Nuclear Waste Siting using a Private Sector Approach

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1. The Opportunity

Impasse. Disarray. Broken. Three words that many feel describe the present state of the U.S. nuclear waste management program:

> *"The United States may have spent more money in the effort to develop nuclear waste sites than any other nation on earth, but save for a facility in New Mexico that handles only military waste, every single effort to site a new repository in the last several decades has ended in failure."*[1]

But what if the siting decision-making framework was changed? Could that help envision a more positive outcome? Could the descriptors-- *impasse, disarray and broken* become *hopeful, collaborative and successful*? Transforming the standard facility siting process into one in which host communities, project proponents and the nation at large all realize value is the goal of Deep Isolation's private sector approach to nuclear waste management.

As will be more fully explored in this paper, Deep Isolation's preliminary siting efforts have proven positive. But first it will be useful to develop an understanding of current siting dynamics and its relationship to the past.

2. The Siting Status Quo

To date, nuclear waste facility siting efforts have typically followed a predictable trajectory. First, project proponents determine that a problem exists and that a solution is needed. The solution is then designed, generally outside of the public eye, to meet this predetermined need. Regulatory approvals and permits are then sought for the proposed facility at which time the public is informed, usually for the first time, as to the nature and extent of the proposed project. In most cases, the newly informed public is caught off-guard and they begin to seek answers to questions through a public engagement process that is a component of the regulatory permitting effort. These opportunities for public "engagement" tend to resemble a perfunctory exercise rather than a means to seek meaningful input. The general result is a dissatisfied and disengaged public who view the motivation of proponents as simply "going through the motions" of stakeholder engagement. Tensions then mount, positions harden, and project opposition builds to the point where "Not In My Backyard" (NIMBY) is soon used as a label characterizing the public's now seemingly irrational behavior. At this point, the project generally grinds to a halt and becomes a no-win situation.

Into this dynamic, risk assessments and other seemingly objective and quantifiable measures are inserted which focus attention on objective safety criteria in order to resolve conflicts and evaluate project soundness. However, in facility siting controversies, risk assessments have tended to be particularly *ineffective* in assuaging public concerns; not because of any technical deficiency, but rather because by design, their scope omits the underlying social dimensions of the conflict.

[1] Freudenburg, W. R. (2004). "Can we learn from failure? Examining US experiences with nuclear repository siting." *Journal of Risk Research*, 7(2), 153-169.

Herein resides the deeper discord: technical experts (i.e., quantitative risk assessors backed by all the tools of the physical sciences) are being tasked with resolving siting controversies that, at their core, may be decidedly non-technical in nature. The challenge for the facility siting community, therefore, is how to effectively integrate these social forces with the traditional technical analyses. Many in the siting community suggest that the answer is in greater public participation. In particular, some argue that "…to increase the likelihood of siting good facilities in good locations, long-term oversight arrangements that provide for greater community involvement, power sharing, and risk sharing will be necessary."[2] While successful examples of this approach are few, failures are many. For instance, in the 1980s, the U.S. government (in this case the U.S. Army) experienced repeated failure when trying to site a chemical weapons incinerator, not for lack of technical prowess but because they failed to appreciate and understand the stakeholder engagement dimensions inherent in the siting dynamic. This failure is characterized as follows (with emphasis added):

> *All we wanted was to know is if the thing was going to be safe or not. All we got from them was stonewalling. If they had been more up front about what they knew and what they didn't, **we all would've probably been more inclined to work together with them to help figure what to do with the stuff**. Maybe incineration was fine, but we had questions about it and they weren't answering and some of us were pretty agitated about that.*[3]

Returning back to the matter of nuclear waste, the chronic controversy that is Yucca Mountain speaks to the dominant role that social forces play in preventing a project from moving ahead. Though some may argue the technical merits, social and political forces prevented the repository from being placed on a more stable pathway towards completion.

A similar dynamic is seen on smaller scale disposal efforts, namely the recently-cancelled Deep Borehole Disposal program launched by the U.S. Department of Energy (DOE). From the beginning, this project suffered from an incomplete analysis and incorporation of stakeholder engagement. By the time the public and local government were made aware of the project, and despite DOE's repeated efforts to convince the public that no nuclear waste would be incorporated into any aspect of this effort, stakeholder fears continued to focus on the nuclear-related risks. In particular, these risks included mistrust of project proponents (DOE and its contractors), concerns regarding groundwater contamination, and the potential for a test site to become a permanent repository for nuclear waste. As one New Mexico resident stated, *"Not here. I will fight you on this until the day I die."*[4]

3. The Role of Trust in Facility Siting

[2] Mazmanian, D., and Morell (1993). "The 'NIMBY' Syndrome: Facility Siting and the Failure of Democratic Discourse." In *Environmental Policy for the 1990s*, ed. M. Kraft and N. Vig. Washington, D.C.: Congressional Quarterly Press.

[3] Futrell, R. (2003). Framing Processes, Cognitive Liberation, and NIMBY Protest in the U.S. Chemical-Weapons Disposal Conflict. *Sociological Inquiry, 73*(3), 359-386.

[4] Clements, D. (2017, February 9). Residents Overwhelmingly Reject Nara Visa Nuclear Waste Research Project. New Mexico Politico.

As reviewed above, the behavior of project proponents (the U.S. Army and the Department of Energy) occurs in the midst of preexisting relationships and perceptions. Appreciating the general nature of this complexity further informs our understanding of the underlying dynamics of the facility siting process.[5]

In recent years, there has been steady erosion in the quality of the relationships among facility siting stakeholders exemplified by a decreasing level of trust in government institutions of all kind. This has significant implications for highly technical matters:

When the public does not fully understand the complex issues related to risk assessment, they need to turn to experts for information about risks. The concept of trust plays several key roles in assessing public opinion…and this lack of trust in government officials contributes to difficulties in siting new facilities."[6]

This importance of trust, and its recent erosion, is further reinforced by the U.S. Office of Technology Assessment which found that, "The greatest single obstacle that a successful waste management program must overcome is the severe erosion of public confidence in the Federal Government that past problems have created."[7]

In partial response to this revelation, the DOE Secretary convened a special task force on behalf of the Secretary of the Energy Advisory Board (SEAB) that was charged with the responsibility to recommend measures the government could take in order to address this deficit of trust and confidence. In its seminal finding, the SEAB revealed that "by any conceivable indicator, the Department rouses little trust and confidence from any sector of the public."[8] As a final declaration, they lifted the blame for the impasse from pure "NIMBYISM" to the consequence of various publics experiences with the Department. This refocusing of responsibility for siting impasses is important as it recognizes the outsized role of proponent behavior on the success of the overall effort.

Unfortunately, the federal government has done little to correct this trust-eroding approach to siting. In fact, they continue to address the socially-constructed stakeholder concerns primarily with technical arguments that fail to address root causes. It is as if two very different languages are being spoken between the government or project proponents, and the public, with the end result being that neither side understands or trusts the other. To make things worse, those who act on behalf of their respective views tend to adopt entrenched positions with outcomes limited to binary win-lose terms. The middle ground is mostly unoccupied.

4. Factors Contributing to Failure

The above discussions demonstrate the complex relationship between social, technical and deliberative decision-making in facility siting and the dominant role that technological thinking has played in the process. It also highlights the lack of trust that has been inherent in, and common to, repeated siting failures.

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[5] Note: A thorough treatment of trust, risk and their respective roles in highly technical and public facing projects is outside the scope of this report. For a more detailed discussion of this complex issue, the reader is referred to, among others, (Kasperson, 2003), (Freudenburg, 1993) and (Slovic, 1993).

[6] (Johnson & Scicchitano, 2012)

[7] Committee on Disposition of High-Level Radioactive Waste, Disposition of High-Level Waste and Spent Nuclear Fuel: The Continuing Societal and Technical Challenges, National Academy Press, Washington, DC, 1993.

[8] Committee on Disposition of High-Level Radioactive Waste, p.1.

None of this discussion is however new, as this history of facility siting is well-documented. Why then, does the United States continue to find itself in this unfortunate stalemate? For the purposes of this paper, one primary failure factor may be the nature and ability of the project proponent itself.

In the United States, the federal government (in particular the U.S. Department of Energy) is the entity solely responsible for disposing of nuclear waste. While the department is staffed with talented professionals, their education and professional backgrounds are almost entirely technological in nature. This factor is the initial contributor to failure as according to Freudenburg, "there is growing evidence that the naïve hope for a site selection process that is 'strictly scientific' may have an unfortunate if unforeseen consequence: it may be placing on the institutions of science and technology a burden that a 'purely technical' approach to facility siting appear to be singularly ill-advised."[9]

Secondly, the department is subject to layers of federal bureaucracy in addition to procurement and procedural conditions. These requirements diffuse accountability, elongate schedules and decrease the federal government's ability to quickly respond to stakeholder inquiries, all of which hinder its ability to effectively work with project stakeholders. In this context, instead of being able to speak candidly and establish productive working relationships with stakeholders, the federal government is forced into bureaucratic modes of engagement (most commonly a public hearing) which, as one observer put it, are "…marked by tension and often serve as a common flashpoint for conflict escalation, so much so that dispute resolution expert Susan Carpenter[10] calls [public hearings] 'one of the most destructive and deadly processes ever devised.' "[11]

This combination of a techno-centric skill set combined with rigid policies and procedures have served to regularly undermine the department's siting programs. This approach is, however, not of the department's choosing as existing regulations (the federal Nuclear Waste Policy Act) prohibit any entity but the Department of Energy from engaging in nuclear waste disposal efforts. But does it have to be this way? For answers, we may look to the international siting experience for guidance.

5. International Facility Siting Examples

5.1. Scandinavia

In Sweden and Finland, progress has been incremental with both countries appearing to be on the path to opening their respective facilities. Sweden's nuclear fuel is owned and managed by SKB: a private-sector waste management company. Operating outside of the rigid controls of the Swedish bureaucracy, SKB was able to design and implement a stakeholder engagement effort that focused on trust building and the pursuit of common objectives.[12] This bifurcation of roles and responsibilities allowed the two entities to play to their strengths: SKB for engagement and siting and the Swedish government for regulating safety. This process has proven successful as evidenced by the fact that towards the end of the facility siting process, two candidate municipalities were actively *competing* to host the disposal facility. Finland has also given control of nuclear waste management to a private-sector entity (Posiva) which is jointly owned by Finnish nuclear utilities. At present, Finland is poised to be the first to open a repository by 2023.

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[9] Freudenburg, 2004. p. 166.

[10] Carpenter, S. and Kennedy, W. (1996). Managing Public Disputes, a Practical Guide to Handling Conflict and Reaching Agreements, Jossey-Bass, San Francisco

[11] Senecah, Susan. (2004). The trinity of voice: The role of practical theory in planning and evaluating the effectiveness of environmental participatory processes. Communication and Public Participation in Environmental Decision Making. 13-33.

[12] Elam, M. and Sundquist, G. *Stakeholder Involvement in Nuclear Waste Management,* SKI Report 2007:02, 2006

Experts in nuclear waste management attribute what appears to be the near-term success of the Finnish and Swedish projects to the way in which the projects were presented to the potential host communities. For example, each community under consideration as a repository location was extensively consulted and granted veto power during the process so there was an inherent feeling of control. In addition, project proponents exhibited considerable patience in the stakeholder engagement process (measured in years) to ensure that a solid foundation of trust was being built. Rod Ewing, ex-Chairman of the Nuclear Waste Technical Review board and renowned global expert in nuclear waste management expressed this well in his comment, "When you look at the Finnish repository, it's natural to admire the technical accomplishment, but of equal importance has been the social accomplishment."[13]

5.2. Canada

There are no hares in the quest for a final geological disposal, but if we were to identify a tortoise in the race it would be Canada. Following on from a previously unsuccessful effort, Canada has created a bottoms-up approach to siting. Again, under the direction of a private-sector corporation (Nuclear Waste Management Organization) Canada has adopted a process it has called Adaptive Phased Management which is designed to "enable our generation to proceed in a deliberate and collaborative way to establish the foundation for the safe and secure stewardship of Canada's used nuclear fuel for the long term."[14] It is noteworthy that even before institutionalizing this approach, the Canadians entered into a multi-year public dialogue to discern their national preference for the long-term management of used nuclear fuel. In particular, the public was offered the opportunity to choose between three options: 1) deep geological disposal in the Canadian Shield; 2) storage at nuclear reactor sites; or, 3) centralized storage, either above or below ground. The resounding choice was for deep geological disposal, and this baseline consensus is one of the features that is contributing to project success.

5.3. Learning

Although the experiences in these countries are diverse due to a range of variables (unique political, regulatory, and cultural environments), there are common elements from which to learn. One primary observation is that the countries that appear to be succeeding in the near-term, or are on a future course to do so, have pursued a siting process that prioritizes dialogue and stakeholder involvement along with a parallel pursuit of technical issues. According to one description: "A trend can be seen in OECD countries towards implementing forms of public involvement that require new or enhanced dialogue among all parties concerned. As parties to this dialogue, regional and local political players and civil society take an active role where appropriate in decisions concerning radioactive waste management, including the siting and implementation of geological repositories." [15]

In complement to the theme of sophisticated stakeholder engagement efforts, all countries that are demonstrating success in the siting arena have chosen to cede responsibility for accomplishing the siting effort from the public to the private sector while still retaining federal responsibility for ensuring facility safety.

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[13] Fountain, H., "On Nuclear Waste, Finland Shows U.S. How It Can be Done" New York Times, June 9, 2017

[14] Nuclear Waste Management Organization, *Moving Forward Together; Designing the Process for Selecting a Site,* August 2008

[15] Nuclear Energy Agency, Geological Disposal of Radioactive Waste: National Commitment, Local and Regional Involvement, A Collective Statement of the OECD Nuclear Energy Agency Radioactive Waste Management Committee, Adopted March 2012

These two interrelated elements: 1) authentic and comprehensive engagement with stakeholders undertaken by 2) a private-sector organization inherently more capable of successfully navigating the nuances of facility siting, are fundamental lessons from the international community that the United States would do well to consider in its nuclear waste management efforts.

6. A Way Forward

As mentioned in the introduction to this paper, the U.S. remains poorly positioned to implement a solution to the nuclear waste impasse. One of the hurdles we face in doing so is the lack of clearly established policy for the storage and/or disposal of nuclear waste upon which to implement a legitimate siting process. Although most in the U.S. concur that the waste should be disposed of in a deep geological environment, there remain many questions as to what to with the waste for the several decades until a repository is opened. Some believe the waste should be stored at its current location until such time a repository is open. Others believe the waste should be transported to one or more centralized and consolidated locations and stored there until a repository is developed. And there are also those for whom any "solution" is not welcomed because of their strong dislike of nuclear power. Regardless of the final resolution of this issue, lessons from the siting literature and international experience indicate that any future U.S. siting effort must consider improving the design of its implementing organization as well as including more integrated and deliberative engagement processes.

One way to accomplish both of these objectives may be the consideration of a private-sector company to lead the disposal effort. Such is the case for consolidated storage of nuclear waste in the U.S. as we have seen entities in Texas and New Mexico launch private sector storage initiatives. Although the federal Nuclear Waste Policy Act presently precludes a private sector option for disposal, a change in this law would create new opportunities. This new approach would mirror the successful attempts abroad and is reinforced by the "Stanford Reset Initiative" (a group of experts, government officials and members of the public focusing on the "reset" of U.S. nuclear waste management strategy and policy) who recently noted, "…. the unique advantage of a not-for-profit, utility-owned waste management organization (NUCO), particularly based on the clear success of this approach as evidenced by other national programs, such as in Finland, Sweden, Switzerland and Canada."[16]

Given the complex social and technical dynamics that presently weigh on and continue to obstruct siting progress, one may give more serious consideration to a model that opens up the alternative for private sector interests to pursue the challenge. While a simple institutional shift in the nature of the project proponent will not address deep-seated nuclear fears, a new siting entity may operate more nimbly and responsively and begin with a clean slate to build trust and confidence. For instance, in the absence of a political or legislative mandate, the responsibility to create the abiding consent of the potential host community would be the siting entity's responsibility and would have to be freshly-earned. As we have seen, this is neither a simple nor quick process, and the distrust created by some federal initiatives may complicate the task, but consistent and authentic actions and behaviors could overcome this and may prove lasting. By focusing on shared outcomes jointly crafted, such an approach could help mitigate many of the obstructions of the past.

One example of this new approach focusing on consent and shared outcomes is Deep Isolation, a recent private-sector entrant into the nuclear waste disposal arena. Deep Isolation seeks to place nuclear waste in horizontal drillholes, in a suitable geologic environment, thousands of feet below the surface. With the technical and regulatory challenges being addressed, this company holds particular promise in

[16] Center for International Security and Cooperation, *Reset of America's Nuclear Waste Strategy and Policy*, Final Report, 2018

its ability to successfully navigate the social, and political siting issues that have hindered federal initiatives for decades. Central elements that distinguish Deep Isolation are:

- The founders of the company are new faces in the decades-long stalemate of nuclear waste disposal. As such, they are not tarnished with the legacy of distrust faced by existing governmental entities. This provides opportunities for a fresh start and honest dialogue unencumbered by previous mistakes.
- The company is not solely reliant upon government funding to accomplish its mission. As such, it can make strategic and long-term investment decisions relatively independent of the political forces that drive federal appropriations.
- Siting of the company's drillhole installations is a voluntary decision made by the host community, and the community maintains veto power which is a hallmark of successful international siting efforts.
- The company designs and implements unique and site-specific disposal installations. Its pursuit of multiple disposal locations, voluntarily hosted, reduces the presence of stigma (no community feels singled out). This approach is integral to successful siting efforts and is a key component of the Facility Siting Credo.[17]
- The company is unencumbered by federal procurement and bureaucratic policies. In addition, it is staffed with professionals with considerable experience in both the social and technical sciences. As such, Deep Isolation is able to design and implement authentic stakeholder dialogue efforts that build and maintain trust.
- Long-term success is predicated on creating shared value: both for the company and the host community. The joint development of these outcomes and their collective pursuit will go far in building the needed trust and diminishing the fear and stigma associated with previous efforts.

For the past several months, Deep Isolation has been in active dialogue with nuclear reactor host communities across the country. The chief purpose of these dialogues has been to learn what community leaders in the communities feel about the presence of stored waste at the reactor sites, and inform them of the Deep Isolation solution as a prospective option. To date, a substantial majority of these communities have expressed initial interest in a Deep Isolation facility and have wanted to learn more. While these are only preliminary indications as to the receptivity of a private sector approach and a new option on the table—it is encouraging and the time for a new approach is now. Hopeful, collaborative, successful.

[17] Kunreuther, H., & Susskind, L. (1990). *The Facility Siting Credo.* University of Pennsylvania.