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Best Practices for Consent-Based Siting of Nuclear Waste Repositories

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On April 22, 2021, the Biden Administration announced a firm goal of 100 percent carbon pollution-free electricity by 2035, a goal that is unlikely to be achieved without nuclear power. As nuclear energy continues to play a large role in the clean energy profile of the United States for the foreseeable future, this raises the concern of what to do with the current high-level radioactive waste (HLRW) and spent nuclear fuel (SNF) located at 23 stranded sites across the United States. Efforts to site and permit a permanent repository for HLRW and SNF have made minimal progress over the years, but this will need to change moving forward to finally resolve the nuclear waste issue and prevent further buildup at reactor sites. A crucial step to speeding up the process of siting and constructing a permanent disposal facility will be garnering the support and whole-hearted consent of a host community, something the Department of Energy (DOE) is dedicated to ensuring throughout the siting process.

The Department of Energy's Office of Environmental Management (DOE-EM) enthusiastically embraces the idea of a consent-based siting process at the core of selecting a site for a permanent repository. The informed consent of all stakeholders that will be involved, from Tribal and State governments to local communities, is key to ensuring that activities conducted at a permanent disposal facility will be carried out in an efficient, conscientious, and transparent manner and fully accommodate the interests, needs, and values of the groups it will affect. While the DOE-EM understands the vitality of utilizing a consent-based siting process to site any potential interim-storage or permanent disposal facilities for HLRW and SNF, one paramount question remains: What should a consent-based siting process look like?

It is crucial that a standard consent-based siting process is curated before any concrete actions are taken toward accomplishing the end goal of siting a permanent repository to ensure the process is both efficient and transparent to the community. To be-

gin devising what this process could look like, it is essential that the DOE-EM analyzes past missteps and what corrections have been made to cultivate consent and avoid past pitfalls. Furthermore, looking to current best practices can provide the basis for a broader consent-based siting process, and adding current community engagement measures can inform potential plans that can be implemented into the process to maintain the consent of communities throughout the lifecycle of a future storage facility.

PAST SITING MISSTEPS

The first step to formulating a successful consent-based siting process will require the DOE-EM to review the lessons learned from past siting complications and what feedback should be noted from the affected communities. Numerous present-day nuclear sites were initially sited in the 1940s to contribute to war efforts for World War II through a highly secretive project known widely today as the Manhattan Project, which produced the first atomic weapon. The Hanford, Oak Ridge, and Los Alamos sites were all established through the Atomic Energy Commission, the predecessor to the DOE, through the power of eminent domain under the War Powers Act.

This method of siting displaced the communities surrounding the areas of interest, including Native American Tribes, particularly at Hanford, along with homesteaders who were at a bargaining disadvantage against the federal government. While many communities considered it their patriotic duty to pack up and leave to support the war effort, the homesteaders at the Los Alamos site were comprised of a significant portion of Hispanics who accepted minimal compensation from the government due to fear and an apparent language barrier. The imbalance

inherent in the dynamic between the homesteaders and the federal government resulted in the descendants of these homesteaders seeking reparations approximately 60 years later through two separate lawsuits that were filed in 2000. Although the statute of limitations for both cases was exceeded, Congress authorized a $10 million program named The Pajarito Plateau Homesteaders Compensation Fund as part of the Defense Authorization Bill of 2005 to do right by these past missteps. The DOE additionally funded a book on the history of homesteading on the Pajarito Plateau to formally acknowledge and keep in mind the importance of garnering community consent in future siting missions. These cases of early siting through eminent domain illustrate that for consent to be given, communities must be fully informed and should not be coerced by any means. The DOE has since come a long way from such processes of siting nuclear facilities and is committed to placing equal importance on community consent and support alongside the other factors that impact the siting process.

In addition to early siting practices, analyzing more recent complications regarding nuclear sites can shine a light on what specific areas are vital to consider for a future consent-based siting process. The first recent case of concern is the case of the Rocky Flats Raid of 1989 in which the Rocky Flats nuclear facility was invaded by the Federal Bureau of Investigation (FBI) and the Environmental Protection Agency (EPA) for alleged environmental violations. Upon discovering the violations that were committed at the Rocky Flats site, the DOE embarked on an environmental cleanup plan to rectify the harm done to the surrounding area and communities. The original estimation for the environmental cleanup predicted that it would take approximately 65 years to complete; however, in January of 2000, the DOE signed a next-generation contract with Kaiser-Hill that instituted increased contractor responsibility and unprecedented safety performance incentives all whilst accelerating the cleanup completion to December 2006. While the environmental violations were a serious issue, the environmental regulations the DOE has implemented in the aftermath have now become part of the core missions of many cleanup projects since, helping to win back the trust of affected communities.

Zahn's Corner Middle School in Pike County, Ohio, presents another case that can inform future consent-based siting practices conducted by the DOE-EM. A DOE 2017 Annual Site Environmental Report detected Np-237 in an air monitor near the middle school, and a year later also detected americium-241 indicating radiological contamination. A laboratory analysis study was conducted by Savannah River National Laboratory (SRNL) upon these detections and found there was no indication of radiological risk above background levels to the public. The misstep stems from the DOE neglecting to notify the community of Pike County of these detected isotopes until 2019, two years after the initial detection, and in response to learning this information the community decided to shut down the middle school. The lack of transparency and communication by the DOE in a timely manner resulted in the community losing trust despite further studies indicating the low risk. The DOE-EM did take steps to rebuild trust with the community by awarding a $20 million grant to the Southern Ohio Diversification Initiative to build a new middle school and has also awarded a $3.5 million grant to the Ohio Environmental Protection Agency for increased oversight and monitoring of the Portsmouth Gaseous Diffusion Plant Decontamination and Decommissioning Project.

In October 2022, Jana Elementary School in Missouri was shut down for similar reasons to the Zahn's Corner Middle School case. This came following a private study conducted by Boston Chemical Data Corp. which indicated the presence of radiological contamination. This study was funded by lawyers whose clients were in the process of suing over the radioactive waste in Coldwater Creek, which was located near the school. Two follow-up studies were conducted, one by the Army Corps of Engineers and

the other conducted by SCI Engineering as ordered by the Hazelwood School District; however, both studies found no signs of contamination. In both the Jana Elementary School case and the Zahn's Corner Middle School case a lack of initial and immediate transparency eventually led to a substantial loss of trust with the affected communities. These cases also indicate the importance of educating impacted communities on subjects such as background radiation to increase transparency and allow for the communities to give informed consent.

A final case of interest that provides key insights into curating a consent-based siting plan is the past missteps of Yucca Mountain. In 1987, Congress passed the Nuclear Waste Policy Amendments Act which designated Yucca Mountain as the only site to be considered for a permanent geologic repository. The Yucca Mountain Project has since stalled, mainly because of the backlash and resistance from a variety of levels. The Western Shoshone National Council challenged the U.S. government by issuing Land Use Permits to anti-nuclear protestors, while the group Public Citizen joined forces with the State of Nevada to file lawsuits against the EPA, DOE, and NRC to discontinue the Project. Amidst this backlash from the tribal governments, local communities, and the State, the DOE discovered in 2005 that a U.S. Geological Survey of quality assurance work on Yucca Mountain may have been falsified. The lack of transparency and lack of engagement with all relevant stakeholders amounted to a neglect of the importance of trust and consent in the siting process, and in the end the Yucca Mountain Project came to a halt. This case illustrates how consent from all parties plays a vital role in the siting process for a permanent repository, and how a project for such a facility can crumble without these key pieces.

ESTABLISHING A CONSENT-BASED FOUNDATION WITH WIPP

Creating an effective consent-based siting process requires not only learning from past missteps and how they were ameliorated, but also from taking the best practices of fostering consent that are already being implemented at sites. The Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico, represents a prime example that the DOE-EM can pull current best practices from to inform what elements should be incorporated in consent-based siting efforts for a future permanent disposal facility. Analyzing how the WIPP site involves stakeholders at all levels through the transportation, permitting, and monitoring processes will be instrumental to solidifying a sound consent-based siting process that builds and maintains trust for any future permanent repository.

When considering where to site a future permanent or interim storage site for HLRW and SNF, it is crucial to consider how the construction of such a facility will impact all areas and communities that will be affected as nuclear waste travels from other sites to the facility to be stored. It is paramount that any consent-based siting process should include a comprehensive transportation plan for building trust and transparency with all territories and communities that the waste will travel through. The WIPP facility provides an excellent starting point for developing such a plan through their Transuranic (TRU) Waste Transportation Plan. The TRU Waste Transportation Plan covers all transportation requirements, systems, operations, organizational responsibilities, emergency management, and public communication for implementing the plan. This allows the thorough monitoring and governing of truck shipments to and from WIPP by the DOE Carlsbad Field Office (CBFO) contract carriers. For additional security, the vehicles transporting the waste are linked to a satellite tracking system which continuously sends tracking data to a central control site at the WIPP facility. State and tribal governments are involved in formulating the shipping routes for the waste travelling to and from WIPP, and both receive notice of any shipments that will be passing through their borders in advance. The State of New Mexico provides additional input on the transportation process

through the WIPP Transportation Safety Program, a joint effort between seven New Mexico agencies implemented by the New Mexico Radioactive Waste Consultation Task Force Coordinator. These extensive measures in the transportation process showcase some of the best ways in which a facility should communicate with affected States, tribal governments, and local communities so that transparency remains a priority and allows ongoing informed consent.

The permitting process is another area in which WIPP can shed light on how to foster consent in the siting process for a nuclear facility. The permitting process sets the foundation for building the consent of the State, tribal governments, and local communities as the legal starting point for siting. Promoting further engagement, trust, and consent during the permitting process sets the tone for how each stakeholder will feel about the activities being carried out at the facility in question. In WIPP's case, the New Mexico Environment Department's (NMED) Hazardous Waste Bureau (HWB) manages and implements all Resource Conservation and Recovery Act (RCRA) permits. The HWB reviews the permit applications, modifications, closure plans, and post-closure care applications for hazardous waste treatment, storage, and disposal whilst coordinating and communicating with other NMED programs and the EPA. This allows the State to have greater say over the activities taking place at the WIPP facility through its entire lifecycle, promoting a better working relationship between the state and federal governments.

WIPP also offers best practices for maintaining consent through the monitoring process. As previously noted, transparency in monitoring is key for fostering consent and ensuring that the DOE does not lose the trust of the community such as in the cases of Zahn's Corner Middle School or Jana Elementary School, both of which came about from a lack of trust in the monitoring process. A variety of monitoring agencies and actors will be required to maintain transparency throughout the lifecycle of any future interim or permanent storage facility to provide accountability and counteract bias that may come from any monitoring actor. The WIPP facility is monitored by two primary regulators: the NMED and the EPA. Federal monitoring is conducted by the EPA while the site is also monitored by the NMED under the State government. The EPA issues final regulations for the disposal of SNF, HLRW, and TRU waste under the WIPP Land Withdrawal Act and conducts recertifications of WIPP's compliance with EPA standards every five years. The EPA also authorizes NMED to carry out the State's base RCRA mixed waste programs in lieu of equivalent federal programs to allow the State more input in the monitoring process. In addition, independent environmental research and monitoring is conducted by the New Mexico State University Carlsbad Environmental Monitoring and Research Center (CEMRC). This allows further transparency outside of direct oversight from DOE-EM, mainly intended to inform the public and the environmental science community. By providing monitoring reports from multiple types of stakeholders, reports can be easily compared to ensure transparency.

MAINTAINING LONG-TERM TRUST AND CONSENT WITH COMMUNITIES

Creating an effective consent-based siting proUpon garnering initial support and consent through the processes of permitting and monitoring when determining a site for a permanent repository, the DOE-EM should analyze current community engagement plans implemented by various nuclear sites to further curate the ongoing consent of local communities. Currently, there are numerous forms of community engagement plans across DOE-EM sites and pooling together the best practices from each can assist in formulating a broader plan to be incorporated into the consent-based siting process.

The Hanford Site's Public Involvement Plan provides key insights into how a community engagement plan can be implemented to help regain and

maintain the consent of a community. Through the Public Involvement Plan, the agencies that make up Hanford's Tri-Party Agreement (TPA) encourage and support public participation through collaborative and independent events. As stated in this plan, they communicate with the community through a variety of channels to notify them of important actions. The plan has also established the Hanford Advisory Board which informs and involves stakeholders and the public in a more direct manner regarding cleanup decisions, and it allows the community to advise the TPA agencies on public perspectives. These measures have helped the Hanford site rebuild trust with the community through increased public input through more formal channels. Implementing these key aspects into a broader community engagement plan for a permanent repository would be an excellent way to maintain consent through the lifecycle of such a facility.

The WIPP facility not only provides an outstanding example of forming consent through the initial siting process but also through its ongoing community engagement. The WIPP 2023 Community Relations Plan is required under the Hazardous Waste Facility Permit issued by the NMED, giving it a more permanent hold. The Plan's participants include individuals, organizations, special interest groups, federal, state and local government entities, and tribal governments all working together to establish better working relationships. The Plan is a living document meant to change to accommodate participant input and exemplifies an important part of maintaining consent.

The Savannah River National Laboratory (SRNL) can also guide the formation of a community engagement plan for the siting of a permanent repository through its current best practices. SRNL's Community Involvement Plan utilizes various approaches to engage the surrounding community to maintain their trust and consent for the operations conducted at the site. As part of this plan, the DOE and EPA fund grants to Savannah State University to work with communities to promote an understanding of the cleanup work being carried out at Savannah River Site (SRS), and the DOE conducts additional science and literacy outreach programs. Furthermore, SRS employees are encouraged to be active members of the community in local organizations to create familiarity and encourage communication, feedback, and engagement from the community. Most significantly, this Plan established the SRS Citizens Advisory Board which allows communication from the public to SRS, the DOE, the EPA, and the South Carolina Department of Health and Environmental Control.

Idaho National Laboratory (INL) has established a unique community engagement plan regarding Tribal governments which can inform broader actions to build and maintain consent directly with Tribal communities in the consent-based siting process. The Agreement-in-Principle between the Shoshone-Bannock Tribes and the DOE reflects a commitment to increase the level of assurance that activities conducted at the INL site will protect and address the interests of the tribe. This plan sets up coordination and cooperation between Tribal consultants and the INL Oversight Program, amongst other DOE groups. The Plan demonstrates the importance of addressing more specific stakeholder concerns and provides a guideline for how to directly involve Tribal governments from a community engagement approach. All of these aspects from the various community engagement plans are necessary to bolster consent-based siting and ensure that informed consent continues throughout the lifecycle of a facility from all involved stakeholders and affected groups.

The DOE-EM has already initiated a set of first steps that will launch the broader consent-based siting effort for a permanent or interim storage facility through its Funding Opportunity Announcement (FOA) that was issued on June 9, 2023. The FOA program does not currently seek to identify communities interested in hosting a nuclear waste storage facility, but the program has selected 13 awardees

to fund increased consent-based siting dialogue and to elicit public feedback that will inform the consent-based siting process moving forward. This consent-based siting consortia will assist in identifying public values, interests, and feedback of the consent-based siting process for a potential consolidated interim storage facility for SNF. The FOA is a great initial step for building trust and transparency as a purely informational plan with a goal of establishing an open dialogue to help refine the process. The information that will be gathered from this program will be of utmost importance in directing the next steps of the DOE-EM's path to formulating a grander consent-based siting process that could finally lead to establishing a permanent storage facility.

CONCLUSION

A permanent repository for HLRW and SNF is a necessity for the U.S. moving forward as it continues to produce nuclear energy in pursuit of the climate goals laid forth by the Biden Administration, and this can only be achieved by first establishing a comprehensive consent-based siting process. A formal consent-based siting process should ensure that all stakeholders are educated on the topics relevant to a nuclear repository to allow for fully informed consent to be given, and the DOE-EM should focus on providing transparent communication throughout the process to prevent future missteps and ensure the process proceeds smoothly. Using the example of the WIPP facility to inform the creation of a detailed transportation plan, the involvement of stakeholders in the permitting process, and the inclusion of monitoring from various actors beyond the direct oversight of the DOE will also be crucial to curating a transparent and effective consent-based siting process. Finally, building off current community involvement measures across DOE-EM sites to construct an avenue for direct involvement through a community engagement plan embedded in the consent-based siting process will allow for ongoing consent throughout a facility's lifecycle. With a firm foundation of what elements should be implemented in a consent-based siting process, it will be possible to inform the vital next steps on the path to siting an interim or permanent storage facility.

POLICY RECOMMENDATIONS

1. The DOE should consider distributing learning resources and hosting informational sessions with the FOA consent-based siting consortia communities to elicit specific feedback on the informational quality of these methods. This would assist the DOE-EM in identifying informational gaps that need to be filled and the ideal methods for conveying the knowledge to communities and stakeholders in anticipation of hosting an interim or permanent storage facility.
2. The DOE-EM should work with its sites and the FOA consent-based siting consortia to create a detailed framework of what a grander consent-based siting process would entail. This should build from the lessons learned and best practices detailed within this report and be refined through cooperative efforts to finalize a more specific, thorough consent-based siting plan.
3. Upon completion of a framework for a consent-based siting process, the DOE-EM should present the framework to the Senate Committee on Energy and Natural Resources to provide context and support for the Nuclear Waste Administration Act which seeks to establish an organization that would provide a consensual process for siting nuclear waste facilities.

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