Siting Radioactive Waste Management Facilities: Successes and Failures - 16392

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ABSTRACT

Our assessment in 2015 of 39 attempts to site nuclear waste facilities in democratic countries over the past 40 years identified common inherent threads of both success and failure.

In the successes, including those efforts still ongoing, the common threads include a) providing the host communities the opportunity to withdraw at any point, b) the physical presence of a significant project team in the host community, and c) the establishment of credibility and trust in the project team, the regulator and, where possible, a neutral commenting party.

In the failures, two dominant causes are present. The first is the failure to properly address the legitimate concerns of indigenous people. This has caused failures in the US and Australia. The second and more common cause is lack of political consensus amongst the host community. In nearly every case when the facility proponent selects the site and attempts to gain host approval, the effort has failed.

Within the failed cases, two topics appear to be common. The first is that the definition of "host community" is initially too narrow by the proponents. In many situations, the very local community is supportive of radioactive waste projects but the larger community is not. The second factor is a failure on the part of the proponent to accurately communicate the risks associated with the project, driven significantly by differences in the manner in which the general public and experts process risk communications.

INTRODUCTION

This paper presents the results of an assessment of 39 attempts to site nuclear waste facilities in democratic countries over the past 40 years. The related evaluation of the 39 siting efforts is presented separately in another WM2016 session [1]. The assessment included a review of siting efforts for low-level wastes (LLW), transuranic wastes (TRU), high-level wastes (HLW) and used nuclear fuel (UNF). The scope of the facilities examined included both interim storage and disposal. The following results emerged from this review:

- 13 successes in Finland, Germany, Japan, Korea, Spain, Sweden and the US.
- 18 failures in Australia, Korea, the UK and the US.
- 8 ongoing efforts in Canada, France, Germany, Japan, Sweden, Switzerland, the UK and the US.

The inherent commonalities to success and failure, and the related lessons learned are described in the subsequent text.

DESCRIPTIONS AND DISCUSSIONS

The Public Does Not Differentiate Waste Types

Those of us in the field of radioactive waste management are tempted to classify LLW differently from UNF or HLW, as well as to differentiate between storage and disposal. For example, in 2009, the US Nuclear Waste Technical Review Board developed a report for the US Congress on how different countries were approaching the management of HLW and UNF [2]. This differentiation is entirely justified given the technical challenges and differences, as well as the regulatory standards for each type of waste.

This understanding is not shared by the public. In the broadest sense, all radioactive materials are the same. In one study, “Radioactive Wastes” were judged by the public to be the second largest global environmental problem (admittedly, this study was done prior to the ongoing public discussion about climate change). The public did neither differentiate between the various classes of radioactive wastes, nor between the handling steps [3].

In the same study, the public was asked “how long will a repository store wastes?”. Seventy eight percent of the public believed that the repository will store wastes less than 1,000 years [3]. The key point here is that nuclear program leaders are keenly aware of the technical differences between storage and disposal. The public does not understand this, although this is likely a more manageable gap than the misunderstanding of the differences between the types of wastes.

Another vital conclusion is that nuclear waste management programs must live with the history that includes efforts by others with different types of wastes. Thus, every “bad” experience with radioactive wastes, even LLW, “poisons the well” to some extent for those working to solve UNF or HLW disposition challenges.

Initial Lack of Trust and Measures to Build It

A vital element of successful nuclear waste facility siting is the presence of trust by the public in the proponents. Unfortunately, trust is often lacking.

In a study done in Sweden, a large segment of the population was polled to understand where trust and mistrust rests. Government experts and “the nuclear industry” were found to be trusted by only 41% of the general public. “Responsible politicians” were the only group that scored worse in this study, with only 7% of the public having trust in this group [4]. This study concludes that “the public suspects that experts know less than they claim and are corrupt based on employment.”

Two ways have been demonstrated for building trust with a host community. The first is the role of a “trusted” regulator. A regulator who is active and

uncompromising is a vital ingredient to building trust in the host community. This has been found in public metrics in Sweden [5] and is demonstrated empirically in certain successes. The second vital path is that the project proponent needs to establish a significant presence in the proposed host community. The affected population has to recognize that many staff members associated with the proponent have made their home in the to-be-affected community, sharing the risk. Again, this has been validated by polling in Sweden [5] and demonstrated in the US for WIPP in New Mexico and the Waste Control Specialists' (WCS) facility in West Texas.

Perhaps the most dramatic example of this lack of trust comes from the LLW siting effort in Nebraska. The public trusted neither the project proponents nor the state regulators [1]. This even became a campaign issue in a gubernatorial election. The subsequent governor ended the project, but at a court-awarded cost of $140 million.

Who is the Host Community?

There have been many failed siting efforts where the proponent did not correctly identify the "host community". It is difficult to establish the entire set of "stakeholders" in a siting effort. There are groups that have the direct ability to veto a siting program, and those who can influence the groups with veto rights (as well as those who attempt to influence the influencers). What is clear is that many siting efforts have failed to get this fundamental and vital concept right:

- Australia: LLW disposal at Muckaty Station: The dominant cause for failure was an incorrect identification of the traditional owners with rights over the land.
- Korea: 5 LLW disposal attempts: Korea went through five failed LLW disposal siting efforts. In all (except for the one where technical flaws were revealed – Galup Island), agreements for siting were too narrowly defined by the government. Only in the sixth and successful effort at Gyeongju where all of the "host communities" brought into the siting discussion process.
- US: LLW siting in Boyd County Nebraska, Fort Hancock Texas, Sierra Blanca Texas, Spofford Texas, and Ward Valley California: While the siting failures at these locations are complex and involve many different factors, the failure to identify and engage with the host community can be seen in each.

One example where things were done right is the LLW siting efforts in West Texas undertaken by WCS. The "host community" was broadly defined, and included State officials as well as those potentially impacted by transportation.

Dread Fear

Some fraction of the public has a great deal of fear of our work, that is, of radiation, wastes, nuclear power and all related things. This fear translates directly into action in opposition to siting efforts. Many of the US LLW siting failures are tied to the political response to the fears of the public [1]. In survey work done in

relation to the Yucca Mountain HLW-repository project, results that confirmed this fear include the following [3]:

- When asked to judge the seriousness of health risks, a nuclear waste disposal facility was judged to have a higher risk than chemicals from an abandoned landfill or accidents on the job.
- When asked whether an accident at a repository would involve certain death, 74% of the public agreed.
- When asked if an accident at a repository would kill many people at once, 83% agreed.
- Sixty-three percent of the public believe that a large accidental release of radioactive material from a repository is likely or highly likely.

Work done in Sweden addresses the “dread” risk perception associated with nuclear wastes [6].

Communication Challenges

As nuclear facility siting programs get underway, the communication challenges that exist need to be acknowledged and addressed.

- Experts use the term “risk” in relation to its scientific meaning. The pubic measures nuclear risks in terms of consequences not probability [7].
- The public often mistrusts “expert” assessments of risks, believing that bias has been placed into the model either by commission or omission [7]. Similarly, 59% of the public don’t trust government experts or the nuclear industry when conveying assertions of the risks and dangers associated with nuclear waste management [4].
- The public is unable to interpret such things as probability density function representations of risk [7], although the public is able to understand different risk language.
- In a US national survey, less than 10% of respondents attended public information meetings regarding nuclear materials management. Further, most of the public surveyed could not identify the sources of information on which they based their views about the safe management of nuclear materials [3].

There is No Safe Way

A study done by the European Commission posed the comment “There is no safe way of getting rid of high-level radioactive waste”. Seventy-two percent of the public surveyed agreed with this statement. [8] While not asked directly, the responses to a series of questions asked in a US national survey convey the same conclusion [3]:

- An accident at a repository would involve certain death: 74% agreed
- An accident at a repository would kill many people at once: 83% agreed
- A repository would pose a risk to future generations: 81% agreed

Money Can't Buy Acceptance

In a US national survey, only 25% of the public believe that the monetary benefits associated with nuclear wastes outweigh the risk [3]. Failed siting efforts in Korea reinforce this conclusion [1].

CONCLUSIONS

The authors have reviewed failures and successes to site radioactive waste management facilities, occurring in the past 40 years in democracies. The lessons derived from these are:

1. The public does not differentiate the various waste types. While experts understand the difference between, for example, spent nuclear fuel and low-level wastes, the public simply understands that wastes are being discussed and they are radioactive. Attempts to communicate presuming that there is an understanding will fail.
2. The public does not trust us. The public trusts their neighbors (to an extent) and regulators. Proponents who don't live in the community have very low credibility with most members of the public.
3. The host community has to be clearly defined. There is no simple definition of the host community, but it can't be pre-defined based on geopolitical boundaries on a map.
4. The public has a dread fear of radioactive waste. A huge majority, 83%, of people believe that an accident at a nuclear waste facility will kill many people at once. Communications must start from this perspective.
5. We typically use language that does not actually communicate our messages. Most obvious is the word "risk" where we mean some relation between probability and outcome while the public actually thinks more in terms of worst case consequences.
6. The public views there is no safe way to manage nuclear wastes, this view being held by 72% of people surveyed. When asked, 81% of people thought a repository would pose a risk to future generations.
7. Money can't buy acceptance. Failures in the US and Korea validate this view.

As the US Consent Based Siting program advances, the authors commend to them these and other lessons from the past and hope that certain mistakes will not be repeated.

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