a LLW repository, starting off the National Repository Project.⁴ A number of social, technical and environmental factors were considered equally (as opposed to being weighted according to their importance) by a specifically designed geographic information system to find suitable sites. Eight regions across Australia were shortlisted in 1994.⁵

Resource restraints on the ability to further investigate all of these areas resulted in a focus on just one. Billa Kalina in South Australia's (SA) north was chosen as the preferred region to host the National Repository.⁶ Eighteen sites in the region were selected for test drilling to identify the most suitable final site, which was then to host

¹ Nuclear Fuel Royal Commission 2015: 7

² Safe management of LLW often requires monitoring for a few hundred years.

³ Nuclear Fuel Cycle Royal Commission 2015: 5

⁴ Australian Government Department of Industry and Science 2015 a

⁵ Australian Department of Primary Industries and Energy 1998: Fact sheet 6

⁶ *ibid.*

not just the shallow LLW repository but also an above ground storage facility for intermediate long-lived waste.⁷

An important group of Aboriginal women with cultural connections and responsibilities, the Kupa Piti Kungka Tjutas, strongly opposed the siting of any facility on their lands. They recalled the history of nuclear testing in SA during the 1950s and 1960s, which had serious negative health impacts involving blindness, cancers, asthma and many other impacts on a significant number of people. The Kungkas also feared health impacts caused by a radioactive waste facility, mainly through the possible contamination of ground water, a precious water source in the dry lands of northern SA.⁸

The Coober Pedy Committee against the Radioactive Waste Repository was formed and a number of activities were organised to oppose the government plans. These included public meetings, petitions, media briefings, the distribution of information, partnering with anti-dump groups, the production of a film, walks and presences at key events. They also tried to engage with the then responsible government Department of Industry, Science and Resources but felt that their concerns were not taken seriously. After continued pressure on the District Council and a very successful petition among the local residents, Coober Pedy was declared a Nuclear Free Zone in 2000.⁹

At the end of the same year, the SA Liberal government split from their federal party's position on the radioactive waste facility and passed legislation prohibiting the importation and dumping of ILW and HLW in SA. However, they did not pass a law against the LLW repository. In January 2001 the federal government announced Commonwealth Defence land in the Woomera Prohibited Area to be the preferred site for the facility. It claimed to have consulted extensively with regional stakeholders, although the local Elders had not been consulted on the issue.¹⁰

The first wins for the community came with the announcement that co-location of a LLW repository and an ILW storage facility was to be ruled out due to community pressure, thereby concentrating the project efforts on the LLW repository. In 2002 the newly elected Rann Labor state government legislated against any dump to be situated in SA.¹¹

This development did not stop the federal government from pursuing their objective and although several hundred submissions in opposition to the site were made following the release of the draft Environmental Impact Statement (EIS), the final document still recommended approval of the site. Additionally, the government announced \$300,000 funding to (re-) educate the public about the issue to quieten their concerns. At this stage even the federal Environment Minister's advisors urged the siting be reconsidered on the ground that the project faced opposition from Traditional Owners, who had not been adequately consulted. The Defence Department also publicly spoke out against hosting the site, as they were not

⁷ Kupa Piti Kungka Tjuta 2005: 10

⁸ ibd.: 11ff.

⁹ ibd: 14 f.

¹⁰ ibd. 39 ff.

¹¹ ibd. 42, 50, 55

adequately consulted during the EIS either. It stated that the EIS misjudged the risks of hosting a facility so close to a military target range.¹²

The objection from the Defence Department saw the final EIS recommend a site on a nearby pastoral property rather than the military land. Along with wide opposition, the then Minister for Environment stated that his decision followed ‘a rigorous and transparent assessment process with full public involvement.’¹³ The federal government furthermore stopped an attempt by the SA state government to prevent the dump by declaring it a public park thereby making it impossible for the Commonwealth to acquire the land without state consent. In response to this the Commonwealth urgently removed all native title, state and pastoral rights on the site in July 2003. The SA government subsequently challenged this compulsory land acquisition on urgent grounds in the Federal Court in 2004. The Court unanimously found the Commonwealth action to be unlawful. Despite this, the government still declared that it would proceed with the repository at Woomera. However, in the face of sustained opposition and in the context of the 2004 federal election, the federal government reconsidered the siting and finally announced the abandonment of its SA radioactive waste plans in July 2004.¹⁴

In this first attempt to site a national LLW repository in Australia, the Commonwealth worked strongly against local communities, repeatedly trying to force the repository on them. This approach saw many condemn the disrespect shown to the Indigenous and wider local people as well as the state government. Although local opposition succeeded in preventing the repository, the government did not learn from the process and just shortly after, in 2005, started a new siting attempt using similar means.

Instead of working towards a more consensus-driven solution, the government pushed in the opposite direction by trying to avoid state opposition in passing the *Commonwealth Radioactive Waste Management Act* in 2005 for the establishment of a National Radioactive Waste Facility (NRWF) in the Northern Territory (NT). This gave the federal government the ability to overrule any state legislation or position regulating, hindering or preventing the establishment of the NRWF. This further applies to provisions of the *Aboriginal and Torres Strait Islander Heritage Act* of 1984 and the *Environment and Biodiversity Conservation Act* of 1999. Furthermore, the legislation removed entitlements to procedural fairness as the Minister’s final siting decision is not considered a legislative instrument and thereby cannot be challenged through judicial review.¹⁵ This legislation was aimed at paving the way for three possible Department of Defence sites without any consultation of Traditional Owners, the state government or the community.¹⁶

The NT government and federal Labor party together quickly opposed this approach and called for a return to a consensus-driven and consultative process based on the already established scientific parameters. Concerns over the implications of the federal government’s overpowering approach for democratic representation were expressed and the higher chances for success of a transparent and consultative process

¹² ibd. 58 f.

¹³ ibd. 67

¹⁴ ibd. 69, 108 ff.

¹⁵ Lloyd, Brian 2006: 3, 6 f., 12

¹⁶ Wasley, Natalie 2012: 1

emphasised.¹⁷ Good governance, transparency and participation were thereby already clearly demanded in 2005 but they were still a long time from being heard.

At the request of the Northern Land Council (NLC) to allow for further site nominations apart from the three proposed sites, the *Commonwealth Radioactive Waste Management Act* of 2005 was amended a year later to provide for Aboriginal land nominations from Land Councils. It set out a two-stage process, where nominations to host the NRWF were sought in the first phase and a final site was to be selected in the second phase. Muckaty Station in Central Australia, nominated in 2007 by the NLC, was the only nomination received. An upfront payment of \$200,000 was issued, with a promised further compensation of \$11 million in cash payments and increased service provision should the land be declared the final site.¹⁸

In 2010 a local Aboriginal elder initiated legal proceedings against the nomination on the grounds of issues of ownership, consultation and consent. The nomination builds on the assumption that just ‘one sub-group of the Ngapa dreaming group is the exclusive Traditional Owner of the proposed site’.¹⁹ It therefore concluded that consent to the nomination would only be required from this group, which had indeed granted its support. Their decision was based on economic reasons including the hope of the promised funds enabling health and education programs in the area, as other funding was severely limited.²⁰ However, a land claim resolved in 1997 found that there are actually seven groups with different dreamings of this particular land and it therefore cannot be attributed to a single group. The proceedings were directed against the NLC, the Muckaty Land Trust (MLT), the Commonwealth and the Minister for Resources and was soon supported by other elders representing different dreaming groups, seeking the invalidation of the nomination.²¹ The then responsible Minister for Resources and Energy, Martin Ferguson, refused to meet with the Traditional Owners of the MLT to discuss the issue and did not even provide them with details of a contested deed of agreement, which allegedly was signed by the MLT. Instead, he announced that community engagement would only take place after the site selection.²²

Besides the group of Traditional Owners, a strong popular movement developed in opposition to the Muckaty site. This included the local community in Tennant Creek, trade unions, environment, anti-nuclear and social justice groups and wider Aboriginal organisations. Public rallies and meetings were organised, conferences held, submissions made and films, songs and exhibitions produced to further highlight the issues and concerns. This broad alliance began and continues to call for a comprehensive and independent inquiry into radioactive waste management that explores all available options to manage Australia’s radioactive waste, including decentralised management.²³

¹⁷ Lloyd, Brian 2006: 10 f.

¹⁸ O’Shea, Lizzie 2013: 35 f.

¹⁹ ibd: 36

²⁰ Wasley, Natalie 2012: 1

²¹ O’Shea, Lizzie 2013: 36

²² Wasley, Natalie 2012: 2

²³ see Beyond Nuclear Initiative 2014 b

The long conflict around a possible NRWF in Muckaty was finally resolved in June 2014. Two weeks into a Federal Court trial, the NLC and the federal government agreed with the applicants not to further pursue the Muckaty nomination. Traditional Owners announced they would oppose any possible future site nominations within the MLT and keep fighting for a nuclear-free Muckaty.²⁴ Once again, the top-down approach pursued by the Australian government failed to deliver a site.

After these convoluted, contested and ultimately failed attempts to impose a NRWF on communities in South Australia and the Northern Territory, the federal government appears to have finally accepted that a matter of such importance cannot be imposed on communities but rather has to be the result of a voluntary and transparent process.

The revised federal approach

The new NRWMP is structured in four phases. The first phase, aimed at providing a shortlist of potentially suitable sites, saw federal Industry Minister Ian Macfarlane call in March 2015 for landowners across Australia to nominate their land to host a radioactive waste facility. The two-month nomination period ended on May 5 and is followed by a desktop study to assess all the nominated sites. This will result in the shortlist which is expected to be released in July 2015. Once the shortlist is approved by the Minister and officially released, a public comment period of at least 60 days duration will take place.²⁵ This is supposedly the time when community engagement and consultation will begin to take place. The statement that ‘local communities will be provided with support, including access to information and education support services to assist with community understanding of the Project and to enable the Commonwealth to better understand the needs and priorities of affected communities’²⁶, leaves uncertainty about the extent that this interaction is actually consultative, as the framing rather points towards more transactional information platforms and events.

The second phase of the project consists of further site characterisation studies to determine if the shortlisted sites are technically suitable to host a radioactive waste facility. According to the current timeframe a preferred site might be identified by mid-2016. In phase three a Detailed Business Case would be developed to recommend a preferred design and engineering option for the facility and a broader community engagement strategy. On the basis of this information and the government’s approval of the Detailed Business Case, the Minister may select the actual site.

At no time leading up to the selection of a preferred site is there provision for the establishment of community consent to the siting. Although there is mention of the project seeking to ‘ensure that no site is perceived as being “imposed” from “above” but is the result of a voluntary, open and transparent process’²⁷, there are a number of questions about how this is to be realised in practise.

²⁴ Beyond Nuclear Initiative 2014 a

²⁵ Australian Government Department of Industry and Science 2015 b: 6

²⁶ ibd: 9

²⁷ ibd: 9

A successful siting process would also commence wider facility licencing procedures, which involve the assessment of the selected site and proposed facility design in regards to compliance with relevant laws and regulations. These processes would involve the Department of the Environment, through the *Environment Protection and Biodiversity Conservation Act*, and ARPANSA, the Australian federal nuclear regulator. The actual construction and operation of the facility (phase four) is dependent on gaining the necessary approvals and an operating licence, which is not expected before 2018.²⁸

Arising challenges

Even though the current process is still in its early stages, it already either faces new challenges or has not yet dealt with older ones. Despite repeated calls by civil society organisations for an independent Inquiry into the full range of radioactive waste management options available, the government has instead continued its preferred option of a centralised radioactive waste facility. This leaves the current process vulnerable to criticism that the waste should remain at the sites where it is produced rather than being transported long distances through Australia, posing the risks of accidents on the way and the risk of an out of sight - out of mind approach in a remote area far away from expert oversight.

A continuing concern remains the federal government's perception of urgency to solve the siting challenge, which is used as a justification for avoiding a more time consuming approach based on extensive consultation and consensus. Other countries have recognised that the provision of realistic timeframes is an essential condition in successful siting processes. The Australian government, despite the last 20 years of unsuccessful, rushed and pressured approaches, has again chosen to be bound by a rigid and self-imposed timeframe, trying to resolve the siting in around 18 months.

The current *National Radioactive Waste Management Act* (2012) is democratically compromised, as it provides for key legislation to safeguard cultural heritage and the environment as well as state legislation to be overridden in order to declare a site. SA, WA, Victoria and the NT all have state legislation in place prohibiting the storage or even transportation of radioactive waste from outside the state or territory. The federal government's call for all Australian landowners to consider making a site nomination has failed to address this conflict of undermining existing laws and a 'voluntary' process.

The government so far has declined to release a list of all nominated sites as it committed to do in the nomination guidelines and refers to doing so only at the time of a shortlist being released. A range of non-for profit organisations across Australia called for the immediate release at the end of the nomination period but the government failed to inform and include the public at this stage raising concerns over its stated values of transparency and consultation.

A number of site nominations in northern SA and in WA which have become public all face opposition by local Aboriginal communities and some by the wider local community. It remains uncertain how these nominations will be handled in this context. Might they be shortlisted anyway and how will the project engage with the

²⁸ ibd: 5f.

communities in that case? Due to already arising community opposition, it seems likely that possible sites will be contested again, which might see the government back to where it failed in the earlier siting attempts in SA and the NT.

3 International siting processes: Experiences and lessons

3.1 Sweden

Although Sweden is one of the countries with the highest share of nuclear produced electricity, the issue of storing nuclear waste was not considered until the 1970s. The Government ruled the KBS-3 method (direct geological disposal without reprocessing), developed by the Swedish Nuclear Fuel and Waste Management Company (SKB), as suitable and the company has since engaged in a process to find a site to implement it.²⁹

SKB has never reassessed its approach of using the KBS-3 method although it is highly contested by civil society for various technical reasons. Many calls have been made for an analysis of alternative methods to ensure the safest and most suitable method is chosen for the storage of Sweden's HLW prior to any siting process.³⁰ In retrospect, SKB could have avoided a lot of the confrontation with civil society and public questioning of the method by commissioning an independent assessment before seeking to identify a site for a repository with a technology that might not be the most suitable for the Swedish context.

Eventually SKB succeeded in selecting a site for its nuclear fuel repository. Site investigations were concluded in 2007 and in 2009 SKB selected Forsmark in the municipality of Östhammar as its preferred site to host a national geological repository for spent nuclear fuel. It submitted its application to build the repository to the Swedish Radiation Safety Authority (SSM) and the Land and Environment Courts in March 2011.³¹ The application is currently under review with a result expected by 2017 and it is worth having a closer look at how this result came about:

The original process

SKB originally intended to find the most geologically suitable site in Sweden to dispose of HLW based on the bedrock conditions. Test drilling began in a number of municipalities in the 1980s. This took place without SKB informing the local population or even sometimes with the company trying to carry out the drillings in secret. This caused strong protests on the side of the local residents, which were described as acts of extremism and propaganda by SKB, a highly polarising approach.³²

As a result, SKB had to adjust its approach from concentrating on technical features to accepting local community involvement as the primary factor in the siting process. In 1985 some drilling operations were stopped due to protests and the Waste Network, formed between local groups in areas affected by the investigatory drillings,

²⁹ Holmstrand, Olov 2006: 415 f.

³⁰ *ibid.*: 1999: 4

³¹ SKB 2015

³² *ibid.*: 6

was invited to discuss the situation. In 1990 the Swedish Nuclear Inspectorate (SKI) initiated the DIALOGUE-project as a joint research project between SKI, the Swedish Radiation Protection Authority (SSI), municipalities and environment organisations, including the Waste Network. This initiative sought to bring stakeholders with conflicting interests together to reach a common agreement.³³ SKB, however, refused to participate in the project.

Although constituted by diverse participants, the DIALOGUE-project reached some common conclusions, including that other actors than SKB should be allowed to participate in any repository Environmental Impact Assessment (EIA) and be given resources to do so. Furthermore it was proposed that the EIA process be coordinated by an independent authority rather than the pro-nuclear SKB and that the siting process be carried out in a systematic way and announced in advance, so stakeholders know what to expect and when.³⁴

In the meantime SKB realised the difficulties with its purely technical approach particularly that it was perceived as imposing a repository on a local community and in 1992 the company adopted a new approach based on voluntarism.

The revised, voluntarist process – a staged learning experience

In the beginning even this approach did not seem to be very effective. In October 1992 SKB contacted all 286 Swedish municipalities explaining the planned project and inviting expressions of interest to participate in feasibility studies for hosting the repository. Feasibility studies ‘were partly exploring the feasibility of a working partnership between local communities and SKB. The purpose of the feasibility studies was to collect information about the general suitability of the potential sites (e.g. environment, infrastructure/transport, socio-economic status, local industries, geology). The aim was to gather existing knowledge about the areas, not to conduct much new research. Only if a workable local partnership between the community and SKB could be established and the feasibility studies showed that the area could be suitable would the option of a site investigation be offered.’³⁵ Although the approach led to feasibility studies being carried out in two municipalities, both, in a subsequent residents referendum, decided not to further continue participating in the siting process. As no more expressions of interest were coming forth, the siting process once more seemed stalled.³⁶

It became clear that no broad support for hosting a geological repository could be expected from communities that did not have a nuclear history. A number of existing nuclear communities had ignored the initial letter due to it not being perceived as directed towards them. SKB therefore started looking directly into their suitability for hosting the repository and ‘given the likely presence of appropriate bedrock in several of these communities, the existing infrastructure, as well as the established knowledge and competence in these locations is deemed important for defining them as prospective sites for a deep repository’.³⁷

³³ Päiviö Jonsson, Josefin/ Westerlind, Magnus 2006: 246

³⁴ Holmstrand, Olov 2006: 419

³⁵ OECD 2010: 83

³⁶ Elam, Mark/ Sundquist, Göran 2006: 504 f.

³⁷ *ibid.*: 505

In a renewed effort, four out of the five existing nuclear communities were specifically approached by SKB. Two of these Oskarshamn (after setting up conditions for its participation) and Östhammar agreed to participate in feasibility studies. Another municipality decided not to take a formal decision on the issue as it was perceived not to make a difference in case SKB deemed the location suitable for a feasibility study.³⁸ As became clear later on, the fact that SKB lived up to the expressed intention of not imposing a repository on an unwilling community gave other communities the confidence and trust to continue participating in the siting process, knowing that by doing so they did not automatically commit to hosting the repository but could opt out at any time. This verbal commitment and corresponding action was especially crucial in the Swedish process as the national government can legally override a municipal veto in matters of siting a nuclear waste dump if deemed in the ‘national interest’.³⁹ However, SKB would have to appeal to the government to override and its promise not to do so was crucial to establish municipal confidence in the process. As a result, municipalities have the option to withdraw from the process before the feasibility studies are carried out, before further site investigations are taking place and before the actual construction of the repository started.⁴⁰ A municipality also has further influence in the repository planning through its role in the Environmental Impact Assessment (EIA) outlined below.

Due to the changed approach three further municipalities, all of them neighbouring Oskarshamn and Östhammar, agreed to feasibility studies which were completed in 2000. SKB proposed three municipalities for further site investigations, however only Oskarshamn and Östhammar agreed after involving their local communities. The agreement was conditional with a number of terms outlined by the municipalities, including detail on the origin of the waste, the possibilities for public participation in the process and independent oversight of SKB’s research and conclusions.⁴¹

Site investigations started in 2002 and, besides providing the geological data necessary to investigate the suitability for hosting a repository and necessary safety arrangements, also formed the basis for submissions in the course of the Environmental Impact Assessment. As an Instrument of the Swedish Environmental Code, this process requires detailed statements to be submitted to ‘Environmental Courts’. ‘Here the possible and expected impacts of the two planned facilities on the natural environment, human health and society are to stand in focus. The question of alternative siting must be seriously addressed, as must the use of alternative methods for achieving the same technological ends. In addition, the option of carrying out no development at all must be addressed (the so-called zero-alternative) for both an encapsulation plant and deep repository.’⁴² The EIA is a process encompassing a range of stakeholders and offers opportunities for public participation and the strengthening of the municipality’s role in the process.

³⁸ *ibid.*

³⁹ The veto will not take effect if it can be shown that there is a more appropriate site alternative or another, equally suitable community that would be willing to host the repository.

⁴⁰ OECD 2010: 84 f.

⁴¹ Elam, Mark/ Sundquist, Göran 2006: 506 f.

⁴² *ibid.*: 508

Participatory elements of the process

Both municipalities have taken participation in the siting process seriously and specifically established groups to follow and inform the process. Oskarshamn followed the ‘Oskarshamn model’ which stresses openness, participation and transparency through various frameworks. The project office called ‘Local Competence Building’ was set up early in the process according to the model, with the municipal council as the reference group. Working within the EIA framework, its objective was to prepare comprehensive basic documentation for the municipal council’s decision in case SKB suggested siting the repository in Oskarshamn. It monitored SKB’s activities, investigated relevant issues, built capacity in the local community and engaged with it and neighbouring communities, while following international developments in radioactive waste management. Its structure changed over time adapting to new challenges and changes in the public focus. Different working groups encompassed council members and politicians, municipal civil servants, representatives from various organisations such as environment organisations, landowners, experts and interested local and neighbouring residents. The working groups also sought information from and engaged with SKB and the regulators (in 2008 SKI and SSI merged to form SSM – the Swedish Radiation Safety Authority) and prepared reports to inform upcoming council decisions.⁴³

While engaging in different ways during the implementation of the feasibility study, the Nuclear Waste Repository Project and further groups were established in Östhammar in 2002 to ensure continuous engagement with the siting process. These included a group of civil servants working on administrative issues, groups to feed into the EIA process and work on information and safety issues as well as a consultative group bringing representatives from the municipal council, NGOs and neighbouring communities together to discuss issues related to the repository. In addition, the regional EIA fora offered further opportunities to engage with SKB and the regulators, which both municipalities made use of.⁴⁴

While both communities actively participated in the siting process, it is worth looking at how this participation was facilitated and how other stakeholders could be involved as well. Whereas the original process provided for reimbursement of the costs occurring for participating municipalities by SKB, ‘Oskarshamn and the other municipalities involved in the feasibility studies successfully influenced the national government and in 1995, the Act on Nuclear Activities was changed so that funding for the municipalities’ involvement was paid directly through the Nuclear Waste Fund (a fund contributed to by the nuclear operators to cater for radioactive waste management and decommissioning activities).⁴⁵ This enabled the municipalities to participate independently from nuclear industry funding and pressures. The funding is intended to facilitate the participation in the local EIA as well as monitoring and evaluating issues concerning the disposal of nuclear waste and its impact on the environment and human health. While it was originally limited to participating communities, it was expanded to neighbouring communities and interested parties, like non-governmental organisations (NGOs) in 2004.⁴⁶ Several organisations, mainly

⁴³ OECD 2010: 85 ff., 90

⁴⁴ ibd. 88 ff.

⁴⁵ OECD 2010: 91

⁴⁶ ibd.: 91 ff.

nuclear-critical and environmental organisations had advocated for civil society's eligibility for funding over many years, arguing that it would be 'reasonable to take local objections and standpoints seriously into account by providing sufficient economic means so that also critical standpoints could be worked out and brought into the process of decision-making in the society, locally as well as nationally'.⁴⁷ In consequence, three NGOs were awarded funding and their involvement was an essential component in fostering transparency and accountability in the process as they provided independent monitoring and ensured that critical issues would be addressed.

It should, however, be noted that the consultative approach SKB engaged in still did not live up to other stakeholder expectations and was criticised on a number of issues including a failure to neutrally assess alternative storage methodologies. 'There are also examples of how SKB tried to play down the alternative expert conclusions that organisations wanted to raise by saying that the organisations did not have enough knowledge to participate in the discussion on equal terms with SKB.'⁴⁸ The EIA should, however, be a dialogue platform to ensure all relevant questions by concerned stakeholders are satisfactorily addressed in the process, thereby being a tool for a participatory deliberation. This also requires that the outcomes of these deliberations have an impact on the actual decision made. SKB, in this process, did not always pay respect to these aspects, using 'consultative' meetings more for distributing information than enabling deliberation and trying to shape the discussions in their interest, rather than allowing a discussion between equals.⁴⁹ The Swedish experience therefore also offers insights in the challenges of participatory deliberative processes.

Lessons learnt

- ∞ A thorough siting process should address the repository's health and environmental impacts and assess alternative options of handling the waste to ensure the best methodology for the particular environmental and socio-economical context is chosen before engaging in a siting process.
- ∞ A purely technical approach to the siting of a nuclear waste repository does not take into account the various socio-economic aspects influencing such a project and is unlikely to succeed.
- ∞ Putting out a call for volunteer nominations does not necessarily result in a large number of actually suitable or possibly successful applications.
- ∞ Pursuing efforts to host a nuclear waste repository in communities without a nuclear history has less chance of success.
- ∞ Existing nuclear communities, if geologically suitable, have several advantages for hosting repositories: existing infrastructure, knowledge and competence and an increased acceptance for nuclear issues.
- ∞ Trust is an essential factor for the successful siting of a repository.
- ∞ Commitments to volunteerism, even if verbal, have to be observed to gain and retain trust from participating communities.
- ∞ The participation of a wide range of stakeholders including communities and civil society organisations is essential to ensure a transparent siting process with the best

⁴⁷ Holmstrand, Olov 1999:3

⁴⁸ Johansson, Hanna Sofia 2006: 280

⁴⁹ ibd.: 275, 280

possible outcome and public acceptance. Their participation should be facilitated with funding and be independent from the nuclear industry.

- ∞ A truly participatory approach should be open to alternative opinions and not be dominated by one party or pre-determined outcome. Such an approach should offer true arenas for deliberation that can influence the outcome of the decision.

3.2 Canada

The other international examples in this paper all showcase voluntary processes where communities are actively solicited to host radioactive waste management facilities, as is the case in Australia, however this case study explores a municipality actively initiating the process. In Canada this is the case in several locations, both for legacy LLW and for operational LILW. This chapter concentrates on the latter as an example of how community support for a repository can be established and the challenges can arise even if that is achieved.

The background

Kincardine is a municipality on the shores of Lake Huron, Ontario, close to the US border. This region has hosted a nuclear power station since the 1960s and the Western Waste Management Facility (WWMF) for the intermediate storage of LILW since the 1970s. WWMF receives waste materials from all of Ontario Power Generation's⁵⁰ (OPG) reactors and Kincardine has a long nuclear history.⁵¹ 3500 people are locally employed in the sector and OPG has established good relationships with the community which is familiar with nuclear issues and reportedly feels a responsibility to provide a long-term solution to the radioactive waste produced in its midst.⁵²

OPG had been contemplating an expansion/upgrade of the WWMF for disposal of LILW since the 1980s but was not actively seeking to advance this when the municipality of Kincardine expressed interest in entering into discussions about the long-term management of the waste in 2001. Besides the above-mentioned factors, Kincardine's decision was also fuelled by the potential for future economic benefits from the nuclear industry following the recent termination of community impact payments.⁵³

In 2002 Kincardine Municipal Council signed a Memorandum of Understanding (MOU) with OPG with the objective of developing a long-term plan for the management of LILW. An Independent Assessment Study (IAS) by an expert consultant had the objective of identifying the safety and technical feasibility of various management options: enhanced processing and long-term storage, deep geological repository and covered, above ground concrete vault disposal. Furthermore, the socio-economic impact of current and potential operations was to be assessed and European and American LILW management examples to be reviewed, including in respect to technical infrastructure and community compensation.⁵⁴

⁵⁰ Previously Ontario Hydro

⁵¹ OECD 2010: 44

⁵² IAEA 2007: 29

⁵³ ibd: 30; OECD 2010: 44;

⁵⁴ IAEA 2007: 30

The results of the study were presented in the IAS report in 2004. It concluded that all three analysed waste management options were feasible and safe and would not have significant adverse effects on the environment for LLW and some of the options could also involve handling some of the ILW. It also indicated that no significant negative social effects were expected and that there would be economic benefits for the community if engaging in long-term radioactive waste management.⁵⁵

Involving the community

Community information about the assessed options of involvement in radioactive waste management and community consultations were part of the IAS. In April 2004 following the review of the resulting report the municipal council indicated its support through endorsing the 'Deep Rock Vault' or Deep Geological Repository (DGR) as its preferred option for long-term radioactive waste management. The decision was mainly based on the perceived highest safety level through a DGR, its permanent isolation of the LILW and the potential economic benefit to the community. Important factors in the council's confidence were the agreement that no HLW would be stored at the facility, that there would be a detailed environmental assessment (EA) and that the community had an opportunity for input before any final approval.⁵⁶

Consequently a hosting agreement for the implementation of the DGR at the WWMF site was negotiated with OPG and signed in October 2004. It provided for community consent to be a necessary condition before any legal approval could be sought, giving the community a right-to-veto for the repository. It further comprised payments to the communities of Kincardine and four adjacent municipalities, a property value protection plan compensating for actual losses as a result of property devaluation due to the repository and the provision for the further creation of local employment. During a three-month consultation period, a storefront Community Consultation centre was established in Kincardine as a contact point to obtain information, raise questions and express feedback or concerns. In addition briefings on the proposed GDF were held with key stakeholders and community leaders. A telephone poll was subsequently conducted in February 2005, with a participation rate of 72% with 60% of respondents in favour of the facility. Following the support in Kincardine, OPG focused its communication efforts on the neighbouring communities and the two local First Nations communities.⁵⁷

Although significant community support had been established, OPG still had to satisfy the regulatory approval process. In December 2005 it filed a project description with the Canadian Nuclear Safety Commission (CNSC) initiating the EA. A Community Consultation Advisory Group was established to provide regular updates on the status of the project, identify emerging issues and concerns in the community and advise on community consultation activities. It was comprised of representatives from Kincardine and neighbouring municipal councils and OPG and is funded by OPG. Plans were made for the establishment of a nuclear centre of excellence, trades and vocational schools and community benefit payments, provided in the hosting agreement, are being disbursed. In addition to annual payments (planned from 2005 to 2034) the C\$ 35 million benefit package comprises one-off

⁵⁵ ibd., Golder Associates 2004

⁵⁶ IAEA 2007: 31

⁵⁷ ebd.: 32 f.

payments linked to key project milestones. The first of these was issued in 2005 following documentation of community support while the second one is scheduled for the actual GDF construction approval.⁵⁸

Current status and challenges

Over the last few years several challenges have arisen in a process that initially seemed so promising for OPG. Sparked by changes to a number of environmental laws, including the change of responsibility to conduct EAs from the Canadian Environmental Assessment Agency to CNSC, the impartiality of the EA review panel became widely questioned. Although the EA provided further opportunity for (funded) community and civil society participation, CSNC is widely regarded as a strong nuclear proponent. A series of internal controversies over radiation protection and a failure to hold nuclear companies accountable raised concerns over CSNC's commitment to environmental protection and further eroded its credibility as an independent regulator.⁵⁹

Although evidence of leaks and accidents at existing radioactive waste facilities were repeatedly emphasised during the 14 years of study and consultation of the EA, the review panel's final report released in May 2015 supported the construction of the DGR at the shore of Lake Huron.⁶⁰ This decision was based on the panel's conclusion that no significant adverse environmental effects were expected. With the facility being expected to store radioactive waste for thousands of years, there is widespread concern that no one can effectively guarantee that no environmental harm will be caused. The release of the report was followed by a statement from the Saugeen Ojibway Nation who do not approve of a radioactive waste facility at the site due to fears of contamination of the world's largest fresh-water system. As a result, it could have negative impacts to the water supply in the Great Lakes Basin, a very highly populated area in both Canada and the USA. OPG has repeatedly committed to not proceeding with the project without the approval of the local First Nations. It now faces questions why the site is supposed to be the best possible for an endeavour with such unique and far-reaching risks and might have to justify why it did not examine other potential sites, which could have shown to be more suitable. Having pursued only one location because it was volunteered is now backfiring for OPG, which is facing wide public opposition to the DGR siting by 154 cities across Canada and a large number of civil society and environmental organisations.⁶¹ There is also growing concern and active opposition to the project in the United States. Most recently, a citizen's group challenged the review panel's recommendation in Federal Court, arguing that it failed Canada's international obligations, violated environmental law and was biased.⁶²

The Federal Environment Minister normally has 120 days to decide on authorising the panel to issue a licence to prepare the site for the repository. This period has currently been extended until after the upcoming federal election, giving rise to further criticism of the process as political and fraught.⁶³ Construction of the DGR may be expected by

⁵⁸ OECD 2010: 39 ff.

⁵⁹ Hendrickson 2015

⁶⁰ ibd.

⁶¹ Gowan 2015

⁶² The Canadian Press 2015

⁶³ Perkel, Colin 2015

2018 and might last seven years.⁶⁴ It is uncertain whether the necessary approvals will be given or how OPG will react to the growing local, national and international opposition to the project.

Lessons learnt from the process

- ∞ Just because a site is volunteered does not necessarily mean it has wider public support or is the most geologically suitable site. This puts the siting process at increased risk of opposition and failure.
- ∞ The support of the local Indigenous people is essential to avoid imposing a radioactive waste management facility.
- ∞ Communities with nuclear history are more likely to be interested in hosting a radioactive waste facility.
- ∞ Co-hosting radioactive waste management facilities with other nuclear activities has the benefit of the affected communities already being aware of some implications and risks and the advantage that potentially unsafe and unpopular nuclear transports could be minimised.
- ∞ Good relationships with the operator and a good safety record contribute positively to the establishment of trust from the community, an essential factor in any agreement to host a facility.
- ∞ Independent assessments of radioactive waste management options can contribute to communities being willing to consider hosting a facility as it provides them with an increased ability to consider associated risks and benefits. Informed decision-making carries less potential for future conflict.
- ∞ Consultations and contributions only have real meaning if they are taken into account by the decision-making institutions and reflected in decision making. Consent to a siting decision is an essential factor of any voluntary process.
- ∞ Continuous community engagement throughout the entire process and the provision of a test for community support are essential conditions for a community to agree to enter a hosting process.
- ∞ Neighbouring communities which may be affected by a facility should also be included in communications, consultations and compensation.
- ∞ Community and civil society participation can be facilitated through funding and capacity support. This should be non-binding, not tied to the delivery of a specific outcome and delivered through an independent mechanism.
- ∞ Environmental and wider impact assessments form part of an informed decision making process and should be carried out by independent institutions and agencies with a high level of expertise, transparency, accountability and credibility.

3.3 The UK

The UK produces high-level radioactive waste and therefore has different storage requirements than Australia. However its attempts to develop an inclusive and transparent path towards finding a sustainable solution to the long-term management of radioactive waste, characterised by its emphasis on technical expertise and community engagement, can usefully inform the Australian NRWP.

⁶⁴ ibd.

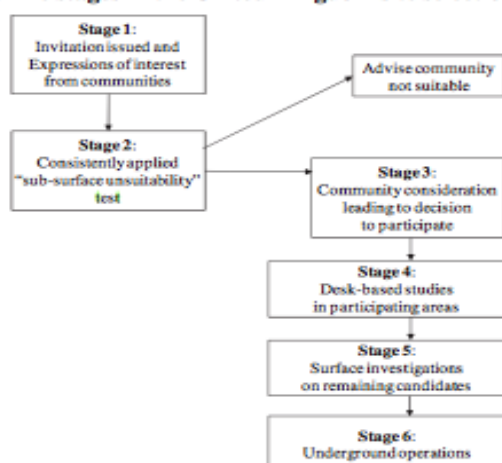
The original process

The UK government started a process of long-term disposal of its HLW in 2001 with the Managing Radioactive Waste Safely (MRWS) programme. The Committee on Radioactive Waste Management (CoRWM) was set up to investigate options for the safe storage of the waste and in 2006 recommended a Geological Disposal Facility (GDF) in combination with secure interim storage, a position which was adopted by the government.⁶⁵

As a result of comparative international experience and the failure of prescriptive/directive processes, the government decided on an approach based on voluntarism in hosting the proposed GDF to help enhance the quality and public acceptability of any chosen site. “In principle an approach based on willingness to participate, with the ‘Right of Withdrawal’ should allow progress to be made only at a speed communities are comfortable with. It should also force an implementing body to address issues of concern to local communities before any final decision can be made.”⁶⁶

The Government initially engaged in a process based on 6 stages, as shown below:⁶⁷

Figure 1. The stages in the United Kingdom site selection process



As set out in a 2008 White Paper the process was based on a series of agreements from community and local decision-making bodies to engage in the next stage, followed by further site investigation and renewed community assessment. After five years of this process between 2008 and 2013 a number of communities had participated in its early stages, but none progressed beyond Stage 3. By February 2013 none of these communities were still involved and, with the process stalled,⁶⁸ the need for a revised process was clear.

A learning process – reviewing and reshaping

A 2013 review aimed at finding a way forward for the siting, partly by engaging communities more effectively, saw the UK government considering lessons learnt, engaging key stakeholders and putting out a wider Call for Evidence. This culminated

⁶⁵ Department of Energy and Climate Change 2013: 10f.

⁶⁶ *ibid.*: 14.

⁶⁷ Graphic as in OECD 2010: 106.

⁶⁸ Department of Energy and Climate Change 2014 b: 8.

in a Consultation Review⁶⁹ that delivered suggestions on how to improve the process, followed by a period of public consultation. In July 2014 a Government Response to the review was issued together with a new White Paper for the implementation of the review process.⁷⁰

The Consultation Review was based on a process of ‘Learning’ and ‘Focusing’ phases that sought to make it more continuous. This was a reaction to the previous process working through a number of ‘decision points’ for continued participation that were seen to put pressure on communities before they might even be informed enough to make such decisions. Additionally to the non-binding ‘Learning’ phase, pre-emptive pressure for a community commitment was supposed to be reduced by introducing a continuous ‘Right of Withdrawal’ throughout the whole siting process with any final decision directly involving the local population:

“There would clearly still be decisions to be made throughout such a process, not least to enter the process initially, to form the consultative partnership bodies required in later stages, and finally to agree (or not) to proceed with the development of a GDF. The process in any given area could also only progress at the pace at which the representative authority was prepared to move, but the UK Government would not require commitments to proceed. The community, through its representative authority, could continue to progress through the siting process as long as it wished to, while retaining a Right of Withdrawal.”⁷¹

In contrast, the previous process only allowed for Withdrawal up to Stage 5, before any underground operations to confirm the site’s actual suitability. It was widely seen that this reduced community confidence in the process.

The proposed ‘Learning’ stage should ensure information is made available and discussed early on in the process, including on regional geology, the inventory of waste for disposal, the generic socio-economic impacts on a hosting community and the scale and time of a community benefit package. Independent reports, financed by the government, can also be produced during the ‘Learning’ phase and help inform the local representative authority if it wished to proceed into the ‘Focusing’ stage.

If a community has proceeded to that stage, potentially suitable sites within the community will be identified and investigated in more detail. ‘At a suitable point in the ‘Focusing’ phase, there would be a requirement of a demonstration of community support as the final step of the siting process.’⁷² Community consent is made a condition for the project to go ahead, seeking to leave the final decision-making power in the hand of the community and helping ensure voluntarism throughout the whole process.

The 2014 White Paper acknowledges the quality and importance of these proposals and sets the stage for their implementation. It paves the way for a continuous process without ‘artificial barriers’ and goes beyond the recommendations to help ensure

⁶⁹ Department of Energy and Climate Change 2013.

⁷⁰ Department of Energy and Climate Change 2014 a and b respectively.

⁷¹ Department of Energy and Climate Change 2013: 25.

⁷² *Ibid.*: 6

inclusive community engagement through a community working group to drive community input.

The White Paper provides for no one level of local government to be able to veto the siting, so that it remains a decision of the whole community to take. It's therefore an objective of the working group to specify which criteria a 'test of public support' will have to fulfil, as this will be the last determining factor in the siting process. A community can decide at any point of time to cease the discussions with the developer, which will halt the process in the area, and in case of a negative outcome of the 'test of public support' there will be no imposition of a GDF on a community. The working group also provides high-level information on community investment both for communities participating in the process and any that might host the final facility. It has already been decided that the latter will receive funding to mitigate the impacts of the project as well as additional investment funding and that community investment will be made available early on to participating communities, comprising £1 million per year in the beginning and £2.5 million per year when borehole investigations commence.

The working group seeks to work alongside a national geological screening exercise to develop and apply an early assessment of geological potential and actions in national land-use planning in England. This implies that participation of interested communities will not begin before these initial actions are completed, at the earliest in 2016.

*"This new siting process will provide more information to communities before they are asked to get involved. With greater clarity on issues like geology and development impacts, community investment and community representation, communities will be able to engage with more confidence in the process to deliver this nationally significant infrastructure project."*⁷³

No predetermined deadlines are applied throughout the process to ensure its truly voluntarist character and in order to both reflect and satisfy the criteria of extensive public engagement and consent. The extended community approach thereby complements the technical expertise applied throughout the process, aiming for the best site possible.

⁷³ Department of Energy and Climate Change 2014 b: 6.

The following graphic illustrates the new process outline and possible timeframe:



(Graphic as in Department of Energy and Climate Change 2014 b: 29)

Criticism and open questions

As the siting process in the UK is ongoing it might well change over time. It is therefore necessary to monitor developments and analyse their impact upon the voluntarist character of the process. The most radical of such potential developments would be the government deciding to follow a completely different, non-voluntarist approach. This is a particular concern as it has specifically reserved its right to do so if voluntarism fails.⁷⁴ Clearly it is hoped that such a drastic process reversal will not occur.

Some environmental organisations including Greenpeace and Friends of the Earth have also criticised the Government's approach of paying community benefits for participating in the siting process, describing these as bribes and false incentives to motivate communities to even consider the option. Paying benefits is indeed a controversial issue in radioactive waste management siting processes with one side arguing as above and the other that a community taking on such a high risk as hosting radioactive waste should at least benefit from it in some way. It is clear that poverty or the lack of viable economic alternatives is not an ethical or acceptable rationale for siting such facilities.

Further concerns have been expressed over the fact that local government does not have a right of veto in the process as well as the recent inclusion of a GDF and borehole drilling under the Planning Act 2008 in the list of Nationally Significant Infrastructure Projects. This means that local planning can be by-passed by a pre-determined decision making process that does not require community consent. These

⁷⁴ Department of Energy and Climate Change 2014 b: 31.

valid concerns over the threat of an undemocratic and imposed process have to be addressed if the UK process is to credibly respond to critics. In the White Paper and public comments, and also in recent and direct correspondence between the author and the responsible department, the government has clearly expressed that the outlined community engagement will work alongside the process of Nationally Significant Infrastructure Project Approval and that no decision will be taken without the clear consent of the community. This commitment is not as strong as legislation and therefore the possibility of the Government not living up to its promise still remains. Currently however there is reason to believe that a voluntarist approach really is favoured and that it will hopefully prevail.

Lessons learnt

A truly voluntarist approach requires:

- ∞ Early and extensive provision of geological, technical, socio-economic and other information to communities, including independent analysis
- ∞ Continuous engagement and debate throughout the siting process and beyond. This must be without artificial barriers and informed by the community.
- ∞ Clear communication and negotiation about community benefit and investment
- ∞ Time for communities to make an informed decision ie/ no imposed timeframe
- ∞ A continuous Right of Withdrawal
- ∞ Recognition – preferably in law - of the essential nature of community consent on the final siting decision.

3.4 Belgium

Belgium has long produced radioactive waste from nuclear energy generation and medical purposes and first used to dispose of its LLW in the sea. However when Belgium decided to adhere to the 1983 International Moratorium of the Dumping of LLW, ONDRAS/ NIRAS (the Belgium National Agency for Radioactive Waste and Enriched Fissile Material) had to look for other ways to dispose of the waste on Belgium territory. ONDRAS/ NIRAS first concentrated on the short-term storage of the waste and, after this had successfully been completed, started developing solutions for the long-term management of its LILW in the late 1980s.⁷⁵

The original process

ONDRAS/ NIRAS first conducted a number of studies on the best option of storing Belgium's LLW. In 1990 the first of these recommended shallow land burial (also termed near-surface disposal) to be the most technically feasible, secure and cost-effective option as compared to disposal in old charcoal mines or quarries and deep geological disposal. Shallow burial was therefore chosen as the option to be pursued by the agency. Further studies investigated the technical feasibility of this option for various geological formations with a 1994 report stating the feasibility of disposing at least 60% of the short lived LLW produced in Belgium at surface level and identifying 98 zones in the country as potentially suitable, drawing on a bibliographical survey.⁷⁶

⁷⁵ Hooft, E./ Boyazis J.P./ Bergmans A. 2007: 13 f.

⁷⁶ ibd.: 14.

The report was received positively by a multidisciplinary scientific advisory panel which recommended the process be expanded to include economic and human science issues. However the public reaction was quite different. All local councils in the listed zones unanimously rejected the report. While ONDRAS/ NIRAS argued it had chosen the best way to find a (technical) solution to radioactive waste management in Belgium by adopting a scientific and rational approach, it now had to realise that this alone did not characterise a successful site selection process. A revised process, incorporating technical as well as socio-political, ecological and economic aspects of a repository had to be developed.⁷⁷

Ensuring stakeholder engagement - a partnership approach

The new process was launched in 1998 ‘based on the principles of (a) voluntarism, (b) local participation in the decision-making through joint project development, (c) site specific repository design, and (d) development of an integrated repository project.’⁷⁸

All Belgian municipalities were invited to participate in an approach that would investigate possible sites while discussing the implications of hosting the facility. A municipal council decision was necessary for municipalities to declare willingness for participation, which did not equate to an agreement to actually host the repository. Municipalities could stipulate the conditions under which they would participate and therefore had a de-facto, although not legally explicit, right of veto.⁷⁹ This veto right was regarded as an essential factor for the process success as it empowered the communities by giving them the responsibility for influencing their own future. Only a few municipalities showed interest in the process and local partnerships were formed: STOLA in Dessel in 1999, MONA in Mol in 2000 and PaLoFF as a joint partnership of the municipalities of Fleurus and Farcennes in 2003.⁸⁰

All of these municipalities already hosted some nuclear activity, although the participation of Fleurus-Farcienne is attributed to the perceived opportunities for economic development rather than the small-scale nuclear activities and site of one operating company already in the municipality. However, in ‘both Dessel and Mol clearly the main reason to engage in the programme was the presence of the temporary storage facility at Belgoprocess, the nuclear companies, the nuclear research centre’⁸¹, along with a nuclear history dating back to the 1950s. The local communities were therefore already somewhat sensitised to the nuclear industry and its impact on the local economy.

The partnership approach sought to be as inclusive as possible from the beginning. It was developed and later facilitated and monitored by the Universities of Antwerp and Liège, which engaged in extensive surveys in the municipalities to establish the variety of interests and opinions involved and identify who the community would want to participate in the partnership and what its structure was going to be.⁸²

⁷⁷ OECD 2010: 21.

⁷⁸ Bergmans, Anne/ Van Steenberge, Annelies 2006: 512.

⁷⁹ Note the difference to the revised process in the UK, where a continuous Right-of-Withdrawal was an essential feature for communities to have trust in the process. In Belgium, the process was simply based on the trust that ONDRAS/ NIRAS would uphold their statements of not imposing a facility.

⁸⁰ Bergmans, Anne/ Van Steenberge, Annelies 2006: 512, 514.

⁸¹ *Ibid.*: 513.

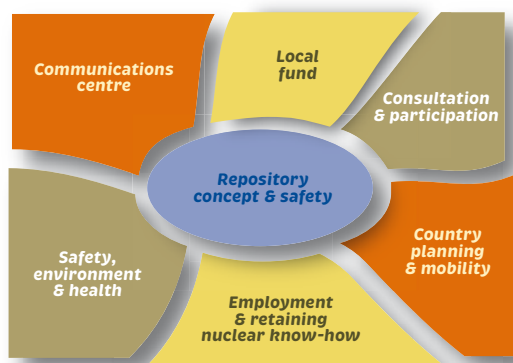
⁸² OECD 2010: 22.

The partnerships were composed of council representatives, ONDRAS/ NIRAS and civil society representatives like environmental, cultural, social and socio-economic organisations. These partners were eligible to vote on the proposed project before handing it to the municipality and represented a wide range of views and expertise regarding the management of radioactive waste. The diversity of input was widened by the inclusion of individual interested citizens in working groups that helped prepare and shape the project proposal.⁸³

The responsibilities of the partnerships included communication with the local population, inviting them to participate in the debate and the provision of information of the partnership's activities and related issues. The main objective was the development of an integrated project proposal that included not only site investigations and the development of a repository design but also a socio-economic package for the area.

The Belgian partnerships are funded with an agreed annual lump sum by ONDRAS/ NIRAS and are structured as non-profit organisations. They include working groups focussing on issues such as implementation and design, safety, public health and the environment and local development.⁸⁴

ONDRAS/ NIRAS had the main influence on the design and concept of the repository through putting forward propositions that were then critically discussed and examined by the partners. Partner groups would also sometimes commission additional studies or engage external experts to assist with oversight and help make well-informed decisions. The co-ownership of the outcome and adaptation to the local needs was aided by the integration of an accompanying socio-economic or other local project to ensure community benefit if hosting the repository. This interdependent and inseparable character of the process was to be captured in naming it the 'integrated project for surface disposal of category A waste in Dessel' – the cAt project.⁸⁵



The seven building blocks of the cAt project⁸⁶

Pivotaly, the partnerships were not given time limits to develop their proposals but could take the time they needed to do so thoroughly and make informed decisions. The three participating partnerships took between two and six years each to present a

⁸³ Bergmans, Anne/ Van Steenberge, Annelies 2006: 514.

⁸⁴ Ibid.

⁸⁵ Ibid.: 514 f.

⁸⁶ Graphic from NIROND 2010: 29

proposal to their municipal council, reflecting the different needs and conditions of communities in engagement.

Successful siting and the way forward

All of the three partnerships established in the new process recommended the siting of a repository in their municipalities and developed integrated project proposals. However only the proposals for the neighbouring municipalities of Dessel and Mol were accepted by the local councils and thereby made official candidates to host the LILW-repository. In 2006 the federal government decided on a surface disposal to be located in Dessel, closely situated to Mol on the site indicated in STOLA's proposal. Since this time both municipalities partnerships have been closely involved in the development of the integrated repository project.⁸⁷

Although the municipalities seemed to trust ONDRAS/ NIRAS commitment to honour the integrated character of the jointly designed proposal, there was more scepticism about the strength of this from other important players, especially the federal government and waste producers. Both communities therefore only put themselves forward to host the repository under the condition that a range of local demands were met, including the upholding of a participatory decision making structure. This was followed by the two municipalities introducing by-laws for the continuation of the local partnerships into the next phase and STOLA's transformation into STORA.⁸⁸

The co-operation between ONDRAS/ NIRAS and STORA and MONA was institutionalised on both an administrative level (in integrated decision making and project orientation through a steering group) and 'an operational level of preparatory discussions, monitoring and implementation of studies and action'.⁸⁹ They maintain essential influence in diverse domains such as administering the Local Fund that was introduced to implement socio-economic, cultural or other projects to finance opportunities for sustainable community development. This is divided in two sub-funds, one for each of the two municipalities and seeks to provide benefit to the community beyond any direct value emanating from the project through jobs, infrastructure development and such, however it is not meant to be used to fund matters of common council responsibility. The value of the Local Fund was estimated at €90-110 million. The partnerships are also involved in design discussions, monitoring of the project and spatial planning. They are also mainly responsible for the establishment of an Information Centre and intended Knowledge Centre to retain and further develop nuclear know-how in the area, both quite special features of the project to ensure public information about the project as well as specialised nuclear waste management knowledge. STORA and MONA furthermore requested to be involved in other nuclear activities in the area, apart from the waste issue.⁹⁰ Beyond the engagement in the current project phase, the partnerships will also be involved in diverse ways in the operational, closure and post-closure phases of the project.

⁸⁷ OECD 2010: 21.

⁸⁸ Bergmans, Anne/ Van Steenberge, Annelies 2006: 512 f., 515 f.

⁸⁹ OECD 2010: 23.

⁹⁰ NIROND 2010: 8 f.

As can be seen, through making continuous involvement a condition for the approval to the siting of the nuclear waste management facility on their land, the municipalities have helped ensure their role throughout the entire project. All partners have concluded that “the success of the primary goal of the cAt project, i.e. safe disposal of category A waste, largely depends on the relationship with the social environment and on support of the repository”⁹¹.

Lessons learnt from the process

- ∞ Socio-political and economic aspects, in addition to technical criteria, are essential criteria in selecting a suitable and accepted radioactive waste management site.
- ∞ A radioactive waste management repository should not be imposed – a right-to-veto for the community, either legal or an effective de-facto veto, is pivotal.
- ∞ Partnership or close collaboration with local communities and stakeholders is at the heart of a voluntary approach that places emphasis on ownership and consent.
- ∞ Inclusive community and key stakeholder engagement requires sufficient time (several years) to make well-informed decisions on the siting of a repository and ensure its wide acceptance. The decision on how much time is actually needed should lie with the community.
- ∞ Community engagement does not have to be limited to the siting and operational process but can rather be extended to include wider community projects and facility design.
- ∞ Long-term involvement of the local community throughout the duration of the project (beginning with the siting and continuing throughout the operational and closure period) improves its acceptance, is essential for successful operation of the repository and can ensure the community receives maximum benefit.
- ∞ Interest in hosting a LILW-repository is more likely when the local community is already familiar with nuclear activities of some sort.
- ∞ Co-hosting radioactive waste management facilities with other nuclear activities has the benefit of the affected communities already being aware of some implications and risks, adding to the advantage that risky nuclear transports being reduced.
- ∞ A community benefit fund can be a means of acknowledging the service the community provides to the wider public through accepting nuclear waste and the associated risks and long-term impacts. The communities should administer the fund themselves for the development of sustainable socio-economic projects.

4 International experience and lessons for Australia

The international case studies highlight some features that are essential to a successful voluntary siting process. This chapter aims to explore these characteristics and how they feature in the current Australian context and make recommendations for possible improvements of the Australian approach based on the international experience.

All over the world attempts to site radioactive waste management facilities, no matter of what level of radioactivity, based on purely technical and/or political considerations have been ineffective. Public and community opposition has

⁹¹ ibd.

repeatedly halted such approaches. The current international consensus is that siting processes should be voluntary, with no imposition of any facility on a community and that socio-economic factors have to be considered equally and together with technical criteria.

As with any approach to radioactive waste management the voluntary one faces challenges. If a call for voluntary nominations is not based on a preceding geological base-survey of the most suitable geographical areas, it is possible that many of the nominated sites may not be technically suitable to host a radioactive waste repository. And even if a base survey has been conducted, there is no guarantee that wider communities in the proposed areas are actually willing to host a repository.

Countries deal with these possibilities in different ways. Often these have been reactionary to a first failed attempt. In Australia these factors pose a risk for the NRWMP. So far, there has been no official statement on what alternatives might be pursued if the current nominations do not fulfil the necessary criteria to safely host the proposed national facility. Most critically, it has to be ensured that the government does not just settle for a site that only fulfils the minimum safety standards necessary, just because it might be the most or only accepted site available. Settling for a sub optimal location, even if it is the best of the nominated ones, should be strictly avoided. In this case, the government should embark on revising its approach to find a safer but still publicly accepted site.

Interestingly in all the cases presented siting has only been successful in communities with a nuclear history of some sort, such as hosting a nuclear reactor or intermediate storage facilities for radioactive waste. Even when other communities had shown initial interest in hosting a radioactive waste facility, they ended their engagement in the siting process quite early on. This shows that it is much more likely for a repository to be hosted by a community already familiar with the nuclear industry. An already existing positive relationship with the respective nuclear operator can furthermore contribute to a community showing interest. Co-hosting a repository with other nuclear activities can also reduce the risks in transporting radioactive waste materials to the facility as transport can be reduced or minimised.

Australia currently has a limited number of nuclear activities and stores its radioactive waste materials in a large number of intermediate storage places, most of which are very small. Only the site of the Australian Nuclear Science and Technology Organisation's nuclear reactor and larger radioactive waste storage facility at Lucas Heights would reflect this international experience.

To be truly voluntary community and public opinion has to be effectively taken into account by the respective decision making institutions and reflected in decisions. This means that commitments to not impose a repository on any community have to be observed. Showing respect towards informed decision-making necessitates providing local communities and the wider public with the necessary time and information. This is an essential factor to build trust towards the implementing agency.

Furthermore, a truly voluntary process acknowledges the role of the communities by engaging with them throughout the whole duration of the project. This should not be limited to the siting process but extend to the construction, operation and closure

phases of the project. As the case of Belgium shows, communities can engage on issues such as the facility design and wider community implications e.g. facility monitoring and socio-economic projects. The early provision of information is essential in providing the community and wider public with the possibility to commission studies, reports and expert opinions. This encompasses an extensive assessment of environmental impacts and of alternative methods and siting options as major references to base a meaningful siting decision on for both the implementing agency and the community.

These provisions enhance transparency and accountability and help build a more trusting relationship with the community. They raise the chance of a successful siting process as it is based on an informed decision and allows communities to feel more confident. Indigenous communities and Traditional Landowners play a central role in the siting process in some countries. Their consent and close engagement is critical and this is key in Australia where the process is highly likely to involve Traditional Owners. Furthermore, community engagement should also encompass neighbouring and wider transport corridor communities affected by the project.

It is pivotal that a non-restrictive timeframe is applied in siting processes, providing all stakeholders with sufficient time to make informed decisions. In the international case studies this has sometimes shown to require years. Given the longevity of radioactive waste this increased time investment early in the process is justified and necessary. When the community feels comfortable to make a decision on the matter, a credible test of community support should be taken to establish its position. Similarly, the right-to-veto the government's or operator's siting decision can also provide the community with the final say on hosting a facility or not. In general, a community should be able to leave the siting process at any time if wished. As the UK example shows, this was one of the main factors communities wanted when consulted on how to improve the siting process and has further proven to be a key feature of all the siting processes, making engagement really voluntary.

In Australia, the timeline of the NRWMP has been decided upon by the government and is extremely tight. This self-imposed timeline reduces the room for the community to gather the information needed to make an informed decision and works against the realisation of full and informed consent. The current timeframe, which envisages a decision on the preferred site to be taken by mid-2016, seems to be driven more by political considerations and electoral timelines rather than pursuing a participatory approach.

Community engagement, as in actually acknowledging the communities opinion and developing a project together, is not adequately embraced in the current approach. The project outlines a period of two months for public comment on the initial shortlist and during this time, information events will be held in the affected communities, providing an opportunity to express their view on hosting a national facility. These are not consultations as such and no inclusive, long-term engagement strategy with communities to build trust in the project and enable informed decision-making has been detailed. This is highlighted by the lack of a provision requiring community consent. In fact, a nomination cannot even be withdrawn after the approval of the shortlist, before detailed site investigations start. This is quite early in the process and it is not unlikely nor unreasonable for a nominator to change their opinion or

community opposition to arise at that stage. All the mentioned points leave room for a repository to be imposed on a community either against its will or without its full awareness and informed consent thereby undermining the whole voluntary character of the revised Australian approach.

To avoid such a negative outcome the government needs, at a minimum, to commit to only siting a facility in a location that fulfils all the technical criteria and enjoys broad community support, expressed through a clear test of support and the provision of a right to veto. Furthermore, the strict timeline of the NRWMP should be revisited to make room for extensive deliberations and the gathering of all information needed to make informed decisions, such as studies, commissioned reports, expert panels etc. Communities and nominators should also enjoy the right to withdraw from the process at any point before the final decision.

All the international examples enabled community engagement through providing funding for a community to use according to their own needs to engage effectively on the issue. Additionally, some countries provide benefit packages for communities participating in the process and/or hosting the planned facility as a way to compensate for the efforts and risks associated and further drive local development, apart from the economic benefits already associated with the project such as employment and infrastructure – which in the Australian context are negligible. It is important that communication on funding or contributions is very clear from the beginning and that it does not compromise the position of the community on the issue and can be handled independently from nuclear operators or facility proponents.

In the case of Australia community engagement is completely carried out and funded by the NRWMP and aimed at supporting the understanding of the project, instead of providing room for engaging on the issue. This transactional approach does not allow for the community to engage in ways it finds meaningful and should be replaced or complemented. The federal approach states that a benefit package for the hosting community is to be negotiated with the affected community to fit the specific needs. This is positive in that it recognises that communities have different development visions and requirements, but it fails to provide adequate detail or context.

In the countries looked at in this paper the above-mentioned characteristics have all emerged as central in driving their siting process for radioactive waste repositories. Apart from this framework, there is no standard procedure to follow and all countries design the process to fit the local requirements and build on past experiences. As long as the key aspects are taken up, it seems like there is a lot of room to create a voluntary process suiting the particular environment and culture.

5 The way forward

A number of characteristics have internationally proven to be crucial for the success and integrity of a voluntarist approach. The current process around the Australian NRWMP could be strengthened in relation to almost all of these.

Affected communities, particularly Aboriginal communities and neighbouring communities, should be engaged early and inclusively throughout the siting, construction, operation and closure of the planned facility. This should be done through providing the information and time required to make an informed decision and engaging in transparent, accountable, participatory and deliberative processes that culminate in a credible test of community support, which should be decisive for the facility to be built or not. Communities engaged in the process should be facilitated to do so through the provision of funding of the necessary activities and be able to opt out at any point if wished.

In the end, a community willing to host a facility is not enough for it to be actually located there, as a large number of geological, technical and other factors have to be taken into account to allow for the safest possible management of the radioactive waste. It is crucial that health and environmental safety standards do not get reduced if the available voluntarily nominated sites do not provide optimal conditions for hosting a national facility. The government needs to be open and flexible enough to learn from its experience and reshape its approach to finding the most suitable site for the purpose. There is no question that the handling of radioactive waste, with its unique and highly dangerous properties, requires the highest level of safety provisions and scrutiny.

If the government is serious about its voluntary intentions and wants to be successful in the siting of a radioactive waste repository, the changes and issues outlined in section four of this background paper need to be incorporated into the NRWMP. The project is still in its early stages and can easily accommodate and develop around these requirements. Whether or not these issues are addressed will be an important test of how willing the government is to learn from its own and international experiences and the prospects for ultimately realising responsible radioactive waste management in Australia.

Bibliography

- Australian Department of Primary Industries and Energy 1998: Information Kit. Our Radioactive Waste. Managing it Safely. Community consultation, Canberra
- Australian Government Department of Industry and Science 2015 a: Resources. National Radioactive Waste Management Facility. History; under: <http://www.radioactivewaste.gov.au/history> (last viewed 22/05/2015)
- Australian Government Department of Industry and Science 2015 b: Radioactive Waste Management. Nomination of Land: Guidelines 2015; under: <http://www.radioactivewaste.gov.au/files/files//Nomination%20Guidelines.pdf> (last viewed 22/05/2015)
- Australian Government Department of Industry 2014: Capital Works Construction Project. Long term Management of Australia's Radioactive Waste. Initial Business Case (Revised); under: <http://www.radioactivewaste.gov.au/files/files/IBC%20revised%20FINAL.pdf> (last viewed 22/05/2015)
- Bergmans, Anne/ Van Steenberge, Annelies 2006: Stakeholder Involvement in Radioactive Waste Management in Belgium: the Past, the Present and Challenges for the Future, in: Kjell Anderson (Ed.) 2006: VALDOR 2006. Proceedings, Stockholm, 512-519
- Beyond Nuclear Initiative 2014 a: Muckaty nuclear waste plan DUMPED; under <http://beyondnuclearinitiative.com/muckaty-nuclear-waste-plan-dumped/> (last viewed 27/05/2015)
- Beyond Nuclear Initiative 2014 b: Responsible Radioactive Waste Management in Australia: The Case for an Independent Commission of Inquiry, under <http://beyondnuclearinitiative.com/wp-content/uploads/2014/06/Radioactive-Waste-Management-The-need-for-an-Inquiry.pdf> (last viewed 27/05/2015)
- CEAA 2015: Availability of federal funding to assist participation in the upcoming consultation of the proposed DGR project; under: <http://www.ceaa-acee.gc.ca/050/documents/p17520/101258E.pdf> (last viewed on: 04/05/2015)
- CEAA 2007: News Release. OPG Proposed Deep Geological Repository Referred to a Public Review Panel; under: <http://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=22074> (last viewed on 04/05/2015)
- Department of Energy and Climate Change 2014 a: Government Response to Consultation. Review of the Siting Process for a Geological Disposal Facility, London
- Department of Energy and Climate Change 2014 b: Implementing Geological Disposal. A framework for the long-term management of higher activity radioactive waste, London

- Department of Energy and Climate Change 2013: Consultation. Review of the Siting Process for a Geological Disposal Facility, URN 13D/250, London
- Elam, Mark/ Sundquist, Göran 2006: Stakeholder Involvement in Swedish Nuclear Waste Management; in: Kjell Anderson (Ed.) 2006: VALDOR 2006. Proceedings, Stockholm, 504-511
- Golder Associates 2004: Final Report on Independent Assessment of Long-Term Management Options for Low and Intermediate Level Wastes at OPG's Western Waste Management Facility; under http://www.nwmo.ca/uploads_managed/MediaFiles/544_IndependentAssessmentStudy.pdf (last viewed 05/05/2015)
- Gowan, Rob 2015: First Nations oppose Ont. Nuclear waste burial deal; under: <http://www.torontosun.com/2015/05/08/first-nations-oppose-ont-nuclear-waste-burial-project#> (last viewed 12/05/2015)
- Green, J./ Weasley, N./ Sweeney, D. 2014: Responsible Radioactive Waste Management in Australia: The Case for an Independent Commission of Inquiry; under: <http://beyondnuclearinitiative.com/wpcontent/uploads/2014/06/Radioactive-Waste-Management-The-need-for-an-Inquiry.pdf> (last viewed on 01/05/2015)
- Hendrickson, Ole 2015: See you at the ribbon cutting? Federal panel approves nuclear dump on Lake Huron; under: <http://rabble.ca/columnists/2015/05/see-you-ribbon-cutting-federal-panel-approves-nuclear-dump-on-lake-huron> (last viewed 12/05/2015)
- Holmstrand, Olov 2006: Nuclear Waste Management in Sweden in Comparison with other European Countries - NGO Experiences of the COWAM Process, in: Kjell Anderson (Ed.) 2006: VALDOR 2006. Proceedings, Stockholm, 284-291
- Holmstrand, Olov 1999: Participation of Local Citizens Groups in the Swedish Nuclear Waste Process, under: <http://www.avfallskedjan.se/file/11.pdf> (last viewed on 22/04/2015)
- Hooft, E./ Boyazis J.P./ Bergmans A. 2007: Local partnership for developing an integrated project for the disposal of low level short lived waste – The Belgian experience; in: IAEA 2007: Low and Intermediate Level Waste Repositories: Socioeconomic Aspects and Public Involvement. Proceedings of a Workshop held in Vienna, 9-11 November 2005, TECDOC 1553, Vienna, 13-19
- Johansson, Hanna Sofia 2006: The Siting of Swedish Nuclear Waste: An Example of Deliberative Democracy?, in: Kjell Anderson (Ed.) 2006: VALDOR 2006. Proceedings, Stockholm, 273-281
- Kupa Piti Kunga Tjuta 2005: Talking Straight Out: Stories from the Irati Wanti campaign, Coober Pedy
- Lloyd, Brian 2006: The National Radioactive Waste Facility, Research Papers of the Parliamentary Library Service, 1/2006, Northern Territory Library

- NIROND 2010: Masterplan. The cAt project in Dessel. A long-term solution for Belgian category A waste; under: http://www.nirascat.be/downloads/cAt_masterplanENG.pdf (last viewed on 13/03/2015)
- Nuclear Fuel Cycle Royal Commission 2015: Issues Paper Four: Management, Storage and Disposal of Nuclear and Radioactive Waste; under: <http://nuclearrc.sa.gov.au/app/uploads/2015/04/Issues-Paper-Management-Storage-and-Disposal-of-Waste1.pdf> (last viewed 22/05/2015)
- OECD 2010: Partnering for Long-term Management of Radioactive Waste. Evolution and Current Practise in Thirteen Countries, NEA No. 6823, Paris
- O’Shea, Lizzie 2013: Muckaty and Radioactive Waste; under http://119.9.9.28/wp-content/uploads/2014/06/Muckaty_and_radioactive_waste_Lizzie-OShea.pdf (last viewed 27/05/2015)
- Päiviö Jonsson, Josefin/ Westerlind, Magnus 2006: SKI’s engagement in the process for siting a spent nuclear fuel repository; in: Kjell Anderson (Ed.) 2006: VALDOR 2006. Proceedings, Stockholm, 245-248
- Perkel, Colin 2015: Delay in nuclear waste decision sign burial plan politically fraught: critics; under: <http://london.ctvnews.ca/delay-in-nuclear-waste-decision-sign-burial-plan-politically-fraught-critics-1.2415916> (last viewed on 15/06/2015)
- SKB 2015: SKB – Swedish Nuclear Fuel and Waste Management Co; under: http://www.skb.se/default_____24417.aspx (last viewed on 24/04/2015)
- The Canadian Press 2015: Burial of nuclear waste near Lake Huron subject of legal action; under: <http://www.cbc.ca/news/canada/toronto/burial-of-nuclear-waste-near-lake-huron-subject-of-legal-action-1.3111403> (last viewed 15/06/2015)
- Wasley, Natalie 2012: Protecting Manuwangku: Radioactive Wrongs or Indigenous Rights; under: http://119.9.9.28/wp-content/uploads/2014/06/120203_Protecting-Manuwangku_ILB-article.pdf (last viewed 27/05/2015)