

End of the (Fuel) Cycle: What can South Australia learn from the world?- 17047

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ABSTRACT

This project consists of a study of five countries' nuclear waste policy histories, a review of the presence and role of bureaucracy, how these factors have influenced their citizens' attitudes towards nuclear waste and progress made towards the planning, siting and construction of nuclear waste repositories. A survey was sent to a selected stratified sub-group of the community questioning their attitude towards the location of a potential nuclear waste repository in South Australia and what the most influential factor responsible for their opinion was.

France is currently in the process of converting its underground nuclear waste research facility in Bure into the country's first high-level nuclear waste repository. Sweden is also constructing an underground high level nuclear waste repository, after decades of planning, community engagement and candidate site selection processes. The Nuclear Energy Agency estimates that Switzerland will construct a low and intermediate level nuclear waste repository by 2035 and a high level nuclear waste repository by 2045¹. Finland will be the first country in the world to successfully construct and operate a high-level nuclear waste repository and it is expected to be operational in 2023.

The project summarises the most influential factors affecting the success of five case-study countries in managing their nuclear and radioactive waste and apply them to an Australian context. It also highlights the outcome of the surveys and connects the result to those previously conducted in the five case-study countries.

INTRODUCTION

On the 15th of May 2015, the South Australian government convened a Royal Commission to investigate the potential for the nuclear fuel cycle in South Australia². On February 2016, the Commission released its Tentative Findings report, where almost all aspects of the fuel cycle were deemed commercially redundant in South Australia in the near future, except for one: the management, disposal and storage of nuclear waste. The Commission expressly stated that 'an integrated storage and disposal facility would be commercially viable and the storage facility could be operational in the late 2020s'. The 'commercially viability' of the project was estimated by the report to be near the order of several hundreds of billions of dollars over its life.

The aims of this project are, first and foremost, to assess the most influential factors to the successes and failures of five chosen countries in nuclear waste

management and storage. Secondly, we will critically analyse the role of public opinion, how it is shaped and how it has shaped the policy history of each of the selected countries. In doing so, we will discuss, analyse and compare for each selected nation: the policy history of nuclear waste storage, current and historical developments in construction of radioactive waste repositories and the shifts in public and community attitudes towards radioactive waste storage over time. Finally, we aim to assess current opinion of radioactive waste storage in South Australia, uncover the most influential factors and summarise the most pertinent aspects to the successes of each of the five selected nations.

AUSTRALIA

The lucrative appeal of nuclear waste storage has lured successive Australian governments to undergo successive, numerous and failed attempts at establishing radioactive waste facilities within the country, since about 1980. During the 90s, the state and federal governments attempted to collaborate to successfully locate and construct a nuclear waste repository in Australia and conducted several-phase studies. The process, 'as with everything to do with the nuclear industries anywhere in the world... was significantly over-run' and was further complicated by other contingencies, such as changes in the public mentality and in government³.

Any developments into nuclear waste repositories are usually demolished at the state level: in 1998 the findings of a pilot study into nuclear waste storage were rejected by the Northern Territory government and in 2004, the then-South Australian state government, led by Australia Labor Party³ premier Mike Rann, torpedoed a renewed federal initiative (under former Coalition leader John Howard) to locate one in SA, despite its widespread and ongoing support for uranium mining (at the exact opposite end of the nuclear fuel cycle) within the state⁴. In the year prior, opposition to storage and disposal of low and intermediate level waste within the state was estimated at around 72%⁵. A legacy of distrust towards nuclear energy is particularly evident in South Australia, where nuclear weapon testing was conducted during the middle of last century at the expense of the existing communities.

In 2012, the then-Labor minority government renewed its commitment to radioactive waste management and passed the *National Radioactive Management Act*, laying the foundation for another attempt at selection and acquisition of a site for a radioactive waste repository, this time on a voluntary basis⁶. In late 2014, the Minister for the Department of Industry, Ian Macfarlane, announced the commencement of a nationwide nominations process for site selection – the first of four planned phases leading to the construction and operation of a national radioactive waste storage facility, anticipated for completion by sometime in 2020.

FRANCE

The French process for repository siting is controlled and democratic. 'Voluntarism', where local municipalities volunteer to host disposal facilities, is embedded into these political processes, as is the principle of 'waste zoning' – the segregation of nuclear waste as much as possible from all other sectors⁸.

France has actively addressed the issue of nuclear waste storage and management since the late 1960s; the Waste Act⁹, Known formally as Law No. 91-1381 of 30 December 1991, on Radioactive Waste Management Research, set out a policy timeline for the next 15 years, at which time it was to be replaced, as per its directive, by new laws based on 'an overall assessment of research' in the interim period. The law mandated the involvement of 'locally elected officials and the population of the affected sites'¹⁰.

In the early 90s ANDRA, the National Radioactive Waste Management Agency, encountered numerous difficulties engaging in the communities it had identified as potential radioactive waste storage sites. Public demonstrations caused then-Prime Minister Michel Rocard to issue a 12 month moratorium on site drilling and local stakeholders at the departmental level 'refused to talk with ANDRA'¹⁰.

In almost direct contrast to the nation's progress in developing radioactive waste sites and repositories, only 36% of the nation's respondents believed that "deep underground storage represents the most appropriate solution for long-term management of high-level waste"¹¹. Effects on the environment and health constituted the greatest risk of siting a radioactive waste repository in half of both French and European respondents and just over half of both populations expressed their wish to be participate in the decision making process and be directly consulted.

SWEDEN

SKB, the Swedish Nuclear Fuel and Waste Management company, is a 'joint associate company' founded by the state's nuclear power plant operating companies in 1977 'to develop a comprehensive concept for the management of and disposal of used fuel and other radioactive wastes'¹². In 1977, SKB completed construction on one of the world's first nuclear research underground laboratories in abandoned mine in Bergslagen, north of lake Mälaren and slightly north-west of Stockholm County. The underground laboratory was closed in the early 90s and moved to Oskarshamn, where it operated from 1990 to 1995¹³.

SKB's studies and municipal engagement are considered **Error! Bookmark not defined.** an exercise in 'creating trust', with SKB deliberately emphasizing the social acceptance side of nuclear waste management over the 'geological barrier'. SKB have a track record of responding and adapting 'to demands from actors in the surrounding world' – both scientific and social, while maintaining their original

technical design concepts for disposal sites. The nuclear industries are important employers in both Östhammar and Oskarshamn municipalities and, in Oskarshamn, the issue of siting a high-level nuclear waste disposal facility is 'not controversial anymore'¹⁶.

FINLAND

Finland is expected to become the first country in the world to construct a high-level nuclear and radioactive waste repository¹⁷¹⁸. Called 'Onkalo'¹⁹, it is to be located 450 meters below ground level on Olkiluoto Island, near a nuclear power plant, in the south west of the country. Onkalo is currently under construction by developer Posiva Oy, who is confident in their ability to entomb spent radioactive reactor fuel for hundreds of thousands of years¹⁷¹⁸. Posiva Oy, like Sweden's SKB, was created by the two of the nation's utility companies, Fortum and Teollisuuden Voima Oy, in 1994²⁰²¹. The repository is expected to cost somewhere within the region of £2.3bn to USD\$4.5bn¹⁷¹⁸. Its built capacity is 12,000 tonnes and it is encased within 1.8 billion-year-old bedrock¹⁸.

Olkiluoto Island was chosen after two decades of research because of the area's distinct lack of natural resources, circumventing potential issues with accidental drilling, and the Eurajoki municipality's citizens' familiarity with the two nuclear power stations already located on the island. The municipality retained a right of veto in the final decision on the repository site location and Posiva Oy sought community acceptance 'in every phase of the project', persisting in their community engagement and 'construction of a pro-nuclear political network' for over two-decades to win over the Eurajoki municipality support¹⁹. Even then, in 2012, 35% of Eurajoki residents (the municipality containing Onkalo) were against the siting of a nuclear waste repository in the area¹⁹.

SWITZERLAND

In 1972, the Swiss Federal Government and the nation's nuclear power plant operators created Nagra, the National Co-operative for the Disposal of Radioactive Waste²²²³. Nagra is the nation's primary nuclear waste management body and oversees all disposal activities. They are also responsible for all activities involving disposal facilities, such as data collection and other siting requirements and provide 'expert services' to third, possibly international, parties. Every five years, Nagra prepares a Waste Management Program 'describing the steps for treatment, interim storage, and disposal of all radioactive waste in Switzerland'²².

Stage 1 of Switzerland's site selection program began with a 'white map of Switzerland' – meaning the entire country was under consideration – and was purely a technical evaluation of each area's safety and feasibility. These areas underwent testing against a set of 13 criteria, conceived by Nagra²⁴. This stage composed five steps and investigations spanning over 3 decades.

The aim of Stage 2 was to locate a storage facility in each of the above identified regions 'and to narrow down the number of siting regions to at least two of each type' (HLW and L/ILW)²⁴. This process involved 'regional conferences', where overall, approximately 100 representatives from each corresponding region attended the conferences, with all relevant information from each conference being published on a dedicated website²².

The siting region issued their verdict on the location of a surface nuclear waste repository on January 2014^{22,24}. Nagra then systematically narrowed down the number of siting regions based on 'safety arguments and required quantitative analyses', qualitative analyses and 'technical feasibility as defined by the Sectoral plan'²⁴. Stage 2 is anticipated to be completed in 2016²².

Stage 3 will essentially review each of the Stage 2 regions in a more detailed examination and conduct, 'where necessary, supplementary geological investigations from the surface'²⁵. This Stage will identify which regions are to be selected for general license application, which, among other tasks, includes a 'preliminary analysis of operational safety' and reports on environmental and economic impacts²⁴. The Sectoral Plan also outlines compensation measures for the chosen municipalities and mandates the negotiation and publication of these details²⁵.

The objective of Stage 3 is to select one final disposal site for each repository type and it is anticipated to be concluded by 2022²². This will culminate with a 'national referendum option' on the final location of the repository, although it is unclear whether the Swiss parliament will be bound by the results.

RECOMMENDATIONS & ANALYSIS

The following recommendations are made for the Australian federal and state governments' continued pursuit of success in nuclear waste management and storage. They are based on the analysis of the five case study countries presented in this report, and they capture the parts and aspects of nuclear waste management processes in these other countries which have led to progress in this area:

- 1) Coordinated, bipartisan, consistent cooperation across all levels of government (local, state and federal)

Essential, given the numerous failures in prior Australian nuclear waste repository projects due to inconsistencies in state, federal and local government approaches.

- 2) Develop and implement a long-term national primary and secondary education campaign where the topics of nuclear energy and nuclear waste are integrated into all Australian schools

Finnish and Swedish societies are among the most educated in the world in their understanding of nuclear waste, as evidenced by consecutive Eurobarometer surveys on the subject. Public education is critical to the development and maintenance of informed opinion and informed debate on the topic of nuclear waste storage, and correlates positively to progress in this area.

- 3) Survey as much of the population as possible to ascertain each community's level of acceptance

This was done in Switzerland, Sweden and Finland, and was an instrumental step in determining the location of their (planned or actual) nuclear waste repositories. Quantitative and qualitative data describing each municipality's (electoral division, in Australia's case) opinion on the location of a repository within their area is crucial to obtaining a social license to operate one.

- 4) ANSTO must play a greater role and be lawfully empowered to act as necessary to facilitate community acceptance and become the nation's official nuclear waste management agency. It's headquarters should be relocated to South Australia (with Lucas Heights remaining as a branch facility)

Each case study nation examined created a national nuclear waste management agency which fulfils critical roles in this area, such as: education, community consultation, data management, technical and analytical processing, population surveys, repository design and marketing.

- 5) Harmonise and finalise revision of ARPANSA (Australian Radiation Protection and Nuclear Safety Agency) and ratify or adopt the highest international standards of radioactive waste management and disposal (e.g. IAEA standards)

Necessary to demonstrate the highest standards of waste stewardship to the nation's stakeholders and international observers, as well as to update Australian legislation which, currently, does not contain provisions concerning nuclear waste management and is thus inadequate at meeting the demands of this industry.

- 6) Contract a fixed price with customers of an Australian international high-level waste repository (Taiwan, Japan and South Korea)

Among the most influential factors determining the attitudes of South Australian citizens towards nuclear waste is perceived economic benefit. As Australia produces no high-waste nuclear waste itself, a guaranteed price for storing and disposing of other nation's (including the aforementioned) nuclear waste provides clarity and certainty of the project's financial viability and structure, which, to date, have been strongly criticized by opponents of the Royal Commission Nuclear Fuel Cycle report and the subsequent Citizens' Jury process.

7) Develop a community wealth fund to manage the project's revenues

South Australians' as well as the nation's trust in government has been recognised as sorely lacking. Accordingly, a wealth fund should be managed independently of state and federal administrations and be responsible for investing and redistributing the wealth generated by the project in a prudential and fiscally responsible manner.

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