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October 9, 2018

Dr. David Victor, Chairman
c/o SONGS Community Engagement Panel

VIA EMAIL: david.victor@ucsd.edu

Dear David:

We are very grateful that you will have the time to visit San Luis Obispo later in October, and to share your experiences involving decommissioning and community engagement with both the Diablo Canyon Independent Safety Committee and the Diablo Canyon Decommissioning Engagement Panel.

In respect for your limited time and busy schedule when in San Luis Obispo, we'd like to send a few of our concerns and questions in advance:

1. Among the stakeholders who make general public comment, what has emerged as their greatest issues of concern (by topic)?

2. What do you consider the three key accomplishments of the SONGS CEP to date?

3. Why has the CEP so strongly supported SCE's desire to remove SNF from the spent fuel pools? From a community-relations standpoint, do you think it important to transfer the SNF to dry casks as soon as that can be safely accomplished?

4. What is the "make-up" of the SONGS CEP membership, based on their occupation or community affiliation? Seeing where that panel is at today with regard to progress and process, do you feel this has been a successful compositional basis for its membership? To what achievements might you attribute the expertise of the local elected officials on the CEP?

5. Do you see an advantage to initiating a decommissioning engagement panel 2-5 years before the plant closes? If so, what are those advantages?

6. How much did the Engagement panel rely on using SCE's PSDAR filed at the NRC in September 2014 as a resource and guide?

7. How much did the Engagement panel rely on using SCE's *Joint Application of Southern California Edison Company ("SCE") and San Diego Gas and Electric Company ("SDG&E") for 2014 SONGS Units 2 and 3 Decommissioning Cost Estimate and Related Decommissioning Issues* filed at the CPUC at the end of 2014 as a resource and guide?

8. You had previously expressed satisfaction at the level technical, scientific and coastal environmental expertise on the SONGS CEP; would you recommend that PG&E include equivalent levels of expertise in its panel? What value do you ascribe to having individuals with this knowledge on the CEP?

Once again, we appreciate your time and experience with this undertaking, and look forward to your responses. Please feel free to contact us promptly if you need additional information or seek any clarification of our questions.

Thank you.

Yours truly,

/s/

Rochelle Becker,
Executive Director

RESET OF AMERICA'S NUCLEAR WASTE MANAGEMENT

Strategy and Policy

2018



RESET OF AMERICA'S NUCLEAR WASTE MANAGEMENT

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RESET OF AMERICA'S
NUCLEAR WASTE MANAGEMENT
Strategy and Policy

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Acknowledgements

During the course of the five, public Reset meetings, we benefitted from the more than 75 invited presentations. We also appreciated the vigorous discussion among experts, scholars, fellows and students who participated. The Steering committee thanks all of the participants for sharing their time and views. Most importantly, we thank all of the participants for their civility and patience as we tried to understand and articulate the fundamental issues that confront the U.S. nuclear waste management program.

This project could not have happened without the support of the Freeman-Spogli Institute for International Studies, the Precourt Institute for Energy at Stanford University, and the MacArthur Foundation for the support of the meetings at George Washington University. The grants from these institutions provided the travel support for all speakers and members of the Steering Committee.

The meetings were hosted by the Center for International Security and Cooperation at Stanford and the Elliott School of International Affairs at George Washington University.

Stanford staff and students provided support for each of the meetings. We are especially grateful to Aparna Surendra, Elizabeth Gardner, Kathryn Anne Holleb, Zlator Gogolevse, Chelsea Papa, Katlyn Turner, Sulgiye Park and Paulette Wolak. Without their unfailing support and attention to detail, the meetings would not have been successful.

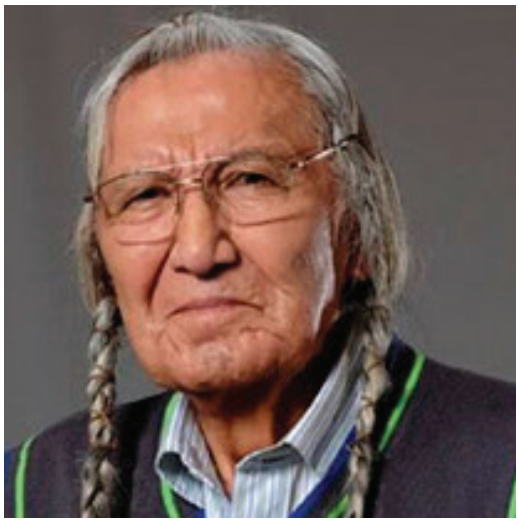
Finally, since the time of the meetings, two important participants have passed away: Russell Jim and Milt Levenson.

Russell Jim, an Elder of the Yakama Nation, had a long history of dealing with the issues created by nuclear waste. Russell was a forceful advocate for rigorous environmental standards and the necessity of thorough cleanup at the Hanford site in Washington in order to protect the Columbia River and surrounding lands.

Milt Levenson began his career with the Manhattan Project, working at Oak Ridge, Tennessee. He was the Associate Laboratory Director at Argonne National Laboratory,

Director of the Nuclear Power Division at Electric Power Research Institute and an executive consultant at Bechtel Power Corporation. He was the president of the American Nuclear Society (1983-1984).

Safe to say that Russell and Milt reflected two very different perspectives on nuclear waste issues, but at the Reset meetings the dignity of both set the tone of the discussions. Their knowledge and sense of purpose are a guide for us all. We were honored to know them both.



RUSSELL JIM (1935-2018)



MILT LEVENSON (1923-2018)

RESET OF AMERICA'S
NUCLEAR WASTE MANAGEMENT
Strategy and Policy

Executive Summary and Recommendations

Status of the U.S. Program

The U.S. nuclear waste management program has labored for decades at a cost of billions of dollars each year, and yet there is still no active disposal program either for spent nuclear fuel from commercial reactors or for the high-level radioactive legacy waste and spent nuclear fuel from defense programs. The program has suffered from a number of factors, including major changes to the original law; a series of amendments to the Nuclear Waste Policy Act of 1982; a slowly developed but changing regulatory framework; erratic funding; significant changes in policy with changing administrations; conflicting Congressional and Executive policies; and finally, and most significantly, inadequate public engagement in decisions about strategies for the storage and disposal of the nuclear waste.

Such disruptions are not unexpected in any extremely large technical megaproject subject to strong debates over value trade-offs extending far into the future. Only the radioactive waste-management program in Finland has been relatively immune to such challenges. The programs in Sweden, France, Switzerland, Germany, Japan, Canada, and the United Kingdom have all faced similar challenges. In some cases, the programs "reset" themselves relatively rapidly; in others, they did so over decades. Currently, Finland is in the process of constructing its repository after receiving a license; Sweden and France have selected sites and are moving through their licensing processes; and Canada and Switzerland are well into a comprehensive siting process. Germany has recently initiated a "reset" of its program with an entirely new, comprehensive siting process.

Meanwhile, the U.S. program is an ever-tightening Gordian Knot—the strands of which are technical, scientific, logistical, regulatory, legal, financial, social and political—all subject to a web of agreements with states and communities, regulations, court rulings and the Congressional budgetary process. There is no single group, institution or governmental organization that is incentivized to find a solution, nor is any single institution entirely responsible for the failure of the U.S. Program.

Reset Initative

The Reset initiative, *Reset of America's Nuclear Waste Management Strategies and Policies*, is based on the simple premise that given the scale and importance of the challenges at the back-end of the nuclear fuel cycle, there is great value in taking a penetrating look at some of the most critical problems and their possible solutions. Reset is an effort to untangle the technical, administrative and public concerns in such a way that important issues can be identified, understood and addressed.

Any new strategy must be informed by a thorough understanding of the history of the U.S. nuclear waste program, as well as the scientific, technical, social and policy challenges required to "reset" the U.S. program. Today, technical and policy issues have been overwhelmed by a partisan political process. A Democratic administration has tried to shut down the Yucca Mountain project as "unworkable", while some Republicans in Congress view Yucca Mountain as the "law of the land."

As a first step, and in order to inform any new strategy, the "Reset" meetings have provided a forum for discussing the critical issues that must be addressed in order for the U.S. program to move forward. The meetings were organized by an international Steering Committee, listed in Appendix A. The members of the Steering Committee represent diverse and international perspectives and have considerable experience with issues involving the back-end of the nuclear fuel cycle. *The members of the Steering Committee do not represent the views of their organizations.* They, however, bring considerable technical skills and experience to the discussion.

The "Reset" process involved convening five meetings, which consisted of 75 presentations by internationally recognized experts, government officials, legislators, nongovernmental organizations and members of the public (Appendix B). The series of five meetings were held at Stanford University and George Washington University (Appendix C: Prospectus and Agenda for Each Meeting). The meetings were open to the public, interested experts and scholars.

This report is a summary of the major issues that were raised during the discussions as understood by the Steering Committee during their subsequent deliberations. As one might expect, there are a range of views, and we have tried to capture the essential elements of these different perspectives. At the same time, the Steering Committee has tried to emphasize specific ways forward for the U.S. program. *This is not a consensus report.* Individual members of the Steering Committee may have preferred a different emphasis on certain options, but we have tried to capture the "center of gravity" of our different perspectives. We think that these recommendations will be useful as the U.S. fashions a new strategy and policy for the management and disposal of the Nation's nuclear waste.

A New National Radioactive Waste Management Organization with a New Funding Strategy

The lynchpin to the recommendations of the Reset Steering Committee is the recognition of the need for a new, independent, single-purpose national radioactive waste management organization and reform of the funding process.

These are not new ideas. Many reviews, most recently *The Blue Ribbon Commission on America's Nuclear Future* in 2012, have made similar recommendations. Nearly seven years after the *BRC* report, the need for such an organization has only become more evident. We review the history of organizational responsibilities for nuclear waste management in the United States and discuss possible alternatives to a government-chartered organization (a FEDCORP)—as recommended by the *Blue Ribbon Commission*. The Steering Committee is unanimous in its recommendation that the United States needs a new, independent, single-purpose nuclear waste management organization. *Further, a majority of the Steering Committee supports an alternative type of organization—a nuclear utility-owned, not-for-profit, implementing corporation, NUCO. The Steering Committee believes that it is essential that the administration of the Nuclear Waste Fund be transferred from Congress to the new organization.*

The Steering Committee recognizes that any decision about how to organize implementation and funding, whether it preserves or alters the *status quo*, carries with it both benefits and costs. But, on balance, the Steering Committee maintains that its recommendation best addresses a critical national issue, which has been left in limbo for far too long.

The new organization, regardless of its type and structure, must have a clearly stated charge; a structure that embraces public engagement and engenders trust; a focused research agenda; an implementation plan that matches the knowledge needs for geologic disposal; and, most importantly, sufficient and consistent funding over decades.

Funding for the new organization must also be removed from the annual Congressional appropriations process to ensure adequate year-to-year funding in order to maintain an efficient site selection, characterization, licensing, and construction process.

RECOMMENDATIONS:

- ***Create a new, independent, single-purpose nuclear waste management organization.*** This is not a new idea, and there are many models for such an organization. The Blue Ribbon Commission favored a FEDCORP structure. However, the Reset Steering Committee points to some unique advantages 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.

  A NUCO would align technical decisions for final geologic disposal from the moment that the used fuel is extracted from a commercial reactor until it is disposed of in a geologic repository. Financial incentives would also be aligned to support the final goal of geologic disposal.

Regardless of the type of organization, careful attention must be paid to the scope of its mandate, particularly in defining the types of waste that are the responsibility of the new organization.

Scientific integrity and public engagement will be essential to the success of any new organization.

- ***The NUCO should initially manage the storage, packaging, transportation and disposal of commercially generated waste only.*** The responsibility for defense waste would continue to reside with the federal government or a FEDCORP if one were to be created.

  The value of such an approach lies mainly with the desire to ensure the success of the NUCO. It would be a major accomplishment if a NUCO were able to successfully manage the disposal of commercially-generated spent nuclear fuel in the United States. Such an accomplishment would account for the disposal of nearly 95% of the radioactivity of the nuclear waste that requires geologic disposal.

- Funding reform is essential to ensure the timely and appropriate use of the Nuclear Waste Fund. ***The Nuclear Waste Fund should be transferred from congressional control of annual budget allocations to full access by a new, waste management organization.***

  The Reset Steering Committee recommends that the Nuclear Waste Fund be transferred from the federal government to the new waste management organization over a 25-year period. One of the advantages of a not-for-profit utility-owned organization is that it would be responsible for collecting fees for nuclear waste management and allocating funds as needed in a timely and appropriate manner.

Integration of the Back-end of the U.S. Nuclear Fuel Cycle

When policy makers contemplated nuclear waste disposal in the U.S. Nuclear Waste Policy Act of 1982, they envisioned a straightforward process: storing spent fuel in pools at reactors for no more than a few years and then transporting the spent fuel to a geologic repository starting in 1998. More than 35 years later, an *ad hoc* system for managing spent fuel has replaced this strategy, with no geologic repository in sight. The current situation exists without clear and consistent incentives on how best to manage spent fuel at reactor sites, without agreement on the necessity of centralized storage, and without consent from a host community or state for the site of a final geologic repository. As a result, there are no standardized waste management strategies at reactors, no standard waste packages, and no plan for transportation of the spent fuel from reactor sites to either interim storage or a geologic repository. Hence, it is nearly impossible to assure the compatibility of waste package design with storage or repository requirements. Spent fuel is stored using a variety of different technologies that directly impact how and when final disposal can happen. Instead of a planned, coherent system, we have the confusion of an unplanned, less than optimal system, with each player only focuses on their own small piece of the larger system. This is not a situation that builds public confidence.

More importantly, the United States has taken its "eyes off the prize"—***the prize being disposal of highly radioactive nuclear waste in a deep-mined geologic repository.***

RECOMMENDATIONS

- Congress must revise existing laws so that it:
  - **Transfers the corpus of the Nuclear Waste Fund to the new organization.**[1]
  - **Orders the Department of Justice to consider the impact of its payments on the integration of the back-end of the fuel cycle.** Payments should not limit the possibility of conditioning and packaging the spent nuclear fuel for geologic disposal, *e.g.*, packaging the fuel into smaller, potentially repository-appropriate canisters for earlier transport and disposal.
  - **Requires the nuclear utilities and the new organization to work together to establish an integrated system for spent fuel and high-level waste management** that has the capability to repackage spent nuclear fuel from the current, relatively large casks and canisters into canisters that are designed for geologic disposal.
- **The Standard Contract should be revised under the new organization to include planned removal of spent fuel first from shutdown plants.**[2]
- **The new organization should be required to work with all interested parties: industry, local, state, and tribal governments, public interest groups, academia, the regulator, to ensure that all relevant views on storage, transportation, and disposal are not only heard, but become part of the overall strategy for dealing with the waste.**
- **Finally, Congress must reaffirm that a geologic repository (or repositories) is the final goal for the fate of high-activity radioactive waste, such as spent nuclear fuel and the high-level waste from reprocessing.**

Each of these recommendations is meant to harmonize the back-end of the fuel cycle such that every decision is focused on the final goal—geologic disposal.

Public Engagement and Consent-Based Siting

Over the last half-century, implementers of national waste-management programs in more than a dozen countries have launched at least 24 efforts to site a deep-mined, geologic repository. *In only five of these efforts was a site actually chosen.* Nearly one-half of the initiatives ended prematurely because the projects failed to gain and sustain social acceptability. Those abandoned attempts typically adopted a strategy of *"decide-announce-defend,"* in which the implementer, with little or no consultation, identified potential candidate locations, informed the recipient communities, and dismissed objections and criticism as they emerged.

In contrast, Finland has selected a site near Olkiluoto, France near Bure, and Sweden near Östhammar. In the United States, a site near Carlsbad was selected for the Waste Isolation Pilot Plant in which defense-generated transuranic-contaminated waste is being disposed.

[1] Transfer of the Nuclear Waste Fund need not occur all at once but can be completed over decades. The need to re-establish the Nuclear Waste Fund can then be evaluated by the new nuclear waste management organization and done under their authority as discussed previously.

[2] The Standard Contract, 10 CFR 961, sets forth the responsibilities of the nuclear utilities and DOE in preparing and accepting commercial SNF for disposal. See the discussion in Chapter 2.

The site for the proposed Yucca Mountain repository was formally selected in 2002. Today, the fate of that site is in political limbo. In each of those instances, except the last, the development of a repository appears to be on a strong and stable track. It is no wonder that countries resetting their siting processes, such as Canada, Japan, and the United Kingdom, have decided to adopt an alternative strategy, requiring that the siting community *volunteer or consent* to the development of the facility.

Hence, the process by which a candidate geologic site is investigated, determined to be "suitable" or "unsuitable," licensed, constructed, operated and eventually permanently sealed needs to be one that involves not only the nuclear waste management organization and the regulator, *but also those affected by and interested in this process*. These can include members of local and regional communities, local, state, and tribal governments, industry, public interest groups, and the wider scientific and engineering community. All of these parties have some level of interest in, and in some cases, authority over the development of a deep-mined geologic repository. The goal, therefore, must not be a "*decide-announce-defend*" approach by the nuclear waste management organization and the regulator, but rather one in which all interested parties have the ability to participate in the process. The controversial nature of radioactive waste management demands consideration—and incorporation—of a broad range of views if a final disposal facility is to be successfully developed and used.

The details of who consents, what is consented to, and how consent is given varies from country to country. But based on the information gathered during the Reset meetings, as well as the experiences and knowledge of the members of the Steering Committee, two significant challenges have to be addressed if the United States waste management program is to move forward using a consent-based process for siting a repository for high-level waste and spent nuclear fuel.

- The implementer and the regulator have to establish strong bonds of trust with the local, tribal, and state governments involved and have to sustain that trust for the many decades during which development moves from scientific and engineering studies in support of siting through operations to final closure.
- An effective mechanism has to be put in place that allows local, tribal, and state governments to exercise decisive decision-making power throughout the repository-development program. In the chapter on public engagement and consent based-siting, the Steering Committee has outlined a process that increases the power of local, tribal and state governments in the decision-making process.

RECOMMENDATIONS:

- **The Steering Committee recommends the adoption of a consent-based siting process that (1) establishes strong bonds of trust between localities, tribes, and states on the one hand and the implementer and that (2) fairly reallocates power among the parties.**

  The Steering Committee proposes ways by which those two objectives might be secured.

  - ***Collaborate to design the siting process.*** Consent-based siting necessarily involves multiple players, such as the implementer, industry, the affected local,

state, and potentially tribal government, and public interest groups, who agree to initiate a process and become active participants willing to sustain siting activities over an extended period. The extent to which the siting principles and repository-development process reflect the expectations and values of interested and affected parties improves the chances of a positive outcome.

- ***Entrust the siting process to an independent, competent and trustworthy organization***, such as a NUCO. An organization that has established itself within a stable political environment will be needed to lead the process and be the trusted guardian of the siting. Such an organization will embrace and reflect in its operations the values central to earning and sustaining public trust and confidence.
- ***Articulate a structured and transparent process for selecting candidate sites and winnowing them down to a technically suitable and socially acceptable final choice.*** From the early engagement regarding society's expectations for a siting process, it will become evident what might provide clarity and confidence at the outset.
- ***Assemble information required to support participation.*** Early engagement by the implementer can lead to an understanding of public expectations about the information required to launch the siting process.
- ***Partner with local, tribal, and state governments.*** Once engaged, these entities will wish to co-design the journey and establish appropriate control over the process.
- ***Provide an appropriate, ethically-based platform for inviting communities to explore the repository project and consider their potential interest in hosting the repository.*** The implementer will need to provide early steps focused on the learning process and exploring the repository project.
- ***Build the conditions for sustained interest and momentum.*** A community must be a continuing strong proponent of learning about the project and participating in the siting process.
- ***Respect the need for flexibility and adaptability.*** It will not be possible at the outset to foresee all of the programs, resource needs and process details that will be essential at each point in the long multi-year period of site evaluations and repository development.
- ***Adopt a process for approval of a repository site that gives substantial authority to the local municipality, tribe or state to stop the process of site selection and repository construction.*** The decision by local and tribal governments to object should come after an appropriate period of engagement and the completion of important scientific and engineering studies. A possible point of decision could be anytime before the formal submission of the license application to the regulatory authority. A state's objection after a license has been granted could only be overturned by a supermajority of both houses of Congress.

- **Finally, in order to insure a fair process, more than one site should be characterized, just as the 1982 Nuclear Waste Policy Act originally required.**

Regulations, Risk and Safety for the Geologic Disposal of Radioactive Waste

While most of the radionuclides in spent fuel and high-level waste will decay away during the first 1000 years after removal of the fuel from the reactor, some radionuclides will persist for tens of thousands to over one million years. The purpose for any deep-mined geologic disposal system is to delay the release of radionuclides to the biosphere until they are below regulatory limits or have decayed to non-radioactive elements. This is accomplished by a series of multiple barriers, both engineered and geologic. The engineered barriers include the waste form, metal canister and back-fill that surrounds the canister. The geologic barriers rely on the low solubility of radionuclides in the groundwater, high sorption onto mineral surfaces, the slow movement of groundwater through the repository, and dilution during transport in order to delay and reduce the amount of radioactivity released from the engineered barriers. Depending on the geology of a particular site, different strategies for a geologic repository have emerged, as evidenced in the different international programs (see for example, Yardley et. al., 2016).

Natural geologic systems are by nature complex. Although a substantial fraction of the radioactivity decays during the first several hundred years, a limited number of long-lived fission products, such as ^{99}Tc and ^{129}I, and actinides, such as ^{239}Pu, ^{238}U, remain for long periods. Thus, it is necessary to evaluate the performance of a geologic repository over hundreds of thousands of years. Detailed predictions of the release and fate of radionuclides in a naturally complex system over such a long time is neither possible nor necessary. The state of the art practice is to collect enough information about the long-term evolution of the entire disposal system, such that there is sufficient confidence that the disposal system will keep humans "safe" both in the near and very long term. "Safe" does not mean zero health risk for hundreds of thousands of years, but a health risk that is low enough to be acceptable to today's population and future generations. There are no absolute guarantees of safety in any activity. The decision of what constitutes "safe-enough" has been delegated to regulatory authorities in each nation.

To best achieve an understanding of whether a site is "safe" or not, the Reset Steering Committee supports the "safety case" approach in the evaluation of the performance of a geologic repository. The safety case provides a transparent and much more complete rationale as to why the selected site is safe. The safety case approach begins with the determination of appropriate site selection criteria and iteratively continues to be developed throughout the entire process leading to a successful license application. The safety case establishes a strong and consistent relationship between the criteria for the initial selection of a site and the knowledge of the site as it is characterized and understood. A safety case describes the reasoning behind the determination that a disposal site is "safe" for a range of possible future scenarios. The safety case is based on multiple lines of qualitative and quantitative evidence and clearly addresses uncertainties, safety margins and subjective decisions that are an essential part of projecting very long-term behavior of the disposal system. The safety case goes well beyond quantitative projections of the behavior of a geologic site but rather addresses the strength of the rationale for the selection of a site. The determination of the

"safety" of a specific site over such long periods is a uniquely challenging effort for scientists and engineers. When the technical uncertainties are large, there should be a greater consideration of the ethical and social issues (Jasonoff 2004). The safety case encompasses all of these considerations.

RECOMMENDATIONS:

- **The Steering Committee recommends that the implementer be required to develop a safety case during the initial stages of site investigation that is based on site selection criteria, and to regularly update the safety case as additional information is revealed and as it receives comments from various stakeholders and other interested parties.** While formal compliance calculations are still an essential part of the licensing process, *the primary vehicle for communication with the broadest range of stakeholders and other interested parties should be the safety case*. In addition, the license application should be based on the safety case, as it has been developed during the characterization and design of the geologic repository.

- **The Steering Committee recommends that a new approach to geologic disposal repository regulation be adopted that recognizes that uncertainty in predicting geologic processes grows over time.** There are several good examples of how growing uncertainty should be treated over very long timeframes (beyond, for example, 10,000 years). Fundamentally, these alternative approaches include a stronger reliance on quantitative analyses for shorter periods of time (such as perhaps up to several thousand years), with reliance on more qualitative factors over longer periods of time. However, quantitative calculations for long time periods are still valuable as a starting point for more qualitative analyses. A new regulatory framework will need to be established in order to establish the safety case approach as the basis for the license application.

- Finally, an essential step in building trust and ensuring that the safety case remains adequate is thorough formal peer review. **The Reset Committee recommends an independent, continuing, internationally-based peer review of the safety case.** Sweden, Switzerland, and France conducted independent reviews through the Nuclear Energy Agency's international expert group (NEA 2012).

In addition to the international peer review of technical issues, local communities, tribes and states should receive funding so that they can hire their own experts, who will conduct and publish their own reviews.

In addition to the international peer review of technical issues, local communities, tribes and states should receive funding so that they can hire their own experts, who will conduct and publish their own reviews. The important role of the Environmental Evaluation Group for the state of New Mexico in the opening of the geologic repository at the Waste Isolation Pilot Plant is a good example of the success of such an approach.

SUMMARY AND REFLECTION

The recommendations by the Steering Committee are not, in sum, a modest proposal. We are recommending that a new, independent, single-purpose organization take responsibility for spent fuel from the moment that it is removed from a commercial reactor until final geologic disposal. We are placing the responsibility for the creation, funding and oversight of the new organization on the utilities that use nuclear power. We would remove Congress from controlling the funding process through annual appropriations, and over time, we recommend that the Nuclear Waste Fund be transferred to the new organization. We would increase public engagement and redistribute the power in the decision-making process to the affected and participating parties. Finally, we recommend fundamental changes in the regulatory framework and the process by which "safety" is determined.

These recommendations are tied tightly one to the other. The centerpiece, a new organization, must be properly funded. The new organization has to be in charge of every step of the process from the creation of the used fuel to its final disposal. This is the only way that decisions at each step along the way can be aligned toward the final goal of geologic disposal. The new organization must engage the public, and the public and local political entities must have the right to exercise their own preferences and make decisions about the future of the project within an appropriate time frame. The issue of safety is paramount—but the determination of safety must go well beyond a technical evaluation and extend to the values of impacted communities, tribes and states.

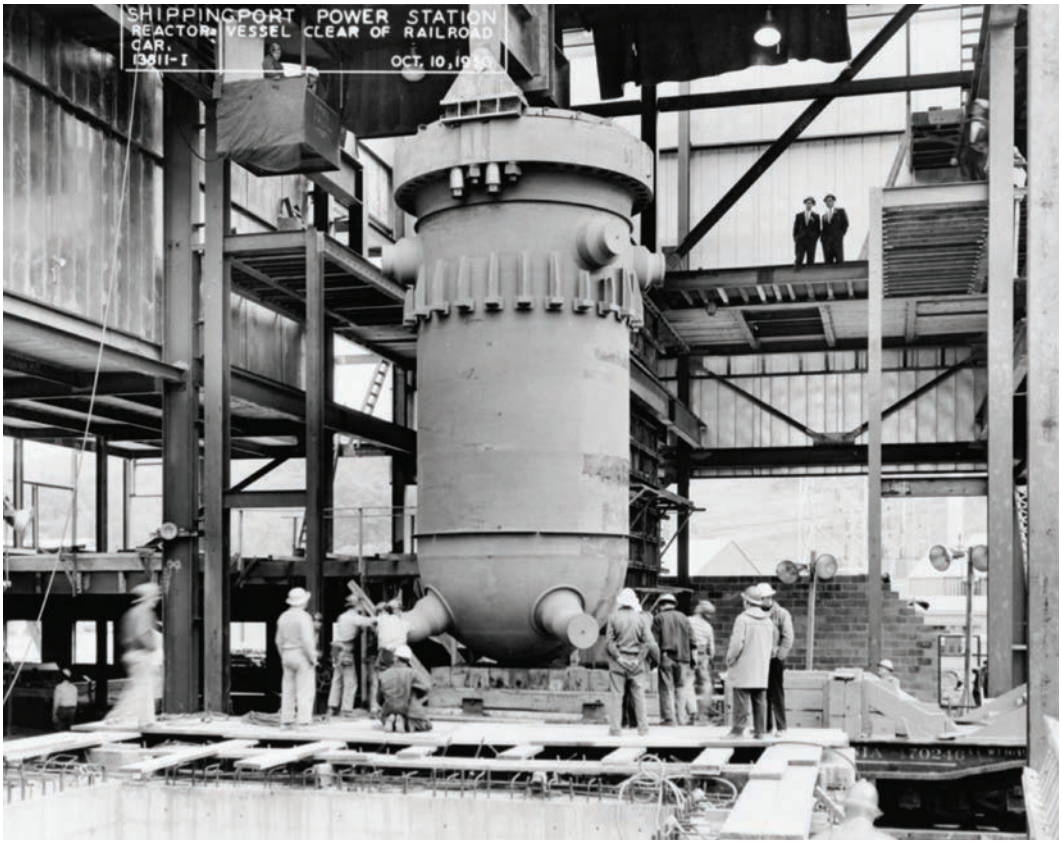
We expect that experts and the old hands in this effort will scoff at our recommendations. We simply note that after tens of billions of dollars spent and decades of effort, the U.S. program has made little progress. In such a situation, we believe that new ideas and approaches are in order. This is the time to take careful stock of the U.S. and international experience and design a new strategy that seeks to avoid that in thirty years we are still trapped in the present situation. The Nation must take the time to chart a new way forward for the safe disposal of nuclear waste.

REFERENCES:

Jasonoff, S. 2004. "Technologies of Humility." *Nature* 450:33.

Nuclear Energy Agency (NEA). 2012. *The Post-closure radiological safety case for a spent fuel repository in Sweden.* NEA/RWM/PEER(2012)2.

Yardley, B.W.D., Ewing, R.C. and R.A. Whittleston. 2016. "Deep-Mined Geological Disposal of Radioactive Waste. *Elements* 12:233-274.



The Shippingport Atomic Power Station, located on the Ohio River in Pennsylvania, was the U.S.'s first full-scale nuclear power plant used exclusively for the production of electricity. It came on line in 1957 and operated until 1982. In subsequent years, the number of nuclear reactors grew to peak of 104 that provided some 20 percent of the U.S.'s electricity. Presently, there are 60 sites with 98 nuclear reactors operating in 30 states. Typically, a nuclear reactor will produce some 20 tons of spent fuel per year. Today, the U.S. has over 80,000 tons of spent fuel stored at 75 sites where there are operating reactors or at sites where the reactors have been decommissioned.

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RESET OF AMERICA'S
NUCLEAR WASTE MANAGEMENT
Strategy and Policy

Introduction: Status of the U.S. Program & the Reset Process

The U.S. nuclear waste management program has labored for more than four decades at a cost of greater than $13 billion dollars, yet the program for disposing of spent nuclear fuel from commercial reactors or the high-level radioactive waste and spent nuclear fuel from defense programs continues to slip further into the future.[1] During that time, the program has suffered from major changes to the original law, a slowly developed but changing regulatory framework, erratic funding, significant changes in policy with changing administrations, conflicting Congressional and Executive policies and, finally, inadequate public engagement in decisions about fundamental strategies for the storage and disposal of the nuclear waste.

Such disruptions are not unexpected in any extremely large technical megaproject that is subject to strong debates over value trade-offs extending far into the future. Only the radioactive waste-management program in Finland has been relatively immune to these challenges. The programs in Sweden, France, Switzerland, Germany, Japan, Canada, and the United



Meeting #1 of Reset of U.S. Nuclear Waste Management Strategy and Policy (February 17, 2015).
SOURCE: CISAC

[1] To simplify the exposition, this report uses the term "high-activity radioactive waste" to mean both high-level radioactive waste and spent nuclear fuel.

Kingdom have all faced similar challenges. In some cases, the programs "reset" themselves relatively rapidly; in others, this process took decades. Currently, Finland is in the process of constructing its repository, having received a license to do so; Sweden and France have selected sites and are either moving through or embarking on efforts to obtain a license to construct a repository; and Canada and Switzerland are well into a comprehensive siting process. Germany has recently initiated a reset of its program with an entirely new, comprehensive siting process, which places on hold the presumptively selected Gorleben site.

TYPES OF NUCLEAR WASTE

In the United States, the high-activity radioactive wastes are of two main types: i.) spent nuclear fuel generated by defense programs or commercial nuclear power reactors and ii.) the highly radioactive material, containing mainly fission product elements, that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations and other highly radioactive material that the Nuclear Regulatory Commission, consistent with existing law, determines by rule requires permanent isolation. Some 95% of the total radioactivity in high-activity radioactive waste in the United States is in the spent nuclear fuel from commercial nuclear power reactors.

Meanwhile, the US program is caught in an ever-tightening Gordian Knot—the strands of which are technical, scientific, logistical, regulatory, legal, financial, social and political—all subject to a web of agreements with states and communities, regulations, court rulings and the congressional budgetary process. There is no single group, institution or governmental organization that is incentivized to find a solution nor is any single institution entirely responsible for the failure of the U.S. Program.

Why does the United States find itself in its current situation?

Managing High-Activity Radioactive Waste Continues to be a Low Priority

Seventy-six years ago, Enrico Fermi and colleagues demonstrated sustained nuclear fission using the Chicago Pile–1 reactor in a squash court under the stands of Stagg Field at the University of Chicago. This historic moment was the culmination of rapid advances in physics after Otto Hahn and Fritz Strassman demonstrated that the uranium atom could be split by a neutron, causing the release of huge amounts of energy and creating highly radioactive fission products. That discovery was massively scaled-up by the Manhattan Project during World War II. At what is now the Hanford Site in eastern Washington, uranium fuel rods were "burned" in nuclear reactors and then chemically processed to recover fissionable plutonium that would be used in the bomb exploded over Nagasaki. Large volumes of high-ac-

tivity radioactive waste were subsequently generated. Because stainless steel was needed for the war effort, the high-level radioactive waste from the processing activities was stored in large carbon-steel tanks, which are prone to corrosion and leakage. The Cold War stimulated a massive plutonium-production program that the Atomic Energy Commission carried out not only at the Hanford Site but also at the Savannah River Site in South Carolina. In addition, at the Idaho National Laboratory, smaller volumes of high-level radioactive waste were generated from reprocessing the fuel from nuclear submarines. The waste management "strategy" at each location was to store the waste in tanks, pending the development of permanent disposal technologies. For the most part, that strategy remains in place today. Consequently, at each of these sites, the clean-up from these waste-producing activities will stretch into future decades at a cost of roughly six billion dollars per year.

The first commercial nuclear power plant at Shippingport, on the Ohio River in Pennsylvania, came online in 1957. Eventually over 100 nuclear power plants would provide electricity in the United States. These reactors have generated some 80,000 metric tons of spent nuclear fuel, most of which are still stored at some 75 reactor sites across the country.

From the early days of the Manhattan Project and the Atomic Energy Commission, there has been little focus on the fate of high-activity radioactive waste. This benign neglect continued in part because of competing budgetary priorities but also because both policymakers and the technical community underestimated how difficult it would be to manage and dispose of these radioactive materials. The situation remains much the same today. There is still no accepted strategy for dealing with high-activity radioactive waste generated by nuclear defense programs and commercial reactors.

A Technical—If Temporary—"Fix" Was Available

During the first decade after high-activity waste was generated in the defense program, a commonly held view was that its management was a straightforward and easily solved technical problem. If a tank needed to be replaced, it was a simple matter of pumping the contents of one into a replacement. This feat could be carried out "in perpetuity."

By the mid-1950s, the prospect of commercially generated nuclear electricity began to be realized. Although perpetual tank storage might have been an option in the plutonium-production program, it did not seem viable once utilities began to generate spent nuclear fuel. The Atomic Energy Commission decided to ask the National Academy of Sciences (NAS) to provide advice on a more sustainable approach. At that time, a wide variety of possible solutions were considered from disposal in the deep ocean to deep space.

In 1957, an Academy Committee issued a report that even today frames how high-activity waste is to be managed (NAS 1957). The Committee maintained that the material could be disposed of in mined-out, stable, and deep geologic formations. Therein lay the idea of constructing a permanent waste-disposal repository. Although the committee believed that many sites in the United States would be suitable, it was particularly attracted to the idea of disposing the waste in salt. To overstate the case, "solving" the radioactive waste management "problem" meant digging a hole and emplacing the waste therein.

The Academy's endorsement of a long-term technical solution rationalized the AEC's decision to support only a low level of research and development funding. Compared to its reactor and weapons design programs, much smaller efforts for the waste problem were cobbled together at the agency's national laboratories.

Implementing a Technical "Fix" Was Not as Easy as Expected

A fire in 1969 at the Rocky Flats Plant, a weapons facility in Colorado that produced bomb components, led AEC Chairman Glenn Seaborg to send the contaminated material to Idaho along with a promise to Idaho's governor to remove that waste within a decade.

Those commitments forced the AEC to fund a more aggressive waste-management program. By 1970, the agency proposed to construct a repository in a salt formation outside of Lyons, Kansas. The leader of the Kansas Geologic Survey convinced state officials and one congressman that the nominated site was technically suspect. Moreover, vocal opposition arose to the very idea of developing a nuclear waste repository. Ultimately, the Lyons project was abandoned.

Further complicating matters, in 1974 India tested a "peaceful" nuclear device using plutonium separated from US-provided fuel irradiated in a Canadian-designed research and test reactor. This led President Ford and then President Carter to propose indefinitely deferring the reprocessing of spent nuclear fuel from civilian reactors in order to set an example for other countries that had or were contemplating a nuclear power program. Spent nuclear fuel that might have been shipped off site to a reprocessing facility would now certainly build up at the reactor sites across the country. Although President Reagan lifted the indefinite ban on reprocessing in 1981, commercial spent fuel is still not reprocessed in the United States.

By the end of the 1970s, environmental protection as well as opposition to further development of commercial nuclear power emerged as salient political issues. Environmental advocates found their views bolstered by, among other things, the passage of the National Environment Policy Act (NEPA). NEPA forced the question of radioactive waste management to be deliberated in forums outside the technical community. Reflecting this change, President Carter established an Interagency Review Group on Nuclear Waste Management (IRG) to propose wide-ranging policies that would fundamentally alter the dynamics underlying the management of radioactive waste.

Released in 1979, the Interagency Review Group recommendations came at a time when key members of Congress were exploring initiatives and approaches that might be included in new legislation. In 1982, the IRG recommendations and Congressional ideas, which in many cases overlapped, were incorporated into the Nuclear Waste Policy Act (NWPA).

Key Bargains in the Nuclear Waste Policy Act (1982) Unravel

At its core, the NWPA contains four interlinked "bargains": (1) sites for a repository would be chosen based on technically driven evaluations of at least three candidate sites; (2) to promote geographic equity, two repositories would be developed; although not explicitly stated in the law, it was generally accepted that the first one would be in the western U.S. and the second in the east; (3) in return for a fee levied on the generation of nuclear-pow-

ered electricity, the federal government would begin accepting high-level radioactive waste and spent nuclear fuel for disposal by January 31, 1998, and (4) states would be given a meaningful role in approval of the selected site.

The NWPA laid out a plan to achieve a repository: the Department of Energy (DOE) would recommend to the President three sites for extensive investigation and characterization. Subsequently, DOE would recommend one of those sites as the location for the first repository for high-activity waste. Congress would either sustain an objection from the state where the proposed site was located or override it. DOE would submit an application to construct a repository at the site and would submit it for approval by the Nuclear Regulatory Commission (NRC). The repository's projected performance would have to comply with standards set by the Environmental Protection Agency (EPA).

Almost immediately after the passage of the NWPA, each of the bargains started to unravel. The cost of exploring multiple sites was higher than anticipated. Moreover, public and political opposition to siting both a facility in the west but especially to a repository in the east intensified. Consequently in 1986, the Secretary of Energy determined that the second repository was "no longer needed."



FIGURE 1.1. The underground Exploratory Studies Facility built at Yucca Mountain by the Department of Energy to determine whether the location was suitable as a deep geological repository.
SOURCE: *https://flic.kr/p/qacBkD*

Attempting to address these problems, Congress passed the Nuclear Waste Policy Amendments Act (NWPAA) in 1987. This law designated the Yucca Mountain site in Nevada as the sole location for the Department of Energy (DOE) to characterize to determine whether it might be suitable for a repository. The law also officially terminated the second repository program by requiring that DOE report on the need for a second repository by 2010.

The faith placed in the "technical fix" soon appeared to be based more on wishful thinking than on actual evidence. Nevada's continued opposition to developing a repository at Yucca Mountain, erratic policy directions at DOE, intermittent budgetary support from Congress, and the intrinsic difficulty of characterizing a complex site all contributed to repeated failures to meet targeted milestones.

By the late 1990s, it became clear that the January 1998 date to begin accepting spent nuclear fuel could not be met. Reactor owners sued DOE for damages for the agency's partial breach of contract. To date, the courts have awarded those parties several billion dollars in damages. Depending on when waste acceptance finally occurs, the anticipated final total will be in the tens of billions of dollars and will be paid out of the Judgment Fund using general revenues.

In a vibrant pluralistic democracy, policy opponents retain many avenues for making their views felt. As it turned out, one of Nevada's senators, Harry Reid, rose to a position of political power. As the Majority Leader in the Senate, he convinced incoming President Barack Obama that the Yucca Mountain project had become "unworkable." In 2010, the Obama administration tried to withdraw DOE's license application to construct the repository at Yucca Mountain, which was then pending before the NRC. When that tact did not succeed, Reid and the Obama Administration eliminated the project's funding at both DOE and NRC.

Yet support for the Yucca Mountain Project remains strong. A comprehensive bill to provide funding to restart the suspended NRC hearings has passed in the House. For those supporters, the more than $13 billion already spent represents a significant sunk cost that members of Congress were unwilling to walk away from. Moreover, who among them would want to place their state back into play? The Trump Administration's request for $160 million in new funding, however, has been rejected so far.

It is unclear how long the current stalemate will continue. One can envision at least two possible futures. In the first, comprehensive waste-management legislation is passed within the next year or so. That legislation would, at a minimum, provide funding to DOE and NRC to resume the suspended hearings on Yucca Mountain. In the second scenario, the United States adopts an approach similar to the one just chosen in Germany. A new site-selection process is launched. Yucca Mountain remains in contention but is not automatically the preferred choice. Depending on which scenario emerges, the following pages of this report will be more or less relevant.

"Yesterday's solutions have become today's problems."

These words, spoken by a DOE official who asked to remain anonymous, capture the essence of the fundamental dilemma. Over the course of decades, decisions meant to provide solutions often created even greater problems. When one surveys the fate of nuclear waste at the back-end of the nuclear fuel cycle in the United States, "today's problems" include:

- Spent nuclear fuel from commercial nuclear power plants continues to accumulate at some 75 sites in 35 states. The United States produces approximately 2,000 metric tonnes of spent fuel per year. The total inventory is over 80,000 metric tonnes, more than the legislated capacity for the geologic repository proposed at Yucca Mountain. Even if a repository is built at Yucca Mountain, a change in law will be required in order to authorize DOE to permanently dispose of all of the waste anticipated to be generated by the continued operation of existing nuclear power plants to their end of life. In 2008, the life cycle costs for the repository at Yucca Mountain were revised upward from $58 billion to $96 billion for the 150 years of research, construction and operation of the geologic repository (Sproat 2008). To date, the cost of developing the repository at Yucca Mountain is approximately $13.5 billion.

- The Nuclear Waste Policy Act of 1982 established the Nuclear Waste Fund (NWF) mainly from receipts from the collection of fees by nuclear utilities. The fee (one-tenth of a cent per kilowatt-hour) was to be used to fund the permanent disposal of spent nuclear fuel from commercial nuclear power plants. The fund presently has accumulated over $40 billion, including interest (Bearden 2015). In the absence of an active program to establish a geologic repository, the collection of the fee was suspended in May 2014, by a federal court, but interest continues to add significantly to the fund's balance.

- U.S. taxpayers pay over $500 million dollars a year to the utilities as a result of a judgments against the federal government for its failure to take ownership of the spent nuclear fuel in 1998, as required by the Nuclear Waste Policy Act of 1982. Estimated future liabilities for these judgments may reach $23.7 billion (Cotton 2016), but the total could be higher if there is a continuing delay in opening a geologic repository.

- Funds from the Nuclear Waste Fund were appropriated annually by Congress, but the amount of funding is subject to statutory (Budget Control Act of 2011) and procedural (Congressional budget resolutions) limits. Thus, appropriations for the nuclear waste disposal program remain under the spending cap applicable to all domestic programs, even though the NWF is self-financed and well-funded. In summary, the rate payers using electricity generated by nuclear power plants have provided substantial funds to support the disposal of nuclear waste, but few of these funds are available to DOE for this purpose.

This landscape of major challenges is decorated by cascading controversy and legal action caused by the continued delay in implementing the U.S. Nuclear Waste Policy Act of 1982, its subsequent amendment in 1987, and numerous unmet agreements between the Department of Energy and states that presently have large amounts of nuclear waste.

No Repository in Sight

Central to all of these issues is the need to locate, build, license and operate a geologic repository for the disposal of high-level nuclear waste. However, after nearly thirty years of effort, there is now no clear path forward for the selection, characterization and development of a geologic repository for spent nuclear fuel and high-level nuclear waste. When one surveys and reflects on the types of problems that have plagued the Department of Energy, it may well be that Yucca Mountain is not the major issue but rather is a symptom

of the intrinsic challenges of the U.S. program for the disposal of radioactive waste. Even if the Yucca Mountain project should move forward, it has become clear to most parties that important changes will need to be made in the U.S. strategy and policy for the management of the back-end of the nuclear fuel cycle.

Yucca Mountain is not the major issue but rather is a symptom of the intrinsic challenges of the U.S. program for the disposal of radioactive waste.

The problematic issues are many: program management has been plagued by political interference, such as abandoning the original idea of characterizing multiple sites; the funds, though collected, have not been appropriated when needed; the affected state has not consented to the process; the waste at reactor sites is not managed with an eye to final disposal in a geologic repository; and the current site evaluation methodology is opaque and controversial.

The Reset Initiative

The Reset initiative, *Reset of America's Nuclear Waste Management Strategies and Policies*, is based on the simple premise that given the scale and importance of the challenges at the back-end of the nuclear fuel cycle, there is great value in taking a deep look at some of the most critical problems and their possible solutions. Reset is an effort to untangle the technical, administrative and public concerns in such a way that important issues can be identified and addressed.

Any new strategy must be informed by a thorough understanding of the history of the U.S. nuclear waste program, as well as the scientific, technical, social and policy challenges required to reset the U.S. program. Today, technical and policy issues have been overwhelmed by a partisan political process. A Democratic administration has tried to shut down the Yucca Mountain project as "unworkable," while Republicans in Congress view Yucca Mountain as the "law of the land."

The members of the Steering Committee do not represent their organizations.

As a first step, and in order to inform any new strategy, the Reset Project has provided a forum for the discussion of the critical issues that must be addressed in order for the U.S. program to move forward. Meetings were organized by an international Steering Committee, listed in Appendix A. The members of the Steering Committee represent diverse and international perspectives and have considerable experience with the back-end of the nuclear fuel cycle. The members of the Steering Committee do not represent their organizations. They bring their technical experience and professional views to the discussion.

The Reset process involved convening five meetings, which consisted of 75 presentations (Appendix B) by internationally recognized experts, government officials, legislators, nongovernmental organizations and members of the public. The meetings were held at Stanford University and George Washington University (Appendix C: Prospectus and Agenda for each meeting.) The meetings were open to the public.

Some of the critical issues discussed during the Reset meetings had been previously identified by the *Blue Ribbon Commission on America's Nuclear Future* in its 2012 final report. However, in contrast to the broader agenda of the BRC, the Reset meetings were focused only on the back-end of the nuclear fuel cycle. In cases where the Reset topics overlapped with the BRC, we tried to push further into the details of the issue, such as the need for a new organization and the consent-based siting process. We also identified additional issues as being important, such as the need for integration of the back-end of the nuclear fuel cycle, particularly in the analysis of risk and the regulatory framework.

CRITICAL ISSUES

At the first meeting in February 2015, the Steering Committee identified critical issues, each of which was the subject of a subsequent meeting:

- ***A new waste management organization:*** Although recommended by the Blue Ribbon Commission, there has been only limited discussion of the structure, characteristics and funding of such a new organization. The committee identified four very different issues that needed to be addressed: i.) the structure or anatomy of the organization; ii.) the behavior or physiology of the organization; iii.) the lifetime of such an organization; iv.) funding. Although the Blue Ribbon Commission considered the structure of a new organization and how it might be funded, there was little attention to how such an organization would operate, particularly over an extended period of time. However, it is exactly the behavior of the organization that goes immediately to the issue of trust. Any large technical program that deals with nuclear topics requires trust. The issue of trust is seldom discussed, but it is critical to success. Issues include:

  Any large technical program that deals with nuclear topics requires trust.

  - *What are the values of the organization?*
  - *How does the organization interact and communicate within its political and technical sphere while maintaining credible, constructive interactions with the affected public and state governments?*
  - *How does the organization set priorities?*
  - *How does the organization learn and change, particularly as it moves from the research stage to implementation and construction of the repository?*
  - *How does one design an organization that will function for a very long time, perhaps more than one hundred years, through a constantly changing political environment?*
  - *How should such an organization be funded?*

  This issue was the subject of the meeting at Stanford in September 2015.

- ***Definition of a consent-based process for siting geologic repositories:*** Although the Blue Ribbon Commission and the DOE under the Obama administration often referred to the need for a consent-based process, there was little discussion of what this meant and how such a process might be designed. The Trump administration appears to have abandoned this concept. A consent-based process requires the blending of social and technical criteria in the selection, characterization, and development of one or more geologic repositories, but there has been no effort to design a technically-based, legal process that is compatible with the needs of a community, tribes, the states, and the federal government. Simple questions remain unanswered:
    - *What constitutes consent? If consent is a "legally binding agreement", how does it differ from the present array of legally binding agreements that the DOE has already entered into with states and communities?*
    - *What technical criteria will be used in the consent-based process?*
    - *How does a community or state give informed consent?*
    - *To what extent can a local community or state affect the repository design and strategy?*
    - *When and how can a local community, tribe or state government withdraw consent? Should the U.S. government have the power to override withdrawal of consent, and, if so, at what stage in the development of the repository and by what mechanism?*
    - *Once consent is achieved, how can important aspects, such as the type of waste to be disposed, be modified? Who has the power to modify the agreement?*
    - *Can a consent-based siting process succeed in the federal system of the United States?*

  This issue was the subject of a meeting at Stanford in March 2016.

- ***Integration of the entire commercial nuclear waste generating system:*** The value of a "total system analysis," from the point of waste generation to its final disposal, is generally recognized. However, such an evaluation has not been completed in terms of the analysis of risk, the development of incentives, or the development of a consistent regulatory framework. In fact, there are many disconnects in the back-end of the U.S. nuclear fuel cycle. For example, the nuclear utilities can make locally rational decisions for optimizing the storage of their spent nuclear fuel that may complicate its final disposal. Issues include:
    - *Can incentives for all parties be aligned such that they drive the back-end of the nuclear fuel cycle to a final solution—permanent geologic disposal?*
    - *Does the Standard Contract between the utilities and the federal government require modification?*
    - *Are regulations consistently applied across all activities at the back-end of the fuel cycle, such as for storage, transportation and geologic disposal?*

Can incentives for all parties be aligned such that they drive the back-end of the nuclear fuel cycle to a final solution—permanent geologic disposal?

This was the subject of a meeting at George Washington University in May 2016.

- ***Regulations, risk and safety:*** The present regulatory framework for a geologic repository in the U.S., unlike other nations, requires the quantitative calculation of risk out to hundreds of thousands of years. This approach is technically complex, difficult to review and provides a poor basis for public engagement. However, a revision of the regulations and standards may open the way to a more straightforward siting process for nuclear facilities and generate greater public acceptance.
    - *Is a quantitative, probabilistic approach necessary or realistic in its goals?*
    - *What is the relation between calculated risk and safety?*
    - *Does reliance on a quantitative approach instill pubic confidence or skepticism?*
    - *Are there alternative approaches to determining safety?*
    - *How are these issues addressed in other countries?*
    - *Although the ultimate goal of the back-end of the nuclear fuel cycle is geologic disposal, this results in an emphasis on long-term impacts, but what about risk and safety during the early period of construction and emplacement of the waste in a repository?*

  This was the subject of a meeting at Stanford in October 2016.

- ***What are the risks with present U.S. policy:*** The Steering Committee determined that in order to develop a compelling case for a new U.S. policy, it is necessary to understand the risks of continued delay of the U.S. waste program. Many of these risks are of great interest to the affected public:
    - *What are the risks of continued storage of spent nuclear fuel at reactor sites?*
    - *What are the risks associated with the transportation of spent nuclear fuel, first to an interim storage site and then to a geologic repository?*
    - *Does consolidated storage prior to geologic disposal reduce the overall risk?*

  The Steering Committee has not yet completed such a risk assessment, as this will require substantial funding and time. The basic approach, however, would be to assemble a risk assessment team with representatives from all affected parties with diverse perspectives and concerns, so that the final results are generally understood and, perhaps, accepted.

Each of these critical issues has a generally under-appreciated level of complexity. The discussion of each issue requires input across the broadest range of disciplines – science, engineering, social science, political science and the law. The discussions also importantly benefit from the participation of concerned members of the public, state governments, national laboratories, and universities, as well as members of the executive and legislative branches of government. The purpose of the Reset meetings has been to provide such a forum for discussion from a wide range of perspectives.

This report is a summary of the major issues that were raised during the discussion as understood by the Steering Committee during their subsequent deliberations. As one might

expect, there are a range of views, and we have tried to capture the essential elements of these different perspectives. At the same time, the Steering Committee has tried to emphasize specific ways forward for the U.S. program. This is not a consensus report. Individual members of the Steering Committee may have preferred a different emphasis on certain options. Still, we hope that the recommendations will prove useful as the U.S. fashions a new strategy and policy for the management and disposal of the Nation's nuclear waste.



Reset Meeting #5 on Regulations, Risk, and Safety (October 16, 2016). SOURCE: CISAC

REFERENCES

Bearden, D.M. 2015. "Testimony to the House Committee on Energy and Commerce, Subcommittee on Environment and the Economy." December 3.

Blue Ribbon Commission on America's Nuclear Future (BRC). 2012. *Report to the Secretary of Energy.* Washington, D.C.: U.S. Department of Energy.

Budget Control Act of 2011. https://www.congress.gov/112/plaws/publ25/PLAW-112publ25.pdf.

Cotton, T. 2016. Presentation to Reset Meeting, George Washington University, May 13.

NAS (National Academy of Sciences). 1957. *The Disposal of Radioactive Waste on Land.* Washington, D.C.: National Academy of Sciences.

Nuclear Waste Policy Act of 1982. https://www.energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf.

Nuclear Waste Policy Amendments Act (NWPAA). 1987. https://www.energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf.

Sproat, W. 2008. "Yucca Mountain cost estimate is increased." *United Press International*, Aug. 5. http://www.upi.com/Yucca-Mountain-cost-estimate-is-increased/16051217961093/.

World Nuclear News. 2008. "Yucca Mountain cost estimate rises to $96 billion." World Nuclear Association, August 6. http://www.world-nuclear-news.org/newsarticle.aspx?id=20196.



Director Yukiya Amano touring the Onkalo spent nuclear fuel repository on Olkiluoto – a sparsely inhabited island off Finland's western coast. The Finnish implementer – a utility-owned corporation, Posiva Oy – has adopted the Swedish KBS-3 disposal concept (see page 74), essentially, spent fuel in a copper canister with a bentonite backfill in crystalline rock. The Finish program began in the early 1980s, and if construction proceeds according to schedule, the repository will begin accepting spent nuclear fuel by the mid-2020's. SOURCE: *https://flic.kr/p/d4RYob*

A New National Radioactive Waste Management Organization with a New Funding Strategy

The lynchpin to the recommendations of the Reset Steering Committee is the recognition of the need for a new, independent, single-purpose national radioactive waste management organization and reform of the funding process.

These are not new ideas. Many reviews, most recently *The Blue Ribbon Commission on America's Nuclear Future*, have made similar recommendations. Nearly seven years after the BRC report, the need for such an organization has only increased. In this chapter we review the history of organizational responsibilities for nuclear waste management in the United States and discuss possible alternatives to a government-chartered organization, a FEDCORP, recommended by the Blue Ribbon Commission. Based on its analysis, a majority of the Steering Committee supports an alternative model– a non-profit, nuclear utility-owned implementing corporation, NUCO. The Steering Committee maintains that a new organization will be needed even if the license application for Yucca Mountain, filed and presumably defended by DOE, is approved.

The lynchpin to the recommendations of the Reset Steering Committee is the recognition of the need for a new, independent, single-purpose national radioactive waste management organization and reform of the funding process.

Regardless, of the type of organization, there is a compelling case to be made that a new organization and funding reform are absolutely essential to the future success of the management and disposal of nuclear waste in the United States.

The new organization, regardless of its type and structure, must have a clearly stated charge, a structure that embraces public engagement and engenders trust, a focused research agenda that matches the knowledge needs for geologic disposal over long periods of time and, most importantly, sufficient and consistent funding over decades. Funding for the new organization must also be removed from the annual Congressional appropriations process so as to ensure adequate year-to-year funding to maintain an efficient site selection, charac-

Regardless, of the type of organization, there is a compelling case to be made that a new organization and funding reform are absolutely essential to the future success of the management and disposal of nuclear waste in the United States.

terization, licensing, and construction process. Federal oversight would be through the determination of standards by the Environmental Protection Agency, the determination of regulatory compliance by the Nuclear Regulatory Commission and active surveillance of the NUCO by federal agencies, such as the Nuclear Waste Technical Review Board.

History of U.S. Organizations Responsible for Nuclear Waste

As part of the Manhattan Project, high-level radioactive waste was first created at the Hanford Reservation in eastern Washington State in 1944. For the next 25 years, the federal government was the sole generator of nuclear waste as it produced the plutonium used in nuclear weapons. In 1946, the Atomic Energy Act (AEA 1946) assigned responsibility for radioactive waste management to the federal government. The federal agency in charge from 1947 onward, the Atomic Energy Commission, retained the implementing approach that had served the Manhattan Project well. Rather than using federal personnel, the AEC contracted with private corporations and universities to carry out its research, development and materials production activities.

Such an approach seemed defensible, even optimal, because a private corporation or university could better recruit scientists, engineers, and managers. Private corporations and universities also ran the national laboratories that were a legacy of the Manhattan Project. Further, contracting with a private corporation or university allowed the AEC to retain control over classified information and materials while facilitating technology transfer to industry (Orlans 1967). However, for reasons well documented elsewhere (OTA Appendix A 1985), competing congressional priorities relegated to the back-burner the AEC's efforts to direct its contracting corps to establish a program for long-term management of its radioactive waste. Nonetheless, as a for-profit nuclear power industry began to mature in the mid-1960s, the AEC felt pressure from Congress and the public to clarify how not only defense, but also commercial, high-activity radioactive waste would be managed.

In 1971, the Atomic Energy Commission promulgated a rule governing the operation of soon-to-be-constructed private reprocessing plants and regulating the waste that would be generated within them (10 CFR 60: Appendix F). The rule placed on the federal government the responsibility to develop a deep-mined, geologic repository to isolate the waste from the biosphere for millennia.

Under legislation in place today, the Nuclear Waste Policy Act (as amended) (NWPA 1982; NWPAA 1987), DOE is responsible for siting, designing, and operating a deep-mined, geologic repository and transporting defense and commercial high-activity radioactive waste from 121 sites where the material is stored to a geological repository. For a limited time in the mid-1980s, DOE was authorized to construct and operate a centralized storage facility. To do so in the future, however, new legislation would have to be enacted. The NWPA calls

for the waste generators to pay the costs incurred either through a fee based on the electricity produced by the nuclear utilities for the disposal of commercial waste or through appropriations from the federal government's general fund for the disposal of defense waste. Although DOE's activities are mostly sanctioned under the amended 1982 law, it retains residual authorities under the 1954 Atomic Energy Act (AEA 1954). Funding for commercially generated spent nuclear fuel and DOE-owned high-activity radioactive waste is controlled by Congress.

Most of the underlying presumptions and conditions that led the federal government to become the implementer of the U.S. waste-management program have changed. For example, the technical expertise needed to design, site, and license a deep-mined, geologic repository is no longer to be found in a single government agency. Measured by Curie-content, the inventory of commercial spent nuclear fuel now dwarfs the inventory of DOE-managed high-activity radioactive waste. Gone too is the original cohort of contractors, such as DuPont, General Electric, and AT&T, whose management fees were minimal. These corporations have been replaced by companies whose management fees can be substantial.

The Steering Committee believes that the responsibility for developing a repository should be transferred to a new, independent, single-purpose organization outside of DOE.[1] Furthermore, the Steering Committee believes that it is essential for control of the administration of the Nuclear Waste Fund be transferred from Congress to the new organization.

Had DOE and its predecessor agencies successfully negotiated these changes in their technical and political environments, the question of whether a government agency is the appropriate implementer for the nation's radioactive waste-management program likely would never have arisen. But, for many reasons, some of which are beyond its control, after 35 years, DOE has not delivered an operating geologic repository despite decades of effort and an expenditure of more than $13 billion. The current structure has shown itself to be too susceptible to changing political influence over the sustained period of effort necessary to site, construct and operate a repository. Funding fluctuations, changes in policy direction, and continuous changes in the technical strategy of the program have led to a situation where the DOE consistently fails to meet its goals and schedules.

The Steering Committee believes that the responsibility for developing a repository should be transferred to a new, independent, single-purpose organization outside of DOE. Furthermore, the Steering Committee believes that it is essential for control of the administration of the Nuclear Waste Fund be transferred from Congress to the new organization.

The Steering Committee recognizes that any decision about how to organize implementation and funding, whether it preserves or alters the *status quo*, carries with it both benefits and costs. But, on balance, the Steering Committee maintains that its recommendation best ad-

[1] The timing for this shift depends on when and if the NRC's suspended hearing on the Yucca Mountain license application is resumed as well as the outcome of that adjudication.

dresses a critical national issue, which has been left in limbo for far too long. In the following pages, the Steering Committee provides the basis for its recommendation.

What Type of Organization?

Over the course of nearly four decades, students of organizational behavior and practitioners have been considering the question of an appropriate institutional form for the radioactive waste-management implementer. In particular, they have explored whether the responsibility for the long-term management of high-level radioactive waste and spent nuclear fuel was appropriately placed in the hands of the federal government. No consensus has emerged from that prolonged debate in large part because the choice is typically cast as depending on difficult trade-offs being made between efficiency and effectiveness on the one hand and credibility and responsiveness on the other.

Mason Willrich and Richard Lester prepared the first detailed analysis of alternative institutional arrangements for implementing the U.S. radioactive waste-management program (Willrich and Lester 1977). They concluded, "the existing organization for radioactive waste management is likely to be unworkable if left unchanged." They recommended "a national Radioactive Waste Authority be established as a federally chartered public corporation." The authority would be governed by a Board of Directors, composed of members drawn from academia, the nuclear industry, the research community, and the general public. It would be self-financing. It would, in the view of Willrich and Lester, provide *comprehensive, integrated, efficient* management of both defense and commercial radioactive waste.

When Congress crafted the 1982 NWPA, it was not unaware of the concerns about the federal government's performance that non-governmental organizations and policy analysts alike were raising. The congressional General Accounting Office was especially critical of DOE and its predecessor agencies. (See, for example, GAO 1971, 1974.) In response, Congress included in the 1982 law specific instructions to revisit the question of institutional form. [2]

> The Secretary of Energy shall undertake a study with respect to alternative approaches to managing the construction and operation of all civilian radioactive waste management facilities, including the feasibility of establishing a private corporation for such purposes.

In June, 1983, the Secretary of Energy established a diverse, 13-person Advisory Panel on Alternative Means of Financing and Managing Radioactive Waste Management Facilities (AMFM Panel). He charged the panel with developing "a thorough and objective analysis of the advantages and disadvantages of each alternative approach."[3]

The AMFM Panel compared the *status quo*, the Office of Civilian Radioactive Waste Management, the sub-cabinet unit then reporting directly to the Secretary, with three to five (depending on how one counts) alternatives (AMFM Panel 1984). Each institutional form reflected specific (and different) policy assumptions.

[2]NWPA, Section 303.
[3]Amended Charter for the AMFM Panel. Reproduced in AMFM 1984. pp. A3-A4.

- Independent Government Agency
    - Independent Federal Commission, modeled after the Atomic Energy Commission
    - Independent Federal Administration, modeled after the Environmental Protection Agency
- A mixed public/private Corporation for Waste Management, modeled after AMTRAK
- Private Corporation
    - Federally chartered American Nuclear Corporation, mostly owned and operated by nuclear utilities and purveyors of nuclear energy equipment and services
    - A company, ownership and structure to-be-determined, that would bid for the national franchise to develop and operate repositories for high level waste and spent nuclear fuel.

Notably absent from the alternatives considered was the option of a fully private not-for-profit corporation that would be operated by a Board of Directors composed of members of the U.S. nuclear utilities and would be fully self-financing.

The AMFM Panel evaluated each institutional form against 14 "organizational tests," such as mission orientation, credibility, stability, responsiveness, technical excellence, political immunity and political accountability. The "scores" represented "expert judgments." No attempt was made to reference or use academic research or studies by business consultants. The panel concluded that none of the alternatives was optimal; although each possessed clear advantages, each were burdened by substantial disadvantages.

Instead, the AMFM Panel advanced an additional possibility, advocating the creation of a FEDCORP. FEDCORP would be a single-purpose organization focusing solely on implementing the U.S. radioactive waste-management program. It would be a government-chartered corporation with no equity apportionment, making it a wholly owned instrument of the federal government. FEDCORP would have a Board of Directors appointed by the President and confirmed by the Senate. The Board of Directors would function like analogous bodies in the private sector. A strong chief executive officer would report to the Board.

In the view of the AMFM Panel, FEDCORP scored highly on all 14 organizational tests. Creating it, however, would be especially valuable with respect to credibility, stability, internal flexibility, political immunity and cost-effectiveness. The one downside noted was the significant transition costs that would be involved. But, as the panel observed, this shortcoming was common to all changes in the *status quo*.

Within two months after he received the panel's report, Secretary Donald Hodel appointed a four-person review committee composed of senior DOE political appointees. The committee took exception to virtually every judgment on the organizational tests rendered by the AMFM panel (Boggs *et al.* 1985). In particular, the committee maintained:

- Credibility was improving with the passage of the Nuclear Waste Policy Act.
- Although the political cadre changed with changes in the Administration, civil servants provide sufficient stability.

- Internal flexibility could be improved if the Office of Civilian Radioactive Waste Management had decided to seek exemptions from the requirements of the Civil Service Act.
- Political immunity would be bought at the cost of having a less accountable organization.
- Cost-effectiveness will improve as OCRWM moves up the learning curve of operating under the Nuclear Waste Policy Act.

Moreover, the committee pointed to strong opposition from states and the nuclear utilities to any reorganization. Thus, the committee's bottom-line recommendation to the secretary: if institutional redesign is at all called for, it only should be undertaken once a construction license for a repository had been approved.

Fifteen years later DOE prepared a congressionally mandated report aimed at revisiting the question of institutional form. The management consultant firm of Booz-Allen & Hamilton compared three institutional possibilities:

- Transforming Office of Civilian Radioactive Waste Management into a performance-based organization within DOE
- Establishing an autonomous internal authority within DOE with its own personnel and procurement systems
- Creating an independent authority, governed by a corporate-style board of directors.

DOE's bottom-line position shifted somewhat from the one it held earlier. Rather than await the granting of the construction license: "No decision on whether to implement any of these alternatives or other approaches should be made until the Site Recommendation [dealing with the proposed repository at Yucca Mountain] process is completed" (DOE 2001:3). Yet when that effort concluded the following year, 2002, DOE never returned to the question of institutional form.

The Blue Ribbon Commission's Recommendation

This situation changed markedly after the Obama Administration took office in 2009. Within a year, it determined that the Yucca Mountain project was "unworkable" and that DOE's license application to construct the facility, then before NRC, should be withdrawn. The President instructed the Secretary of Energy to charter a *Blue Ribbon Commission on America's Nuclear Future* (BRC). Among its duties was the analysis of management issues.

Two years after its creation, the BRC issued its final *Report to the Secretary of Energy* (BRC 2012). One key recommendation was that Congress should create a new single-purpose implementing agency, outside of DOE, charged with the responsibility of implementing the nation's radioactive waste management program.

> "[T]he record of the last several decades indicates that the current approach is not well suited to conducting the steady and focused long-term effort, and to building and sustaining the degree of trust and stability necessary to establish one or more disposal facilities and implement other essential elements of an integrated waste management strategy."

Although the BRC acknowledged that "previous studies have concluded that a number of different organizational forms could get the job done," it favored a FEDCORP structure as compared with a new single-purpose federal agency.

DOE reviewed the analyses and recommendations contained in the BRC report for the next year. During that time, among other things, it commissioned a study by the RAND Corporation (Davis *et al.* 2012). RAND evaluated three institutional forms:

- PRIVCORP—a federally chartered private, for-profit, corporation.
- GOVCORP—a federally chartered government instrumentality, typically formed with a commercial purpose.[4]
- IGA—an independent government agency.

Like the AMFM study, the RAND study did not evaluate the advantages and disadvantages of a nuclear utility-owned, not-for-profit corporation.

Nonetheless, the RAND study concluded that a PRIVCORP would lack critical attributes, such as political credibility, capacity to develop public trust and confidence, and accountability. In particular, the analysis maintained that the Swedish model, a not-for-profit corporation formed by nuclear power plant owners, is "unlikely to be a viable option in the United States." RAND declined to choose between a GOVCORP and an IGA, arguing that either institutional form could be structured to meet critical performance goals. Ultimately, the study observed, policymakers will have to strike a "balance between the competing values of accountability and flexibility called for in the design of the new management and disposition organization."

In January 2013, DOE released its "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste" (DOE 2013). It concurred with the Blue Ribbon Commission's recommendation that a new implementing organization was needed to "provide the stability, focus, and credibility to build public trust and confidence." DOE further asserted that the management of high-level waste and spent nuclear fuel was "inherently a governmental responsibility." However, consistent with the RAND analysis, DOE declined to endorse either the FEDCORP or IGA institutional form.

In June 2013, a bipartisan group of four Senators introduced the Nuclear Waste Administration Act. The Act called for, among other things, the creation of an independent government agency to execute the nation's nuclear waste-management program. A hearing was held in July 2013, but no vote was taken. Two years later, the same group of Senators re-introduced the legislation.[5] However, no hearings were held then or later. Thus, the question of whether a new implementing organization will be established remains unanswered.

Waste Management Organizations in Other Countries

Across the globe, five national radioactive waste-management programs stand out: Canada, Finland, France, Sweden, and Switzerland. With the exception of Finland, the programs in

[4]This form corresponds closely to what other analysts have termed FEDCORP. For consistency sake, this report shall continue to use the term "FEDCORP."
[5]Nuclear Waste Administration Act, S.1240, 113th Congress, 2013; and S.854, 114th Congress, 2015.

each of the other countries experienced significant disruptions and had to be reconstituted. But in each case, the necessary changes needed to put the efforts back on track were adopted in a relatively short time, typically three to five years.

- In Canada, 23 communities expressed interest in learning more about hosting a repository. By 2018, the implementer had winnowed them down to five potential sites and is now conducting more detailed assessments in five of them. Importantly, none of the communities chose to withdraw from the site-selection process.
- In the beginning of 2016, the Finnish government approved a license application to construct a repository.
- In 2018, the Swedish regulator advised Government that SKB's application to construct a repository in the Municipality of Östhammar met the requirements of the Nuclear Activities Act. The Land and Environment Court, however, advised Government that SKB had failed to demonstrate that it had fully complied with the requirements of the Environmental Code. As of mid-2018, it is unclear how Government will respond to this divergent advice.
- The French implementer is preparing a preliminary license application, which is scheduled to be considered by Parliament in 2019.
- The Swiss implementer has begun extensive, site investigations in three regions (NWTRB 2016).

The radioactive waste-management programs in Canada, Finland, Sweden, and Switzerland have two features in common. First, their aim is to dispose of all types of commercially generated radioactive waste.[6] Thus, those firms manage all elements of the back-end of the nuclear fuel cycle, including, in most nations: interim storage of low- and intermediate-level radioactive waste, geologic disposal of high level waste and spent nuclear fuel, as well as waste packaging and transportation. *Consequently, those companies have a strong technical incentive to align decisions at every stage with the final goal of geologic disposal.* Second, responsibility in all four countries has been placed in the hands of *a single not-for-profit organization owned by the nuclear utilities.*[7] The programs in Canada, Finland, Sweden and Switzerland are *also mostly self-funded with the funds administered by the program*.

The importance of aligning the incentives of the various actors is illustrated by the example of extended storage of commercial spent nuclear fuel in the United States. As the prospects for operating a deep-mined, geologic repository recede, nuclear utilities will have to store increasing amounts of spent nuclear fuel in dry casks. They have strong economic incentives to use larger and hotter containers. Without a significant repackaging campaign, the size and thermal output of the disposal packages could complicate the design of a geologic repository. (See discussion in the following chapter on the integration of the back-end of the nuclear fuel cycle in the United States).

The situation in France differs in some respects. The French implementer, ANDRA, a government-owned Public Service Agency, must not only provide for the long-term manage-

[6]The Canadian implementer focuses only on the disposal of spent nuclear fuel.
[7]The Swiss Federal Government provides three percent of the implementer's financing to cover the cost of disposing of radioactive waste from medicine, industry, and research. The Federal Government holds one of nine seats on the Board of Directors.

ment of commercially generated reprocessed radioactive waste, but it must also dispose of waste produced by that country's defense nuclear program. It must engage the three major waste-generating organizations, Électricité de France, Orano (formerly Areva), and the Commissariat à l'Energie Atomique et aux énergies alternatives, that play important roles, especially with respect to the interim storage, packaging, and transportation of radioactive materials. However, all four organizations are wholly or partly controlled by the French government, thereby minimizing, although not eliminating, barriers to integrating the entire waste management system.

An Alternative for the United States: A Utility-Owned Nuclear Waste Management Organization

In the view of the Steering Committee, the track record of nuclear utility-owned implementers abroad, coupled with the intrinsic harmonization of technical and business incentives, makes at least a *prima facie* case for considering the creation of a not-for-profit, nuclear utility-owned implementing corporation (NUCO).[8] Such an approach is consistent with the "polluter pays" principle to which other energy producing systems are subject.

Below, the Steering Committee examines the conditions under which a NUCO might be effective in the United States. The first question that must be considered is the scope of responsibilities for the non-profit, nuclear utility-owned implementing corporation (NUCO).

Commercially-generated spent nuclear fuel and high-level defense waste. The NWPA does not require commercial spent nuclear fuel to be "co-mingled" with defense high-level waste in the same repository. The decision of whether to "co-mingle" these wastes is left to the President. Since 1985, the decision had been to combine these two types of waste into a single repository, but a determination in March 2015 by President Barack Obama that a separate repository was "required" for defense waste, has also raised the possibility that defense high-level waste and commercial spent fuel might be managed by different institutions (DOE 2015). Under the Steering Committee's proposal NUCO would initially manage the packaging, storage transportation, and disposal of commercial waste only.[9]

The responsibility for defense waste would continue to reside with the federal government or a FEDCORP if one were to be created. The value of such an approach lies mainly with the desire to ensure the success of the NUCO. It would be a major accomplishment if a NUCO were able to successfully manage the disposal of commercially generated high-activity radioactive waste in the United States. Such an accomplishment would account for the disposal of some 95% of the radioactivity of the nuclear waste that requires geologic disposal.

The rationale for such an approach includes:

- The utility-owned NUCO should not be burdened by the legacy waste of the U.S. defense program. Nuclear waste from defense programs is a uniquely federal responsibility.

[8] Indeed, this option was recently suggested by an analysis the Heritage Foundation (Tubb, Loris, and Spencer, 2017), who proposed that industry should be responsible for managing the waste of the commercial nuclear industry in compliance with federal rules and regulations.

[9] The Steering Committee recognizes that a FEDCORP could take over responsibilities for managing commercial-origin radioactive waste. Such an arrangement would be an improvement over the *status quo*. The Steering Committee has concluded, however, that creating NUCO with those responsibilities is the preferred option.

- The NUCO should not inherit the obligations and agreements that the DOE has entered into with communities and states for the disposal of defense waste.
- One of the advantages of the NUCO strategy is that it provides for the necessary integration at the back-end of the nuclear fuel cycle - from the production of the spent fuel in a utility reactor to its disposal by a NUCO in a geologic repository.
- Defense wastes are not part of the back-end of the nuclear fuel cycle created by nuclear power plants.

Such an approach would create two nuclear waste management programs in the United States: one private and one federal. Given the history of the past thirty years, it would certainly be prudent to advance nuclear waste management in the United States across these two fronts. Over time one could monitor the success of each approach. If the NUCO successfully develops a geologic repository, one can imagine that on a fee basis some or all of the defense waste could be disposed of in the repository. The contract would also contain the criteria for waste-acceptance along with a waste acceptance schedule. Table 1 lays out NUCO's initial responsibilities, as well as additional responsibilities it might assume at a later date.

As Table 1 demonstrates, the Steering Committee's proposal for a NUCO would fundamentally restructure the U.S. nuclear waste-management program.[10] Whether it will be adopted depends on how well it can satisfy the interests of key affected parties, including owners of nuclear reactors, state and local authorities, the NRC, non-governmental organizations, and the public-at-large represented by the federal government. It is to that question that the Steering Committee now turns.

Congress would authorize the creation of NUCO as a not-for-profit organization. NUCO would be owned exclusively by the nuclear utilities. NUCO would be governed by a Board of Directors elected by the owners. Its senior management team would include a Chief Executive Officer, Chief Nuclear Officer, and a Chief Financial Officer. Because NUCO might have to site one or more deep-mined, geologic repositories, a Chief Scientist and a Chief Engineer would report to a Chief Site Investigations Officer. Also, at the highest level, perhaps as a Vice-President, there should be a corporate officer directly responsible for public engagement.

Responsibilities now held by the federal government would transfer to NUCO over a period of 12 months beginning with the enactment of authorizing legislation. The Nuclear Waste Fund would slowly be transitioned from federal control to control by the new organization. The formula for levying fees deposited in the Nuclear Waste Fund for commercial high-activity radioactive waste would be retained. However, those fees would be provided to the new organization. Annual appropriations for general tax revenues to manage defense-origin radioactive waste would continue as long as the Federal Government retains those responsibilities. The Federal Government would still be obligated to pay the full cost of managing defense-originated radioactive waste, either directly or through payments to NUCO. Upon its creation, NUCO would receive 2.5 percent of the *corpus* of Nuclear Waste Fund. The remainder (including the accumulated interest earned) would steadily transfer to NUCO over a period of 25 years. If additional revenue is required to fulfill its mission to dispose of

[10] Management of defense transuranic waste should remain with the federal government since WIPP is currently in operation.

TABLE 1: NUCO's initial responsibilities with respect to nuclear waste as well as additional responsibilities it might assume at a later date.

WASTE TYPE AND ACTIVITY	CURRENT	PROPOSED
Commercial Greater-Than-Class-C (GTCC) and Defense GTCC-like Waste		
Storage	Private Sector	Private Sector or NUCO
Transportation	Federal Government	NUCO
Packaging	Federal Government	NUCO
Disposal	Federal Government	NUCO
Defense Transuranic*		
Storage	Federal Government	Federal Government
Transportation	Federal Government	Federal Government
Packaging	Federal Government	Federal Government
Disposal (WIPP)	Federal Government	Federal Government
Defense HLW		
Storage	Federal Government	Federal Government
Transportation	Federal Government	Federal Government initially and perhaps NUCO ultimately
Packaging	Federal Government	Federal Government initially and perhaps NUCO ultimately
Disposal	Federal Government	Federal Government initially and perhaps NUCO ultimately
Defense SNF		
Storage	Federal Government	Federal Government
Transportation	Federal Government	Federal Government initially and perhaps NUCO ultimately
Packaging	Federal Government	Federal Government initially and perhaps NUCO ultimately
Disposal	Federal Government	Federal Government initially and perhaps NUCO ultimately
Commercial SNF		
Storage	Private Sector	NUCO
Transportation	Federal Government	NUCO
Packaging	Federal Government	NUCO
Disposal	Federal Government	NUCO

commercial, high level waste and spent nuclear fuel, it would be provided by the new organization's owners. Provisions to cover increased costs for the disposal of defense radioactive waste would be included in any contract between the federal government and NUCO. The Standard Contract (DOE 1983) between nuclear utilities and the federal government would remain in force. The owners of nuclear reactors would maintain their ability to obtain damages from the Department of Justice Judgment Fund. Damage awards shall cease after 25 years or until all of the commercial high-activity radioactive waste has been removed from reactor sites, whichever comes first.

The new organization's responsibilities would include the development of facilities to manage commercial Greater than Class-C waste, high-level radioactive waste, and spent nuclear fuel, and any waste types transferred from the federal government. The new organization should establish a transportation system for moving all those waste forms from sites where they are stored to centralized facilities. The new organization would be responsible for the construction of a waste handling facility that would include a capacity to repackage and conduct research and development on the characteristics of the waste and its pre- and post-disposal containers. The new organization would have the authority to construct a consolidated storage facility. Depending on the fate of the proposed repository at Yucca Mountain, the new organization would select at least one new site to characterize as a potential repository. Ultimately, at least two repositories would be developed in separate states. The location of all these facilities shall be chosen by the new organization, but all nuclear facilities would have to be licensed by NRC.

Key Issues for Any Nuclear Waste Management Organization

During the Reset meetings there was considerable discussion of the key attributes or values that a nuclear waste management organization should have. Here we summarize some of the important points that apply to both the NUCO and FEDCORP:

- The new organization must be created with careful attention to the roles of other organizations. Nuclear waste management requires a *strong* and *engaged regulator*, a web of university, national laboratory and other researchers, diligent review by independent scientific organizations, and support for community, tribal and state organizations that are charged with the continuous review of the project. The latter point is particularly important. Affected communities, tribes and states must be provided with support so that they can engage their own independent experts.
- Public engagement cannot be left as an afterthought to the project. Early public engagement and an explicit strategy for continued public engagement have to be part of the values and mission of the new organization. This goes well beyond public education, but rather requires careful attention to the concerns of local communities, as well as the interested public and state agencies. (See further discussion in the chapter on public engagement.)
- The new organization must be insulated from a changing national political environment, but never insulated from scientific review or engagement with the local communities or state agencies. Congress and the Executive should not be involved in site selection.

- The new organization must be designed with the expectation that it will last for a very long time. The selection, construction and final emplacement of waste in a geologic repository will take over one hundred years. During that time, societal values, political and funding constraints, and scientific knowledge will change considerably. A new organization must be able to adjust to these external changes and new knowledge.
- Considering the challenge of geologic disposal over unprecedented time frames, the new organization must be able to direct a robust science program, manage a major engineering and construction project, handle large quantities of highly radioactive material—and do this all while under intense public scrutiny and engagement.
    - The scientific programs must balance fundamental scientific studies that provide the basis for the safety assessment and applied science and engineering that implements the design strategy and construction of the repository. Up until now, the science program in support of the siting and evaluation of a geologic repository has been fragmented among contracting organizations, and the programs come and go on an annual basis depending of appropriations or the problem of the day. The program has been large but without a proportional scientific impact. In fact, the program could probably be smaller and more successful if the implementing organization had the opportunity to fund experts and laboratories around the world based on their expertise and could provide extended funding so that the necessary intellectual capital would be created and maintained throughout the project.
    - Should the direction of the nation's radioactive waste-management program shift to explore new sites for a repository, the early stages of site characterization and evaluation are mainly scientific. However, the next stage—construction and emplacement of the waste—requires considerable engineering expertise, very different from that provided by the scientific community. This means that the new organization must be able to transition from laboratory scale and modeling activities to field studies and, finally, to the actual construction of the repository.
- Finally, maintaining public trust and scientific integrity have to be part of the DNA of the new organization—valued throughout all parts of the organization and through all stages of repository development. Public trust requires early and continuing engagement with the public and state authorities. Scientific integrity requires transparency in data collection and interpretation, publication in peer-reviewed journals and tolerance for the tough questions that go with any rigorous scientific process.

RECOMMENDATIONS:

- Create a new, independent, not-for-profit, single-purpose nuclear waste management organization. This is not a new idea, and there are many models for such an organization. The Blue Ribbon Commission favored a FEDCORP structure. However, the Reset Steering Committee points to some unique advantages 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.

A NUCO would align technical decisions for final geologic disposal from the moment that the used fuel is extracted from a commercial reactor until it is disposed of in a geologic repository. Financial incentives would also be aligned to support the final goal of geologic disposal.

Regardless of the type of organization, careful attention must be paid to the scope of its mandate, particularly in defining the types of waste that are the responsibility of the new organization.

Scientific integrity and public engagement will be essential to the success of any new organization.

- The NUCO should initially manage the storage, packaging, transportation and disposal of commercially generated waste only. The responsibility for defense waste would continue to reside with the federal government or a FEDCORP if one were to be created.

  The value of such an approach lies mainly with the desire to ensure the success of the NUCO. It would be a major accomplishment if a NUCO were able to successfully manage the disposal of commercially-generated spent nuclear fuel in the United States. Such an accomplishment would account for the disposal of some 95% of the radioactivity of the nuclear waste that requires geologic disposal.

- Funding reform is essential to ensure the timely and appropriate use of the Nuclear Waste Fund. The NWF should be transferred from congressional control of annual budget allocations to full access by a new, waste management organization.

  The Reset Steering Committee recommends that the Nuclear Waste Fund be transferred from the federal government to the new waste management organization over a 25-year period. One of the advantages of a not-for-profit utility-owned organization is that it would be responsible for collecting fees for nuclear waste management and allocating funds as needed in a timely and appropriate manner.

REFERENCES

AMFM Panel (Advisory Panel on Alternative Means for Financing and Managing Radioactive Waste Management Facilities). 1984. *Managing Nuclear Waste—A Better Idea.* Washington D.C.: U.S. Department of Energy.

Atomic Energy Act. 1954. https://www.nrc.gov/docs/ML1327/ML13274A489.pdf.

Atomic Energy Act. 1946. https://science.energy.gov/~/media/bes/pdf/Atomic_Energy_Act_of_1946.pdf/.

Blue Ribbon Commission on America's Nuclear Future (BRC). 2012. *Report to the Secretary of Energy.* Washington, D.C.: U.S. Department of Energy.

Boggs, D. J., T. Garrish., M. Dolan, and B. Rusche. 1985. *Report to the Secretary of Energy on the Conclusions and Recommendations of the Advisory Panel on Alternative Means of Financing and Managing (AMFM) Radioactive Waste Management Facilities.* Washington, D.C.: U.S. Department of Energy.

Davis, L. E., D. Knopman, M. Greenberg, L. Miller, and A. Doll. 2012. *Choosing a New Organization for Management and Disposition of Commercial and Defense High-Level Radioactive Materials.* MG-1230-DOE. Santa Monica, CA: RAND Corporation.

DOE. 1968. "Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities." *10 Code of Federal Regulations 50*, Appendix F. Washington, D.C.: U.S. Government Printing Office.

DOE. 1983. "Standard Contract for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste." *10 Code of Federal Regulations 961.* Washington, D.C.: U.S. Government Printing Office.

DOE. 2001. *Alternative Means of Financing and Managing the Civilian Radioactive Waste Management Program.* DOE/RW-0546. Washington D.C.: U.S. Department of Energy.

DOE. 2013. *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste.* Washington, D.C.: U.S. Department of Energy.

DOE. 2015. *Report on Separate Disposal of Defense High-Level Radioactive Waste and Spent Nuclear Fuel.* Washington, D.C.: U.S. Department of Energy.

GAO (General Accounting Office). 1971. *Progress and Problems in Programs for Managing High-Level Radioactive Wastes.* B-164052. Washington D.C.: General Accounting Office.

GAO (General Accounting Office). 1974. *Improvements Needed in the Land Disposal of Radioactive Wastes: A Problem of Centuries.* RED-76-54. Washington D.C.: General Accounting Office.

Nuclear Waste Policy Act. 1982. https://www.energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf.

Nuclear Waste Policy Amendments Act. 1987. https://www.energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf.

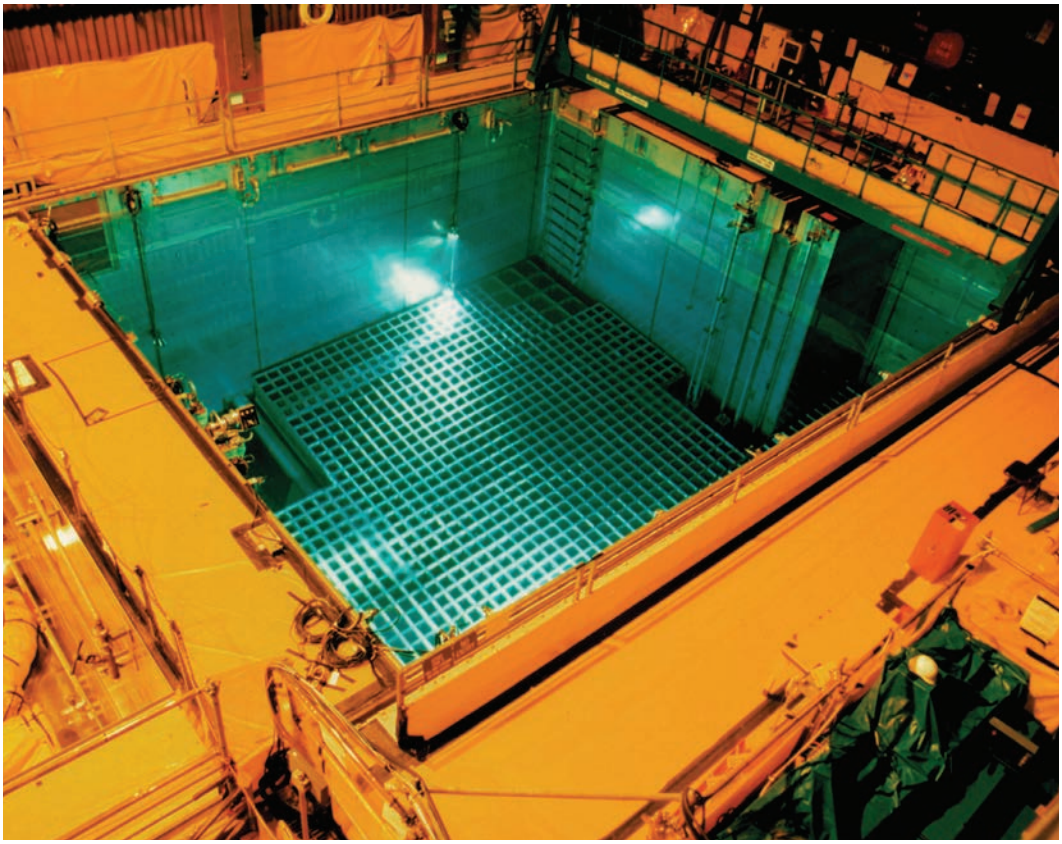
NWTRB (Nuclear Waste Technical Review Board). 2016. *Survey of National Programs for Managing High-Level Radioactive Waste and Spent Nuclear Fuel: Update.* Washington, D.C.: Nuclear Waste Technical Review Board.

Obama, B. 2015. "Presidential Memorandum—Disposal of Defense High-Level Radioactive Waste in a Separate Repository" (March 24, 2015). Washington, D.C.: The White House.

Orlans, H. 1967. *Contracting for Atoms.* Washington, D.C.: Brookings Institution.

OTA (Office of Technology Assessment). 1985. *Managing the Nation's Commercial High-Level Radioactive Waste.* OTA-O-171. Washington, D.C.: Government Printing Office

Willrich, M. and R. Lester. 1977. *Radioactive Waste: Management and Regulation.* New York, NY: Free Press.



Spent fuel pool located at the San Onofre Nuclear Generating Station (SONGS) located 60 miles north of San Diego. The nuclear power plant, consisting of three nuclear reactors, was shut down in 2013. In the absence of a geologic repository for the disposal fuel, some 1,700 tons of spent fuel at SONGS will be transferred to dry cask storage. The transfer to dry cask storage is expected to be completed in 2019. The 80 steel-lined concrete monoliths will remain on site, unless another interim storage site can be identified. SOURCE: *https://flic.kr/p/qrBH8p*

Integration of the Back-end of the U.S. Nuclear Fuel Cycle

When policy makers contemplated nuclear waste disposal in the early 1970s, they envisioned storing spent fuel in pools at reactors for roughly five years and then transporting the fuel to a reprocessing plant. The high-level radioactive waste from reprocessing would be solidified and then transported to a deep-mined, geologic repository, again roughly within five years. The NWPA of 1982 set 1998 as the date when a repository would start to receive nuclear waste from the commercial reactors of the utilities.

More than 35 years later, an *ad hoc* system for managing spent fuel has replaced this strategy; there has been no reprocessing of commercially generated nuclear fuels, and there is no geologic repository in sight. The current situation exists without clear and consistent incentives on how best to manage spent nuclear fuel at reactor sites, without agreement on the necessity of centralized storage, and without consent from a host community or state for the site of a final geologic repository. As a result, there is no standardized waste management strategy at reactors, no standard waste packages, and no plan for transportation of the spent nuclear fuel from reactor sites to either a centralized interim storage facility or a geologic repository. Spent nuclear fuel is stored using a variety of different technologies that impact how and when final disposal can happen. Instead of a planned, coherent system, we have the confusion of an unplanned, less than optimal system with each player focused only on their own small piece of the larger system. This is not a situation that builds public confidence. Regardless of Yucca Mountain's fate as a geologic repository, the integration of the back-end of the fuel cycle is essential to the future of nuclear power in the United States. Integration deals with all aspects of the back-end of the nuclear fuel cycle, including the integration of knowledge, methods, practices, as well as the application of a regulatory framework that covers all aspects of the back-end of the nuclear fuel cycle. We are not the first to note this need, others (*e.g.*, Rechard *et*

Regardless of Yucca Mountain's fate as a geologic repository, the integration of the back-end of the fuel cycle is essential to the future of nuclear power in the United States.

al., 2015; Bonano *et al*., 2018) have examined options for improving the level of integration of the back-end of the nuclear fuel cycle in the United States.

Most importantly, the United States has taken its "eyes off the prize," that is, disposal of highly radioactive nuclear waste in a deep-mined geologic repository.

Most importantly, the United States has taken its "eyes off the prize," that is, disposal of highly radioactive nuclear waste in a deep-mined geologic repository. Spent nuclear fuel stored above ground—either in pools or dry casks—is not a solution to the very long-term hazard posed by these nuclear materials. One has to assume, as all countries with nuclear power programs have, that eventually spent nuclear fuel containers stored near the surface will degrade, which could result in the radioactive contamination of the environment and exposure to human beings. The need for a deep geologic repository is predicated both on the assumption that societal institutions cannot be relied upon to ensure safety in perpetuity and on the ethical responsibility of present generations to safely manage the nuclear waste that they have created, as they have benefitted from the nuclear energy.

What is Integration?

In the United States, the back-end of the fuel cycle comprises many steps that begin when spent nuclear fuel is removed from the reactor core and placed in a spent fuel pool. The pool storage allows the fuel to cool and provides shielding from its intense radiation field. Spent nuclear fuel may then be transferred to large concrete casks for dry storage at the reactor site, later transported to a centralized, away-from-reactor interim storage facility (if available), and finally shipped to a deep geologic repository for final disposal. The properties of spent nuclear fuel evolve over time, and this affects how it should be handled and managed as it passes from one stage to the next of initial storage, transportation, interim-storage and, finally, disposal (Ewing 2016).

Integration *of the back-end of the fuel cycle should include clear plans for storage (on-site and centralized), transportation, and the final disposal of high-activity radioactive waste.*[1] *This requires many decisions, such as the selection of waste containers, a determination of transportation means and routes, and the design and development of a geologic repository. Each of these activities is tightly interdependent. Their proper function requires thoughtful, but challenging, decisions to ensure that they remain integrated. For the U.S. program, disconnects among these activities have become increasingly evident with the continuing delay in the development of a deep-mined geologic repository for high-activity radioactive waste.*

For instance, a well-thought out strategy for the back-end of the nuclear fuel cycle would have selected a repository site relatively early in the process of storage and transportation planning—with an understanding of the geologic environment into which the nuclear waste would be emplaced. Early knowledge of the selected site and/or the disposal concept allows

[1]Although reprocessing of spent nuclear fuel is not precluded, no private-sector entity has recently expressed interest in constructing such a facility.

the implementer to tailor the canisters of spent nuclear fuel used initially for storage and transportation so that the fuel would not have to be repackaged before being emplaced in a repository; thereby, decreasing costs and worker exposure. Spent fuel pools would be sized appropriately (they are currently often holding 4 times their originally designed volume of spent fuel) and equipment would be in place at reactors to transfer fuel from the pools to dry storage after an appropriate cooling period. Transportation systems would be thought through and set in place so that when spent nuclear fuel needs to be transported, potentially over long distances, the necessary equipment and infrastructure would already exist.

Feasible, safe, and efficient integration should strive to minimize fuel handling to ensure that health risks and costs are reduced. A good strategy would involve a single managing organization responsible for the spent fuel from discharge to disposal, and this would be done within a regulatory framework that is consistent across each stage of the fuel cycle. Because long periods, years to tens of years, are involved at each stage, funding should be available when needed to transfer the fuel to the next stage of the process.

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Current Practice for the Management of Spent Nuclear Fuel

Storage of Commercial Spent Nuclear Fuel. By April 2016, civilian nuclear reactors had generated approximately 80,000 metric tonnes of heavy metal (MTHM)[2] of commercial spent nuclear fuel in the U.S., of which roughly 55,000 MTHM was in pool storage and 25,000 MTHM was in dry storage (Figure 3.1). The 99 currently operating reactors in the U.S. discharge about 2,000 metric tonnes of spent fuel each year, and because most reactor pools are operating at full capacity, dry storage capacity must increase at an equivalent rate. This requires adding about 160 new storage canisters each year to the approximately 2,080 already in service at active and decommissioned reactor sites. Assuming no new reactors are built and all currently operating reactors receive full renewals of their NRC licenses, and also assuming that no permanent disposal facility becomes available, by the time the last of the current reactor fleet is retired in the mid-21st century, the United States will have approximately 134,000 metric tons of spent nuclear fuel in dry storage if no permanent repository becomes available. Essentially all of this fuel will be in approximately 11,000 dry storage canisters at more than 75 different locations.

Although there are some 30 designs of dry storage cask and canister systems in use in the U.S today, sites are now loading dual-purpose canisters that are designed by vendors

[2] Under current law, the statutory limit for Yucca Mountain is 70,000 MTHM.

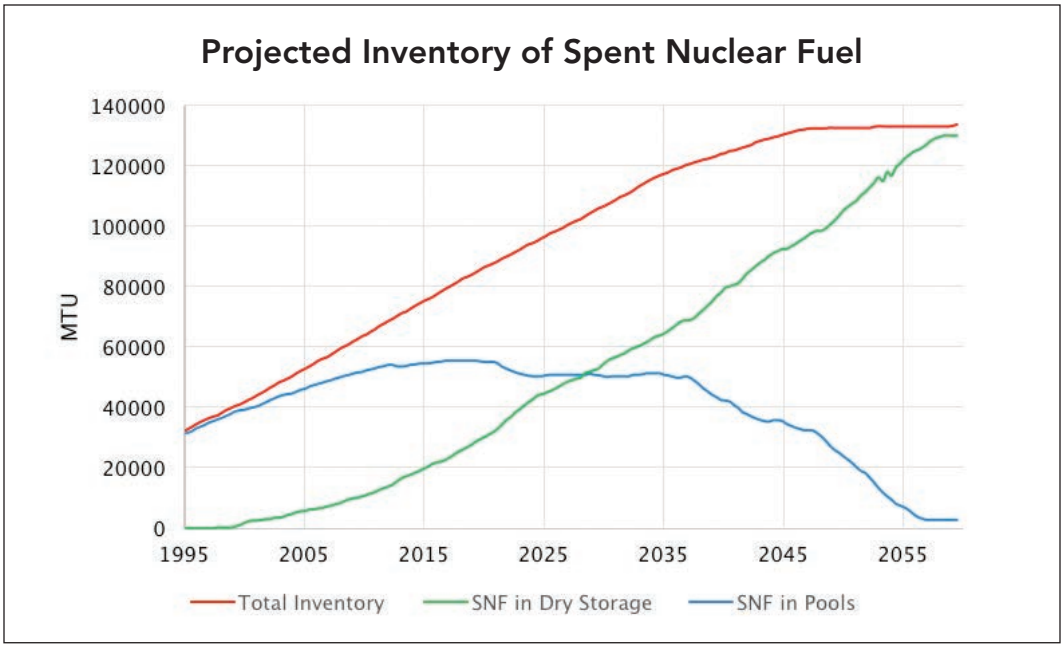


FIGURE 3.1. The existing and projected inventory of commercial spent nuclear fuel in the U.S. Projections assume full license renewals of operating reactors, no new reactor construction, and no permanent disposal of spent nuclear fuel.

SOURCE: updated from Figure 6 of Rechard *et al.* 2015 or Figure 3 of Bonano *et al.*, 2018

and licensed by NRC for both storage and transportation.[3] The majority of commercially available canister designs in the U.S. place welded stainless-steel canisters inside concrete or concrete and steel overpacks[4] in both vertical and horizontal configurations (Figure 3.2), with options for vertical emplacement both above and just below the ground surface. The canisters themselves are large: up to two meters in diameter and five meters in height, and the largest currently in use can accommodate up to 37 intact fuel assemblies from pressurized water reactors, which account for about two thirds of the U.S. reactor fleet.[5] A loaded canister weighs approximately 70 metric tons, and transportation shielding may increase the weight to 150 metric tons. Cost and operational efficiencies at reactor sites often compel licensees to order and deploy larger and larger canisters.

In the United States, the heat limit for the transport mode of these relatively large storage and transportation systems is often half of that of the storage mode. This means that some of the spent fuel in dry storage will need to remain at reactor sites up to tens of years until they are cool enough to be transported. This will have a direct effect on how long some spent fuel storage sites must exist before they can be cleared of all of their spent fuel.[6]

[3]An example of the inconsistent regulations is that the DPC's heat limit for transport is often one-half of that for storage.
[4]The majority of dry storage systems in use outside the US are the bolted lid metal casks as do a few utilities in the U.S.
[5]One bolted lid metal cask design in use at one reactor site can hold 40 pressurized water reactor assemblies.
[6]This situation is exacerbated as utilities move to higher and higher burn-up.

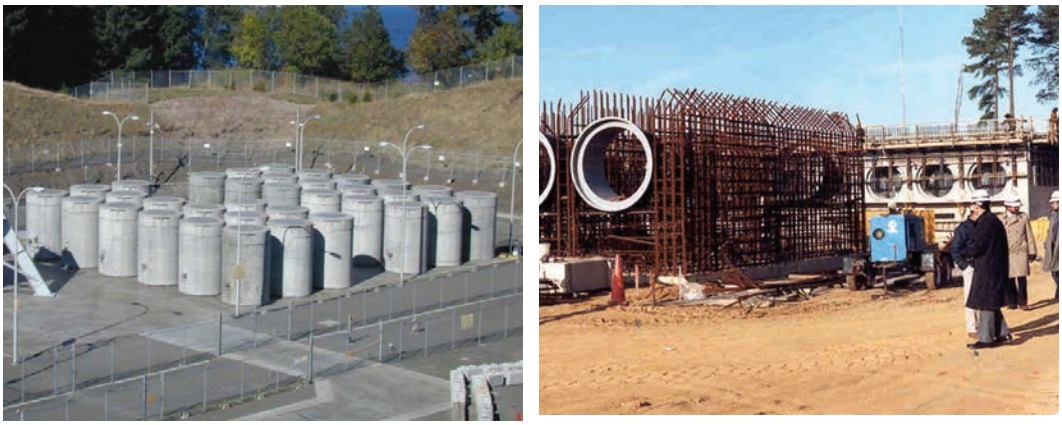


FIGURE 3.2. An example of a vertical (left) dry storage configuration of spent nuclear fuel from the decommissioned Trojan Nuclear Power Plant in Oregon. The horizontal (right) configuration, under construction, shown is from the Calvert Cliffs Nuclear Power Plant in Maryland.
SOURCE: https://flic.kr/p/dcNYfE, https://flic.kr/p/bmV9E5

Centralized interim storage. Interim storage of spent fuel at a centralized location has been proposed as an approach to alleviating storage concerns at reactor sites. Developing such a facility may also provide a path to resolution of legal issues discussed below associated with federal responsibility for spent nuclear fuel management (DOE 2013). Moving spent fuel to such a facility may avoid the creation of orphaned sites where spent nuclear fuel is the only remnant of past nuclear reactors. Centralized storage facilities could also be used to provide flexibility in repackaging options for ultimate disposal as well as being able to avoid the need to construct repackaging facilities at more than one site. However, no consolidated dry storage facility exists in the United States, and, as discussed below, legislative amendments to the NWPA will be required before substantive federal storage facilities can be licensed and operated.[7]

Transportation. Transportation of high-activity radioactive waste is integral to the nuclear fuel cycle. However, transportation routes, the order in which spent fuel is transported, and the existence of appropriate transportation equipment and infrastructure must be developed before there can be large-scale transportation of spent nuclear fuel to either a centralized storage facility or a geologic repository. Approximately 22 percent of the loaded canisters do not have the transportation overpacks required for transport and an additional 15 percent of canisters may not have appropriate casks for transport (Jones Jr 2016). Transportation will be done by barge, heavy haul truck, or rail. Many power plants are not yet transport-ready, in other words, their rail spurs have not been maintained, their barge slips are not ready for use, and railroad tracks are not appropriately sized to transport spent nuclear fuel off site (Maheras *et al.* 2016). Under the NWPA, the DOE is charged with developing a transportation plan for spent fuel to a repository but has completed only preliminary work on this task. Thus, final decisions regarding the plan for transporting spent fuel—by road, rail, or ship have not yet been made.

[7] Two private initiatives have been launched to develop a centralized storage facility, one in Texas and the other in New Mexico. Regulatory review of the license application submitted by Texas project has been suspended (Exchange Monitor 2017) but may be revived.



FIGURE 3.3. A spent fuel cask being transported at the Surry nuclear plant in Virginia. A typical dry storage cask is approximately 18 feet tall and can weigh up to 350,000 pounds when fully loaded.
SOURCE: *https://flic.kr/p/bmVajm*

Repository. Under the NWPA, a U.S. repository was to have begun accepting spent nuclear fuel by January 31, 1998. This has not happened, and plans for developing a repository in the United States remain mired in political controversy. Whether the Yucca Mountain site should be developed continues to be open to political and technical debate. In the absence of a specific site and a knowledge of its geologic characteristics, decisions on the packaging, storage and transportation of spent nuclear fuel are constrained by the absence of the clear strategy for handling the highly-radioactive waste at the back-end of the nuclear fuel cycle.

Lack of Integration of the Back-end of the Nuclear Fuel Cycle

The current U.S. program is not integrated at a number of different levels. As an example, there is no government regulation of a number of spent nuclear fuel practices at reactor sites. For instance, the Nuclear Regulatory Commission does not maintain an inventory of spent nuclear fuel at reactor sites—not amounts, burnups, time since discharge, or other factors associated with the fuel (Jones Jr 2016). Some reactors do not now have the capability to off-load the full core of a reactor into the pool in case of emergency. Whether the utility offloads recently discharged spent nuclear fuel into one location in the pool or distributes it around

the pool is not known. Some plants do not have the capability to transfer spent nuclear fuel to dry casks. For example, the Indian Point facility in New York had to add this capability at significant cost long after reactor operation began. From the beginning of reactor operation, then, there has been limited thought into spent fuel management practices starting with discharge into the pool. Managing the pool efficiently, having the capabilities to load spent nuclear fuel into dry storage canisters/casks and predetermining locations to store them at reactor sites was not done early in the operation of these facilities.[8] These capabilities have all had to be added as the U.S. program continues to experience significant delays.

Early in the development of dry storage technology, many approved cask designs were not approved for transportation. At least some fuel that remains in those casks might require repackaging in order to be moved off-site. Currently, dual-purpose casks are approved with different permitting conditions for storage and transportation, thus some are loaded to the maximum allowed heat load and will require decades of cooling before they can be transported. For economic reasons, the nuclear reactor owners are increasing the level of fuel burn-up, that is, the length of time the fuel is allowed to remain in the reactor before it is permanently removed. Vendors have responded to those decisions by designing casks that can manage the increased heat and different radionuclide content of high burn-up spent fuel. None of the casks currently in use were designed for disposal in a repository: the thermal limits, criticality limits, and canister materials have not been optimized for safe disposal. In addition, the lifetime requirements of a cask have not been determined. In other words, with continued delays in the repository program, the integrity of the casks could be compromised. The required period for safe, interim storage, prior to transportation, is not known.

One of the most significant gaps in integration of the back-end of the nuclear fuel cycle in the U.S. is caused by the lack of knowledge surrounding the final geologic repository. Uncertainty about the fate of the Yucca Mountain site and the potential need for additional repositories has impacted the entire back end of the fuel cycle. Because the geologic environment and the design of a new repository is not yet known, both storage at reactors and transportation will likely be affected. Both the size and thermal load of the dual-purpose canisters may exceed conditions that might otherwise be considered optimal for waste packages destined for geologic disposal. With respect to the size and mass of the canisters, engineering solutions for hoist, ramp, and transport operations appear to be feasible, but need to be part of an integrated plan. With respect to thermal load management in repositories, different types of geology impose different temperature constraints on the underground environment. For example, many repository designs have assumed that the maximum temperature in clay backfill must remain below 100°C, while salt may accommodate higher temperatures. The heat from larger canisters that contain many assemblies may be accommodated by cooling the canister above ground for decades to centuries.[9]

Most of the existing dual-purpose canisters may also pose complications for repository licensing analyses of long-term post-closure criticality control in the repository environment. Criticality control only becomes a concern in scenarios in which the canister and its disposal overpack fail and sufficient water is available to flood the waste package before

[8]The first dry storage systems were not loaded until 1986.
[9]The choice of thermal management strategies is important even if Yucca Mountain is developed as a repository site (NWTRB 2002).

radioactive decay has reduced the inventory of fissile material. Aluminum-based neutron absorbers used in some dual-purpose canisters will degrade in water, causing an increase in the nuclear reactivity of the spent fuel. Options for assuring criticality control in dual purpose canisters, following geologic disposal, include the use of long-lived corrosion-resistant disposal overpacks and, potentially, opening already-sealed dual-purpose canisters to add additional criticality control materials. Post-closure licensing may require case-by-case criticality analysis of individual dual-purpose canisters, taking into account details of package loading and the potential for neutron sorption by naturally occurring chlorides in groundwater. Estimates of the consequences of criticality events in the overall safety assessment for mined repositories will also be required.



FIGURE 3.4. Larger red circles show the locations of shutdown reactors (Independent Spent Fuel Storage Installation Only and License Terminated). Smaller yellow circles show the locations of nuclear power reactors to be decommissioned or currently in the process (SAFSTOR or DECON).
SOURCE: *https://www.nrc.gov/info-finder/decommissioning/power-reactor/*

Impacts from the Lack of Integration

The lack of integration of the back-end of the nuclear fuel cycle has significant impacts on safety, cost, technological solutions, and long-term environmental effects. This lack of integration has occurred because the incentives at each stage of the back-end of the nuclear fuel cycle are not aligned toward the final goal—geological disposal of high-activity radioactive waste.

Technological Impacts

Inventory of commercial spent nuclear fuel. As shown in Figure 3.1, the quantity of spent nuclear fuel in dry storage will unavoidably increase in coming years. Because a number of reactors have already shut down and more reactors are planning to shut down over the next few years (Figure 3.4), the fraction of spent fuel that is stored at decommissioned reactor sites where a pool is no longer available for repackaging canisters will also increase (Figure 3.5). Spent fuel is currently stored at 15 sites without an operating reactor, and eight of these sites have already decommissioned their fuel-handling facilities; the rest have plans to do so in the coming decade.

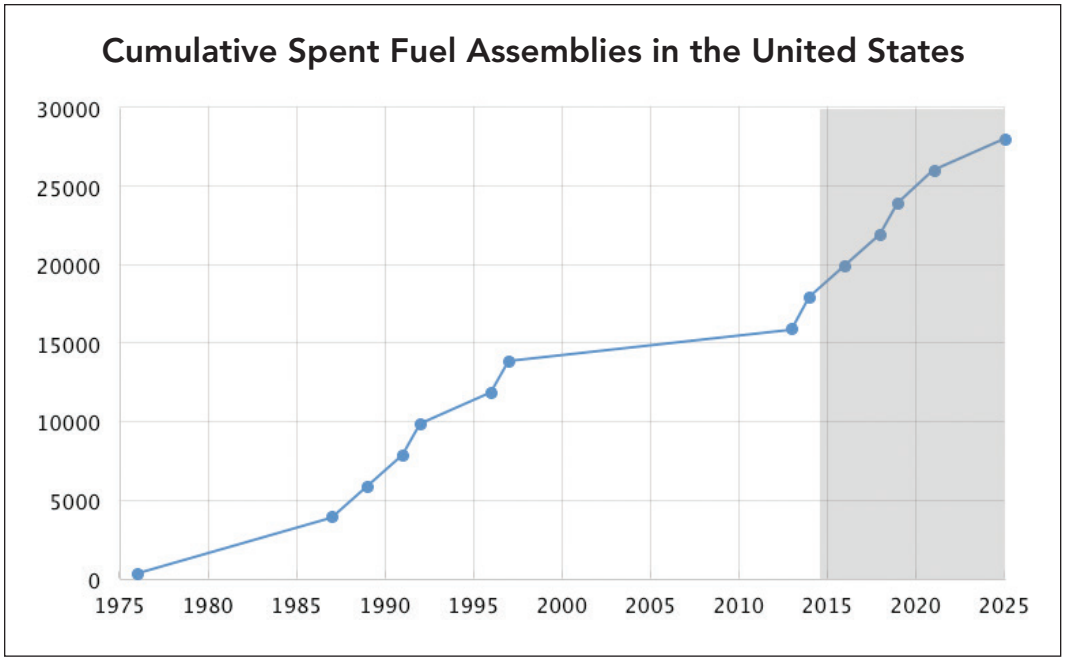


FIGURE 3.5. Existing and projected (in gray) cumulative spent fuel assemblies at shutdown nuclear power plants in the United States. DATA FROM: https://curie.ornl.gov/map

Assuring safety and security of extended storage. At least some, and perhaps most, spent nuclear fuel will remain in dry storage at the current reactor sites for decades longer than initially intended. Options for detecting and mitigating potential problems during storage will change as fuel-handling capabilities are decommissioned at former reactor sites. Any decision to open storage canisters at decommissioned sites for any reason (such as repackaging fuel to replace damaged or degraded canisters or in response to future decisions about transportation or disposal options) will require a significant capital investment to build fuel-handling capabilities at the site. Alternatively, and perhaps more likely in most circumstances, spent nuclear fuel that requires repackaging will be shipped off-site with appropriate overpacks to assure safety. Physical security requirements and commitments at storage

sites will also change through time with the changing mission of former reactor sites. Over longer periods, the dose rate at the surface of the canisters associated with the decaying radioactivity of the fuel decreases the extent to which its own radiation provides protection against diversion or theft, conceivably resulting in a counter-intuitive need for increased security measures at the storage facility decades after the rest of the nuclear power plant has been decommissioned.

Economic and Financing Impacts

The financing of the back end of the fuel cycle in the United States is broken. The Nuclear Waste Policy Act originally set up a mechanism to finance the construction and operation of a geologic repository. The Nuclear Waste Fund received charges to ratepayers $0.001/kWh for electricity generated by nuclear power. The fund collected over $34.3 billion (CBO 2015) but appropriations from the fund are controlled by Congress, which has used it to offset the national debt, rather than for its original purpose to develop a repository. This state of affairs first arose in the 1980s when Congress sought to reduce the national debt. The Gramm-Rudman-Hollings Act of 1985 reclassified the Nuclear Waste Fund, so that the money collected into the fund was put in the "mandatory" portion of the budget, treated like tax revenue, and spent on mandatory measures. Congress placed the money paid out of the fund into the discretionary portion of the budget. Follow-on legislation, such as the 1987 amendments to the Gramm-Rudman-Hollings Act and the 1990 Budget Enforcement Act, required discretionary spending (*i.e.*, using Nuclear Waste Fund) to be offset by cuts in other programs at the Department of Energy. In effect, this situation made it impossible to provide necessary funding when it was needed most by the nuclear waste program (BRC 2012). Finally, due to a 2013 federal court decision, ratepayers are no longer paying into the Nuclear Waste Fund because of the federal government's failure to make sufficient progress on removing spent fuel from reactor sites.

Moreover, taxpayers bear the additional burden of the federal government's inability to construct and operate a repository for final disposal of spent nuclear fuel. The Standard Contract mandated by the NWPA (Section 302) and defined by 10 CFR 961 governs interactions between the nuclear utilities and the DOE with respect to the management of spent nuclear fuel. The Standard Contract requires that the DOE begin to take title to spent nuclear fuel for disposal "not later than January 31, 1998." The DOE's failure to fulfill the terms of the Standard Contract has been the subject of complex and ongoing litigation between the utilities with nuclear power plants and the U.S. Department of Justice and has resulted in the payment of substantial damages to utilities to compensate them for the unanticipated costs of on-site storage of spent fuel. The Judgment Fund, paid for by taxpayers, has already paid out $5.3 billion, and payments are projected to balloon to $23.7 billion, even if the federal government begins to accept spent fuel in 10 years (Cotton 2016). Based on a ruling by the U.S. Court of Appeals for the District of Columbia Circuit, this taxpayer liability cannot be resolved by the government simply taking title to the spent fuel, but still leaving it at the reactor sites. The DOE must physically move the spent fuel off site to fulfill its contract with utilities (USCA-DC 2013).

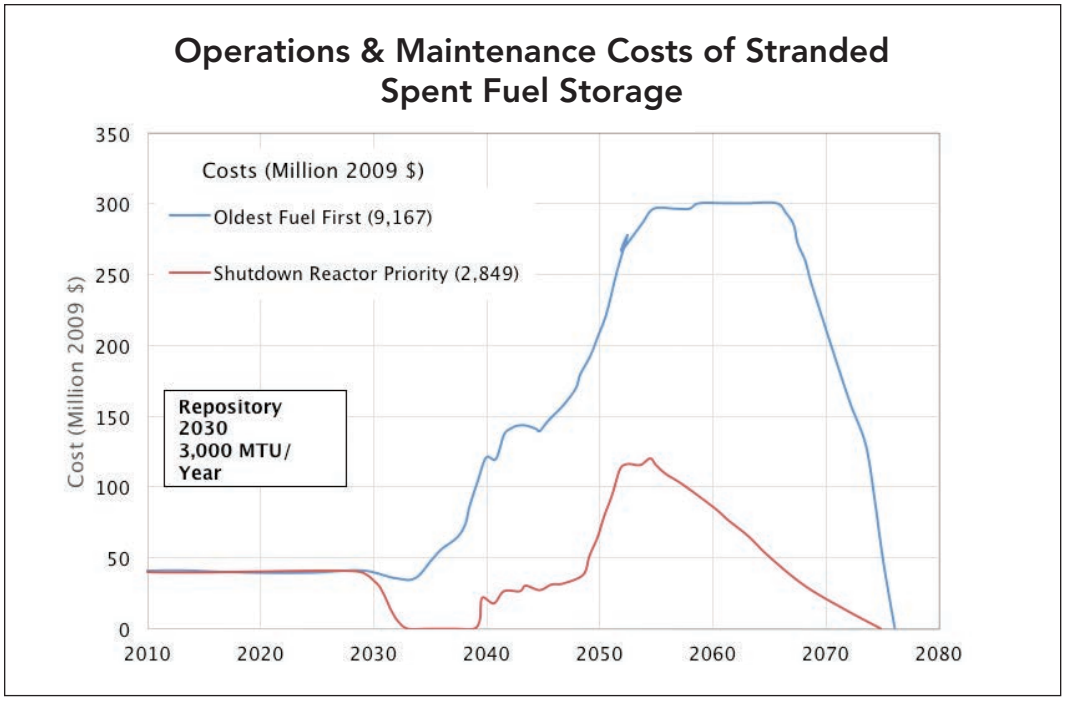


FIGURE 3.6. The dark red curve shows the cost savings for moving spent fuel at shutdown reactor sites first *versus* the blue curve, which is based on moving oldest fuel first (modified from BRC 2012, Fig. 16).

These economic impacts are likely to increase in the future if the planned removal of spent fuel from reactor sites follows the provisions of the current Standard Contract, which specifies that the oldest fuel should be moved first. Still, the utilities have some discretion as to which fuel should be moved and could decide to move the hottest transportable fuel first. This strategy could produce an inefficient system that results in shut-down reactor sites having to stay open longer. *The Blue Ribbon Commission on America's Nuclear Future* (2012) showed that moving fuel from shutdown reactors first, instead of the oldest fuel first, would result in significant cost savings (Figure 3.6). A better strategy would be to reduce the number of active transport routes, as well as optimize moving fuel from shutdown sites first, so they can be fully decommissioned and save hundreds of millions of dollars (Cotton 2016).

Social and Political Impacts

The United States now has more than 70 commercial nuclear power plant sites that store spent fuel of which 60 are at still operating reactor sites. As of early 2017, 18 reactors are shutdown, and 9 reactors have been designated for shutdown by 2025. Thus, in 2018, 15 sites (by 2025 this will increase to 20 sites) host "orphaned" spent fuel.

Active public groups near some shut-down power plants have reacted strongly to the continued storage of spent fuel as these sites. At the Vermont Yankee plant, public interest groups along with state government officials have opposed leaving the spent fuel on site for

the decades as planned by the owner, 3 Yankees. The local municipal governments and many members of the public near the San Onofre Nuclear Generating Station (SONGS) in southern California also oppose leaving the spent fuel on site indefinitely (Victor 2016). In fact, the SONGS plant owner, Southern California Edison, has created a Community Engagement Panel to provide public input into the decommissioning process.

Public interest advocacy groups, such as the Union of Concerned Scientists and Public Citizen, have concerns about the continued management of spent fuel at reactor sites. Their main concern is focused on the safety and security of spent fuel pools, which currently contain about two-thirds of the nation's spent nuclear fuel. They would prefer that these pools be thinned out and most of the spent nuclear fuel be placed in dry storage. In the event of damage to the pool from a terrorist attack or natural disaster, this reduction in the amount of fuel in the storage pools would reduce the possibility of fire and release radioactivity.[10] Many of these groups favor what they call hardened onsite storage of spent nuclear fuel, storing it in dry casks surrounded by berms to protect against terrorist attack.

Environmental Impacts

If the status quo in the United States continues indefinitely and a geologic repository for disposal of spent fuel is not developed, then the environmental impact may be high in the absence of institutional control. The Final Environmental Impact Statement for a repository at Yucca Mountain explored the potential for "no action" and found that within 70 years of the loss of institutional controls that would have ensured casks and spent fuel pools remained intact, water would begin to infiltrate into the waste packages, eventually degrading them and leading to the release of radionuclides into the air, surface and ground water, as well as soils (DOE 2002). The EIS assumed that waste packages begin to release radionuclides 1,000 years after institutional controls are lost. As a result, the Environmental Impact Statement estimated significant radiation doses to the public, up to 31 rem/yr for a person living 5 km from the site (DOE 2002).

Nuclear Industry Impacts

The owners of nuclear power plants are suffering significant impacts themselves. Because the DOE did not meet its contractual obligation to begin moving fuel off reactor sites in January, 1998, most utilities are receiving payments from the Judgment Fund to manage spent fuel at their sites. To save taxpayers money, the funds released by the Justice Department to utilities are kept at a minimum and, therefore, constrain decisions about spent fuel management on site. Further compounding this situation is the economic strain that a number of nuclear power producers are experiencing. These two factors result in decision-making that minimizes industry spending on at-reactor storage and does not allow for adequate planning for the next stages in the future of spent fuel.

[10] This concern resulted in extraordinary efforts to add water to the pool at reactor #4 during the Fukushima accident in Japan in 2011.

Perhaps most deeply affected by this situation are plants that are already shut down. Maine Yankee, for instance, has fully decommissioned its site—all except for the spent nuclear fuel, which sits on a concrete pad. The owner of the Maine Yankee site, 3 Yankees, must pay for security and monitoring at the site, using payments from the Judgment Fund. Further, 3 Yankees must keep up their licenses with the NRC. In the case of the Maine Yankee, Yankee Rowe, and the Haddam Neck reactors, some of their cask storage licenses expire in 2020, requiring them to enter into an expensive effort to relicense the casks (Howes 2015). In fact, the 3 Yankees Company continues to exist simply to monitor and maintain the casks at their three sites.

Regulatory Impacts

The passage of the Continued Storage Rule by the NRC in 2014 represented a significant change in policy for the back-end of the nuclear fuel cycle (NRC 2014). The rule replaced the amended Waste Confidence Decision, which represented the NRC position that the federal government would be able to open a geologic repository for spent fuel. The Continued Storage Rule provides a generic evaluation of the potential environmental impacts of the storage of spent fuel at reactor sites beyond the licensed lifetimes of the reactors. In particular, the Continued Storage Rule found that all environmental impacts, including those 60 years and 160 years after license expiration, as well as indefinitely into the future, were small (NRC 2014), based on the assumption that institutional controls, such as the site monitoring and the physical security measures, would remain in place indefinitely.



FIGURE 3.6. A RH72-B cask containing a load of high-activity waste contaminated with transuranics en route to the Waste Isolation Pilot Plant near Carlsbad, New Mexico. SOURCE: *https://flic.kr/p/omVazd*

As a result of this rule, there is no regulatory requirement or incentive to address current cask loading procedures. Moreover, there is no regulatory push to move spent nuclear fuel from reactor sites—either from the spent fuel pools or the dry casks where it now sits - because the rule has found that there will not be any significant environmental impacts, ever (NRC 2014).

Further, when plants are decommissioned, they are regulated under rules for operating power plants because no separate regulations for shutdown reactors exist. The NRC is currently in the process of developing decommissioning regulations, but their final publication is likely to be some years away. Thus, in order to decrease security measures or change emergency planning (since the reactor is no longer operating) at a shutdown plant, plant owners must apply for an exemption to the operating reactor rules. Asking for an exemption has the appearance of trying to avoid regulations (though clearly that is not the case here), but the process of seeking an exemption can contribute to a negative public image of the licensee.

Incentives Not Aligned Toward the Goal of Geological Disposal

In the United States, the entire nuclear fuel cycle has become quite fragile. Incentives to craft an integrated strategy for the back-end of the nuclear fuel cycle are simply lacking, and the mechanisms that do exist, such as the Standard Contract, do not align incentives to the final goal—geologic disposal. Congress itself is in gridlock, with only a minority of members truly engaged in solving the issue of final disposal of nuclear waste. A majority seems to be content to continue to use the Nuclear Waste Fund for purposes other than that intended by Congress itself. Political awareness of the massive price tag associated with the Judgment Fund may eventually prompt action in Congress. That the ratepayer funded Nuclear Waste Fund is being used to finance the country's debt while the taxpayer forfeits billions because of lack of progress on nuclear waste disposal should be unacceptable.

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The nuclear industry has few incentives to champion this issue. What might have held them back in the past—not being able to build new reactors before resolving the waste problem—has been removed by the NRC's Continued Storage Rule. The Department of Justice, which administers the Judgment Fund, is forcing the lowest-cost solution on the utility industry in an effort to save taxpayers money, and it has no incentive to change its strategy. Finally, many public interest advocacy groups oppose both a repository and transportation of spent nuclear fuel, so they have no incentive to encourage movement on an integrated back-end of the nuclear fuel cycle, with the exception of moving spent nuclear fuel out of pools into dry casks that are housed in hardened onsite storage sites.

The only constituency with a clear incentive to urge that there be progress on an integration of the back-end of the nuclear fuel cycle, which includes development of a repository, are the communities near decommissioned sites. Currently ten states have decommissioned sites. The number of these communities will grow to include six more states by 2020. With time, this constituency may apply political pressure for an integrated solution.

Recommendations—Aligning Incentives

Every country that uses nuclear power and generates nuclear waste must assume responsibility for its safe disposal. Internationally, the consensus is for safe, long-term disposal of nuclear waste in a deep-mined geologic repository.

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There will have to be a change in federal policy, and this requires Congressional action across the entire legislative and regulatory framework that now guides and constrains the U.S. nuclear waste-management program. Piecemeal changes to present laws will not be enough to provide an integrated system of nuclear waste management for the United States. There are technological, political, and policy "fixes" that are required in order to integrate the back-end of the nuclear fuel cycle. Overall, it is essential to recognize and set forth in policy a well-thought out strategy for the management of the back-end of the nuclear fuel cycle—from the removal of spent fuel from reactor sites to its final disposal in a geologic repository. Such an approach will provide a more efficient, more secure, more proliferation-resistant and cheaper strategy for finally solving the nuclear waste problem. Decisions about this strategy must have a solid technical basis, as well as include engagement with those affected by these decisions, including the nuclear industry, relevant government agencies, transportation companies, officials and regulators, and, importantly, public interest groups, including the affected public, local governments, tribes and states.

There are two essential legislative changes required:

- There must be a new funding mechanism for the new waste management organization. The organization responsible for the successful disposal of nuclear waste must be able to use the funds in a timely and appropriate matter and plan expenditures for a program that will last many decades.
- A new legislative framework and organization will only be successful if there are incentives to bring the goals of the utilities with nuclear power plants and the federal government into alignment.

RECOMMENDATIONS

- Congress must revise existing laws so that it:
    - Transfers responsibility for storage, transportation, and disposal of commercially generated spent fuel, and perhaps high-level radioactive waste, to a new, independent, single-purpose organization.
    - Transfers the *corpus* of the Nuclear Waste Fund to the new organization.[11]
    - Orders the Department of Justice to consider the impact of their payments on the integration of the back-end of the fuel cycle and, instead, enable the packaging of smaller, potentially repository-appropriate canisters for earlier transport.
    - Requires the nuclear utilities and the new organization to work together to establish an integrated system for spent fuel and high-level waste management that has the capability to repackage spent nuclear fuel from the current, relatively large casks and canisters into canisters that are designed for geologic disposal.
- The Standard Contract must be revised under the new organization to include planned removal of spent fuel first from shutdown plants.
- The new organization will have to work with all interested parties: industry, local, state, and tribal governments, public interest groups, academia, the regulator, to ensure that all relevant views on storage, transportation, and disposal are not only heard, but become part of the overall strategy for dealing with the waste.
- Finally, Congress must reaffirm that a geologic repository (or repositories) is the final goal for the fate of high-activity radioactive waste, such as spent nuclear fuel and the high-level waste from reprocessing.

Each of these recommendations is meant to harmonize the back-end of the fuel cycle such that every decision is focused on the final goal—geologic disposal.

REFERENCES:

Blue Ribbon Commission on America's Nuclear Future (BRC). 2012. *Report to the Secretary of Energy.* Washington, D.C.: U.S. Department of Energy.

Bonano, E. J., Kalinina, E. A. and P. N. Swift. "The Need for Integrating the Back End of the Nuclear Fuel Cycle in the United States of America." *MRS Advances* 3: 991-1003.

Cotton, T. 2016. Presentation to Reset Meeting, George Washington University, May 13.

[11] Transfer of the Nuclear Waste Fund need not occur all at once but can be completed over decades. The need to re-establish the Nuclear Waste Fund can then be evaluated by the new nuclear waste management organization and done under their authority as discussed previously.

Crowley, K. 2015. "Testimony before the Subcommittee on Environment and the Economy, Committee on Energy and Commerce, U.S. House of Representatives." April 11.

DOE. 1983. "Standard Contract for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste." *10 Code of Federal Regulations 961*. Washington, D.C.: U.S. Government Printing Office.

DOE. 2002. *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*. DOE/EIS-0250. Washington, D.C.: U.S. Department of Energy. https://www.energy.gov/nepa/downloads/eis-0250-final-environmental-impact-statement.

DOE. 2008. *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*. DOE/EIS-0250-S1. Washington, D.C.: U.S. Department of Energy.

DOE. 2013. *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*. Washington, D.C.: U.S. Department of Energy.

Ewing, R. C. 2015. "Long-term storage of spent nuclear fuel" *Nature Materials*, commentary, vol. 14, 252-257.

Ewing, R. C. 2016. "2016 Summer Meeting." Letter from Rodney C. Ewing, Chairman, Nuclear Waste Technical Review Board, to Monica Regalbuto and John Kotek, Department of Energy, December 8.

Howes, R. 2016. Presentation to Reset Meeting, George Washington University, May 13.

Jones Jr, R. 2016. *Dry Storage Cask Inventory Assessment, Fuel Cycle Research and Development, Department of Energy.* FCRD-NFST-2014-000602, Rev. 2.

Maheras, S., R. Best, S. Ross, K. Buxton, J. England, P. McConnell, L. Massaro, and P. Jensen. 2016. *Preliminary Evaluation of Removing Used Nuclear Fuel from Shutdown Sites, Fuel Cycle Research and Development.* FCRD-NFST-2016-000478, PNNL-22676 Rev. 8. Washington, D.C.: U.S. Department of Energy.

NRC (United States Nuclear Regulatory Commission). 2014. *Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel.* NUREG-2157. Washington, D.C.: U.S. Nuclear Regulatory Commission. https://www.nrc.gov/docs/ML1426/ML14262A011.pdf.

NWTRB (Nuclear Waste Technical Review Board) 2002. *Letter Report to the U.S. Congress and the Secretary of Energy (January 2002)*. Washington, D.C.: Nuclear Waste Technical Review Board.

Rechard, R. P., L. Price, and E. Kalinina. 2015. *Integrating Management of Spent Nuclear Fuel from Generation to Disposal*. SAND2015-5503. Sandia National Laboratories.

USCA-DC 2013. *National Association of Regulatory Utilities Commissions, et. al, vs. United States Department of Energy and United States of America. USCA Case #11-1066*. Washington, D.C.: U.S. Court of Appeals for the District of Colombia.

Victor, D. 2016. Presentation to Reset meeting, Stanford University, October 26.



The Waste Isolation Pilot Plant (WIIP), located near Carlsbad, in southeastern New Mexico, opened in 1999 and is the world's only operating geologic repository. The WIPP repository horizon is located in a thick bed of salt at a depth of more than 300 meters. The waste consists of materials contaminated by transuranium elements, mainly plutonium, which were generated by defense programs. In 2014, a release of radioactivity from a breached drum of waste caused WIPP to be shut down for more than two years. Estimates of the cost of the accident reach as high as two billion dollars due to the need to decontaminate the underground workings, replace the ventilation system, and the delay in the continued disposal of transuranic waste. WIPP has now returned to operation.

SOURCE: *https://flic.kr/p/omQPAk*

Public Engagement and Consent-Based Siting

Over the last half-century, implementers of national waste-management programs in more than a dozen countries have launched at least 24 efforts to site a deep-mined, geologic repository. In only five of these efforts was a site chosen. Nearly one-half of the initiatives prematurely ended because the projects failed to gain and sustain social acceptability (NWTRB 2015). The failed attempts typically have adopted a strategy of *decide-announce-defend*, in which the implementer, with little or no consultation, identified potential candidate locations, informed the recipient communities, and dismissed any criticism that emerged.

However, Finland has selected a site near Olkiluoto, France near Bure, and Sweden near Östhammar. In the United States, a site near Carlsbad was selected for the Waste Isolation Pilot Plant in which defense-generated transuranic-contaminated waste is being disposed. In each of those instances, the development of a repository appears to be on a strong and stable track. It is no wonder then countries resetting their siting processes, such Canada, Japan, and the United Kingdom, have decided to adopt an alternative strategy, requiring that the siting community volunteer on consent to the development of the nuclear waste repository.

In contrast, the site for the proposed Yucca Mountain repository was chosen in 2002 through a process that permitted the objections of the State of Nevada to be overridden. But subsequently the fate of that site has become mired in political limbo. It remains unclear whether it will be possible to carry out a repository-development process — licensing, construction, and operation — that will have to span decades. In a vigorous pluralistic democracy, one "no" can defeat many "yeses." *Although such an outcome is not eliminated by using a consent-based siting process, pursuing such an approach can increase the odds that a site is successfully selected for a geologic repository and current generations meet their ethical responsibility to establish a means to manage the risks that they have created.*

In those nations that have adopted such a process, the details of who consents, what is consented to and for how long, and how that consent is given and can be withdrawn varies. But based on the information gathered during the Reset meetings, as well as the experiences and knowledge of the members of the Steering Committee, two significant challenges have to

be addressed if the United States choses to launch a new site-selection effort. ***In the opinion of the Steering Committee, such a decision has to learn the key lesson of the past: finding a new site for a repository is almost certain to fail if it does not, in some fashion, provide a means for local, tribal, and state governments to register their agreement with the choice of a site.*** For a consent-based siting process to succeed two conditions must be met.

An effective mechanism has to be put in place that allows local, tribal, and state governments to exercise decisive decision-making power throughout the repository-development program.

- The implementer and the regulator have to establish strong bonds of trust with the local, tribal, and state governments involved and have to sustain that trust for many decades as development moves from scientific and engineering studies in support of siting through operations to closure.[1]
- An effective mechanism has to be put in place that allows local, tribal, and state governments to exercise decisive decision-making power throughout the repository-development program.

Notwithstanding the creation of an authentic and transparent consent-based siting process, the possibility remains that it will not produce a technically suitable and socially acceptable site. The experiences in Japan and the United Kingdom provide examples for this cautionary note.

Consent is a Process of Continuous Engagement

The *Blue Ribbon Commission on America's Nuclear Future* (BRC) deserves credit for recognizing that any new siting effort must use a consent-based process (BRC 2012). By making such a forceful recommendation, the BRC firmly placed this question on the public agenda. Any discussion of the future of waste-management policy in the United States should seriously consider the BRC's views. The BRC's recommendation for consent-based siting is consistent with the growing realization that public engagement and values should have an important impact on diverse and highly technical issues, from the use of genetically modified organisms to preventing the poaching of ivory (Biggs et al. 2017; Dinneny, 2018). Public engagement not only improves communication and the possibility of acceptance, but also can lead to a better final result (Lavery, 2018).

The strategy subsequently released by DOE embraced consent-based siting as proposed by the BRC (DOE 2013). The DOE underscored the important prerequisites of public trust and confidence. It advocated the development of a process through engagement with communities, tribes, and state governments, as well as other interested and affected parties. But, like the BRC, the DOE strategy did not advance any specific framework for implementing a consent-based process.

[1]Strong bonds of trust are evidenced in the interactions between the implementer and the community and are also revealed in public opinion surveys.

Building on the BRC's advice, the Bipartisan Policy Center (BPC) issued a report that recommended a process that featured "voluntary participation, transparency, trust, and inclusion" (BPC 2016). But like the BRC, the BPC did not go into any detail about how to achieve those aims. The DOE spent seven months listening to the views of interested and affected parties on how to design a consent-based siting process. Meetings were held across the country, in which interested and affected parties had an opportunity to present their views. DOE published a valuable summary of what it had heard (DOE 2016) and followed up with a draft process (DOE 2017). The present administration has not pursued this initiative.

Notwithstanding these contributions, the Steering Committee believes that past efforts to design a consent-based *process* have provide little guidance in addressing the two challenges of *trust* and *power*. DOE (2017), for example, mentions "trust" only with respect to the federal government's "trust relationship" with Native American tribes. "Power" is barely touched upon. What follows, then, is an attempt to fill in some of the remaining gaps.

The BRC, BPC, and DOE narrowly focus on a decision taken at a single point in time: siting. This emphasis fails to take fully into account two fundamental characteristics of the repository-development and operation process: (1) the timescales involved prior to repository closure are on the order of tens of decades and (2) technical and social changes—some of which might be substantial and uncertain—are likely to arise over that period. For these reasons, the Steering Committee has broadened its perspective to recognize explicitly that the two challenges of timescales and socio-technical changes must continuously be attended to. In particular, consent-based siting is more than simply obtaining agreement from relevant local governments—whether contractual or not. Rather consent-based siting is an ongoing effort of public engagement that demands transparency, accountability, and respect for all parties over many decades.

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Establishing and Sustaining Strong Bonds of Trust

Fundamental to the successful launch of consent-based siting will be a decision-making process that is clearly articulated and communicated. The core principles underlying the consent-based process, the level of detail required to launch the process, what details may be best left to emerge as the process unfolds, and who is involved in shaping the process are all important first order considerations, each of which can powerfully influence the level of public trust and confidence in the process.

Collaborate to design the siting process. Consent-based siting necessarily involves multiple players, who agree to initiate a process and become active participants willing to sustain siting activities over an extended period. The extent to which the siting principles and repository-development process steps reflect the expectations and values of interested and affected parties improves the chances of a positive outcome.

Providing early opportunities for broad public input into the design of the siting process will help identify the key values and principles that people expect to see in the decision–making process. These values include benefitting from open dialogue on the past experiences (what worked well and what did not) to ensure the new siting process fully leverages the lessons learned. Taking the time to invite a variety of perspectives, including those with direct experience in past siting projects, will help to reveal important requirements in order for a siting process to be socially acceptable. As DOE (2016) observes, interested and affected parties possess a vast store of experience that can be shared, as well as an interest and willingness to contribute.

Early canvassing of input can provide insight into the values and behaviors important to build and maintain trust and confidence in the players mandated to lead the siting process. Such input can also identify key principles that people see as important for the process. For example, who needs to be involved and the kinds of information and programs are required for those who engage in the siting process? Taking the time to design a siting process that will be broadly accepted as a fair and appropriate basis for taking decisions may support more durable decisions leading to tangible progress of the program.

Entrust the siting process to a strong and trustworthy organization. As noted in Chapter 2, an organization that has established itself within a stable political environment will be needed to lead the process and be the trusted guardian of the siting. Such an organization will embrace and reflect in its operations the values that will be central to earning and sustaining public trust and confidence. SEAB (1994)'s earlier effort provides examples of what is required. The early engagement on expectations for a fair and appropriate siting process will reveal the expectations for the organization. Key to the success of consent-based siting will be the organization's ability to demonstrate competence, transparency, accountability, and adaptability.

Key to the success of consent-based siting will be the organization's ability to demonstrate competence, transparency, accountability, and adaptability.

In addition to the implementer, the regulator also needs to work towards earning and sustaining public trust and confidence. Clarity and agreement on regulatory requirements (discussed in Chapter 5) for the implementer, regulator and communities engaged in siting is important. Consequently, the regulator must be candid and credible, especially when or if those requirements have to be changed. The regulator also needs to be involved in briefing the public, as well as building confidence on safety and regulation at the start of the siting process.

Articulate a clear decision-making path These might include such fundamentals as:

- How will sites be selected, including key technical safety considerations, as well as consent? These rules should establish firmly at the outset that safety will not be compromised to secure a willing host.[2]

[2] Countries have adopted a variety of approaches for developing site-suitability criteria. In many of those nations, the process used has been long and controversial. See NWTRB (2015).

- What are the screening or exclusionary site-selection criteria?
- How might local, tribal, and state governments that enter the process withdraw from it?
- How and when will consent be sought after a site has been selected?
- Is there a clear road map in terms of milestones starting in the study phase from early assessments through to site characterization, regulatory approvals, and decisions regarding repository operation?
- When can consent be withdrawn and under what circumstances?
- How will interested and affected communities be involved and what power will they be able to exercise when the initial set of decisions have to be modified?

The proposed process below explicitly addresses many of these questions.

Assemble information required to support participation. Early engagement by the implementer can lead to an understanding of public expectations about the information required to launch the siting process. Examples of information requirements discussed at meetings with the public include:

- Why is this project needed?
- What is the focus of the siting exercise?
- What kind of repository and related infrastructure will be sited?
- What is the waste inventory and its characteristics that is intended to be disposed of in the repository?
- What information and financial resources will be available to those engaging in the siting process in the initial stages?
- What is the nature of economic benefits or other benefits to local, tribal, and state governments?

A confident launch of a new consent-based siting process will require that this early phase of siting, design and planning be well defined in advance prior to any formal call for proposals to enter into the voluntary process. The responsibility for doing so initially falls on the implementer, although ultimately each question must be answered through authentic and sustained engagement with interested and affected parties.

Provide an appropriate, ethically-based platform for inviting communities to explore the repository project and consider potential interest in hosting. The implementer will need to provide early steps focused on the learning process and exploring the repository project.

- How is the right to withdraw exercised and when?
- What does initial entry into the siting process imply?
- Why is safety non-negotiable? What does that look like in the siting process?
- Why is broad engagement and dialogue at many levels of government required?

Again, the responsibility for creating a platform initially falls on the implementer, although ultimately each of the questions noted above must be answered through engagement with interested and affected parties.

Sustain the process by behaving in a manner that fosters public trust and confidence. Consent is not a one-time achievement, but a process that requires a cultural shift in how to design policies and make decisions. Trust and confidence must be earned and maintained over the large number of years of a siting process, that unavoidably will experience uncertain changing conditions. A process of continuous engagement aimed at sustaining trust can provide the basis for possible changes in strategy as the repository siting, construction and operation proceed.

Be open to partnering with local, tribal, and state governments. Once engaged, these entities will wish to co-design the journey and have some measure of control, including the approach to dialogue in their local areas, establishing platforms for learning, facilitating dialogues, and influencing the pace at which siting studies progress in the area. It may be helpful at the start to underscore the role for active involvement of communities/tribe/state during the multi–year siting and repository-development process, including the scope for shared decision making. It is helpful to also anticipate local interest in discussing what the project will look like at each stage of the regulatory approvals, construction, and operation phases. What involvement will local, tribal, and state governments have at all stages of project execution, such as monitoring, providing first responder services, maintaining community dialogues, and empowering community advisory committees?

Properly implemented, partnering has the advantage of avoiding many of the problems that have plagued DOE's implementation of the cleanup agreements that it has entered into with state governments. Too often these have ended up in extended litigation that truly benefits neither party.

Build the conditions for sustained interest and momentum. A community must be a continuing strong proponent of learning about the project and participating in the siting process. The implementer will need to build diverse engagement opportunities locally and regionally to broaden the base of interest and support such that the siting process can withstand multiple elections. For example, the implementer should establish and support a group that is broadly representative of the community to foster ongoing interactions and sustain momentum and facilitate community input on siting studies. The implementer will have to employ some locally-based staff to support ongoing dialogue and interest. The implementer will also need to provide resources to the local community or tribe to support independent technical reviews of the implementer's proposals.

Respect the need for flexibility and adaptability. It will not be possible at the outset to foresee all of the programs, resource needs and process details that will be essential at each point in the long multi-year period of site evaluations and repository development. It may be beneficial to recognize this and to explicitly provide room to refine and adapt siting resources, schedules, and plans as the process advances. The BRC proposed adoption of an adaptive management framework for the repository plans. Explicitly embracing the merits

of adaptive management and bringing this into the design of the siting process will facilitate the creation of trustworthy relationships. Of course, recognizing the need and importance for adaptability without providing the local community or tribe with the power to secure it is just rhetoric.

Many siting processes begin with learning programs, enabling potentially interested communities to fully explore the project and their own interest in being selected as a site. Over time, the level of inquiry and scope of key issues and interests become more sophisticated, with a commensurate evolution required in information, resources, funding programs and access to third party expertise. By retaining flexibility to adapt public engagement programs and funding programs for capacity building with communities, the implementer can respond in a way that is culturally appropriate and meaningful to the range of players involved. The parties involved in the siting process will be able to identify the topics and issues that need exploring. Continuing to welcome input from those involved and undertaking to be responsive to emerging demands will strengthen the foundation for future partnerships and collaboration, thus slowly building the trust and confidence necessary for making decisions under uncertainty.

Allocating Power between Central and Peripheral Governments

How can local, tribal, and state interests be accommodated in the siting and development of a deep-mined, geologic repository for high-activity radioactive waste? Those involved in the waste-management policymaking have debated this question for nearly 40 years without reaching a clear and settled conclusion. For some, the activity self-evidently falls within the purview of the Federal Government, and thus it rightly ought to have the final say. For others, managing radioactive waste is so fraught with risks—both calculated and perceptual—that those subordinate units of government rightly ought to have a decisive voice.

In 1979, President Jimmy Carter adopted a recommendation from an Interagency Review Group and held that states should be consulted during the siting process and should have the authority to concur at each stage (IRG 1979). This formulation threaded the needle between outright federal preemption and a state's absolute veto. In passing the NWPA, Congress morphed the formulation from "consultation and concurrence" to "consultation and cooperation." In the 1987 Nuclear Waste Policy Amendments Act (NWPAA), Congress limited the investigations required to determine the suitability of a potential site to Yucca Mountain in Nevada. Not affected by the change in the legislation, authority was given to states (now just the State of Nevada) to disapprove the President's choice of site; but that authority could be overridden if each house of Congress passed, by a simple majority, a resolution of repository-siting approval. Following the law, President George W. Bush in February 2002 selected Yucca Mountain as the location for the country's first deep-mined, geologic repository for high-activity radioactive waste. In April, the Governor of the state of Nevada disapproved the selection, but in July, Congress voted to sustain the President's choice.

This argument over how the power over siting and developing a deep-mined, geologic repository should be distributed between the central and the peripheral units of government

has been recapitulated in a number of other pluralistic democracies. In Finland and Sweden, municipalities hold near absolute power to reject a proposed repository site up to a pre-specified point in the siting process. In Canada, France, Japan, and the United Kingdom, communities must volunteer before locations within their jurisdiction can be considered for a repository or an underground research laboratory.[3] In contrast, Switzerland and Germany do not grant localities the formal power to veto a proposed site. However, in each country, the siting process requires extensive public engagement and dialogue.

The challenge then is to craft a sustainable repository-development process that protects the interests of both the central and peripheral governments. The terms "partnering" and "partnership" cover a wide variety of institutional forms that are designed to facilitate engagement by the implementer with interested and affected parties including localities, regional and state governments, and tribal nations (NEA 2010). At one extreme, these terms suggest informal dialogues that take place between the implementer and various interested and affected parties. The interactions arising during the siting of Long-lived Intermediate-Level Waste (ILW-LL) repository in South Korea are an example of this type of partnering.

At the other extreme, the terms can refer to formal arrangements that allow a specially constituted association, composed of governmental bodies and civil society organizations, to engage with the implementer. For example, the formation of the STOLA (renamed STORA) and MONA partnerships in Belgium led to the siting of a repository for short-lived, low and intermediate waste in Dessel.[4] The partnerships have a General Assembly composed of local politicians, social and cultural organizations, environmental organizations, and economic organizations, such as local businesses, farmers, and union members. An Executive Committee undertakes the day-to-day management of the partnership. The implementer, ONDRAF/NIRAS, provides funding to operate the partnerships. The partnerships make recommendations to the Mol and Dessel Municipal Councils, which either approve or reject the advice. ONDRAF/NIRAS granted the Councils the power to veto the siting of a repository in the Mol-Dessel district. Once the Councils gave their approval, they retained significant decision-making power over the design and monitoring of the repository as well as over the content of a socio-economic benefits package. These powers have been delegated to the STORA and MONA partnerships.

The Way Forward

The combined experiences of the waste-management programs in Belgium, Canada, Sweden, and the United Kingdom suggest a path forward for the United States. Below the Steering Committee sets forth the outlines for how to allocate power between communities, tribes, and states on the one hand and the Federal Government on the other.

[3] Twenty-three communities in Canada have expressed an interest in learning more about hosting a repository, but none have committed to do so. Communities in the Haute-Marne region in France have supported the construction of an underground laboratory, knowing that if the geology was found to be suitable, a repository could be constructed nearby. Thus far no community has, in fact, volunteered in Japan and the United Kingdom.
[4] The "Managing Radioactive Waste Safety" initiative in the United Kingdom also relied heavily on formal partnership relations. However, when that approach did not succeed in finding a "willing and informed" host community, the government adopted another strategy that does not seem to rely on partnerships.

To begin with, a broad discussion among interested and affected parties needs to take place about what standards and criteria should be used to select and license a repository site.[5] Communities and tribal nations would be encouraged to express an interest in learning more about hosting a repository. If no locality or tribe volunteers, the implementer could identify potentially suitable sites based on a literature review and would have the authority to carry out surface-based geological investigations in those locations.[6] Regardless of whether a community or tribal nation steps forward, the implementer would provide financial and other resources to create formal partnerships in the areas under study. The partnerships would be composed of representatives from interested and affected parties. It would interact with the implementer to discuss outstanding technical, design, and monitoring issues. After some minimum time has passed, perhaps two to three years, the partnership would make a recommendation to the local or tribal government whether investigations should continue. At that point, the local or tribal government could exercise an absolute veto halting the implementer's work. Even if further studies are allowed, the partnership would periodically review the implementer's work and make recommendations about whether it should proceed.

The communities and tribal nations' power to exercise an absolute veto over the implementer's siting decision expires once the implementer announces that it has gathered sufficient information to submit an application to construct a deep-mined, geologic repository.

The regulatory authorities would then review the application using an adjudicatory process. Participants would include the implementer, regulatory staff, members of the partnership, host state, and other affected parties. If a license is granted, the state then could disapprove construction within some specified period. This objection could be overridden by supermajorities in both houses of Congress and approval by the President but only if it was determined that no other site was suitable.[8] Once construction begins, the local or tribal government would maintain strong oversight, including the authority to specify needed studies, participate in monitoring, and, under predetermined conditions, stop work.

[5] The BRC maintained that the Yucca Mountain-specific standards adopted in 2002 by the Environmental Protection Agency (EPA) and the Nuclear Regulatory Commission (NRC) are inappropriate and that the earlier generic standards need to be updated (BRC 2012). EPA's Yucca Mountain-specific standard is found at 10 CFR 197, and NRC's conforming regulation is found at 10 CFR 63. The earlier generic standards are, respectively, 10 CFR 191 and 10 CFR 60. The Steering Committee's views on regulatory structure are laid out in the final chapter of this document.

[6] As elaborated below, under the Steering Committee's proposal, a community or tribe ultimately will possess unconditional power to halt site investigations and a state will have a strong (but not unconditional) veto power. Thus, it is unlikely that the implementer would venture into a jurisdiction where it is passionately unwelcome. Nonetheless, the national interest in developing a deep-mined, geologic repository requires that technically promising locations not be eliminated at the start.

[7] The partnership could also include representatives of local and tribal governments.

[8] To make explicit what may have been implicit, the Steering Committee recommends that more than one site be characterized as the 1982 Nuclear Waste Policy Act required. The implementer would determine which of them, if any, meet the site-suitability criteria.

Trust and Power

This proposed repository-development process attempts to address the two major challenges: sustaining trust and allocating power. With respect to the first challenge, the proposed process provides for a substantial period of engagement, two to three years, between the implementer and the partnership *before* a local or tribal government can make an initial determination whether it wishes to continue. During that time, the implementer will have to demonstrate its trustworthiness by the series of decisions and actions it takes. In particular, a community or tribe that did not volunteer can test whether the implementer has come to merit trust and confidence.

With respect to the second challenge, the proposed process protects the interests of each level of government. The community or tribe retains the right to withdraw up until the time that a license application is submitted. During that period, it will be able to evaluate the trustworthiness of the implementer. Of course, the community or tribe through the partnership will continue to exercise substantial power during the construction and operational phases of the repository-development process.

A state government would retain a strong, but not absolute, veto, which it could exercise once the partnership and the regulatory authorities have spoken. Under the current law, passage of an override resolution requires just the approval of simple majorities in both houses. That rule makes it too easy for a reverse "Not-In-My-Backyard" sentiment to prevail. *By requiring supermajorities in both houses of Congress, the proposed process makes it much more difficult to reverse a state's objections, especially if other suitable sites can be developed. In this way, the proposed process protects the national interest but does so in a way that respects a state's views.*[9]

RECOMMENDATIONS

- The Steering Committee recommends the adoption of a consent-based siting process that (1) establishes strong bonds of trust between local communities, tribes, and states on the one hand and the implementer and that (2) fairly allocates power among the parties.

  The Steering Committee proposes ways by which those two objectives might be secured.

  - ***Collaborate to design the siting process.*** Consent-based siting necessarily involves multiple players, who agree to initiate a process and become active participants willing to sustain siting activities over an extended period. The extent to which the siting principles and repository-development process reflect the expectations and values of interested and affected parties improves the chances of a positive outcome.
  - ***Entrust the siting process to a strong and trustworthy organization.*** An organization that has established itself within a stable political environment will be

[9] Moreover, like the host community or tribe, the state will continue to exercise substantial influence during the construction and operational phases of the repository-development process.

needed to lead the process and be the trusted guardian of the siting. Such an organization will embrace and reflect in its operations the values that will be central to earning and sustaining public trust and confidence.

- ***Articulate a clear decision-making path.*** From the early engagement regarding society's expectations for a siting process, it will become evident what is required to provide clarity and confidence at the outset.
- ***Assemble information required to support participation.*** Early engagement by the implementer can lead to an understanding of public expectations about the information required to launch the siting process.
- ***Partner with local, tribal, and state governments.*** Once engaged, these entities will wish to co-design the journey and establish appropriate control over the process.
- ***Provide an appropriate, ethically-based platform for inviting communities to explore the repository project and consider their potential interest in hosting the repository.*** The implementer will need to provide early steps focused on the learning process and exploring the repository project.
- ***Build the conditions for sustained interest and momentum.*** A community must be a continuing strong proponent of learning about the project and participating in the siting process.
- ***Respect the need for flexibility and adaptability.*** It will not be possible at the outset to foresee all of the programs, resource needs and process details that will be essential at each point in the long multi-year period of site evaluations and repository development.
- ***Adopt a process for approval of a repository site that gives substantial authority to the local municipality, tribe or state to stop the process of site selection and repository construction.*** The decision by local and tribal governments to object should come after an appropriate period of engagement and the completion of important scientific and engineering studies. A possible point of decision could be anytime before the formal submission of the license application to the regulatory authority. A state's objection after a license has been granted could only be overturned by a supermajority of both houses of Congress.

- **Finally, in order to insure a fair process, more than one site should be characterized, just as the 1982 Nuclear Waste Policy Act originally required.**

REFERENCES

Biggs, D. et al. 2017. "Breaking the deadlock on ivory." *Science* 358: 1378-1381.

Bipartisan Policy Center (BPC). 2016. *Moving Forward with Consent-Based Siting for Nuclear Waste Facilities.* Washington, D.C.: Bipartisan Policy Center.

Blue Ribbon Commission on America's Nuclear Future (BRC). 2012. *Report to the Secretary of Energy.* Washington, D.C.

Dinney, J. 2018. "Getting it right on GMOs." *Science* 360: 1407.

DOE. 2013. *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste.* Washington, D.C.: U.S. Department of Energy.

DOE. 2016. *Designing a Consent-Based Siting Process: Summary of Public Input.* Washington, D.C.: U.S. Department of Energy.

DOE. 2017. "Draft Consent-Based Siting Processes for Consolidated Storage and Disposal Facilities for Spent Nuclear Fuel and High-Level Radioactive Waste." Washington, D.C.: U.S. Department of Energy.

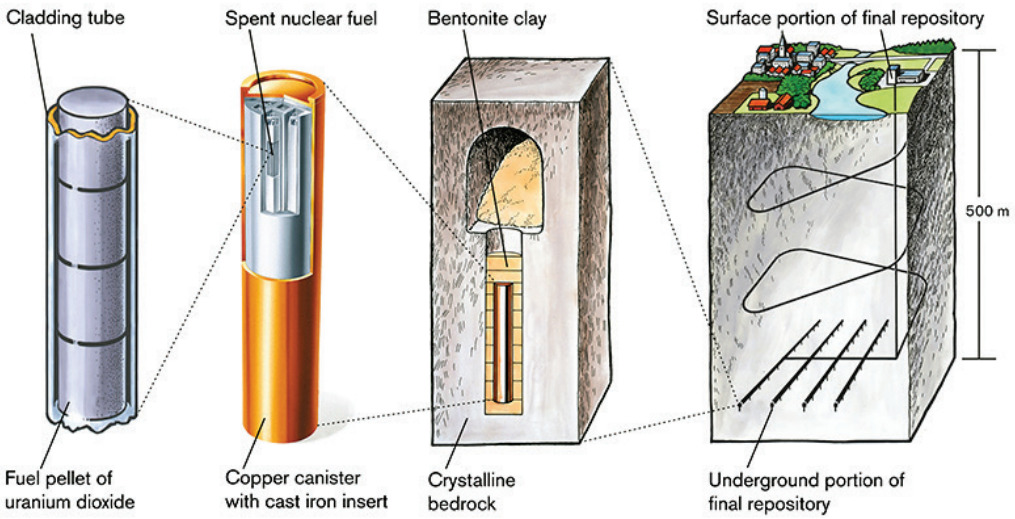
Interagency Review Group on Nuclear Waste Management (IRG). 1979. Report to the President. TID-29442. Washington, D.C.

Lavery, J. 2018. "Building an evidence base for stakeholder engagement." *Science* 361: 554-556.

NEA (Nuclear Energy Agency). 2010. *Partnering for Long-term Management of Radioactive Waste.* NEA-6823. Paris, France: Organisation for Economic Co-operation and Development.

NWTRB (Nuclear Waste Technical Review Board). 2015. *Designing a Process for Selecting a Site for a Deep-Mined, Geologic Repository for High-Level Radioactive Waste and Spent Nuclear Fuel.* Arlington, VA.: Nuclear Waste Technical Review Board.

SEAB (Secretary of Energy Advisory Board). 1994. *Earning Public Trust and Confidence.* Washington, D.C.: U.S. Department of Energy.



A key tenet of geological disposal of nuclear waste is the concept of multiple barriers—engineered and geologic. In Sweden, the KBS-3 concept is based on placing the spent nuclear fuel in iron inserts that are then placed within copper canisters that are five centimeters thick, and then the whole waste package is surrounded by bentonite clay and emplaced at approximately 500 m depth in groundwater-saturated granitic rock. Each element of this strategy has a role to play in delaying the release of radionuclides. Engineered barriers are designed to contain the fuel within the canister. When and if the canisters are breached, the second safety function of the barriers is to retard the release of radionuclides. One of the compelling arguments for safety is the use of natural materials, copper and bentonite, that are known for their very long-term stability. Also, the repository is designed to avoid high temperatures that might accelerate the corrosion and failure of materials. SOURCE: *Permission from SKB. Allan Hedin and Olle Olsson (2016)* Elements, *vol. 12, page 247.*

RESET OF AMERICA'S NUCLEAR WASTE MANAGEMENT
Strategy and Policy

Regulations, Risk and Safety

There is an international consensus that a deep-mined, geologic repository, at an appropriate site and properly designed, can contain radioactive waste for the long periods required to meet regulatory requirements and ensure public safety. The "containment "strategy has three legs:

- containment until radioactive decay has eliminated most of the inventory of radionuclides;
- reduced mobility of radionuclides to ensure that they only arrive to the biosphere after a long time;
- sorption on mineral surfaces and dilution during transport that reduce the exposure to humans.

The safety assessment of a geologic repository evaluates the changing inventory of radioactive nuclides, their release from engineered barriers, such as the waste package, and the movement of radionuclides through surrounding geology to the near surface, and finally, the biosphere. The spatial and temporal scales of the assessment extend from atomic-scale phenomena to distances of tens of kilometers and out to hundreds of thousands of years.

TIME

One of the unique challenges of the geological disposal of nuclear waste is that safety assessments extend to times far into the future. This is because a number of the principal radionuclides have very long half-lives (*e.g.*, ^{238}U = 4.5 billion years; ^{129}I = 16 million years; ^{99}Tc = 400,000 years; ^{239}Pu = 24 thousand years). Fortunately, most of the radioactivity emanates from short-lived fission product elements (*e.g.*, ^{90}Sr and ^{137}Cs = 30 year half-lives). As a rule of thumb, over 99% of the radioactivity is gone after ten half-lives; hence after 300 years nearly all of the ^{90}Sr and ^{137}Cs have decayed away. In some cases radionuclides decay to longer-lived radionuclides (*e.g.*, ^{241}Am to ^{237}Np, which has a half-life of 2.1 million years). Thus, the composition and types of radioactivity change over time. Safety depends

TIME (CONTINUED)

on an evaluation of the ability of a geologic repository to contain highly-radioactive elements over short time periods and the reduced mobility of longer-lived radionuclides that will still be present after hundreds of thousands of years.

Regardless of the time frame, this is an unprecedented effort to protect future "human" generations out to times comparable to the evolution of the human species. EPA's standards are based on advice from the National Academy of Sciences (1995) that suggested that, "compliance with the standard be measured at the time of peak risk, whenever it occurs" (National Academy of Sciences 1995). Of course, this means, ironically, that the better the performance of the repository, the longer the time to peak risk and the longer the period of compliance.

Importantly, the period for regulatory compliance makes a difference in the results of the safety assessment. As an example, the compliance period for the New Mexico's Waste Isolation Pilot Plant, which is the disposal site for defense-generated transuranic waste, is 10,000 years. The compliance period for the proposed repository at Yucca Mountain for spent nuclear fuel and high-level waste is one million years. Why the differences in time frame? The DOE, which manages both sites, has not provided an explanation. Moreover, the original U.S. strategy for disposing of plutonium from dismantled nuclear weapons was to have placed this material (either immobilized in a ceramic waste form or as a used mixed-oxide fuel) at Yucca Mountain. But recently, the DOE has proposed to dilute-and-dispose of this same material at the WIPP site. The same plutonium will have vastly different regulatory frameworks—depending on the disposal site. Small wonder that the public remains confused about the standards for safety.

...this is an unprecedented effort to protect future "human" generations out to times comparable to the evolution of the human species.

In the course of developing a geologic repository, an implementing organization must make a persuasive case that the site that has been selected is technically suitable.[1] The implementer typically presents an argument that the location in question satisfies a pre-established set of site selection criteria for the repository's projected ability to isolate and contain the radionuclides. The strength of that argument generally is judged, in at least a *pro forma* manner, by a designated political institution, such as Congress or the country's parliament.[2]

[1] In addition, the choice of a site must also be socially acceptable. This requirement is discussed in detail in the chapter on public engagement and consent-based siting.
[2] Sweden is a notable exception to the last two statements. The implementer, SKB, never established formal site-suitability criteria. Further, its choice of a location in the Municipality of Östhammar was never formally ratified by any arm of the Swedish Government.

At a later date, after the site has been more intensively explored and characterized, the implementer submits to its regulatory authority a license application to construct the facility. That body determines whether the implementer has demonstrated *compliance* with pre-established rules or regulations. In making that compliance determination, the regulator most often uses qualitative statements, such as "reasonable assurance" or "reasonable expectation" to describe its confidence in its safety analysis.

At its October 2016 meeting, the Steering Committee heard presentations by implementers and regulators from France, Sweden, and the United States. In addition, it listened to scientists describing the strengths and weaknesses of several quantitative modeling methodologies used to project the behavior of natural and engineered systems in a geologic repository into the far future.[3] From those discussions came one clear conclusion: nations differ substantially in how they craft site-selection criteria and how they design the rules by which a license application is evaluated, but almost all are using or intend to use a *safety case* to evaluate their sites. Thus, there is an opportunity to reflect on and devise a regulatory framework that responds to the technical and social requirements for safety.

In the pages that follow, the Steering Committee first reviews how site-selection criteria have been fashioned. Most important is the question of how those criteria are used to compare and rank potential sites and to determine which particular site should be chosen as the location of a geologic repository. The Steering Committee then considers options for designing licensing rules. Of particular interest is how evidence is marshalled to support a claim that the repository can meet societal safety goals over the very long term.

UNCERTAINTY

There are many types of uncertainty that must be considered in the safety assessment of a geologic repository. Most commonly, analysts focus on the uncertainty in parameter values that are inputs to the models and the conceptual uncertainty in the models themselves. Does the model describe the physical or chemical process accurately? Are we even aware of all the relevant processes? Since the repository is expected to operate over geologic periods, we may not have even yet observed some of the relevant processes and therefore they will not be included in the analysis. Equally important over very long periods, but more difficult to quantify, is the uncertainty in the boundary conditions over time, such as the possibility of earthquakes, glaciation or erosion. Hence, the model uncertainty increases over time. Furthermore, natural geologic systems are complex and difficult to characterize completely. Any assessment of a disposal facility system will need to consider both constraints. Therefore, assessments of the disposal system will by their nature be more qualitative for longer times.

In addition, natural geologic systems are complex: the geologic properties relevant to the long-term safety of the geologic disposal facility can vary from location to location

[3] These methodologies are critically important in making the case for site suitability and for judging whether a license application complies with regulatory requirements.

UNCERTAINTY (CONTINUED)

underground, and over very long timeframes, can gradually change. While the engineered portions of the disposal system, such as the containers in which the spent fuel or high-level waste will be placed, are designed to last a long time, they, too, will eventually degrade in a manner that may not be known. The development of conceptual and numerical models of individual parts of the geologic disposal system must take into account such variations and uncertainties. Detailed site investigations should provide a better qualitative and quantitative understanding of these variations and uncertainties that will then be used in the development of the conceptual and numerical models.

SITE-SELECTION CRITERIA

When implementers began work in the mid-1960s, they focused on developing a repository within a particular host rock. Salt was the preferred formation in Germany and the United States. Crystalline rock was favored in Scandinavia and Switzerland. The implementer adopted *exclusion criteria*, such as proximity of natural resources or volcanic and earthquake prone regions, to initially disqualify certain locations. *Host-rock-specific criteria* also were used to winnow broad areas down to candidate sites. These criteria included the degree of fracturing, rate of groundwater flow, water chemistry (Eh and pH), homogeneity, and sorptive capacity of the surrounding rock.

A fundamental paradigm shift arose in the mid-1970s that changed the focus from the host rock to the repository system as a whole, therefore including other natural barriers, such as the hydrogeologic environment and engineered barriers, such as the waste form and backfill. Implementers in countries with diverse geologies realized that a different type of site-selection criteria might be required in order to compare and rank potential locations where dissimilar disposal concepts might be developed. *Generic criteria* were crafted that would arguably portend a site's suitability.[4]

A prototypical example of generic criteria was proposed by the International Atomic Energy Agency (IAEA 1977). It proposed the following hydrogeologic characteristics that could affect how well a repository might isolate and contain high-activity radioactive waste.

- Age, size and homogeneity of the rock unit
- Parameters that constrain the rate and amount of groundwater flow
- Geochemical conditions that will reduce the concentration of radionuclides in the groundwater or increased their sorption onto mineral surfaces
- The possibility of confounding geologic events, such as earthquakes, volcanism, glaciation or erosion
- The possibility of human intrusion, such as drilling or excavation, in the search and development of mineral or energy resources.

[4]See NWTRB 2015: 29-32 for a detailed discussion of these three types of site-selection criteria.

Experience in the United States

The United States is a large country and one with diverse geologic possibilities for a nuclear waste repository. Conceivably a repository might be developed, not only in salt and crystalline rock, but also in clay formations. With the passage in 1982 of the Nuclear Waste Policy Act (NWPA), Congress authorized the Environmental Protection Agency (EPA) to set standards for developing a repository and the Nuclear Regulatory Commission (NRC) to implement those standards through regulation. Both the standard and the regulation would apply to any repository of high-activity radioactive waste.[5]

Congress also made clear its intention that sites associated with different disposal concepts *had to be compared* before one could be selected (NWPA Section 112[a]). NRC's rule has a section devoted to the considerations that had to be incorporated into generic site-selection criteria (10 CFR 60.122). The NRC required DOE to adopt those considerations into its own regulation.

Between 1983 and 1985, DOE worked to develop the site-selection criteria. In the Steering Committee's view, DOE made a serious effort to engage interested and affected parties, even to the point of not truncating the public-comment process for the sake of meeting project schedules. The DOE produced several draft rules and, in some important respects, took suggestions from those parties to heart.

The final rule, 10 CFR 960, contains three major parts:

- Implementation guidelines detailing a process for selecting a site for repository development
- Technical criteria
    - Pre-closure guidelines delineating the site characteristics that affect the construction and operation of a repository, including cost, transportation, and socioeconomics.
    - Post-closure guidelines governing the site characteristics that affect the long-term performance of a repository.
- Guidelines setting forth very general principles for comparing sites.

For each technical criterion, the regulation specifies qualifying conditions, favorable conditions, potentially adverse conditions, and disqualifying (exclusion) conditions.

DOE officials soon discovered that the methodology outlined in the regulation for comparing and ranking sites was of limited value. In 1985, DOE attempted to use the rule to winnow down potential sites for the legislatively mandated second repository. That effort exacerbated political concerns and was terminated by Secretary John Herrington.

[4] In 1985, the EPA issued a standard (40 CFR 191) that set the allowable release to the public at the dose equivalent of 10 mrems/year. It further required that any repository meet that release limit for at least 10,000 years. That standard was overturned by the Court of Appeals for 1st Circuit. Only in 1992 did Congress permit EPA to reinstate that standard for repositories other than one built at Yucca Mountain.

The Steering Committee looked more closely at DOE's second attempt to apply its site-selection criteria in the following year. As required under the 1982 NWPA, DOE carried out Environmental Assessments for each of what it considered the five most promising locations. It then had to decide how to synthesize the collected information on all the various characteristics. The objective was to identify three sites worthy of further investigation.

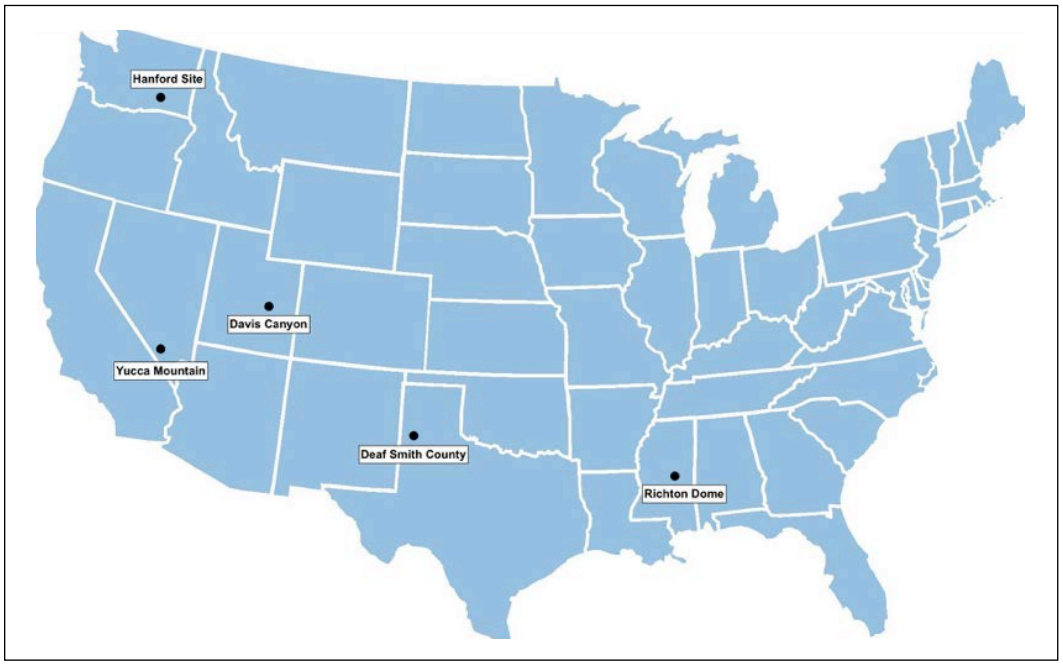


FIGURE 5.1. The early, initial sites considered for a geologic repository by DOE.
DATA FROM: *SWIFT 2018*

DOE proposed three site-ranking methodologies, all of which became the object of immediate and strong criticism from interested and affected parties.[6] Most devastating and influential was the critique leveled by National Academy of Sciences' Board of Radioactive Waste Management (Parker 1985).

After a set of tense exchanges with the Academy panel, DOE eventually settled on a methodology termed "Multiattribute Utility Analysis (MUA)." Based on its evaluation of both the pre- and post-closure guidelines, DOE officials ranked the sites in the following order: Yucca Mountain, Richton Dome, Deaf Smith County, Davis Canyon, and an undefined site on the Hanford Reservation (DOE 1986a).

However, when Secretary Herrington recommended to President Ronald Reagan the three sites that merited further characterization, the order he proposed was Yucca Mountain, Deaf Smith, and Hanford. The Secretary explained why he departed from the MUA results

[6] None of these were clearly envisioned in the regulation.

by noting that the methodology was a "decision-aiding" not a "decision-making" process. In particular, he maintained that the MUA over-weighted the importance of cost and neglected completely the value of selecting sites in differing hydrogeologic environments (DOE 1986b).

One IAEA report put it well: "Members of the general public and representatives of local communities recognize that they have a clear stake in the outcomes of [siting] decisions and almost always seek to have their views taken into account by the policy elites" (IAEA 2007:40).

The "five-to-three" example, like the earlier one involving the second repository, confirms the accuracy of that observation. Whatever credit DOE earned for conducting an intensive public engagement process dissipated almost instantaneously. A congressional investigation produced documents that seemed to call into question DOE's objectivity (Memorandum to Jim Weaver 1986). The three states that had become clear targets called "foul" and rushed to explain why the sites within their borders were technically unsuitable.

DOE's experience in trying to apply its site-selection criteria also makes clear the dilemma that an implementer might very well be exposed to when it seeks to compare and rank potential sites in vastly different hydrogeologic environments. On the one hand, it needs to prove to interested and affected parties that it is trustworthy by applying a "rule" that it is unbiased and uninvested in the outcome. On the other hand, it has a bureaucratic and legal interest in retaining its discretion in applying a "rule" to capture considerations that can escape even the most complex and sophisticated methodology. Trying to find an algorithm to avoid this dilemma strikes the Steering Committee as a futile exercise. However, there is an alternative.

The Safety Case Approach

The Nuclear Energy Agency (2004) defines a safety case as,

> "The synthesis of evidence, analyses and arguments that quantify and substantiate a claim that the repository will be safe after closure and beyond the time when active control of the facility can be relied on."

In many respects, the safety case is akin to a legal brief, advancing a compelling argument for safety. Through a safety case, an implementer reveals its understanding of the repository site and how it expects the radionuclides to behave in the repository over long periods of time. The safety case for a complex, geological repository system should consider the disposal site, its environment, and its evolution over time. To do so, it should address the waste inventories and waste form characteristics. It will need to explain how the disposal concept (repository architecture and engineered barrier system) contributes to the long-term performance of the system.

...the safety case is akin to a legal brief, advancing a compelling argument for safety.

The safety case undoubtedly includes quantitative analyses of the performance of the site, but these are only a part of the argument for safety. Qualitative arguments for safety, such as the site remaining consistent with the site selection criteria, multiple lines of evidence, traditional notions of defense-in-depth, references to other similar geologic systems, and natural analogues should also be part of the safety case. The safety case includes a detailed examination of scenarios, including those that involve repository failure (IAEA 2012).

The safety case undoubtedly includes quantitative analyses of the performance of the site, but these are only a part of the argument for safety.

The safety case must use plain language and jargon-free explanations of the most current understanding of repository behavior over time and the associated uncertainties. The plain language included in the safety case not only serves to make the information accessible to all and to build confidence and trust in the waste management organization and regulator, but it serves another important purpose. The safety case frames the strategy and reasoning of the safety assessment.

In sum, like the author of a legal brief, the implementer provides, through the safety case, an analysis of the system that is consistent with not only the expectations of the site selection criteria but also the combined behaviors of the major safety elements of the analysis. The safety case reveals the reasoning behind why the disposal facility is expected to be "safe" for whatever reasonable scenarios can be envisioned in the future.

"Confidence in safety" can be the most important result of creating of a solid and robust safety case. Such confidence is increased when the independent lines of evidence contained in the "brief" all point to the same conclusion. Confidence in safety is increased when affirmative answers can be given to questions such as these:

- Has the implementer displayed a deep understanding of the evolution of the repository system?
- Have alternative conceptual models of key phenomena been considered and have their implications for repository performance been evaluated?
- Have the uncertainties in the technical and qualitative analyses been clearly identified?
- Have "what if" scenarios of interest, not only to the implementer, but also to interested and affected parties, been considered?

Indeed, these questions can form the basis for a *dialogue* between implementer and regulator and between implementer and society. In the Swedish context, such dialogue has been termed "stretching." The implementer opens itself to queries from a variety of sources. If the response is deemed to be unsatisfactory, the queries are repeated until the responses are convincing.

For such a dialogue to be effective, the implementer must show an open, fair, and honest attitude toward those possessing less technical training; it must display a clearly visible attitude of care and concern for all interested and affected parties. The implementer and

regulator should hold many public meetings to answer questions and provide explanations in person. Alternatives, questions, and issues posed by interested and affected parties must all be given fair and due consideration by the implementer and the regulator. In addition, funding should be made available for the affected community to hire their own technical experts to evaluate the claims contained in the implementer's safety case.

In addition, funding should be made available for the affected community to hire their own technical experts to evaluate the claims contained in the implementer's safety case.

In the course of engaging in this dialogue, disagreements are almost inevitable. It is possible, even desirable, to "institutionalize" mechanisms for ventilating and perhaps resolving these differences. A few examples of how to obtain and incorporate a diversity of technical views are:

- Recruit an independent group of technically competent scientists or engineers to review the work on the relevant scientific or technical aspects of the disposal system.
- Use of a formal "expert elicitation" process (Kotra et. al 1996). A range of experts can be asked to estimate the relevant system or process characteristics, and in some cases, the probability of a particular range of characteristics.
- Interact with the Nuclear Waste Technical Review Board (NWTRB), an independent federal agency established by the Nuclear Waste Policy Amendments Act in 1987. The NWTRB conducts regular public meetings on a range of specific scientific, technical, and logistical issues and reports to Congress and the President with its findings.

By advancing a transparent safety case and promoting an authentic dialogue with interested and affected parties, the implementer can minimize, although probably not eliminate, the consequences of being caught in the dilemma noted above. Universal agreement on the selection of a site will probably remain out of reach. But the process may increase the trust necessary to sustain the repository development process. Certainly, DOE's experience clearly demonstrates that repeating past approaches is unlikely to be successful.

Yucca Mountain – a Brief History

In 1987, in large part because of the controversies engendered by the process to select sites for both the first and second repositories and because of the escalating cost of characterizing multiple sites, Congress passed the Nuclear Waste Policy Amendments Act (NWPAA). This legislation, among other things, prohibited DOE from characterizing any site other than Yucca Mountain and placed the second repository on the back-burner. In effect, then, the NWPAA mandated Yucca Mountain as the site for the first repository for high-activity waste. Yet, DOE was still obliged to make a determination of suitability before Congress could make the selection official. Deciding how to do so would preoccupy DOE for more than a decade.

That saga begins in 1992, when Congress passed the Energy Policy Act. This legislation, among its other provisions, required EPA to promulgate Yucca Mountain-specific standards for developing a repository. Congress instructed the agency to base those standards on the advice of a committee chosen by the National Academy of Sciences. NRC would then conform its regulation to EPA's standard.

The panel's report concluded that the regulatory regime laid out in EPA's still-contested environmental standard, 40 CFR 191, was out of date and difficult to implement.[7] For Yucca Mountain, the report recommended that probabilistic performance assessment (PRA) methodology be used in its place. The panel also recommended that the period over which compliance had to be shown should be increased to the time of peak dose as determined by the performance assessment. For Yucca Mountain, that time extends to one million years (NRC 1995).

EPA and NRC eventually promulgated new regulations, 40 CFR 197 and 10 CFR 63 respectively, which were generally consistent with the Academy's advice.[8] Those actions resolved DOE's predicament about how to evaluate Yucca Mountain's suitability when, in effect, Congress had already declared the site suitable. If NRC were to review a license application, DOE reasoned, it would use probabilisitic risk assessment (PRA) to do so. It made sense then to harmonize suitability with licensability. To do so DOE also promulgated a new regulation, 10 CFR 963, which enshrined PRA as the methodology of choice. In 2002, Congress used that analysis to officially select Yucca Mountain as the site for the first repository for high-activity radioactive waste.

LICENSING

It is difficult to overstate the significance of the shift that took place when EPA and NRC adopted Yucca Mountain-specific standards and regulations. Formerly, the basis for granting a license to construct a repository was set forth in general terms.

> "The geologic setting shall be selected and the engineered barrier system and the shafts, boreholes and their seals shall be designed to assure that releases of radioactive materials to the accessible environment following permanent closure conform to such generally applicable environmental standards for radioactivity as may have been established by the Environmental Protection Agency with respect to both anticipated processes and events and unanticipated processes and events (10 CFR 60.112)."

In addition, the implementer had to demonstrate that the projected performance of specific barriers met precisely defined requirements (60.113). How compliance with the general and specific conditions was to be shown was left to the implementer's discretion.

[7] By extension, NRC's licensing regulation, 10 CFR 60, was equally flawed.

[8] Both agencies, however, retained the 10,000-year compliance period. That decision was challenged in the Appeals Court for the District of Columbia Circuit and was overturned. For the moment at least, the Yucca Mountain compliance period is 1,000,000 years. The dose limit is 15 mrem for the first 10,000 years and 100 mrem subsequently. The State of Nevada has challenged those limits in court, but the suit has been suspended for nearly a decade.

A Total System Performance Assessment (TSPA), a variant of PRA, occupies the center of NRC's Yucca Mountain-specific licensing regulations. TSPA "is a probabilistic analysis that identifies the features, events, and processes that might affect the performance of the repository; examines their effects on performance; and estimates expected annual dose to the potential receptor" (DOE 2002: Section 4.2). To show compliance with the regulations, DOE depends almost exclusively on the results of TSPA.

TSPA is a complex computer simulation of repository behavior over hundreds of thousands of years based on many tens of quantitative models of the overall repository system. These "subsystem" models include models that project climate conditions, hydrologic models of the zones above and below the water table, models of the thermal, mechanical, and chemical changes that the waste and the local geology would experience over time, models of the waste form itself and how it would degrade over time, and models of radionuclide nuclide transport, once released from the waste. The interconnections among the subsystem models are illustrated in Figure 5.2.

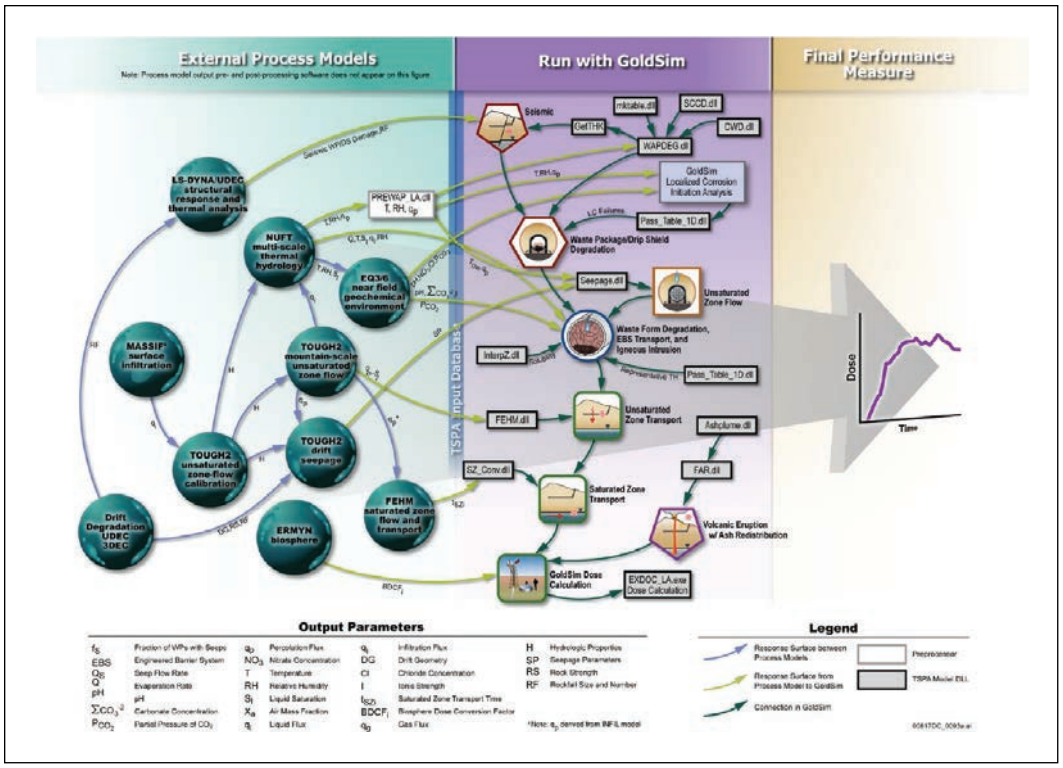


FIGURE 5.2. Schematic of the model linkages used for the total system performance assessment of the proposed geologic repository at Yucca Mountain. SOURCE: *SWIFT 2018*

TSPA relies on Monte Carlo techniques to generate a set of "realizations." These realizations are displayed in the "horsetail" diagram shown below (Figure 5.3.) Compliance with the dose limits would be demonstrated if the mean of the realizations fell below the relevant dose limit at the relevant time.

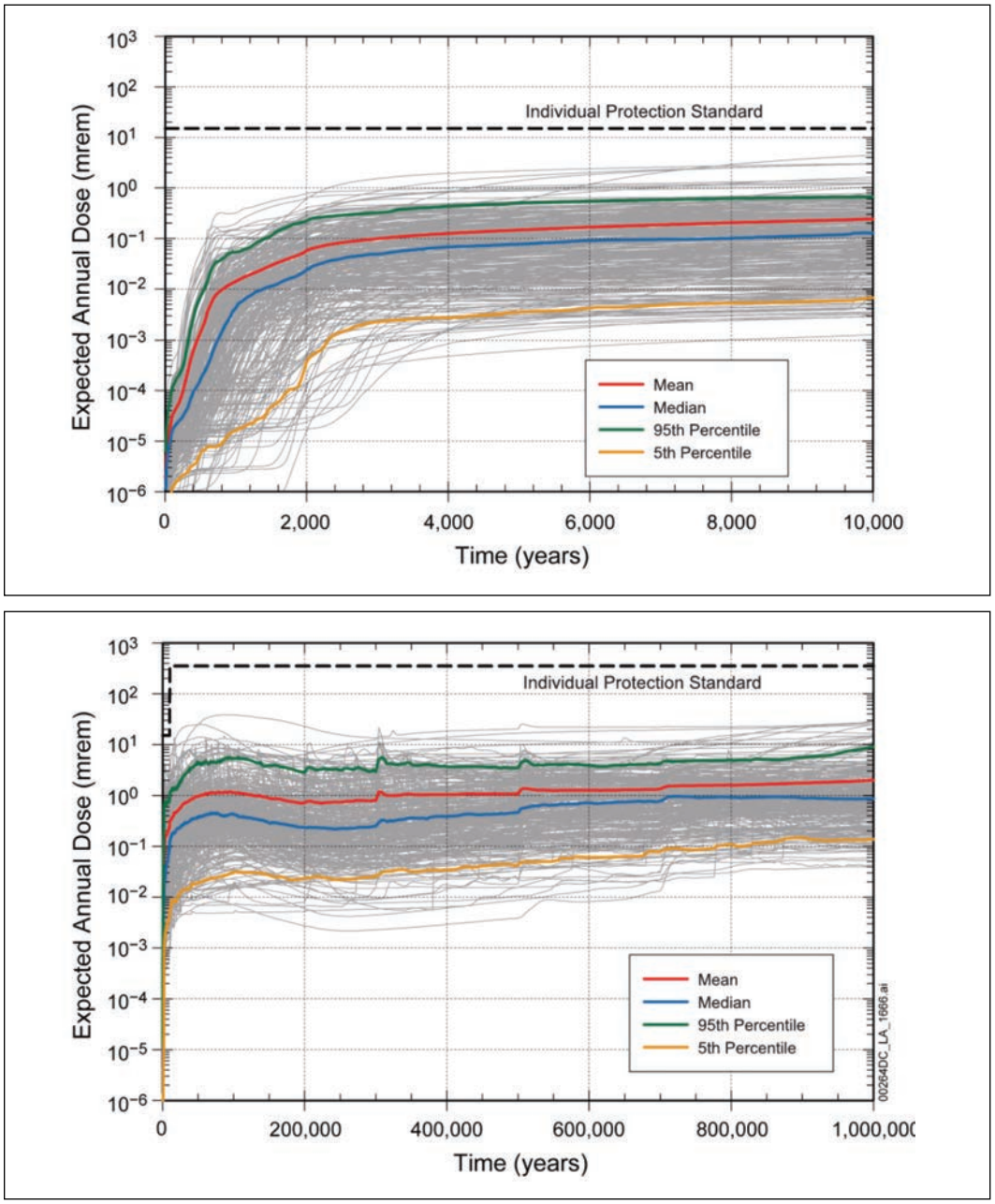


FIGURE 5.3. Example of a horsetail diagram used to evaluate the long-term performance of Yucca Mountain after 10,000 years (top) and 1,000,000 years (below). SOURCE: *Modified from DOE/RW-0573 Rev. 1 Figure 2.4-10, SWIFT 2018*

TSPA, although documented by thousands of pages of highly technical detail, is difficult to understand and opaque to virtually all interested and affected parties. Only a handful of experts can comprehend all the different subsystem models and how they are integrated. TSPA therefore fails to offer a clear and convincing answer to the question: *How confident can we be that the repository site will perform as required?*[9]

Evidence—*pro and con*—to support the technical bases for all models and parameter values is not transparent. The development of the final models in the TSPA, along with the regulatory review, occurs among a small set of technical and regulatory experts. In addition, the emphasis on a calculation of dose as a measure of risk means that all of the uncertainty in the physical and chemical models is conflated with the uncertainty in understanding the exposure and effects of low doses of ionizing radiation. The probabilistic calculations provide numerical results of the "dose risk,"[10] but the uncertainty of the physical and chemical process models is then hard to evaluate. Even though probabilistic models are mandatory for addressing the conceptual and parameter uncertainties, their results offer only one of many indicators of safety. Consistent deterministic scenarios, like those used in France and Sweden, provide additional indicators allowing a clearer explanation of how the repository is expected to evolve and its potential impact on the biosphere. For example, simple bounding case analyses can show in a transparent, understandable manner whether the results of the more complex analyses are credible, even if quantification of many processes remains highly uncertain.

The overall state of uncertainty in risk analyses must be made transparent for both external technical and non-technical stakeholders. One of the most striking panel discussions during the Reset meetings (October 2016) occurred among experts in hydrology and geochemistry and skilled practitioners of probabilistic risk assessment methodologies. This conversation exposed a huge gap between the limitations of the use of models to describe geologic systems and the application of those models in a PRA (see for example, Konikow and Bredehoeft 1992; Bredehoeft and Konikow 1993; Nordstrom, 2012; Ewing *et al.* 1999; Oreskes *et al.*, 1994). When the public sees such a divergence among the judgments of technical experts, their confidence is understandably diminished.

The need for openness and clarity in the development of conceptual and numerical models of the long-term evolution of the disposal system and the choice of numerical model parameter values is an essential part of the successful evaluation of repository performance. The Steering Committee recognizes that a TSPA-like analysis can provide valuable insights into the long-term behavior of a complex natural and engineered system, such as a deep-mined, geologic repository. But it is not the sole means of doing so, and it should not be the only basis for determining whether a particular design meets expectations for protecting health, safety, and the environment.

[9] It might well be argued that the adjudicatory hearing, which must be held before a license can be approved, provides the venue for contesting these issues. The Steering Committee agrees but believes that additional measures need to be taken to understand the value and limitations of relying on TSPA.

[10] "Dose risk" expresses the actual intention of the EPA and NRC regulations for Yucca Mountain and the Waste Isolation Pilot Plant—a probability-weighted assessment of the projected annual dose rate. An alternative approach when considering probabilistic approaches is to calculate "health risk" in which the projections of annual dose rate are supplanted by the projections of the probability of, for example, a latent cancer fatality.

The Steering Committee holds that the safety-case approach, which includes, but is not limited to quantitative calculations, is a better way to establish confidence that the repository system will meet the demands that the public expects.

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This conclusion follows naturally from the discussion above. When there is a divergence of views over technical issues, the broader arguments for safety become even more important to understand (Jasonoff 2007). A process built around a dialogue over an augmented safety case, even prior to submission of a license application, provides an opportunity for interested and affected parties to challenge key hypotheses (alternative scenarios and conceptual models, parameter values) in the overall risk analyses.[11] Moreover, the safety case encourages a reassessment of a site's suitability in light of new information derived from intensive characterization that occurs after a location has been selected.

This reexamination must be able to clearly address not only technical issues, but also political and stakeholder questions and concerns. It must also account for other qualitative factors, such as economic impacts at the federal, state, and local levels, intergenerational risk tradeoffs, psychological risks, impacts to biota, and others. The safety case allows for multiple exchanges among interested parties in the definition of risk.

Finally, using a safety case approach helps to ensure that the regulatory determination of compliance is consistent with common sense expectations for the role that important parameters (e.g., tectonic stability, limited movement of water through the repository horizon, and redox conditions) play in determining the long-term safety of a site (Ewing and Macfarlane, 2002). In short, the quantitative analysis of safety must, in the final analysis, support the qualitative understanding of repository performance and public expectations.

STANDARDS

Yucca Mountain Standard: The safety assessment of the Yucca Mountain site is based on a probabilistic analysis of the annual dose that a person might expect to receive at a distance of 20 kilometers from the site. During the first 10,000 years the dose limit is 0.15 milliSieverts (= 15 millirem). Beyond 10,000 years out to one million years the dose limit is one milliSievert (100 millirem). For comparison, typical exposure to natural radiation sources is on the order of 300 millirem per year.

Waste Isolation Pilot Plant Standard: The safety assessment of WIPP combines a probabilistic analysis with a probabilistic standard. The cumulative release should have a

[11] This means that local communities and states should be provided support so that they have their own, trusted experts who participate in the safety evaluation.

STANDARDS (CONTINUED)

likelihood of one chance in ten of exceeding specified quantities (Table 1 in Appendix A; 40 CFR191.13) and a likelihood of one chance in a thousand of exceeding the specified quantities by a factor of 10 over a period of 10,000 years. The calculated cumulative release based on Table 1 in 40 CFR191.12 is scaled to the total inventory disposed of at WIPP, *e.g.*, increasing the inventory increases the amount that can be released.

An important recommendation of the *Blue Ribbon Commission for America's Nuclear Future* (2012) is that the U.S. have a generic standard and supporting regulatory framework. A generally applicable standard would be very useful in the comparison of different sites that have different geologic settings and certainly would enhance public trust in the process of site comparison and selection.

SAFETY ASSESSMENTS IN OTHER COUNTRIES

Most countries with advanced nuclear waste repository programs have developed safety cases for their proposed repositories, including Finland, Sweden, France, Belgium, Switzerland, the UK, and Canada. Finland and Sweden have already completed safety cases for their license applications and provide good examples of what safety cases should include. In most cases the safety case analysis extends to one million years.

Posiva Oy, Finland's nuclear waste management organization, submitted their safety case, TURVA-2012, to support their license application to construct a repository in 2012. Their safety case included a description of the radioactive waste intended to go into the repository, a description of the geology of the site (Olkilouto), and both the natural and engineered systems that will make up the repository. The data in the safety case included quantitative analysis: models and data to support a performance assessment that evaluated not only the performance of the repository but also the ways in which it might fail and release radionuclides to the environment. The safety case also included qualitative data that supported the quantitative analysis as well as a synthesis of all the arguments that show the repository will perform safely (Vira and Snellman 2013).

Another example of a safety case was provided by Svensk Kärnbränslehantering AB (SKB, the Swedish organization responsible for used fuel storage, transportation, and disposal in that country). Svensk Kärnbränslehantering AB (SKB) 2011 describes the safety assessment in simple terms:

"The main purpose of a safety assessment of a final repository is to investigate whether the repository can be considered radiologically safe over time. In principle, this is established by comparing estimated releases of repository derived radionuclides and associated radiation doses with regulatory criteria. For a KBS-3 repository, the primary safety function is to completely contain the waste for hundreds of thousands of years…. An important purpose of this safety assessment is, therefore, also to analyse the repository's

SAFETY ASSESSMENTS IN OTHER COUNTRIES (CONTINUED)

> potential for containing the wastes under a wide range of circumstances and for a very long time.
>
> Appropriate scientific and technical support for all statements made and data selected is essential to give confidence in the calculated results. Demonstrating understanding of the disposal system and its evolution is thus a crucial component in any safety assessment."

The lead technical report supporting SKB's license application for a disposal facility is an example of a detailed safety case. It starts with a general description of what was explored and how the assessment of long-term disposal facility behavior (performance assessment) was conducted by Svensk Kärnbränslehantering AB. The safety case in its simplest form describes the disposal facility, the purpose of the safety assessment, the regulations that guide nuclear waste disposal, the organization of the site project, and some of the technical issues: site investigations and modeling, the engineered systems in the repository, and the development of the spent fuel canisters.

The remainder of the three-volume, approximately 700-page report describes these issues in more detail, but still at a higher level. The report addresses the features of the disposal system and discusses the uncertainties in future scenarios and system parameters, and how they were addressed (*e.g*, bounding (worst case) scenarios, probabilistic risk assessments, and use of "natural analogs"). Supporting this report are thousands of pages of additional, more detailed reports on all aspects of the disposal system, regulations, and how compliance was demonstrated.

RECOMMENDATIONS:

- The Steering Committee recommends that the implementer be required to develop a safety case during the initial stages of disposal site investigation, and to regularly update the safety case as additional information is included and as it receives comments from various stakeholders and other interested parties. While formal compliance calculations will still be an essential part of the licensing process, the primary vehicle for communication with the broadest set of stakeholders and other interested parties should be the safety case. In addition, the license application should be based on the safety case, as it has been developed during the selection, characterization and design of the repository.
- The Steering Committee recommends that a new approach to geologic disposal repository regulation be adopted that recognizes that uncertainty in predicting performance grows over time. Fundamentally, these alternative approaches include a stronger reliance on quantitative analyses for shorter periods of time (such as perhaps up to

several thousand years), with reliance on more qualitative factors over longer periods. However, quantitative calculations for long time periods are still useful as a starting point for qualitative analyses. A new regulatory framework will need to be established in order to establish the safety case approach as the basis for the license application.

- Finally, an essential step in building trust and ensuring that the safety case is adequate is through formal peer review. The Reset Committee recommends an independent, continuing, internationally-based peer review of the safety case. Sweden, Switzerland, and France conducted such an independent review through the Nuclear Energy Agency's international expert group (NEA 2012).

REFERENCES

Blue Ribbon Commission on America's Nuclear Future (BRC). 2012. *Report to the Secretary of Energy.* Washington, D.C.: U.S. Department of Energy.

Bredehoeft, J.D. and L.F. Konikow. 1993. "Ground-water Models: Validate or Invalidate." *Groundwater*: 31: 178-329.

DOE. 1986a. *Area Recommendation Report for the Crystalline Repository Project.* Draft. DOE/CH-15. Washington, D.C..

DOE. 1986b. *Environmental Assessment, Yucca Mountain Site, Nevada Research and Development Area, Nevada.* DOE/RW-0073. Washington, D.C..

DOE. 2002. *Area Recommendation Report for the Crystalline Repository Project.* Draft. DOE/CH-15. Washington, D.C..

EPA (Environmental Protection Agency). 40 Code Federal Regulations Part 197, https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=1&SID=ff7ffbf7ff242cd3d801fe7c25df04fe&ty=HTML&h=L&n=pt40.25.197.

Ewing, R.C., Tierney, M.S., Konikow, L.F. et al. 1999. "Performance Assessments of Nuclear Waste Repositories: A Dialogue on Their Value and Limitations." *Risk Analysis* 19:933.

Ewing, R.C. and A. Macfarlane. 2002. "Yucca Mountain." *Science* 296: 659-660.

IAEA (International Atomic Energy Agency). 1977. *Site Selection Factors for Repositories of Solid High-Level and Alpha-Bearing Wastes in Geological Formations.* Technical Report Series 177. Vienna, Austria.

IAEA (International Atomic Energy Agency). 2007. *Factors Affecting Public and Political Acceptance for the Implementation of Geological Disposal.* IAEA-TECDOC-1566. Vienna, Austria.

IAEA (International Atomic Energy Agency). 2012. *The Safety Case and Safety Assessment for the Disposal of Radioactive Waste.* IAEA Safety Standards Series No. SSG-23. Vienna, Austria.

Jasonoff, S. 2004. "Technologies of Humility." *Nature* 450:33.

Konikow, L.F. and J.D. Brederhoeft. 1992. "Ground-water Models Cannot be Validated." *Advances in Water Resources* 15:47-62.

Kotra, J.B., et al. 1996. "Branch Technical Position on the Use Of Expert Elicitation in the High-Level Radioactive Waste Program." NUREG–1563. Washington, D.C.: U.S. Nuclear Regulatory Commission.

Memorandum from Subcommittee Staff to Jim Weaver, Chairman, Subcommittee on General Oversight, Northwest Power, and Forest Management, Committee on Interior and Insular Affairs, and Edward Markey, Chairman, Subcommittee on Energy Conservation and Power, Committee on Energy and Commerce. October 20, 1986.

NAS (National Academy of Sciences). 1995. *Review of U.S. Department of Energy Technical Basis Report for Surface Characteristics, Preclosure Hydrology, and Erosion.* National Academy Press: Washington, D.C..

Nordstrom, D.K.. 2012. "Models, validation, and applied geochemistry: Issues in science, communication, and philosophy." *Applied Geochemistry* 27:1899-1919.

NRC (National Research Council). 1995. "Technical Bases for Yucca Mountain Standards." Washington, D.C.: Nuclear Regulatory Commission.

NEA (Nuclear Energy Agency). 2004. *Post-Closure Safety Case For Geological Repositories.* NEA 3679. Paris, France.

NEA (Nuclear Energy Agency). 2012. *The Post-closure radiological safety case for a spent fuel repository in Sweden.* NEA/RWM/PEER(2012)2. Paris, France.

NRC (Nuclear Regulatory Commission). 1984. "General Guidelines for the Preliminary Screening of Potential Sites for a Nuclear Waste Repository" 10 Code of Federal Regulations 60. Washington, D.C.. https://www.law.cornell.edu/cfr/text/10/part-960.

NRC (Nuclear Regulatory Commission). 1999. "Disposal of High-Level Radioactive Wastes in Geologic Repositories." *10 Code of Federal Regulations 60. Washington, D.C.*. https://www.nrc.gov/reading-rm/doc-collections/cfr/part060/.

NRC (Nuclear Regulatory Commission). 2002. *Yucca Mountain Site Suitability Evaluation.* DOE/RW-0549. Washington, D.C..

Nuclear Waste Policy Act. 1982. https://www.energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf.

NWTRB (Nuclear Waste Technical Review Board). 2015. *Designing a Process for Selecting a Site for a Deep-Mined, Geologic Repository for High-Level Radioactive Waste and Spent Nuclear Fuel: Detailed Analysis.* Arlington, Virginia.

Oreskes, N., Shrader-Frechette, K., and K. Belitz. (1994). "Verification, validation, and formation of numerical models in the earth sciences." *Science* 263: 641-646.

Parker, F. 1985. Letter to Ben Rusche, Director, Office of Civilian Radioactive Waste Management. April 25, 1985.

Svensk Kärnbränslehantering AB (SKB). 2011. *Long-term safety for the final repository for spent nuclear fuel at Forsmark—Main report of the SR-Site project, SKB TR-11-01.* Technical Report, Stockholm, Sweden: Svensk Kärnbränslehantering AB.

Swift, P. 2002. "Department of Energy Performance Assessment and Barrier Analyses." *Nuclear Waste Technical Review Board meeeting presentation.* Las Vegas NV: U.S. Department of Energy.

Swift, P. 2018. "Deep Geologic Disposal of Radioactive Waste at the Waste Isolation Pilot Plant and the Proposed Yucca Mountain Repository." Stanford University. February 20, 2018.

Vira, J. and M. Snellman. 2013. "TURVA-2012 safety case for licensing a spent fuel repository at Olkiluoto, Finalnd." *IAEA Symposium Proceedings: October 2013*. Paris, France.

Appendix A:
RESET OF U.S. NUCLEAR WASTE MANAGEMENT STEERING COMMITTEE MEMBERS*



Professor **Sally M. Benson** is a Professor of Energy Resources Engineering at Stanford University and the director of Stanford's Precourt Institute for Energy and the Global Climate and Energy Project (GCEP), a pioneering university-industry partnership to develop innovative, low-carbon energy supplies to meet global energy needs. Prior to coming to Stanford, Professor Benson was at Lawrence Berkeley National Laboratory, a U.S. Department of Energy National Laboratory.



Professor **Rod Ewing** is in the Department of Geological Sciences at Stanford University and the Frank Stanton Professor in Nuclear Security at the Center for International Security and Cooperation. Professor Ewing's research focuses on the back-end of the nuclear fuel cycle, mainly nuclear materials and the geochemistry of radionuclides with application to permanent geologic disposal.



Dr. **Peter Davies** is the Director of Sandia's Nuclear Energy and Fuel Cycle Programs (retired in 2017) and responsible for programs and capabilities that include nuclear engineering, nuclear safety and risk analysis, nuclear material transportation and storage, and repository science and engineering. Stepped down from the Steering Committee in May, 2017.

*Steering Committee members represent their own views and expertise not the positions or policies of their organization or employer.



Ms. **Saida Laârouchi Engström** is the Senior Adviser onVattenfall´s Strategy on power production and nuclear waste management. She has a background in chemical engineering and started her career in the Swedish Nuclear Inspectorate as a safety inspector of nuclear installations in Sweden. After 11 years, she joined SKB, first as a leader for feasibility studies to select a site for a final repository for spent fuel in Sweden. Under the site investigation project, Ms. Laârouchi Engström was in charge of the environmental assessment studies and licensing. Ms. Laârouchi Engström has been instrumental in establishing a trustworthy dialogue between SKB and all the stakeholders in Swedish society including the government.



Professor **Bernd Grambow**, Ecole des Mines de Nantes, holds the Chair on nuclear waste disposal and is head of the Subatech Laboratory. Professor Grambow is the former director of the national CNRS-academic/industrial research network NEEDS (nuclear: environment, energy, waste, society). His areas of scientific expertise are radiochemistry, nuclear waste disposal science, geochemical modeling, radionuclide migration in the environment, chemical thermodynamics, and dynamics of solid-liquid interfaces.



Dr. **John Kessler** was with the High-Level Waste and Spent Fuel Management Program at the Electric Power Research Institute (EPRI) from 1993 to June 2015. His experience includes the Yucca Mountain total system performance assessment using probabilistic methods, colloid-aided contaminant migration, LLW and spent fuel storage system design, waste solidification R&D, and aging management for used fuel storage systems. John led EPRI's effort to develop a probabilistic approach to understanding the overall impact of disposing of spent fuel in the candidate repository at Yucca Mountain. In June 2015 John formed his own consulting company with work in the general area of spent fuel and HLW management.



Dr. **Allison M. Macfarlane** is Professor of Science and Technology Policy at George Washington University and Director of the Institute for International Science and Technology Policy at the Elliott School of International Affairs. She served as Chairman of the U.S. Nuclear Regulatory Commission from July, 2012 until December, 2014. She was the agency's 15th Chairman, its 3rd woman chair, and the only person with a background in geology to serve on the Commission. Dr. Macfarlane holds a PhD in geology from the Massachusetts Institute of Technology and a BSc degree in geology from the University of Rochester. From 2010 to 2012 she served on the Blue Ribbon Commission on America's Nuclear Future. In 2018, she held the Fulbright Distinguished Chair in Applied Public Policy at Flinders University and Carnegie Mellon University Adelaide, Australia.



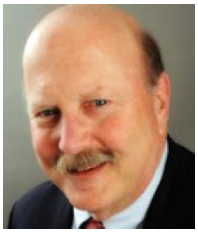
Dr. **Daniel Metlay** recently retired as a member of the Senior Professional Staff of the U.S. Nuclear Waste Technical Review Board after a 24-year career. Prior to his work at the NWTRB, Dr. Metlay taught in the political science at Indiana University, Bloomington and the Massachusetts Institute of Technology. He worked as a Research Scientist at Brookhaven National Laboratory, investigating operational and organizational issues at nuclear power plants. Dr. Metlay served as a Task Force Director on the Secretary of Energy Advisory Board and has testified before Congress and state legislatures.



Dr. **Mark Peters** is the Director of Idaho National Laboratory. Prior to becoming Director at INL, Dr. Peters was Argonne's Associate Laboratory Director of the Energy and Global Security Directorate, which is responsible for Argonne's programs in energy research—including energy storage, renewable energy, energy efficiency and nuclear energy—and national security. Dr. Peters also serves as a senior advisor to the Department of Energy on nuclear energy technologies and research and development programs and nuclear waste policy. Stepped down from the Steering Committee in January, 2017.



Christophe Poinssot is, as of August 2018, the Nuclear Counselor at the French Embassy in Beijing representing the French government in China for the whole civilian nuclear domain and supporting the industrial and scientific French nuclear partnerships within China. Previously, he was Head of the Research Department on Mining and Fuel Recycling Processes at the Nuclear Energy Division, French Atomic and Alternatives Energy Commission (CEA) where his department was tasked with developing spent nuclear fuel recycling processes and operating the Atalante facility. Since 2011, Poinssot has been a Professor of Nuclear Chemistry at the National Institute of Nuclear Science and Technology (INSTN). In 2017, he was awarded Officer from the French order "Palmes Académiques" and received the Van Geen Prize and Chair from SCK-CEN.



Dr. **Chris Whipple** is now retired but was formerly a Principal at ENVIRON. He has over 40 years of environmental engineering experience in the management of human health and environmental risk. Dr. Whipple has served on and chaired numerous national committees studying and advising on radioactive waste management, including committees of the National Academy of Sciences, USEPA and the National Council on Radiation Protection and Measurement. He currently serves as co-chair of the National Academy of Sciences (NAS) Report Review Committee.



Kathryn Shaver is former Vice President of Site Selection and Engagement for the Nuclear Waste Management Organization in Canada. She oversaw the site selection process for Canada's deep geological repository for used nuclear fuel. Ms. Shaver joined the NWMO upon its establishment in 2002 as Executive Director. She supported the three-year national dialogue and study of alternative management approaches and the development of the Adaptive Phased Management program subsequently approved by the Government of Canada in 2007. Ms. Shaver has an M.A (Economics) from Queen's University in Kingston, Canada. Ms. Shaver retired from the NWMO in 2016 and is presently an independent consultant.

Appendix B:
RESET SPEAKERS AND AFFILIATION FOR EACH MEETING

Meeting 1:

Dan Metlay, *Senior Professional Staff, U.S. Nuclear Waste Technical Review Board*

Peter Davies, *Director Emeritus, Sandia National Laboratories*

Mark Peters, *Associate Laboratory Director, Argonne National Laboratory*

Saida Laârouchi Engström, *VP of Strategy and Program, Swedish Nuclear Fuel and Waste Management Co. (SKB)*

Christophe Poinssot, *Director of Radiochemistry and Processes Department, French Atomic and Alternatives Energy Commission (CEA)*

Bernd Grambow, *Professor, Ecole des Mines de Nantes; Director, SUBATECH Laboratory*

Sally Benson, *Professor, Stanford University; Director, Precourt Institute for Energy*

Chris Whipple, *Principal, Environ, retired*

Jason Reinhardt, *Ph. D. Student, Stanford University*

Peter Swift, *Senior Scientist, Sandia National Laboratories*

Meeting 2:

Jeff Bingaman, *U.S. Senator (D-NM, retired)*

Allison Macfarlane, *Professor, Science and Technology Policy, Elliot School (George Washington University)*

Todd La Porte, *Professor Emeritus, Political Science, University of California, Berkeley*

Debra Knopman, *Principal Researcher, Rand Corporation*

Admiral Jim Ellis, *President and CEO, Institute of Nuclear Power Operations (INPO), retired*

John Kessler, Manager, *Used Fuel and High-Level Waste Management Program, Electric Power Research Institute (EPRI), retired*

Russell Jim, *Yakama Tribal Elder, Director of Yakama Environmental Waste Management Program*

Roy Gephardt, *Pacific Northwest National Laboratory (PNNL), Hanford, retired*

Bob Halstead, *Director, State of Nevada Agency for Nuclear Projects*

Margaret Chu, *Director, Office of Civilian Radioactive Waste Management, retired*

Ward Sproat, *Director, Office of Civilian Radioactive Waste Management, retired*

Siegfried Hecker, *Director Emeritus, Los Alamos National Laboratory (LANL); Senior Fellow, CISAC*

Dave Clark, *Director, National Security Education Center (LANL)*

Hans Forsström, *Senior Advisor, Swedish Nuclear Fuel and Waste Management Co. (SKB)*

Kathryn Shaver, *Vice President of APM Engagement and Site Selection, Nuclear Waste Management Organization*

Gerald Ouzounian, *Director of International Division, French National Radioactive Waste Agency (ANDRA)*

Meeting 3:

John Kotek, *Acting Assistant Secretary for the Office of Nuclear Energy DOE; former Staff Director, Blue Ribbon Commission of America's Nuclear Future*

John Heaton, *Volunteer Energy Coordinator, Carlsbad Department of Development, NM*

Don Hancock, *Director, Nuclear Waste Safety Program for the Southwest Research Center, NM*

Cash Jaszczak, *Consultant, Nye County, NV*

Timo Äikäs, *former Vice President, Posiva (video connection), retired*

Claude Birraux, *former Member, French Parliament*

Saida Engström, *Vice President, Swedish Nuclear Fuel and Waste Management Co. (SKB)*

Bruce Cairns, *Head of Geological Disposal, Department of Energy and Climate Change*

Kathryn Shaver, *Vice President of APM Engagement and Site Selection, Nuclear Waste Management Organization*

Daniel Metlay, *Senior Professional Staff, U.S. Nuclear Waste Technical Review Board*

Geoffrey Fettus, *Senior Attorney, Natural Resources Defense Council*

Ingvar Persson, *Legal Adviser, Swedish National Council for Nuclear Waste*

Ken Niles, *Assistant Director for Nuclear Safety, Oregon Department of Energy*

Talia Martin, *Tribal/DOE Program Director, Shoshone Bannock Tribe, Idaho*

Tom Clements, *Director, Savannah River Site Watch*

Russell Jim, *Yakama Tribal Elder, Director of Yakama Environmental Waste Management Program*

Geoffrey Fettus, *Senior Attorney, Nuclear Program, National Resources Defense Council (NRDC)*

Meeting 4:

Tito Bonano, *Senior Manager, Advanced Nuclear Energy Programs Group, Sandia National Laboratories*

Tom Cotton, *Vice President, Complex Systems Group, LLC*

Holger Volzke, *Division Manager, Bundesanstalt für Materialforschung (BAM)*

Andrew Orrell, *Section Head, Division of Radiation, Transport, and Waste Safety, IAEA*

Tyler Ownens, *Clerk, Senate Appropriations Subcommittee on Energy and Water Development*

Rod McCullum, *Senior Director, Used Fuel and Decommissioning, Nuclear Energy Institute*

Sylvia Saltzstein, *Manager, Used Nuclear Fuel Storage and Transportation, Sandia National Laboratories*

John Wagner, *Associate Laboratory Director, Nuclear Science and Technology, I daho National Laboratory*

Allison Macfarlane, *Professor, Science and Technology Policy, Elliot School (George Washington University)*

Adam Levin, *Director, Spent Fuel and Decommissioning, Excelon Generation Company*

Eric Howes, *Director, Public and Government Affairs, Maine Yankee*

John Kessler, *Manager, Used Fuel and High-Level Waste Management Program, Electric Power Research Institute (EPRI), retired*

James Rubenstone, *Branch Chief, Material Control and Accounting (Office of Nuclear Material Safety and Safeguards), U.S. Nuclear Regulatory Commission*

Mark Lombard, *Division Director, Spent Fuel Storage and Transportation (Office of Nuclear Material Safety and Safeguards), U.S. Nuclear Regulatory Commission*

David Lochbaum, *Director, Nuclear Safety Project, Union of Concerned Scientists*

Ted Quinn, *member, SONGS Community Engagement Panel*

Bob Halstead, *Executive Director, Nevada Nuclear Projects Office*

Allison Fisher, *Outreach Director, Public Citizen's Energy Project*

Meeting 5:

Allison Macfarlane, *Professor, Science and Technology Policy, Elliot School (George Washington University)*

Chris Whipple, *Principal, Environ, retired*

Tim McCartin, *Senior Advisor, U.S. Nuclear Regulatory Commission*

Peter Swift, *Senior Scientist, Sandia National Laboratories*

Claudio Pescatore, *Principal Administrator, Radioactive Waste Management, Nuclear Energy Agency (NEA, OECD), retired*

Allan Hedin, *Safety Analyst, Swedish Nuclear Fuel and Waste Management Co. (SKB)*

Patrick Landais, *Chief Technology Officer, French National Radioactive Waste Management Agency (ANDRA)*

Mathilde Maillard, *Head, La Gestion des Dechets Radioactifs, Autorité de Sûreté Nucléaire (ASN)*

Céline Kermisch, *Professor, Philosophy and Ethics of Risk, Université Libre de Bruxelles*

David Victor, *Director, Laboratory of International Law and Regulation; Professor, School of Global Policy and Strategy (UC San Diego)*

Otwin Renn, *Scientific Director, Institute for Advanced Sustainability Studies in Podstdam, Germany; Professor and Chair, Environment Sociology and Technology Assessment, Stuttgart University (video-chat)*

John Downer, *Senior Lecturer, Risk and Resilience, University of Bristol*

Andrew Stirling, *Professor, Science and Technology Policy, University of Sussex*

Kirk Nodstrom, *Senior Scientist, U.S. Geological Survey*

Lenny Konikov, *Scientist Emeritus, U.S. Geological Survey*

Kate Maher, *Assistant Professor, Earth System Science, Stanford University*

Ali Mosleh, *Director, John Garrick Institute for the Risk Sciences, University of California, Los Angeles*

George Apostolakis, *Professor, Nuclear Science and Engineering, Massachusetts Institute of Technology*

RESET OF AMERICA'S
NUCLEAR WASTE MANAGEMENT
Strategy and Policy

Appendix C:
PROSPECTUS AND AGENDA FOR EACH RESET MEETING

Meeting 1:

Reset of U.S. Nuclear Waste Management Strategy and Policy
February 17-19, 2015

PROSPECTUS:

The United States' nuclear waste management program is under extreme stress, with the Department of Energy (DOE) faced with substantial challenges across the country. In Hanford, Washington, the facility intended to solidify high-level waste is plagued with significant design challenges and significant cost overruns. In South Carolina, the construction of a Mixed Oxide Fuel Fabrication facility has exceeded its budget to the extent that development may be halted and alternative strategies pursued. In New Mexico, two accidents have led to the closure, for at least two years, of the Waste Isolation Pilot Plant. Yet, amidst these many challenges, the most demanding remains the siting and development of a deep-mined geologic repository for high-level radioactive waste and spent nuclear fuel, as evidenced by the stalemate in the Yucca Mountain project.

In 2002, Congress approved President George W. Bush's decision to site the nation's repository at Yucca Mountain in Nevada and, in 2008, the DOE submitted a construction application to the Nuclear Regulatory Commission. The process came to a standstill in 2010, when the Obama administration declared the repository "unworkable" and established the Blue Ribbon Commission on America's Nuclear Future (BRC) to recommend next steps. The BRC has since issued its report, the DOE has responded favorably, and there have been Senate hearings on bi-partisan legislation to implement the BRC's recommendations. Yet the measure never came to vote, and the stalemate is unlikely to end soon.

The current stalemate has overwhelmed serious discussion of technical and policy issues. Any new legislation must be informed by a thorough understanding and analysis of the history of the U.S. nuclear waste management program, and by the scientific, technical, social science, and policy challenges that beset it.

Purpose of this meeting: To inform efforts to reset the U.S. nuclear waste program, Stanford University's Freeman Spogli Institute for International Studies (FSI), Precourt Institute for Energy, and Center for International Security and Co-operation (CISAC) will sponsor a series of meetings over a two-year period, beginning in Fall 2015. Each meeting will focus on a critical issue for the formulation of a new legislative roadmap, and produce a white paper framing the critical issues that are likely to underpin any policy discussion. Taken as a whole, the white papers could be a "handbook" for Congress and the Executive as they fashion new legislation and restructure the federal agencies involved in nuclear waste management.

A preliminary meeting will take place in February 2015, when a steering committee of experts in nuclear waste management will guide a discussion (Chatham House Rules) of nuclear waste management strategies in the United States and abroad, and identify the critical topics for discussion in subsequent meetings.

Although no final determination has been made about the topics for future meetings, they may include:

- ***The creation of a new waste management organization:*** *Although recommended by the BRC, there has been only limited discussion of the structure, characteristics and funding of such a new organization.*
- ***Definition of a consent-based process for siting nuclear facilities:*** *A consent-based process requires the blending of social and technical criteria, but there has been no effort to design a technically-based, legal process that is compatible with the needs of a community, states, and federal government.*
- ***Alternatives to a mined geologic repository for SNF and HLW:*** *Because of the stalemate in siting a repository, there have been a number of new proposals on possible, alternative, disposal strategies (e.g., extended on-site storage or deep bore hole disposal), but there has been very limited discussion of how alternatives should be evaluated and compared.*
- ***Standards and regulations:*** *The regulatory framework in the U.S. places heavy demands on science and engineering (e.g., predictions of repository performance out to one million years). The revision of the regulations and standards may open the way to a more straightforward siting process for nuclear facilities and generate greater public acceptance. The fundamental question is how do we determine whether the repository is safe?*

Each of these issues has a generally unappreciated level of complexity. The discussion of each requires input across the broadest range of disciplines – science, engineering, social science, political science and law. Also, it is important to insure the participation of concerned members of the public, state governments, federal agencies, national laboratories, and universities, as well as members of the Executive and Congress.

Stanford's FSI and CISAC, as distinguished, policy-oriented organizations, offer a unique opportunity to address these difficult and controversial issues on neutral ground. Although broad participation is welcome, invited presentations from knowledgeable experts, in the U.S. and abroad, are absolutely necessary. There will be ample opportunity for Stanford faculty, FSI and CISAC fellows and Stanford graduate and undergraduate students to participate in the meeting.

The program committee for each future meeting will clearly state the purpose and issues to be addressed. After the meeting, the organizers will publish a white paper on the critical issues raised and proposed strategies for addressing those issues. The topical meetings would occur over two years, beginning in the fall, 2015. Taken as a whole, the white papers could be a "handbook" for Congress and the Executive as they fashion new legislation and restructure the federal agencies involved in nuclear waste management.

AGENDA:

Tuesday, February 17

8:00 Continental breakfast at CISAC

8:30 Welcome by Professor Mike McFaul, Director, FSI

8:45 Welcome: Organization and Purpose
Professor Rod Ewing, *Senior Fellow Center for International Security and Cooperation (CISAC)*

9:00 **The management of radioactive waste as a socio-technical challenge**
Dan Metlay, *Nuclear Waste Technical Review Board*

9:45 Coffee Break

10:00 **U.S. Experience with WIPP**
Peter Davies, *Sandia National Laboratories*

10:55 **U.S. Experience with Yucca Mountain**
Mark Peters, *Argonne National Laboratory*

11:45 Lunch

1:00 **The Swedish Program in granite**
Saida Laârouchi Engström, *SKB Sweden*

1:55 **The French program in clay**
Christophe Poinssot, *French Atomic and Alternatives Energy Commission (CEA, National Institute of Nuclear Science and Technology (INSTN)*

2:45 Coffee Break

3:00 **Nuclear waste disposal—safety and public debate in France**
Bernd Grambow, *Ecole de Mines, SUBATECH Laboratory*

3:50 Coffee Break

4:00 Open Discussion

** The open sessions are conducted under the Chatham House Rule. Participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.*

Wednesday, February 18

8:30 Continental breakfast at CISAC

9:00 Overview and Plan for the Day, Professor Rod Ewing, *Senior Fellow Center for International and Cooperation (CISAC)*

9:15 **Impact of different fuel cycle options on disposal options**
Christophe Poinssot, *French Atomic and Alternatives Energy Commission (CEA, National Institute of Nuclear Science and Technology (INSTN)*

10:00 **Role of national laboratories in the U.S. program**
Sally Benson, *Stanford University*

10:45 Coffee Break

11:00 **Role of review bodies, such as the NAS, EEG, NEA and NWTRB, in the U.S. waste management program**
Chris Whipple, *ENVIRON*

11:45 Lunch

1:00 **Roundtable discussion: What does "safe" mean?**
Bernd Grambow, *Ecole des Mines de Nantes, SUBATECH Laboratory*
Jason Reinhardt, *Stanford University*
Peter Swift, *Sandia National Laboratories*
Chair: Rod Ewing, *CISAC*

2:30 Coffee Break

2:45 **Roundtable discussion: Issues that need to be addressed in the U.S. nuclear waste program**
Chair: Dan Metlay, **Nuclear Waste Technical Review Board**

Meeting 2:

The Structure and Behavior of a New Nuclear Waste Organization

Sept. 30 - Oct. 1, 2015

PROSPECTUS:

The first meeting of the Reset Project was held on the Stanford campus on February 17-18, 2015 (http://fsi.stanford.edu/events/"reset"-us-nuclear-waste-management). Three Stanford organizations, the Freeman Spogli Institute for International Studies, the Precourt Institute for Energy, and the Center for International Security and Cooperation, sponsored the meeting. After two days of presentations, the project's steering committee identified a set of issues that were judged to be critical to the future success of the U.S. nuclear waste program. *A second meeting, September 30 to October 1, 2015, will be held at Stanford. This meeting will focus on one of the identified critical issues: the structure and characteristics of a new waste management organization for the United States.*

Issues associated with the design of a new waste management organization in the United States have been debated for at least 40 years. When Congress passed the Nuclear Waste Policy Act in 1982, it instructed the Secretary of Energy to undertake a study of alternative approaches for developing civilian radioactive waste-management facilities, including a deep-mined, geologic repository. Nearly 30 years later, Congress directed the Secretary to carry out another evaluation on alternative organizational arrangements. Neither study resulted in any change from the *status quo*. In 2012, the *Blue Ribbon Commission on America's Nuclear Future* recommended that DOE's responsibilities for managing radioactive waste be transferred to a new single-purpose organization. To date, Congress has not acted on this recommendation.

Discussions about a new waste management organization have focused on organizational form as the principal determinative factor, typically comparing the *pros* and *cons* of a traditional government agency, an independent government corporation, or a private nuclear utility-owned company. The situation is further complicated by the unique histories of success and failure in other countries. There is no clear evidence for the effectiveness of one organizational structure over another. A critical issue is the design an organization that can accomplish its mission in a complicated environment that requires interacting with and responding to the Federal government, States, and local authorities, as well as the concerned and affected public. Finally, by focusing only on the structure of an organization, its authority and source of funding, equally important questions are overlooked: What factors influence critical organizational behaviors? How can an organization facilitate its credibility and public acceptance? How do organizations learn and evolve in a changing political and social environment?

The Reset Project's second meeting will focus on a broader exploration of organizational issues:

(1) How does an implementing organization interact with its technical, political, and legal environments? How does it maintain credibility within each of these three realms?

(2) How does an implementing organization "learn" over time? How does it adjust to new knowledge and a changing political environment?

The meeting will include presentations by experts in organizational behavior, both scholars and practitioners. In addition, panels representing different perspectives will be held on each day of the meeting. Considerable time will be set aside for discussion and audience participation.

AGENDA:

Wednesday, September 30th

Morning Session—Structure and Behavior of Organizations (Session Chair: Rod Ewing)

8:00 Continental breakfast at CISAC

8:15 Welcome by Professor Mike McFaul, *Director, FSI*

8:30 Welcome: Organization and Purpose, Professor Rod Ewing, *Senior Fellow Center for International Security and Cooperation (CISAC)*

9:00 U.S. Senator Jeff Bingaman *D, NM, retired*

9:45 Questions for all Speakers

10:15 Coffee Break

10:30 Allison Macfarlane, *Blue Ribbon Commission (BRC) member and former Nuclear Regulatory Commission (NRC) Chair*

11:00 Todd Laporte, *Professor Emeritus UC Berkeley*

11:30 Debra Knopman, *Rand Corporation*

12:00 Questions for all Speakers

12:30 Lunch

Afternoon Session—Interacting with Affected Parties (Session Chair: Chris Whipple)

1:30 Admiral Jim Ellis, *Institute of Nuclear Power Operation (INPO)*

2:00 John Kessler, *Electric Power Research Institute (EPRI), retired*

2:30 Russell Jim, *Yakama Tribal Elder and Director of Yakama Environmental Waste Management Program*

3:00 Coffee Break

3:30 Roy Gephardt, *Pacific Northwest National Laboratory (PNNL), Hanford, retired*

4:00 Bob Halstead, *Director State of Nevada Agency for Nuclear Projects*

4:30 Questions for all Speakers

5:00 Close of First Day

5:10 Shuttle from Encina Hall to Dinner

Thursday, October 1st

Morning—The Framework of Federal Organizations (Session Chair: Mark Peters)

8:00 Continental Breakfast at CISAC

8:45 Rod Ewing: Opening Summary of Previous Day

9:10 Margaret Chu, *Director of Office of Civilian Radioactive Waste Management (OCRWM), retired*

9:40 Ward Sproat, *Director of OCRWM, retired*

10:10 Questions for all Speakers

10:20 Coffee Break

11:00 Sig Hecker, *Director Emeritus of Los Alamos National Laboratory (LANL), Senior Fellow CISAC*

11:30 Dave Clark, *Director National Security Education Center, LANL*

12:00 Questions for all Speakers

12:30 Lunch

Afternoon Session—International Experience (Session Chair: Saida Engstrom)

2:00 Hans Forsström, *Swedish Nuclear Fuel and Waste Management Co. (SKB) – Sweden*

2:30 Kathryn Shaver, *Nuclear Waste Management Organization (NWMO) – Canada*

3:00 Gerald Ouzounian, *French National Radioactive Waste Agency (ANDRA) – France*

3:30 Coffee Break

4:00 Questions for all Speakers, *Saida Engström – Moderator*

4:30 Close of Meeting

4:30 Wine and Cheese Reception with CISAC Fellows, Faculty & Staff

Meeting 3:

Consent-Based Siting

March 9-10, 2016

PROSPECTUS:

The Reset Project's third meeting, March 9-10, 2016, will focus on another key issue: consent-based siting. In 2012, the Blue Ribbon Commission on America's Nuclear Future recommended a new, consent-based approach to siting future nuclear waste-management facilities. As a near-term action, the Commission recommended that future siting efforts be informed by past experience, drawing on experience gained in siting nuclear waste facilities in the U.S. and abroad. In 2013, the Secretary of Energy released the Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High-level Radioactive Waste, which endorsed the principles underlying the BRC recommendations (adaptive, phased implementation). Recently, the Department of Energy has invited public comment on the design of a consent-based siting process.

Critical to the success of any consent-based approach in the U.S. is that the implementer sustain public trust and confidence over decades and that there be a resolution of how power is distributed between the federal government on the one-hand and state/local governments on the other.

The Reset Project's third meeting seeks to advance the understanding of how a consent-based siting process might be designed in the U.S.:

1. What insights are provided from the U.S. experience for building local, Tribe and State confidence, and for initiating and sustaining consent-based siting?
2. How can consent-based siting be informed by the experience by other nuclear projects in the U.S or internationally?
3. How is "consent" sought, demonstrated and sustained?
4. What are priority areas for preparing the policy and regulatory foundations for consent-based siting?

These topics will be addressed over a two-day meeting, through presentations and panel discussions. Invited speakers will share their experience, drawing on their first-hand experience with consent-based siting—from those with direct experience at the levels of local government, Tribe and State governments, to implementers and regulatory authorities involved. Scholars and other experts will be invited to address some important ethical and legal dimensions of consent-based siting. Considerable time will be set aside for discussion and audience participation.

AGENDA:

Wednesday, March 9 :

9:00 **Welcome**, Professor Rod Ewing, *CISAC*

9:30 **U.S. and International Experience with Consent-Based Siting** (**Group Discussion**)
United States Strategy and Experience
John Kotek, *Acting Assistant Secretary for the Office of Nuclear Energy DOE and Former Staff Director, Blue Ribbon Commission of America's Nuclear Future*
John Heaton, *Carlsbad Department of Development, NM*
Don Hancock, *Southwest Research Center, NM*
Cash Jaszczak, *Nye County, NV*

12:00 Lunch

1:00 International Experience
Timo Äikäs (Finland), *Former Vice-President, Posiva (video-chat)*
Claude Birraux (France), *Former Member, French Parliament*
Saida Engström (Sweden), *Vice-President, SKB*
Bruce Cairns (United Kingdom), *Head of Geological Disposal, Department of Energy and Climate Change*
Kathryn Shaver (Canada), *Vice President, APM Engagement and Site Selection, Nuclear Waste Management Organization*

3:30 ***Group Discussion: Key Points and Issues from the Discussion***

4:30 Wine and Cheese Reception with CISAC Faculty, Fellows & Staff

7:00 Small Group Dinners

Thursday, March 10

9:00 **Welcome**, Professor Rod Ewing, *CISAC*

9:15 **Prerequisites for an Effective Consent-Based Siting Process in the U.S.**
Chair: Kathryn Shaver
Review of and key factors in the U.S. and international programs:
Daniel Metlay, *Nuclear Waste Technical Review Board*
Managing Consent in Two Nations:
Geoffrey Fettus, Senior Attorney, *Natural Resources Defense Council*
Ingvar Persson, *Legal Adviser, Swedish National Council for Nuclear Waste*

Maintaining Public Trust and Confidence over Decades:
Ken Niles, *Assistant Director for Nuclear Safety, Oregon Department of Energy*
Talia Martin, *Tribal/DOE Program Director, Shoshone Bannock Tribe, Idaho*
Tom Clements, *Director Savannah River Site Watch*

11:00 **Critical Issues in Consent-Based Siting—Part I**
Moderator: Mark Peters
Panel Discussion: *Bottom-Up or Top-Down: What does the public want?*
John Heaton, *Carlsbad Department of Development, NM*
Don Hancock, *Nuclear Waste Safety Program for the Southwest Research Center, NM*
Tom Clements, *Director Savannah River Site Watch*
Talia Martin, *Tribal/DOE Program Director, Shoshone Bannock Tribe, Idaho*

12:30 Lunch

1:30 **Critical Issues in Consent-Based Siting—Part II**
Moderator: Saida Engström
Panel Discussion: *Who Consents and How?*
Russell Jim, *Yakama Tribal Elder, Director of Yakama Environmental Waste Management Program*
Geoffrey Fettus, *Senior Attorney, Nuclear Program, National Resources Defense Council (NRDC)*
Cash Jaszczak, *Consultant, Nye County, NV*
Ken Niles, *Oregon Department of Energy*
Panel Discussion: *Withdrawing Consent: When and Under What Circumstances?*
Geoffrey Fettus, *Senior Attorney, Nuclear Program, National Resources Defense Council (NRDC)*
Kathryn Shaver, *Nuclear Waste Management Organization*
John Heaton, *Carlsbad Department of Development, NM*
Saida Engström, *SKB Sweden*

4:00 **What are the next steps in establishing a consent-based process?**
Moderator: Rod Ewing

5:00 Adjourn

7:00 Dinner for Speakers and Steering Committee Members

Meeting 4:

Integration of the Back-End of the Nuclear Fuel Cycle: Storage, Transportation and Disposal

May 17-18, 2016

PROSPECTUS:

Spent nuclear fuel must be managed from the time it is removed from the reactor to its eventual reprocessing or permanent disposal in a geologic repository. The present management strategy for commercial spent fuel in the United States is not what was originally envisioned, even as recently as a decade ago.

The inventory of commercial spent nuclear fuel in in the U.S. is growing at a rate of ~2,000 metric tons per year and is projected to be ~140,000 metric tons by mid-century, which is the earliest time that current Administration policy projects the availability of a permanent geologic repository. Without options for off-site storage or disposal and with no prospects for reprocessing, utilities have expanded their capacity to store the growing spent fuel inventory at existing reactor sites, choosing without exception to rely on large dry-storage casks. These casks are characterized as "dual purpose" systems, in that the sealed canisters are designed for both extended on-site storage and, with appropriate over-packs, subsequent transportation. The dual-purpose canisters are not, however, designed for disposal, and they are significantly larger than the disposal canisters planned for all repository concepts currently proposed world-wide.

1) Current Practice and Technical, Operational, and Institutional Concerns
   The current practice of loading commercial spent fuel into dry storage systems carries with it an unavoidable commitment to one of three future alternatives:
   a) all spent fuel placed in large dual-purpose canisters will eventually need to be repackaged into purpose-built casks for disposal,
   b) the nation will need to construct one or more repositories that can directly accommodate large dual-purpose canisters for disposal, or
   c) spent fuel will remain indefinitely at interim storage facilities and be repackaged as needed, perhaps every century.

Suboptimal alternatives will lead to increased uncertainties.

All of these options are technically feasible, but none are what was originally planned, and all introduce major new uncertainties regarding the design and operation of future storage and disposal facilities. These uncertainties will impact already large and uncertain future costs: for example, as part of its 2013 assessment of the adequacy of the Nuclear Waste Fee to meet total disposal costs, the DOE estimated a range for $24 billion to $81 billion (2012 dollars) for future repository costs, not including costs associated with repackaging spent fuel.

Industry continues to load larger and heavier canisters, which pose logistical challenges.

The dual-purpose storage canisters themselves are large: up to 2 meters in diameter and 5 meters in length, and the largest currently in use accommodate up to 37 intact fuel assemblies from pressurized water reactors, which account for about two thirds of the U.S. reactor fleet. A loaded canister may weigh on the order of 70 metric tons, and transportation shielding may increase the weight to 150 metric tons. Because it is economically advantageous for nuclear power plants to load larger canisters, the canister size exceeds sizes and weights that may be optimal for transportation and subsequent disposal. Engineering solutions for hoist, ramp, and transporter operations appear to be feasible, but need to be accounted for in planning.

Although dual purpose canisters are certified by the Nuclear Regulatory Commission for both storage and subsequent transportation, the certificates of compliance set different temperature limits for storage versus transportation. This results in a situation where some canisters may need to cool before they can be transported. This delay may be on the order of decades for some canister designs, and in particular for higher-burnup fuels that generate more heat.

Larger canisters will be hotter for longer and therefore may require a longer time to cool before transportation and subsequent disposal.

With respect to disposal, different geologies impose different temperature constraints on the underground environment. For example, some repository designs have assumed that the maximum temperature in clay backfill must remain below 100˚C, while salt may accommodate temperatures up to 200 to 250˚C. High thermal loads may be accommodated by cooling canisters above ground for many years, ventilating the repository for many years after waste emplacement, or increasing the spacing between canisters. These choices will affect repository costs.

Consolidated Interim Storage is an option.

Constructing consolidated interim storage facilities has the potential to alleviate storage concerns at reactor sites and may provide a path to resolution of legal issues associated with federal responsibility for spent fuel management. Consolidated storage facilities could also be used to provide flexibility in repackaging options for ultimate disposal. Consolidated storage facilities will introduce additional cost and siting concerns, and technical issues associated with the mechanical effects of repeated transportation and storage will need to be addressed.

Legislative and regulatory issues must be addressed.

All options for the management and disposal of commercial spent nuclear fuel currently under consideration in the U.S. will require legislative and regulatory actions.

AGENDA:

Tuesday, May 17

9:00 **Welcome**, Professor Allison Macfarlane, *Elliot School, George Washington University*

Reset Initiative Background & Purpose, Rod Ewing, *Stanford University*

9:30 **Setting the Stage** (Moderator Peter Davies, *Sandia National Laboratories*)
Current Status of US Back End of the Nuclear Fuel Cycle, Tito Bonano, *Sandia National Laboratories*
Policy Barriers to Integration, Tom Cotton, *Complex Systems Group*
Integration in Other Countries, Germany, Holger Volzke, *Bundesanstalt für Materialforschung (BAM), Federal Institute for Materials Research and Testing*
Integration in Other Countries, IAEA, Andrew Orrell, IAEA, *Division of Radiation, Transport and Waste Safety*

Morning Session Moderated Panel Discussion

12:30 Lunch

1:30 **Key Issues** (Moderator Saida Laârouchi, *Engström, SKB*)
Congressional Perspectives on Back End Integration, Tyler Owens, *Senate Appropriations Subcommittee on Energy and Water Development*
Previous Models for Spent Fuel Integration, Rod McCullum, *Nuclear Energy Institute*
Current Studies of Storage/Transportation Technical Issues, Sylvia Saltzstein, *Sandia National Laboratories*
Storage and Canister Concepts for Integrated Spent Fuel Management, John Wagner, *Idaho National Laboratory*

4:30 **Day 1 Wrap Up**, Peter Davies, *Idaho National Laboratories*

5:00 Adjourn

Wednesday, May 18

9:00 **Introduction**, Mark Peters, *Idaho National Laboratories*

9:15 **Industry and Regulatory Perspectives** (Moderator Christophe Poinssot, *French Atomic and Alternatives Energy Commission*)

Industry Path to Back End Integration, Adam Levin, *Excelon Generation Company*

Stranded Fuel Management and Pathways for Disposition, Eric Howes, *Maine Yankee*

Industry Models for Back End Integration, John Kessler, *Electric Power Research Institute (EPRI), retired*

NRC Perspectives on Integration Across Storage, Transportation and Disposal Regulations, James Rubenstone and Mark Lombard, *U.S. Nuclear Regulatory Commission*

Morning Session Moderated Panel Discussion

12:30 Lunch

1:30 **Broader Perspectives** (Moderator Mark Peters, *Idaho National Laboratories*)

Technical Issues and Needed Actions for Integrated Spent Fuel Management, David Lochbaum, *Union of Concerned Scientists*

SONGS Community Engagement Perspective, Ted Quinn, *SONGS Community Engagement Panel*

Role of Transportation in Integration, Bob Halstead, *Nevada Nuclear Projects Office*

Public Perspectives on Spent Fuel Storage, Transportation and Disposal, Allison Fisher, *Public Citizen's Energy Project*

Afternoon Session Moderator Panel Discussion

5:00 **Comments from Meeting Host**, Allison Macfarlane

5:30 Adjourn

Meeting 5:

Regulations, Risk and Safety

October 26-27, 2016

PROSPECTUS:

One of the unique challenges of the safe storage and disposal of nuclear waste is the very long time frame over which the safety of different strategies is evaluated. These evaluations typically involve models that capture atomic- scale processes, such as diffusion and corrosion, to global-scale processes, such as climate change and tectonic events. At each scale, the models are often highly coupled, the outcome of one modeled process becoming the input for the next. The safety analysis becomes the basis for determining risk to the public and environment and is used to determine whether a specific, nuclear waste repository or storage facility will meet regulatory requirements. Thus, there is an inter-play among the determination of risk, regulatory compliance and safety. Finally, these analyses become part of the discussion of safety and acceptability by political institutions and the public.

In this fifth meeting of the series of RESET meetings, the speakers will explore a number of these issues from a technical, as well as social science, perspective.

Topics and questions that we expect to discuss during the meeting include:

- Comparison of different international approaches to the analysis of risk.
- Comparison of the regulatory structures of different countries.
- What is a "safety case" and how is this approach related to a quantitative probabilistic risk analysis?
- What is the relation between regulatory compliance and safety?
- What time periods can be evaluated? Why one million years? Is this necessary or credible?
- How does one maintain the credibility of the regulations and the regulator?
- Once a facility or repository is determined to be in regulatory compliance, how can subsequent, new knowledge be applied to the safety analysis?
- What is the role of public engagement? What role should communities near nuclear facilities play in the regulatory process?

AGENDA:

Wednesday, October 26

8:30 Breakfast

9:15 Introduction to the meeting by Professor Rod Ewing, *Senior Fellow Center for International Security and Cooperation (CISAC)*

9:30 **U.S. program** (Moderator Allison Macfarlane, *Elliot School at George Washington University*)

History and status of U.S. Repository Program, Allison Macfarlane, *Elliot School at GWU*

Rationale for NAS report (1995) for the Yucca Mountain standard, Chris Whipple, *ENVIRON*

Framework and regulatory requirements for U.S. geological repository, Tim McCartin, *U.S. Nuclear Regulatory Commission*

Implementing a license application for a geological repository in the U.S., Peter Swift, *Sandia National Laboratories*

Morning Session Moderated Panel Discussion

12:00 Lunch

1:00 **International Programs** (Moderator Christophe Poinssot, *French Atomic and Alternatives Energy Commission*)

Regulation, safety, uncertainty, confidence, Claudio Pescatore, *Nuclear Energy Agency (retired)*

Swedish regulations and SKB's compliance demonstration for an SNF repository, Allan Hedin, *Swedish Nuclear Fuel and Waste Management Company (SKB)*

A tool for fully integrating scientific models in the safety analysis: The Phenomenological Analysis of Repository Situation (PARS), *French National Radioactive Waste Management Agency (ANDRA)*

French DGR regulatory infrastructure, Mathilde Maillard, *Autorité de sûrete nucléaire (ASN)*

Afternoon Session Moderated Panel Discussion

5:00 Session ends

6:55 Dinner for speakers and Steering Committee members

Thursday, October 27

8:00 Breakfast

8:30 **Risk, Regulation, and Safety from the Perspective of the Social Sciences** (Moderator Dan Metlay, *Nuclear Waste Technical Review Board*)

Towards an ethical management of HLRW: challenging the notion of future generations, Céline Kermisch, *Université Libre de Bruxelles*

What we have learned from Community Engagement at San Onofre: long-term stewardship of a decommissioning site, David Victor, *UCSD School of Global Policy and Strategy*

Governing and communicating complex risks: the case of nuclear energy, Otwin Renn, *Stuttgart University, Institute for Advanced Sustainability Studies in Potsdam*

Three questions in search of an accident: policy makers misconstrue nuclear risk assessments, John Downer, *University of Bristol*

Changing the nuclear waste management paradigm: from risk and regulation to innovation democracy, Andrew Stirling, *University of Sussex*

Morning Session Moderated Panel Discussion

12:00 Lunch

1:00 **Modeling and Probabilistic Risk Assessments** (Moderator Bernd Grambow, *Ecole de Mines, SUBATECH Laboratory*)

Geochemical modeling and the case for safety, Kirk Nordstrom, *U.S. Geological Survey*

Reliability of long-term predictions made using groundwater models, Lenny Konikow, *U.S. Geological Survey*

Modeling actinide fate and transport, Kate Maher, *Stanford Department of Geological Sciences*

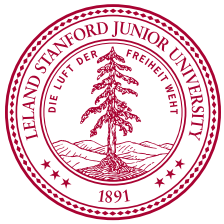
Why and how we do PRA, Ali Mosleh, *UCLA John Garrick Institute for the Risk Sciences*

Regulatory decision making, George Apostolakis, *MIT Department of Nuclear Science & Engineering*

Afternoon Session Moderated Panel Discussion

5:00 Wine and Cheese Reception with CISAC Faculty, Fellows, and Staff

6:55 Dinner for Steering Committee members





Stanford
Precourt Institute
for Energy

MacArthur
Foundation

FSI *Freeman Spogli*
Institute for
International Studies

CISAC Center for International
Security and Cooperation

December 4, 2018

Dear Speaker Ryan and Leaders McConnell, Pelosi, and Schumer:

We are a broad coalition of labor unions, state public service commissioners, clean energy organizations, and energy trade associations, and we urge immediate congressional action to revitalize the federal used nuclear fuel program.

Another year without progress on the Yucca Mountain repository license application and consolidated interim storage is untenable. It is time for the federal government to meet its statutory and contractual obligations. Utilities and their electricity customers have done their part. They have paid more than $40 billion into the Nuclear Waste Fund. Meanwhile, taxpayers have been saddled with the federal government's inaction, with more than $7 billion in damages having already been paid from the Judgment Fund and billions more in liability continuing to mount.

The nuclear energy industry is a powerful engine for job creation. America's nuclear power plants directly employ nearly 100,000 people in high-quality, long-term jobs. This number climbs to 475,000 when you include secondary jobs. Yet the lack of a strong used fuel management program has stymied public support of nuclear power for the existing fleet as well as advanced reactors currently under development. This is unfortunate as the overwhelming scientific evidence clearly demonstrates that used nuclear fuel can be stored, transported, and disposed of safely.

Now is the time to end the stalemate, and for the House and Senate to work in a bipartisan manner to place the federal government on a path to fulfill its responsibilities and to unburden taxpayers of the ever-mounting liability by establishing a durable program for managing used nuclear fuel.

Sincerely,

American Nuclear Society

American Public Power Association

ClearPath Action

Decommissioning Plant Coalition

Edison Electric Institute

International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers, and Helpers

International Brotherhood of Electrical Workers

National Association of Manufacturers

National Association of Regulatory Utility Commissioners

National Rural Electric Cooperative Association

North America's Building Trades Unions

Nuclear Energy Institute

Nuclear Waste Strategy Coalition

U.S. Chamber of Commerce

United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada

Western Interstate Energy Board

High-Level Radioactive Waste Committee Position Paper

Ship Oldest Fuel First

Number 2017-3

Version: Final, September 2017
Date Adopted by WIEB: December 20, 2017

Statement of Policy

To reduce the potential radiological exposure from spent nuclear fuel (SNF) casks in transport, and to reduce potential radiological releases in the event of a severe accident, DOE should adopt a policy of shipping "oldest fuel first." By designing the initial transport program around the policy of shipping oldest fuel first from shut-down nuclear reactor sites, the potential radiological impacts of SNF shipments to either an interim storage facility or a repository will be lessened.

Background & Context

1. **The pressure to move SNF away from reactors continues to grow.**
   As of September 2015, there was approximately 32,930 metric tons of SNF at 16 shut-down nuclear reactors at 13 utility sites in 10 states. At least three additional reactor sites are scheduled to shut down over the next five years. While the NRC's contested 2010 "Waste Confidence" decision determined that SNF can be safely stored on-site indefinitely, the local political pressures for removal are increasing. Communities near at-risk sites (such as facilities in earthquake or tsunami zones), continue to express concern over the lack of federal action.[1] The level of concern varies among reactor sites and host communities, as observed in a series of consent-based siting meetings hosted by DOE in 2016.[2]

[1] San Onofre Community Engagement Panel Meeting on Consolidated Interim Storage (CIS). June 22, 2016. Information available at https://www.songscommunity.com/cep-events/062216_event.asp.

[2] Department of Energy Consent Based Siting website, http://www.energy.gov/ne/consent-based-siting (site unavailable as of the date of writing, pending updates).

2. The National Academies on shipment order.

The National Academies of Sciences (NAS) observed that: "The order for accepting commercial spent fuel that is mandated by the Nuclear Waste Policy Act (NWPA)[3] was not designed with the transportation program in mind. In fact, the acceptance order prescribed by the NWPA could require DOE to initiate its transportation program with long cross-country movements of younger (i.e. radiologically and thermally hotter) spent fuel from multiple commercial sites. There are clear transportation operations and safety advantages to be gained from shipping older . . . spent fuel first."[4]

3. The National Academies on the Standard Contract.

NAS followed with a recommendation that "DOE should negotiate with commercial spent fuel owners to ship older fuel first to a federal repository or federal interim storage," and that, "Should these negotiations prove to be ineffective, Congress should consider legislative remedies."[5]

4. The intent of the Academies' recommendations.

NAS posed these recommendations with the intent to reduce potential radiological exposure from the cask in transport, and reduce radiological release in the event of a severe accident. As stated in the NAS Report: "Some of the oldest spent fuel has been in storage for several decades, enough time for the shortest-lived radionuclides to decay to background levels. Shipping this fuel first would provide an additional margin of safety, especially in reducing the potential hazards to workers and the public during both normal and accident conditions."[6]

5. Complications posed by dual purpose (storage-transport) casks.

A factor not considered by the NAS in 2006 is that prospective transport will now include not just assemblies selected from pools for direct transport in relatively small and standardized multi-purpose casks, but assemblies previously loaded into increasingly large "dual purpose" canisters for on-site storage. In removing fuel from pools for on-site storage, utilities have a greater incentive to make ongoing pool operations safer (by including newer as well as older fuel in dual purpose canisters) than to make prospective transport safer (by increasing the portion of older fuel in dual purpose canisters). Utilities have no incentive to

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[3] NAS is referring to the "Standard Contracts for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste" between DOE and nuclear utilities.

[4] "*Going the Distance: The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*," National Research Council, 2006, page 19.

[5] Id., page 20

[6] Id., page 243.

repackage such canisters in still-operating pools in order to reduce the radiological risk during transportation.

6. Independent spent fuel storage installation (ISFSI) only sites.

Currently, the NRC lists seven decommissioned sites as possessing ISFSI only licenses.[7] ISFSI only indicates the plant license has been reduced to include only the spent fuel storage facility, resulting in orphaned or stranded SNF. Over the next decades the number of stranded ISFSIs will only continue to increase. By 2030, many states may be left managing ISFSI only sites located near some combination of critical waterways, large population centers, active fault lines, or coastal zones. These stranded ISFSIs present unique safety, economic, environmental, and security risks to adjoining communities.[8]

Shutdown date of closed nuclear reactors with fuel on-site[9]

1. Indian Point 1 - Shutdown Date: 10/31/1974
2. Humboldt Bay - Shutdown Date: 07/02/1976
3. Dresden 1 - Shutdown Date: 10/31/1978
4. La Crosse - Shutdown Date: 04/30/1987
5. Rancho Seco (ISFSI only) - Shutdown Date: 06/07/1989
6. Fort St. Vrain (ISFSI only) - Shutdown Date: 08/18/1989
7. Yankee Rowe (ISFSI only) - Shutdown Date: 10/01/1991
8. Trojan (ISFSI only) - Shutdown Date: 11/09/1992
9. San Onofre 1 - Shutdown Date: 11/30/1992
10. Millstone 1 - Shutdown Date: 11/4/1995
11. Haddam Neck (ISFSI only) - Shutdown Date: 12/05/1996
12. Maine Yankee (ISFSI only) - Shutdown Date: 12/06/1996
13. Big Rock Point (ISFSI only) - Shutdown Date: 06/29/1997
14. Zion 1 and 2 - Shutdown Date: 02/13/1998
15. Crystal River - Shutdown Date: 02/02/2013
16. Kewaunee - Shutdown Date: 05/07/2013
17. San Onofre 2 and 3 - Shutdown Date 6/07/2013
18. Vermont Yankee - Shutdown Date: 12/29/2014
19. Fort Calhoun - Shutdown Date: 10/24/2016

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[7] Information retrieved from the NRC webpage **Backgrounder on Decommissioning Nuclear Power Plants**, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html.

[8] *Blue Ribbon Commission on America's Nuclear Future, Report to the Secretary of Energy,* January 2012. Retrieved from http://energy.gov/ne/downloads/blue-ribboncommission-americas-nuclear-future-reportsecretary-energy.

[9] Information retrieved from the NRC webpage **Backgrounder on Decommissioning Nuclear Power Plants**, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html, and from **Sites Undergoing Decommissioning,** https://www.nrc.gov/info-finder/decommissioning/.

Proposed Policy Recommendations

1. **DOE should adopt a policy of shipping "oldest fuel first" for SNF shipments from shut-down nuclear reactors to either an interim storage facility or a repository.**
   Such a policy will greatly reduce the radiological risk during transportation. It will also reduce associated impacts with orphaned ISFSIs.

2. **DOE should invoke provisions of the Standard Contact to prioritize shut-down nuclear reactors over operating reactors in terms of shipment priority.**
   Addressing these impediments must be a key federal objective in Standard Contract negotiation, litigation, and legislation.

3. **DOE should develop a shipping priority list predicated on risk assessment.**
   Reactor sites in earthquake or tsunami zones should be given priority consideration while still adhering to the oldest fuel first principle. Shipment priority and scheduling should be based upon a site risk assessment with shut-down facilities slotted into the first tier, followed by operating reactors.

4. **Newer fuel already packaged in dual purpose casks should move down in shipment priority.**
   The practice of coupling "hotter" assemblies with "colder" assemblies in dual purpose canisters compromises transport safety by increasing the potential radiological exposure during transport, and increasing the potential radiological release in the event of a severe accident. Alternative options that reduce the radiological risk must be reviewed and addressed by DOE. Whatever solution DOE adopts must still give preference to shutdown sites over operating reactor facilities.

NRC NEWS
Office of Public Affairs, Region IV
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No: IV-18-017 December 20, 2018
Contact: Victor Dricks, 817-200-1128

NRC Names Scott Morris New Region IV Administrator



The Nuclear Regulatory Commission has announced the appointment of Scott A. Morris as the agency's Region IV Administrator, effective Dec. 31, 2018, following the retirement of Kriss Kennedy. The regional office is located in Arlington, Texas.

"Scott is an extremely talented individual whose broad range of experience has guided the NRC during many critical safety and security assignments over more than 25 years of service. He is an enthusiastic leader with a demonstrated commitment to public service," said Margaret M. Doane, NRC Executive Director for Operations. "I congratulate him on this important appointment."

NRC's Region IV office is responsible for the inspection and safety assessment of 18 nuclear reactors at 12 sites. Region IV covers 22 states, including Alaska and Hawaii, overseeing the inspection and licensing of medical, academic and industrial users of radioactive materials. Seventeen of those states are Agreement states, which implement the NRC's materials inspection and licensing programs.

Morris joined the NRC in 1993, where he has served in a number of progressively more responsible positions, including senior resident inspector at two power reactor facilities in Region I; senior technical assistant in the Office of the Executive Director for Operations; and reactor security branch chief, Office of Nuclear Security and Incident Response.

Since joining the Senior Executive Service in 2007, Morris has served in several senior management positions, including deputy director for Reactor Security, Division of Security Policy; deputy director for Incident Response; and deputy director, Division of Preparedness and Response. In May 2014, he was selected as the director, Division of Inspection and Regional Support, Office of Nuclear Reactor Regulation. In June 2016, he was appointed to his most recent position as deputy regional administrator, Region IV.

Prior to joining the NRC, Morris served seven years on active duty as a commissioned officer in the U.S. Navy nuclear submarine program. He earned a bachelor's degree in electrical engineering from Pennsylvania State University and is a graduate of the NRC's SES Candidate Development Program.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of HOLTEC INTERNATIONAL (Consolidated Interim Storage Facility)	Docket No. 72-1051

NRC STAFF'S CONSOLIDATED RESPONSE TO PETITIONS TO INTERVENE AND REQUESTS FOR HEARING FILED BY: ALLIANCE FOR ENVIRONMENTAL STRATEGIES, BEYOND NUCLEAR, INC., DON'T WASTE MICHIGAN, ET AL., NAC INTERNATIONAL INC., AND THE SIERRA CLUB

Christopher C. Hair
Alana M. Wase
Joe I. Gillespie III

Counsel for NRC Staff

October 9, 2018

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of HOLTEC INTERNATIONAL (Consolidated Interim Storage Facility)	Docket No. 72-1051

NRC Staff's Consolidated Response to Petitions to Intervene and Requests for Hearing Filed By Alliance For Environmental Strategies, Beyond Nuclear, Inc., Don't Waste Michigan, et al., NAC International Inc., and The Sierra Club

Introduction

Pursuant to 10 C.F.R. § 2.309(i)(1), the U.S. Nuclear Regulatory Commission Staff hereby submits its consolidated response to the requests for hearing and petitions to intervene submitted by: Beyond Nuclear;[1] the Sierra Club;[2] the Alliance for Environmental Strategies (AFES);[3] NAC International, Inc. (NAC);[4] and a consortium consisting of Don't Waste Michigan, Citizens Environmental Coalition, Citizens for Alternatives to Chemical Contamination, Nuclear Energy Information Service, Nuclear Issues Study Group San Luis Obispo Mothers for Peace, and Public Citizen (collectively referred to as the Joint Petitioners).[5] These petitions relate to a notice of opportunity to request a hearing and to petition for leave to intervene published in the

1 "Beyond Nuclear, Inc.'s Hearing Request and Petition to Intervene" (Sept. 14, 2018).

2 "Petition to Intervene and Request for Adjudicatory Hearing by Sierra Club" ("Sierra Club Petition") (Sept. 14, 2018).

3 "Petition to Intervene and Request for Hearing" ("AFES Petition") (Sept. 12, 2018).

4 "Petition to Intervene and Request for Hearing of NAC International Inc." ("NAC Petition") (Sept. 14, 2018).

5 "Petition of Don't Waste Michigan, Citizens' Environmental Coalition, Citizens for Alternatives to Chemical Contamination, Nuclear Energy Information Service, Public Citizen, Inc., San Luis Obispo Mothers for Peace and Nuclear Issues Study Group to Intervene and Request for an Adjudicatory Hearing," ("Joint Petition") (Sept. 14, 2018).

Federal Register regarding Holtec International's (Holtec or Applicant) HI-STORE license application to construct a consolidated interim storage facility ("CISF") to store spent nuclear fuel in Lea County, New Mexico pursuant to the NRC's regulations in 10 C.F.R. Part 72.[6]

The NRC Staff respectfully submits that the Commission (or an Atomic Safety and Licensing Board, as appropriate) should grant, in part, the petitions of Beyond Nuclear and the Sierra Club.[7] As discussed below, both of these organizations have established standing to intervene in this proceeding and have proffered at least one admissible contention. However, the Commission should deny the petitions of AFES, NAC, and Don't Waste Michigan because none of these groups has demonstrated standing and proposed at least one admissible contention.

Background

On March 30, 2017, Holtec submitted an application, including a Safety Analysis Report (SAR) and Environmental Report (ER), requesting that the NRC grant a license to Holtec for the construction and operation of a CISF for spent nuclear fuel (SNF).[8] The proposed CISF would be located in Lea County, New Mexico on land owned by an entity designated as the Eddy-Lea Energy Alliance (ELEA), a public body created through a joint powers agreement between the

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[6] Holtec International HI-STORE Consolidated Interim Storage Facility for Interim Storage of Spent Nuclear Fuel, 83 Fed. Reg. 32,919 (July 16, 2018).

[7] As required by 10 C.F.R. § 2.310, a presiding officer or Board granting a petition to intervene will "determine and identify the specific procedures to be used for the proceeding" pursuant to 10 C.F.R. § 2.310 (a)-(h). Those regulations provide that "proceedings for the . . . grant . . . of licenses subject to [10 C.F.R. Part 72] may be conducted under the procedures of subpart L." 10 C.F.R. § 2.310(a). In the absence of any specific requests regarding the selection of hearing procedures from the petitioners, the NRC Staff respectfully submits that any hearing granted with respect to these petitions should be governed by the procedures of Subpart L.

[8] Holtec's application materials are available at: https://www.nrc.gov/waste/spent-fuel-storage/cis/holtec-international.html, *also available at* https://go.usa.gov/xP9ry. Unless otherwise specified, all of the NRC Staff's citations to the ER are to Revision 1 (ADAMS Accession No. ML18023A904) and all citations to the SAR are to Revision 0 (ADAMS Accession No. ML17116A106). Specific references to SAR Revision 0A are designated as such (ADAMS Accession Nos. ML17310A221 and ML17310A221).

the counties of Eddy and Lea and the cities of Carlsbad and Hobbs located in Southeast, New Mexico. Holtec intends to purchase the land from ELEA prior to construction.

In its license application, Holtec requests authorization in the initial phase of the project to store 5,000 metric tons of uranium (MTUs) in approximately 500 canisters for a license period of 40 years. However, because the capacity of individual canisters can vary, the 500 canisters proposed in the Holtec license application have the potential to hold up to 8,680 MTUs. The NRC's review of Holtec's application consists of a safety review and an environmental review to support a final licensing decision. The NRC Staff's Safety Evaluation Report (SER) will document the NRC's evaluation of potential radiological consequences of Holtec's proposed action to determine whether the construction and operation of the CISF can be accomplished safely and securely and in accordance with the Atomic Energy Act of 1954, as amended, (AEA) and the NRC's regulations in, *inter alia*,10 C.F.R. Part 72. In accordance with the National Environmental Policy Act of 1969, as amended (NEPA), the NRC's Environmental Impact Statement (EIS) will document the NRC's evaluation of the significance of the potential environmental impacts of the proposed action and reasonable alternatives to the proposed action.

On March 19, 2018, the NRC published a notice in the Federal Register regarding the acceptance and docketing of Holtec CISF license application.[9] The NRC subsequently published a notice of opportunity to request a hearing and to petition for leave to intervene in the Federal Register.[10] In response, the NRC received several petitions filed by local governmental bodies seeking to participate in the proceeding.[11] The NRC also received two motions to

[9] Holtec International HI-STORE Consolidated Interim Storage Facility for Interim Storage of Spent Nuclear Fuel, 83 Fed. Reg. 12,034 (Mar. 19, 2018).

[10] Holtec International HI-STORE Consolidated Interim Storage Facility for Interim Storage of Spent Nuclear Fuel, 83 Fed. Reg. 32,919 (July 16, 2018).

[11] *See* "Petition by the Eddy-Lea Energy Alliance to Participate as an Interested Local Governmental Body" (Aug. 30, 2018); "Petition by Eddy County to Participate As An Interest Local Governmental Body (Sept. 13, 2018); "Petition by the Board of Commissioners for Lea County, New Mexico to

dismiss the proceeding based on a legal challenges under the Nuclear Waste Policy Act (NWPA) related to the NRC's ability to review the Holtec CISF license application.[12] Finally, the NRC received five petitions to intervene and requests for hearing regarding the Holtec CISF license application. The NRC Staff responds to each of these five petitions below.

Discussion

In order for a petition to intervene and hearing request to be granted, a petitioner must demonstrate that it has standing to intervene in the proceeding and submit at least one admissible contention. 10 C.F.R. § 2.309(a).

I. Standing to Intervene

A. Applicable Legal Requirements

In accordance with the Atomic Energy Act (AEA), "the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding."[13] The Commission will grant a request for hearing if the petitioner meets the standing requirements of 10 C.F.R. § 2.309(d) and submits at least one admissible contention pursuant to 10 C.F.R. § 2.309(f).[14] The petitioner's hearing request must contain:

Participate as an Interested Local Governmental Body" (Sept. 11, 2018); "Petition by the City of Carlsbad, New Mexico to Participate as an Interested Local Governmental Body" (Aug. 28, 2018). In general, if a hearing is granted, the NRC Staff does not object to the participation of any of these governmental bodies pursuant to 10 C.F.R. § 2.315(c).

[12] "Beyond Nuclear, Inc.'s Motion to Dismiss Licensing Proceedings for HI-Store Consolidated Interim Storage Facility and WCS Consolidated Interim Storage Facility for Violation of the Nuclear Waste Policy Act" (Sept. 14, 2018); "Motion of Fasken Land and Minerals and Permian Basin Land and Royalty Owners to Dismiss Licensing Proceedings for Hi-Store Consolidated Interim Storage Facility and WCS Consolidated Interim Storage Facility" (Sept. 14, 2018). For the NRC Staff's response in opposition to these motions, *see* "NRC Staff's Response to Motions to Dismiss Licensing Proceedings" (Sept. 24, 2018).

[13] 42 U.S.C. § 2239(a)(1)(A).

[14] *See* 10 C.F.R. § 2.309(a).

(i) The name, address and telephone number of the requestor or petitioner;

(ii) The nature of the requestor's/petitioner's right under the Act to be made a party to the proceeding;

(iii) The nature and extent of the requestor's/petitioner's property, financial or other interest in the proceeding; and

(iv) The possible effect of any decision or order that may be issued in the proceeding on the requestor's/petitioner's interest.[15]

1. Traditional Standing Principles

In addition to fulfilling the general standing requirements of 10 C.F.R. § 2.309(d)(1), a petitioner "must demonstrate that it has an interest that may be affected by the proceeding."[16] The Commission applies contemporaneous judicial concepts of standing to evaluate whether the petitioner has demonstrated the requisite interest.[17] To this end, "a petitioner must (1) allege an injury in fact that is (2) fairly traceable to the challenged action and (3) is likely to be redressed by a favorable decision."[18] The injury claimed by the petitioner must be actual or threatened and both concrete and particularized.[19] Further, the injury alleged must be "to an interest arguably within the zone of interests protected by the governing statute"—here, the AEA or NEPA.[20] The causation element of standing requires a petitioner to show "that the injury is

[15] 10 C.F.R. § 2.309(d).

[16] *See Fla. Power & Light Co.* (Turkey Point Nuclear Generating Units 3 and 4), CLI-15-25, 82 NRC 389, 394 (2015).

[17] *See id.* at 394; *see also Calvert Cliffs 3 Nuclear Project, LLC, & UniStar Nuclear Operating Services, LLC* (Calvert Cliffs Nuclear Power Plant, Unit 3), CLI-09-20, 70 NRC 911, 915 (2009).

[18] *Turkey Point*, CLI-15-25, 82 NRC at 394; *Sequoyah Fuels Corp. and General Atomics* (Gore, Oklahoma Site), CLI-94-12, 40 NRC 64, 71 (1994); *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 560–61 (1992).

[19] *International Uranium (USA) Corporation* (White Mesa Uranium Mill), CLI-01-21, 54 NRC 247, 250 (2001); *see also Sequoyah Fuels Corp.,* CLI-94-12, 40 NRC at 71 (stating that "standing has been denied when the threat of injury is too speculative").

[20] *Calvert Cliffs*, CLI-09-20, 70 NRC at 915 (citing *Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Unit 1), CLI-93-21, 38 NRC 87, 92 (1993) (internal quotations omitted)).

fairly traceable to the proposed action."[21] The redressability element of standing "requires the intervenor to show that its actual or threatened injuries can be cured by some action of the tribunal."[22] The petitioner has the burden to demonstrate standing requirements are met.[23] However, a licensing board will "construe the [intervention] petition in favor of the petitioner" when making a standing determination.[24]

2. Proximity-Plus Standing

In cases involving reactor facilities, the Commission will apply a standing presumption based on proximity to the site.[25] No such automatic presumption exists for nuclear materials proceedings.[26] In such cases, to obtain standing based on geographic proximity to a facility, a petitioner must demonstrate that "the proposed action involves a significant source of radioactivity producing an obvious potential for offsite consequences."[27] This "proximity-plus" standard is applied on a "case-by-case basis, taking into account the nature of the proposed action and the significance of the radioactive source."[28] If "there is no 'obvious' potential for radiological harm at a particular distance frequented by the petitioner, it becomes the petitioner's burden to show a specific and plausible means of how the challenged action may harm him or

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[21] *Sequoyah Fuels,* CLI-94-12, 40 NRC at 75.

[22] *Sequoyah Fuels Corporation and General Atomics* (Gore, Oklahoma Site Decommissioning), CLI-01-02, 53 NRC 9, 15 (2001).

[23] *See Commonwealth Edison Co.* (Zion Nuclear Power Station, Units 1 and 2), CLI-00-5, 51 NRC 90, 98 (2000).

[24] *Turkey Point*, CLI-15-25, 82 NRC at 394 (quoting *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, Georgia), CLI-95-12, 42 NRC 111, 115 (1995) (internal quotations omitted)).

[25] *See Florida Power and Light Co.* (St. Lucie, Units 1 and 2), CLI-89-21, 30 NRC 325, 329 (1989).

[26] *See Nuclear Fuel Servs., Inc.* (Erwin, Tennessee), CLI-04-13, 59 NRC 244, 248 (2004).

[27] *Georgia Tech Research Reactor*, CLI-95-12, 42 NRC at 116.

[28] *Id.* at 116–17.

her."[29] "[C]onclusory allegations about potential radiological harm" are insufficient for this showing.[30] Where a petitioner is unable to demonstrate "proximity-plus" standing to intervene, traditional standing principles will apply.[31]

3. Organizational and Representational Standing

When an organization requests a hearing, it must demonstrate either organizational or representational standing. To demonstrate organizational standing, the petitioner must show an "injury-in-fact" to the interests of the organization itself.[32] Where an organization seeks to establish representational standing, it must demonstrate that at least one of its members would be affected by the proceeding and identify any such members by name and address. Also, the organization must show that the identified members would have standing to intervene in their own right, and that these members have authorized the organization to request a hearing on their behalf.[33] In addition, the interests that the representative organization seeks to protect must be germane to its own purpose, and neither the asserted claim nor the required relief must require an individual member to participate in the organization's legal action.[34]

B. The Petitioners' Standing to Intervene

Based on the specific allegations contained in each petition to intervene and request for

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[29] *USEC Inc.* (American Centrifuge Plant), CLI-05-11, 61 NRC 309, 311–12 (2005) (quoting *Nuclear Fuel Servs*, CLI-04-13, 59 NRC 244 (internal quotations omitted)).

[30] *Nuclear Fuel Servs*., CLI-04-13, 59 NRC at 248.

[31] *See U.S. Army Installation Command,* CLI-10-20, 72 NRC at 188.

[32] *Energysolutions, LLC* (Radioactive Waste Import/Export Licenses), CLI-11-3, 73 NRC 613, 621 (2011).

[33] *See Fermi*, CLI-10-3, 71 NRC at 51-52; *see also Sequoyah Fuels Corp. and General Atomics* (Gore, Oklahoma Site), CLI- 94-12, 40 NRC 64, 72 (1994) (citing *Houston Lighting and Power Co.* (Allens Creek Nuclear Generating Station, Unit 1), ALAB-535, 9 NRC 377, 389–400 (1979)) ("An organization seeking representational standing on behalf of its members may meet the 'injury-in-fact' requirement by demonstrating that at least one of its members, who has authorized the organization to represent his or her interest, will be injured by the possible outcome of the proceeding").

[34] *Consumers Energy Co.* (Palisades Nuclear Plant), CLI-07-18, 65 NRC 399, 409 (2007).

hearing, Beyond Nuclear and the Sierra Club have made a sufficient showing to establish standing to intervene based on the NRC's requirements. On the other hand, AFES, NAC, and the Joint Petitioners (*i.e.*, Don't Waste Michigan et al.) have failed to make a sufficient showing.

1. Beyond Nuclear and the Sierra Club

The NRC Staff does not oppose Beyond Nuclear and the Sierra Club's demonstration of standing in this proceeding. In additional to their other arguments regarding traditional standing, both organizations seek representational standing on the basis of declarations submitted by their members. Also, both organizations allege that the proximity of their members to the proposed Holtec facility is sufficient to grant them standing in this proceeding. In support, Beyond Nuclear proffers a declaration from a member residing within a mile of the Holtec facility. [35] Similarly, the Sierra Club proffers a declaration from a member residing within 10 miles of the facility who also owns and operates a ranch within 3 miles of the facility.[36] These members frequent areas within ranges previously determined by Atomic Safety and Licensing Boards to be sufficient to establish standing under the proximity presumption for similar proceedings.[37] Accordingly, as both organizations have proposed at least one admissible contention, the NRC Staff does oppose the standing of either Beyond Nuclear or the Sierra Club here.

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[35] *See* Declaration of Keli Hatley, ¶ 3.

[36] *See* Declaration of Danny Berry, ¶ 1. Notably, both Sierra Club and Beyond Nuclear rely on similar declarations from Mr. Berry to establish representational standing. But both parties should not be permitted to rely in the same individual to demonstrate standing. *See Consumers Energy Co.* (Big Rock Point ISFSI), CLI 65 NRC 423, 426 (2007) (noting that "multiple representation might lead to confusion").

[37] *See Pacific Gas & Electric Co.* (Diablo Canyon ISFSI), LBP-02-23, 56 NRC 413, 428 (2002) (finding 17 miles sufficient and noting other agency rulings approving standing for petitioners located within 10 miles of facility for spent fuel pool expansion proceedings); *see also Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), CLI-00-20, 52 NRC 151, 163–64 (2000) (6 miles sufficient for standing in license transfer proceeding).

2. Alliance for Environmental Strategies

The NRC Staff opposes the standing of AFES in this proceeding. AFES seeks representational standing based on alleged injuries to its members and that its members live within 50 miles of the proposed Holtec facility.[38] As an initial matter, the proximity-plus standing presumption should not extend to AFES's members in this case. AFES alleges that all of its members live within 50 miles within the proposed facility, the closest of which resides 37 miles from the facility.[39] The Commission has declined to extend presumption of standing at such distances for similar facilities, especially "because an ISFSI is essentially a passive structure rather than an operating facility, and there therefore is less chance of widespread radioactive release."[40] Further, AFES's members reside far further than any other previously-approved distance, including the 17 miles supporting the petitioners' standing in the *Diablo Canyon* proceeding involving an ISFSI.[41] The *Turkey Point* case cited by AFES in support of its proximity standing—a case involving the license renewal of an operating nuclear power reactor—is inapposite.[42] Therefore, AFES has failed to establish standing as a matter of proximity.

Where a petitioner is unable to demonstrate "proximity-plus" standing to intervene, traditional standing principles will apply.[43] In support of its allegations of injuries to its members, AFES submits four substantially similar affidavits from its members that share virtually identical language regarding each affiant's allegation of harm. Therefore, the NRC Staff evaluates these allegations together below.

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[38] *See* AFES Petition at 10.

[39] *See* Affidavit of Rose Gardner ¶ 5.

[40] *Consumers Energy Co.* (Big Rock Point ISFSI), CLI-07-19, 65 NRC 423, 426 (2007); *see also Detroit Edison Co.* (Fermi Power Plant ISFSI), LBP-09-20, 70 NRC 565 (2009).

[41] *See Pacific Gas & Electric Co.* (Diablo Canyon ISFSI), LBP-02-23, 56 NRC 413, 428 (2002) (finding 17 miles sufficient for standing related to an ISFSI license amendment).

[42] *See* AFES Petition at (citing *Florida Power and Light* (Turkey Point Nuclear Generating Plant, Units 3 and 4), LBP-01-6, 53 NRC 138 (2001)).

[43] *See U.S. Army Installation Command,* CLI-10-20, 72 NRC at 188.

Here, AFES and its members have failed to allege any concrete and particularized injury-in-fact that is fairly traceable to the proposed Holtec facility. AFES alleges that its members will suffer the "ill effects of the impact of the cumulative location of industrial sites in Lea County and Eddy County, including the future Holtec site and [the U.S. Department of Energy's] Waste Isolation Pilot Project."[44] In support, AFES alleges that "the WIPP site . . . has already been damaging to property values and general social welfare." In addition, AFES alleges that its members "will or reasonably may be injured by the spread of any fire sparked at the site and/or the release of toxic matter into the air, land, or water."[45] AFES also alleges that the "disparate impact of discriminatory site selection, based on race and ethnicity, will have an ill effect on" its members—as well as their family and friends—"in terms of self-esteem and self-worth."[46] AFES alleges that its members will use the highway adjacent to the Holtec facility anywhere from "an occasional basis"[47] to "several times a day."[48] Finally, AFES alleges that its members "never received notice of any public meeting by local officials to address whether to express the community's wish to be the site of another industrial waste site."[49]

In this case, AFES's allegations of harm are too generalized to establish standing. For example, AFES's members generally allege "ill effects" from the siting of the Holtec CISF nearby the WIPP facility and other unnamed industrial sites. However, to establish standing based on an economic loss, a petitioner must show that "the purported economic loss has some objective fundament, rather than being based solely on the petitioner's (or affiant's) perception of the

[44] *See, e.g.*, Affidavit of Rose Gardner ¶ 10.

[45] *Id.* ¶ 15.

[46] *Id.* ¶ 13,

[47] *Id.* ¶ 9.

[48] *See* Affidavit of Lorraine Villegas ¶ 7.

[49] *See, e.g.*, Declaration of Rose Gardner ¶ 18.

economic loss in light of the proposed licensing action."[50] Further, AFES's general allegation of "ill effects" is conclusory.[51] A petitioner cannot simply rely on "conclusory allegations about potential radiological harm," but must show "*how* these various harms might result from the [proposed action]."[52] AFES's remaining allegations fare no better. AFES's allegation of harm resulting from "the spread of any fire sparked at the site" speculates that a fire could occur at the site without any additional support or reference to the application to explain the plausibility of such a scenario. Further, AFES's does not specifically allege any harm resulting from its members using the highway adjacent to the facility. These general allegations regarding fires and transportation are inadequate given the passive nature of the CISF as opposed to a reactor.[53] Indeed, it is well-settled that a petitioner must allege that he or she "will in fact be perceptibly harmed by the challenged agency action, not that he can imagine circumstances in which he could be affected by the agency's action."[54] Finally, AFES fails to establish that the alleged lack of notice to its members regarding "any public meeting by local officials" to address their concerns falls within the zone of interests of either the AEA or NEPA. While NEPA undoubtedly contains a public participation requirement for an agency preparing an EIS (arising

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[50] *Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), LBP-02-23, 56 NRC 413, 432 (2002) (generic, unsubstantiated claims regarding health, safety, and property devaluation impacts are insufficient to establish standing), *aff'd*, CLI-03-1, 57 NRC 1 (2003).

[51] *See Commonwealth Edison Co.* (Zion Nuclear Power Station, Units 1 and 2), CLI-99-4, 49 NRC 185, 191-93 (1999) (conclusory allegations about potential radiological harm insufficient basis for standing); *Florida Power & Light Co.* (St. Lucie Nuclear Power Plant, Units 1 and 2), CLI-89-21, 30 NRC 325, 329 (1989) (injury to others not a basis for standing).

[52] Detroit Edison Co. (Fermi Power Plant ISFSI), LBP-09-20, 70 NRC 565 (2009), citing *Commonwealth Edison Co.* (Zion Nuclear Power Station, Units 1 and 2), CLI-99-4,49 NRC 185, 192 (1999) (emphasis added).

[53] *But see Georgia Institute of Technology* (Georgia Tech Research Reactor), CLI-95-12, 42 NRC 111, 117 (1995) ("driving by" a nuclear reactor daily sufficient for standing).

[54] *Nuclear Fuel Services, Inc.* (Erwin, Tennessee), CLI-04-13, 59 NRC 244, 248 (2004), citing *United States v. Students Challenging Regulatory Agency Procedures (SCRAP),* 412 U.S. 669, 688–89 (1973).

from the "informational role" of the EIS),[55] AFES does not explain how the statute's requirements inherently apply to actions taken by local officials prior to the filing of the license application.

In light of the above, and because (as discussed below) AFES has failed to propose an admissible contention, the Commission should dismiss the AFES Petition.

3. NAC International Inc.

The NRC Staff opposes NAC's standing in this proceeding. NAC has failed to allege a concrete and particularized injury that is fairly traceable to the proposed Holtec facility. Further, any harm alleged by NAC would not be redressable by a favorable decision here. As explained below, this is because the Holtec CISF—as currently proposed—would not authorize storage of NAC canisters.

In support of its standing, NAC alleges that "[m]uch of NAC's design information for its canisters is proprietary to NAC."[56] "NAC has not licensed or otherwise authorized anyone to furnish its proprietary design information to Holtec."[57] In NAC's view, the company would be harmed if the NRC grants Holtec's license application "because NAC's proprietary canister designs, loaded with nuclear materials and SNF under contracts with NAC's customers, would be subsumed into and subject to Holtec's CISF design and its operation."[58] Specifically, because "Holtec would be unable to adequately evaluate or respond to normal operating situations and Design Basis Events (or other potential events) that affect NAC canisters stored at the CISF," NAC would suffer financial, reputational, and informational harm.[59] In essence,

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[55] *See Robertson v. Mathow Valley Citizens Council*, 490 U.S. 332, 349 (1989) (quoting *Baltimore Gas & Electric Co. v. Natural Resources Defense Council*, 462 U.S. 87, 97 (1983).

[56] NAC Petition at 4.

[57] *Id.*

[58] *Id.* at 5.

[59] *Id.*

NAC argues that its company "will be put on the hook for the faults in the Holtec CISF design and operating approach if the application goes through as proposed, even though NAC has no control over the manner in which Holtec handles the canisters stored at the CISF."[60]

In this case, the Holtec CISF license application proposes the exclusive use of HI-STORM UMAX canister storage system, which the NRC previously approved via a Certificate of Compliance (CoC) issued pursuant to 10 C.F.R. Part 72.[61] As NAC concedes, the CoC for Holtec's HI-STORM UMAX cask only permits storage of two types of canisters in the cask—*i.e.*, the MPC-37 and MPC-89—both of which are Holtec canisters.[62] Therefore, the Holtec license application currently *does not include* the potential use of NAC canisters. Further, Holtec is not currently seeking to amend the HI-STORM UMAX CoC to include NAC canisters.[63] Even if it were, the future incorporation of any additional CoC amendment in the CISF would require an amendment to the Holtec license application (or to the license, if one were already issued). Therefore, NAC has failed to allege any injury based on the current license application. Nor has NAC demonstrated how it's discretionary intervention would "assist in developing a sound record," per 10 C.F.R. § 2.309(e)(1)(i), given the use of NAC canisters is not encompassed by the Holtec CISF license application. Therefore, the Commission should dismiss the NAC Petition.[64]

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60 *Id.*

61 *See* 10 C.F.R. § 72.214 (Certificate Number 1040).

62 NAC Petition at 14–15.

63 Holtec is currently is seeking an amendment to the HI-STORM UMAX CoC to include one type of Orano cask (*i.e.*, the NUHOMS 24PT1-DSC canister). *See* Request for Amendment 3 of Holtec UMAX CoC No. 1040 (Aug. 30, 2016) (ADAMS Accession No. ML16250A393).

64 To the extent NAC would seek to intervene solely based on its status as a competitor to Holtec, the Commission has squarely rejected this avenue. *See International Uranium (USA) Corp.* (Receipt of Material from Tonawanda, New York), CLI-98-23, 48 NRC 259 (1998) ("competitor standing" arguments do not fall within the zone of interests of either the AEA or NEPA); *Quivira Mining Co.* (Ambrosia Lake Facility), CLI-98-11, 48 NRC 1, 10 (1998) (a "mere claim of 'competitor injury,' unlinked to a claim of radiological injury, is not among those interests arguably protected or regulated under the Atomic Energy Act").

4. Joint Petitioners (Don't Waste Michigan et al.)

Don't Waste Michigan, Citizens' Environmental Coalition, Citizens for Alternatives to Chemical Contamination, Nuclear Energy Information Service, Nuclear Issues Study Group, Public Citizen, Inc., and San Luis Obispo Mothers for Peace, have submitted declarations of their members in an attempt to demonstrate the organizations' representational standing in this proceeding. However, these declarations do not demonstrate that any of the organizations' members will suffer a concrete and particularized injury-in-fact that is fairly traceable to the proposed construction and operation of the Holtec CISF. Therefore, these organizations have not demonstrated representational standing and, as a result, their Joint Petition should be dismissed.

The majority of the submitted declarations use substantively identical language, *i.e.*, they appear to be form letters with the only differences between them being the declarant's name, address, organization affiliation, and distance to an alleged transportation route. The declarations all argue that the construction and operation of the CISF "will require delivery over hundreds or thousands of miles of at least 10,000 shipments of SNF-filled casks and GTCC wastes . . . by truck, barge and/or rail . . . over 20 years . . . from nuclear plant fuel pool locations . . . ."[65] They all state that the declarant has "studied Department of Energy maps of rail and highway transportation routes" and assert that a transportation route is within a specified number of miles of the declarant's home and/or work and that the transportation route "will likely be used to transport several thousand, or more, cargoes of SNF and/or GTCC wastes . . . ."[66] They state that the declarant is concerned for his/her personal safety and that of others in his/her household, as well as for his/her property value, from "radiation exposure in the event of a serious transportation accident, vandalism or a terrorist attack" that breaches a cask.

[65] *See, e.g.,* Declaration of Chambre V. Beauvais at 1.

[66] *Id.*

They challenge the ER's "rosy projections of perfect transport . . . ."[67] They fault the ER for not including a "public health impact assessment of the effects of 20 years of transports of SNF and GTCC waste" and for only providing "a superficial analysis of the risks from unbreached casks in transport."[68] They assert that, if a cask is received at the CISF with a radiation leakage problem, it will be returned to the point of origin and, thus, "actively-leaking casks" will travel close to the declarant's home, place of employment and/or places of recreation" and that "the risks of a radiation accident will be increased during such shipments."[69] They state that the ER does not evaluate the scenario of a breached cask.[70] They discuss the possibilities of, in the vicinity of where the declarant lives or works or recreates, a cask being stranding "for days or longer" or a cask having to be transferred from one truck to another.[71] They state that "[t]he thought of being stuck in traffic at a rail crossing or on a parallel highway near a cask containing SNF or GTCC causes me concern for my health and safety" and that the declarant is concerned with cumulative exposure from transports.[72]

The declaration of Charles L. Bowman includes the additional statements that, in New York State, most of the radioactive material will be traveling along CSX-owned tracks, that there were 13,870 trains per year along CSX-owned tracks, and that there were 38 rail accidents along CSX-owned tracks in 2017; therefore, Mr. Bowman concludes that there will be "1

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67 *Id*.

68 *Id*.

69 *Id*.

70 *Id*. at 2.

71 *Id*.

72 *Id*. The declarations include a scanned copy of a Declaration of Linda DeStefano. Separate from this declaration is the statement that "Linda DeStefano sent a declaration by email. She says that she and her husband travel on Amtrak several times a year and passenger and freight travels on the same rail. She expresses concern about exposure. Email communique from Linda DeStefano to Barbara Warren." Because this statement is not a part of Ms. DeStefano's signed declaration and because it does not describe why the concern is a plausible basis for harm traceable to the instant proceeding, it is not a valid basis for Ms. DeStefano's standing argument.

accident for every 365 trains traveling along CSX tracks."[73] Mr. Bowman also states that, in 2014, the nationwide derailment rate was "1.63 derailments per million miles" and that, taking into consideration the number of shipments by rail and the distance of the shipments, "[t]he chance of a derailment for each rail shipment of spent nuclear fuel is approximately 1 in 409."[74] Mr. Bowman also posits an accident between a train carrying nuclear fuel and a train carrying "explosive Bakken crude oil."[75] Mr. Bowman states that, "[e]ach day roughly 38 trains travel through the Amtrak Station in Depew NY, which is within 8.6 miles of my home in Getzville NY."[76]

The statements in these declarations do not satisfy contemporaneous judicial concepts of standing because they do not demonstrate that the declarants themselves will suffer a concrete and particularized injury-in-fact that is fairly traceable to the proposed construction and operation of the Holtec CISF. Specifically, the declarations do not provide sufficient support for their assertions that the portions of the transportation routes to which the declarants claim proximity will be used to transport SNF or GTCC waste to the Holtec facility. The speculative assertion that a "rail trackage/highway transport route or barge shipment" is within the proximity of a declarant's home or work is not sufficient. Without a reasoned basis for claiming that SNF or GTCC waste will be transported to the Holtec CISF along the specifically identified segment of railway or roadway or waterway, the alleged injuries to the declarants are not fairly traceable to the proposed construction and operation of the Holtec CISF. In this regard, a "generalized

[73] Bowman Declaration at 3.

[74] *Id.*

[75] *Id.* at 4.

[76] *Id.* at 3.

grievance shared in substantially equal measure by all or a large class of citizens" is not sufficient to support standing."[77]

Northern States Power Co. (Pathfinder Atomic Plant, Byproduct Material License No. 22–08799–02), LBP-90-3, 31 NRC 40 (1990) is illustrative of this point. In that case, the petitioner relied specifically on "an extract from the [licensee's] decommissioning plan" for its assertion that truck shipments of waste would move via a route within a mile of the residence of the individual that the petitioner was representing.[78] The Board determined that this provided a "reasonable likelihood" that the truck shipments of waste will move within the proximity of the individual's residence.[79] The Board contrasted this with *Exxon Nuclear Company, Inc.* (Nuclear Fuel Recovery and Recycling Center), LBP-77-59, 6 NRC 518 (1977), in which the petitioner did not "establish[]" the "expected route of movement" of the waste.[80]

In the instant proceeding, unlike in *Pathfinder* and like in *Exxon*, Joint Petitioners have not established that SNF and GTCC waste will actually move along the portions of the railways or roadways or waterways, the proximity to which their members rely upon for their claims of standing. The declarants state that they have "studied Department of Energy maps of rail and highway transportation routes"; however, unlike in *Pathfinder*, there is no indication that these maps are specific to shipments to the Holtec facility. Instead, the declarants only provide the conclusory statement that the transportation route against which they measure their proximity "will *likely* be used to transport several thousand, or more, cargoes of SNF and/or GTCC wastes

[77] *Envirocare of Utah, Inc.* (Byproduct Material Waste Disposal License), LBP-92-8, 35 NRC 167, 174 (1992).

[78] *Pathfinder*, LBP-90-3, 31 NRC at 42.

[79] *Id.* at 43.

[80] *Id.*

. . . ."[81] Therefore, the Joint Petitioners have not demonstrated representational standing and their hearing requests should be denied.

II. Admissibility of the Petitioner's Proffered Contentions

A. Legal Requirements for Contentions

10 C.F.R. § 2.309(f)(1) establishes the "basic criteria that all contentions must meet in order to be admissible."[82] Pursuant to that section, a contention must:

(i) provide a specific statement of the issue of law or fact to be raised or controverted;

(ii) provide a brief explanation of the basis for the contention;

(iii) demonstrate that the issue raised in the contention is within the scope of the proceeding;

(iv) demonstrate that the issue raised in the contention is material to the findings the NRC must make to support the action that is involved in the proceeding;

(v) provide a concise statement of the alleged facts or expert opinions, including references to specific sources and documents, that support the petitioner's position and upon which the petitioner intends to rely at hearing; and

(vi) provide information sufficient to show that a genuine dispute with the applicant/licensee exists in regard to a material issue of law or fact, including references to specific portions of the application that the petitioner disputes, or in the case of an application that is asserted to be deficient, the identification of such deficiencies and supporting reasons for this belief.[83]

The failure to comply with any one of the 10 C.F.R. § 2.309(f)(1) requirements is grounds for the dismissal of a contention.[84]

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[81] *See, e.g.,* Declaration of Chambre V. Beauvais at 1 (emphasis added).

[82] *Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), LBP-06-14, 63 NRC 568, 571–72 (2006); *see also USEC Inc.* (American Centrifuge Plant), CLI-06-9, 63 NRC 433, 436–437 (2006) (stating that the Commission "will reject any contention that does not satisfy the requirements").

[83] *See* 10 C.F.R. § 2.309(f)(1).

[84] *Private Fuel Storage, L.L.C.* (Independent Irradiated Fuel Storage Installation), CLI-99-10, 49 NRC 318, 325 (1999).

The contention admissibility requirements of 10 C.F.R. § 2.309(f)(1) are intended to "focus litigation on concrete issues and result in a clearer and more focused record for decision."[85] The Commission has stated that it "should not have to expend resources to support the hearing process unless there is an issue that is appropriate for, and susceptible to, resolution in an NRC hearing" as indicated by a proffered contention that satisfies all of the 10 C.F.R. § 2.309(f)(1) requirements.[86] The Commission has emphasized that the 10 C.F.R. § 2.309(f)(1) requirements are "strict by design."[87] Attempting to satisfy these requirements by "[m]ere 'notice pleading' does not suffice."[88] A contention must be rejected where, rather than raising an issue that is concrete or litigable, it reflects nothing more than a generalization regarding the petitioner's view of what the applicable policies ought to be.[89]

Pursuant to 10 C.F.R. § 2.309(f)(1)(iii), a proposed contention must be rejected if it raises issues beyond the scope of the proceeding as dictated by the Commission's hearing notice.[90] Thus, a proposed contention that challenges a license amendment must confine itself to "health, safety or environmental issues fairly raised by [the license amendment]."[91] The adequacy of the Staff's review, as opposed to the adequacy of the application, cannot be

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85 Final Rule, Changes to Adjudicatory Process, 69 Fed. Reg. 2182, 2202 (Jan. 14, 2004).

86 *Id.*

87 *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Units 2 & 3), CLI-01-24, 54 NRC 349, 358 (2001), *petition for reconsideration denied*, CLI-02-01, 55 NRC 1 (2002).

88 *Amergen Energy Co., L.L.C.* (Oyster Creek Nuclear Generating Station), CLI-06-24, 64 NRC 111, 119 (2006) (quoting *Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), CLI-05-29, 62 NRC 801, 808 (2005)).

89 *Private Fuel Storage, L.L.C.* (Independent Irradiated Fuel Storage Installation), CLI-04-22, 60 NRC 125, 129 (2004) (citing *Philadelphia Elec. Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-216, 8 AEC 13, 20–21 (1974)).

90 *See Pub. Serv. Co. of Indiana, Inc.* (Marble Hill Nuclear Generating Station, Units 1 and 2), ALAB-316, 3 NRC 167, 170–71 (1976).

91 *Commonwealth Edison Co.* (Dresden Nuclear Power Station, Unit 1), CLI-81-25, 14 NRC 616, 624 (1981).

challenged.[92] Also, to show that a dispute is "material" pursuant to 10 C.F.R. § 2.309(f)(1)(iv) a petitioner must show that its resolution would make a difference in the outcome of the proceeding.[93]

Further, pursuant to 10 C.F.R. § 2.309(f)(1)(v), a proposed contention must be rejected if it does not provide a concise statement of the facts or expert opinions that support the proposed contention together with references to specific sources and documents. Neither mere speculation nor bare or conclusory assertions, even by an expert, suffices to allow the admission of a proposed contention.[94] While a Board may view a petitioner's supporting information in a light favorable to the petitioner, if a petitioner neglects to provide the requisite support for its contentions, it is not within the Board's power to make assumptions or draw inferences that favor the petitioner, nor may the Board supply the information that a contention is lacking.[95] Additionally, simply attaching material or documents as a basis for a contention, without setting forth an explanation of that information's significance, is inadequate to support the admission of the contention.[96] The Board is not expected to sift through attached material and documents in search of factual support.[97]

Finally, pursuant to 10 C.F.R. § 2.309(f)(1)(vi), a proposed contention must be rejected if it does not present a genuine dispute with the applicant on a material issue of law or fact.

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[92] *See Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 and 2), CLI-10-27, 72 NRC 481, 493 n.56 (2010) ("The contention . . . inappropriately focused on the Staffs [sic] review of the application rather than upon the errors and omissions of the application itself. Such challenges are not permitted in our adjudications."); *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Unit 3), CLI-09-5, 69 NRC 115, 123 n.39 (2009); 69 Fed. Reg. at 2202.

[93] *See Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2, and 3) CLI-99-11, 49 NRC 328, 333–34 (1999).

[94] *See USEC*, CLI-06-10, 63 NRC at 472; *Fansteel, Inc.* (Muskogee, Oklahoma Site), CLI-03-13, 58 NRC 195, 203 (2003).

[95] *See Crow Butte Res., Inc.* (North Trend Expansion Project), CLI-09-12, 69 NRC 535, 553–54 (2009); *Arizona Pub. Serv. Co.* (Palo Verde Nuclear Generating Station, Unit Nos. 1, 2, and 3), CLI 91-12, 34 NRC 149, 155 (1991).

[96] *See Fansteel*, CLI-03-13, 58 NRC at 204–05.

[97] *NextEra Energy Seabrook, LLC* (Seabrook Station, Unit 1), CLI-12-5, 75 NRC 301, 332 (2012).

The Commission has emphasized that "contentions shall not be admitted if at the *outset* they are not described with reasonable specificity or are not supported by some alleged fact or facts *demonstrating* a genuine material dispute" with the applicant.[98] The hearing process is reserved "for genuine, material controversies between knowledgeable litigants."[99]

B. Analysis of the Petitioner's Proposed Contentions

As discussed below, the petitions filed by Beyond Nuclear, the Sierra Club, and NAC all propose at least one admissible contention. By contrast, the AFES Petition and the Joint Petition do not propose any admissible contentions. Therefore, the AFES Petition and Joint Petition should be dismissed. Also, the NAC Petition should still be dismissed because NAC has not demonstrated standing.

1. Alliance for Environmental Strategies

AFES Contention 1

As a Matter of Law, The Applicant Has Not Performed a Sufficient Investigation and Has Not Done a Sufficient Analysis to Support that the Holtec Site Will Not Have a Disparate Impact on the Minority and Low Income Population of Lea and Eddy County

AFES claims that Holtec's site selection process was legally inadequate, requiring the preparation of a new ER that addresses alternative sites, why they were rejected, and the impact on minority and low income local populations.[100] The NRC Staff does not dispute that Holtec must evaluate alternatives to the proposed action (as the ER does in Chapter 2) and must also identify and quantify any impacts on low-income and minority populations (as the ER does in Chapters 3 and 4). However, with respect to an applicant's environmental justice

[98] *Id.* (quoting *Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2, and 3), CLI-99-11, 49 NRC 328, 335 (1999)).

[99] *Id.* (quoting *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Unit 2), CLI-03-14, 58 NRC 207, 219 (2003)).

[100] AFES Petition at 11.

analysis, the Petitioner fails to show how the inadequacy it asserts is contrary to any particular site selection investigation or process required by the NRC. Therefore, Contention 1 fails to demonstrate any material issue regarding the NRC Staff's review and should be dismissed.[101]

In addition to environmental impacts, NEPA requires the NRC to consider ancillary social and economic impacts.[102] Accordingly, the NRC considers environmental justice in its environmental reviews.[103] The term "environmental justice" refers to the federal policy established in 1994 by Executive Order 12,898, which directed federal agencies to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations."[104] The NRC's NEPA reviews incorporate these principles and evaluate any significant impacts that might fall disproportionately on minority and low-income communities.[105] The NRC Staff's guidance in Section 6.4.11 of NUREG-1748 provides that the ER should include "a discussion of the methods used to identify and quantify impacts on low-income and minority populations, the location and significance of any environmental impacts during construction on populations that are particularly sensitive, and any additional information pertaining to mitigation.[106] Finally, Appendix C of NUREG-1748 provides that "[i]f the percentage in the block groups significantly

[101] 10 C.F.R. § 2.309(f)(1)(iv).

[102] *Louisiana Enrichment Services*, (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 101 (1998).

[103] "NRC Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions," 69 Fed. Reg. 52040 (Aug. 24, 2004).

[104] "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994) (E.O. 12898).

[105] "Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions," 69 Fed. Reg. 52,040, 52,040-41, 52,048 (Aug. 24, 2004) (Environmental Justice Policy Statement).

[106] NUREG 1748 at 6-25.

exceed that of the state or county percentage for either minority or low-income population, environmental justice will have to be considered in greater detail."[107]

Section 3.8.5 of the ER discusses environmental justice populations located within the counties encompassing a 50-mile radius around the proposed site.[108] The ER subsequently evaluates the impacts on these populations in Section 4.8.4. For the impact assessment, the ER used block groups for minority populations and census tracts for low-income populations.[109] In Table 3.8.13, the ER presents the site-specific thresholds in New Mexico and Texas for minority and low-income populations.[110]

AFES bases its environmental justice challenge primarily on the site-selection process employed by Holtec, claiming it is facially invalid because ELEA prepared the report 12 years ago for a different purpose (*i.e.*, DOE's solicitation of interest for suitable sites for activities under the Global Nuclear Energy Partnership (GNEP)). AFES concedes that environmental justice was an express consideration during the site-selection process.[111] But AFES offers no legal authority as to why an applicant's evaluation of environmental justice impacts requires any more specific form of investigation or community outreach concerning site selection. Indeed, the Commission has held that NEPA requires an examination of a proposed project's impacts on minority and disadvantaged communities—not an investigation into possible racial bias.[112]

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[107] Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, Final Report (NUREG-1748) (ADAMS Accession No. ML032450279) at C-4 ("As a general matter (and where appropriate), staff may consider differences greater than 20 percentage points to be significant. Additionally, if either the minority or low-income population percentage exceeds 50 percent, environmental justice will have to be considered in greater detail.").

[108] The ER's figures are consistent with the guidance in Appendix C of NUREG-1748 at C-4 ("If the facility is located outside the city limits or in a rural area, a radius of approximately 4 miles (50 square miles) should be used.")

[109] ER at 3-86.

[110] ER at 3-100.

[111] AFES Petition at 19.

[112] *Louisiana Enrichment Services,* CLI-98-3, 47 NRC at 101 (reversing the Board's requirement of an NRC Staff investigation into racial discrimination in LBP-97-8, 45 NRC 367 (1997)); *see also Private*

AFES also avers that the ER's alleged failure to compare the population of Eddy and Lea County with the population of the United States is "directly contrary" to the Environmental Protection Agency's recommendations regarding using a "Meaningfully Greater" analysis and a larger scale reference community.[113] The EPA's approach provides that "a minority population may be present if the minority population percentage of the affected area is 'meaningfully greater' than the minority population percentage in the general population or other 'appropriate unit of geographic analysis.'" [114] First, AFES offers no support for why the appropriate "larger scale" geographic area would be the *entire* United States. And, as noted above, NRC Staff guidance includes criteria similar to the EPA's regarding the identification of minority communities in areas where the minority or low-income population percentage exceeds 50 percent. As shown in Table 3.8.13, the ER apparently adopts the NRC's guidance.[115]

In light of the above, Contention 1 fails to demonstrate any legal requirement for a specific site-selection process or otherwise identify how the contention's allegations regarding the ER's disparate impacts analysis by significant to the outcome of the NRC Staff's review. Therefore, Contention 1 should be dismissed.[116]

AFES Contention 2

As a Matter of Fact and Expert Opinion, the Siting Process Will Have a Disparate Impact on the Minority and Low Income Population of Lee and Eddy County

Contention 2, building from Contention 1, directly asserts that the Holtec site will have a disparate impact on the minority and low income population of Lee and Eddy County.[117] In

Fuel Storage, L.L.C. (Independent Irradiated Fuel Storage Installation) LBP-98-7, 47 NRC 142, 203 (1998) (ruling inadmissible a contention seeking to litigate discrimination in site selection process).

[113] AFES Petition at 20.

[114] *See* https://www.epa.gov/sites/production/files/2015-04/documents/ej-guidance-nepa-compliance-analyses.pdf, *also available at* https://go.usa.gov/xP9re, at Section 2.1.1.

[115] ER at 3-100.

[116] 10 C.F.R. § 2.309(f)(1)(iv).

[117] AFES Petition at 22.

support, AFES proffers a report from Professor Myrriah Gomez, Ph.D.[118] But Dr. Gomez's report does not demonstrate why the information it contains would be material to the NRC Staff's evaluation of whether the Holtec site will have a disparate impact on minority and low income communities. Therefore, Contention 2 is inadmissible.[119]

As previously discussed in the NRC Staff's response to AFES Contention 1, the ER contains a site-specific analysis regarding environmental justice in Section 4.8.4. Dr. Gomez's report disputes this analysis, beginning with a general discussion of New Mexico's history with the nuclear industry.[120] The report then concludes that the Holtec CISF facility "is an example of environmental racism based heavily on the racial and socioeconomic disparities in the proposed-facility's location in southeastern New Mexico."[121] In support, Dr. Gomez cites New Mexico's nuclear history and "the lack of representation of people of color throughout all stages of decision making."[122] Next, Dr. Gomez concludes that the ER's evaluation of secondary environmental impacts caused by economic growth "presents a biased lens with which Holtec is examining socioeconomic environmental justice impacts."[123]

However, Dr. Gomez's report consists of either conclusory statements or factual assertions that Petitioner fails to show are material to the Staff's review or represent a genuine dispute with the application. "[A]n expert opinion that merely states a conclusion without providing a reasoned basis or explanation for that conclusion is inadequate because it deprives the Board of the ability to make the necessary, reflective assessment of that opinion."[124] Similar

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[118] *Id.* at Exhibit 7.

[119] 10 C.F.R. §§ 2.309(f)(1)(iv), (v).

[120] *See* AFES Petition, Exhibit 7 at 1–2.

[121] *Id.* at 4.

[122] *Id.*

[123] AFES Petition, Exhibit 7 at 7–8.

[124] *Entergy Nuclear Operations, Inc.* (Palisades Nuclear Plant), CLI-15-23, 82 NRC 321, 328 (2015) (citing *USEC, Inc.* (American Centrifuge Plant), CLI-06-10, 63 NRC 451, 472 (2006)).

to the legal arguments advanced by AFES in Contention 1, Dr. Gomez appears to conclude that, because the proposed CISF would be located in an area with a significant minority population, the facility would *per se* have a disparate impact on that population. But as previously noted, Table 3.8.13 of the ER addresses the site-specific thresholds for the identification of minority communities in areas where the minority or low-income population percentage exceeds 50 percent. And Dr. Gomez does not dispute Holtec's methodology in selecting these thresholds. Nor does Dr. Gomez specifically explain how the impacts to the populations described in her report would differ—if at all—with Holtec's environmental justice analysis.[125] Dr. Gomez similarly fails to demonstrate the legal significance of the ethnicity of ELEA's members or why any investigation into racial discrimination is a legal prerequisite to the NRC's environmental justice analysis. As previously noted, the Commission has held that NEPA requires an examination of a proposed project's impacts on minority and disadvantaged communities—not an investigation into possible racial bias.[126]

In sum, Contention 2 relies on conclusory statements by Dr. Gomez that ultimately do not demonstrate that the issues raised are material to the NRC Staff's environmental justice review or contradict the analysis and conclusions in the ER.[127] Therefore, Contention 2 is inadmissible.

AFES Contention 3

There Is No Factual Support for Holtec's Primary Site Selection Criterion, which Is Community Support

[125] AFES Petition, Exhibit 7 at 5–6.

[126] *Louisiana Enrichment Services,* CLI-98-3, 47 NRC at 101.

[127] 10 C.F.R. §§ 2.309(f)(1)(v), (vi).

AFES Contention 3 challenges Holtec's statements of community support in the ER.[128] Similar to Contentions 1 and 2, this contention is inadmissible. First, as AFES appears to concede, community support is immaterial to the NRC's evaluation under NEPA as to whether the Holtec site will have a disparate impact on minority and low income communities.[129] Nonetheless, AFES claims that Holtec has effectively relied on community support during the site selection process to account for any environmental justice concerns. But Section 4.8.4 of the ER, which contains a site-specific environmental justice analysis, simply does not discuss community support (or any lack thereof). Rather, the ER's environmental justice analysis is structured around the categories of information described in the NRC Staff guidance in NUREG-1748, Appendix C. Therefore, contrary to 10 C.F.R. § 2.309(f)(1)(vi), Contention 3 fails to identify any specific disagreement with the ER's environmental justice analysis, let alone show that it relies on a representation about the extent community support.

In addition, AFES disputes Holtec's "control" of the land for the proposed site, which Holtec plans to purchase from ELEA via a purchase agreement.[130] However, the issue of control is also conspicuously absent from the ER's environmental justice analysis. In any event, this challenge appears to stem solely from an AFES members' belief that such an agreement is invalid because the ELEA meeting authorizing the purchase agreement was allegedly held without compliance with New Mexico's Open Meetings Act.[131] AFES fails to explain the legal relevance of this claim and similarly fails to dispute whether ELEA currently controls the land or, indeed, whether ELEA intends to convey the property to Holtec. Therefore, Contention 3 has failed to present a genuine dispute with the application on a material issue of law or fact.[132]

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[128] AFES Petition at 23 ("community support *per se* is not material to the findings the NRC must make to issue a license").

[129] *Id.*

[130] ER at 1-4.

[131] AFES Petition at 24 (citing Affidavit of Nicholas R. Maxwell, Exhibit 5, at ¶¶ 14-22).

[132] 10 C.F.R. § 2.309(f)(1)(vi).

For the reasons provided above, AFES has not demonstrated at least one admissible contention and so—independent from the determination on AFES's standing—the AFES Petition should be denied.

2. Don't Waste Michigan, et al.

Don't Waste Michigan Contention 1

The redaction of some 144 pages from Appendix C of the Holtec Environmental Report violates the National Environmental Policy Act and National Historic Preservation Act.

Contention 1 avers that Holtec has violated Section 106 of the National Historic Preservation Act by redacting Appendix C of the ER, which contains Holtec's Cultural Resources Communications and Survey Results. This contention is inadmissible, as it fails to demonstrate a genuine dispute on a material issue of law or fact. In fact, the NRC Staff (not Holtec) has temporarily withheld this information, consistent with the process and criteria of Section 304 of the NHPA. [133] Section 304 provides the following:

> The head of a Federal agency . . . after consultation with the Secretary, shall withhold from disclosure to the public information about the location, character, or ownership of a historic property if the Secretary and the agency determine that disclosure may--
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> (1) cause a significant invasion of privacy;
> (2) risk harm to the historic property; or
> (3) impede the use of a traditional religious site by practitioners.[134]

Advisory Council on Historic Preservation (ACHP) guidance provides that "[a]n official may propose to temporarily withhold information about properties that are currently undergoing eligibility determinations by the Keeper, with the final decision whether to disclose such information dependent on the outcome of that determination."[135] For Section 304 purposes, the Keeper of the National Register within the National Park Service serves as the representative for the Secretary of the Interior.[136] NRC Staff guidance is consistent with the ACHP, stating that

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[133] 54 U.S.C. § 307103(a)

[134] *Id.*

[135] *See* "Frequently Asked Questions on Protecting Sensitive Information About Historic Properties Under Section 304 of the NHPA," https://www.achp.gov/digital-library-section-106-landing/frequently-asked-questions-protecting-sensitive-information, *also available at* https://go.usa.gov/xP9ru (last visited October 8, 2017).

[136] *Id.*

"[i]f an applicant for a license or permit submits a report containing maps or other [sensitive cultural] information of this type then the information may need to be considered sensitive, and distribution should be restricted appropriately."[137]

Consistent with the process outlined above, the NRC Staff will use Holtec's survey information during its environmental review to determine whether any cultural resources will be impacted by the proposed action, and to determine (in consultation with the Keeper) whether any of the resources are eligible for listing on the National Register of Historic Places. On August 28, 2018, the Staff initiated consultation with the Keeper of the National Register regarding the public availability of the properties identified in Holtec's cultural resource survey report.[138] In doing so, the Staff made a preliminary conclusion that the public disclosure of this information may risk harm to a potential cultural resource by invasion of privacy or risk of harm to the potential historic resource.[139] Upon the completion of the Staff's consultation with the Keeper and a final determination of eligibility, the Staff will make available to the public any information that would not harm any potential historic properties.

In this case, the currently withheld cultural and historic resources information in Appendix C falls squarely within the NRC's policy on sensitive unclassified non-safeguards information, or SUNSI.[140] Specifically, the information is within the SUNSI category of "Federal-,

[137] Staff Guidance for Withholding Sensitive Information About National Historic Resources in Accordance With the National Historic Preservation Act, June 7, 2011 (ADAMS Accession No. ML111080735).

[138] "Consultation Regarding An Application For Holtec International's Proposed HI-STORE Consolidated Interim Storage Facility For Spent Nuclear Fuel, In Lea County, New Mexico (Docket Number: 72-1051)," Aug. 28, 2018 (ADAMS Accession No. ML18240A207).

[139] *Id.*

[140] *See* NRC Policy for Handling, Marking, and Protecting Sensitive Unclassified Non-Safeguards Information (ADAMS Accession No. ML18193B170).

State-, foreign government-, and international agency-controlled information."[141] Therefore, the Staff has not made this information publicly available.

Further, the Commission has provided two distinct opportunities for potential intervenors to request access to SUNSI.[142] Indeed, after requesting additional time to intervene in order to allow, among other things, the Joint Petitioners' related Freedom of Information Act (FOIA) request for Appendix C information to be completed, the Commission provided the second opportunity to request such access as part of the adjudication.[143] But the Joint Petitioners offer no explanation as to why they did not request access to SUNSI per the Commission's instructions prior to their filing their petition to intervene. Therefore, to the extent the Joint Petitioners now challenge Appendix C of the ER based on that very lack of access, they have provided insufficient information to show that a genuine dispute exists with the applicant.[144]

Don't Waste Michigan Contention 2

Holtec cannot provide reasonable assurances that it can obtain the necessary funds to cover the costs of construction, operation maintenance and decommissioning of the CISF.

Contention 2 is inadmissible in that it fails to establish a genuine dispute with the applicant on a material issue of fact or law, contrary to 10 C.F.R. § 2.309(f)(1)(vi), and fails to raise an issue within the scope of the proceeding, contrary to 10 C.F.R. § 2.309(f)(1)(iii).

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[141] *Id.* at 1. The Joint Petitioners correctly note that this information had been inadvertently mislabeled as "Security-Related Information" in an earlier version of the ER. The ER was updated to correct this error on September 20, 2018 (ADAMS Accession No. ML18255A266).

[142] *See* "Order Imposing Procedures for Access to Sensitive Unclassified Non-Safeguards Information and Safeguards Information for Contention Preparation," 83 Fed. Reg. 32919, 32922 (July 6, 2018); "Order of the Secretary," (Aug. 20, 2018) (extending deadlines for access to SUNSI).

[143] *See* Letter from the Joint Petitioners et al. to the NRC, "Holtec International HI-STORE Consolidated Interim Storage Facility Project Docket No. 72-1051 (Request for additional 90-day extension of scoping comment period and delay of Federal Register announcement of intervention window)," (July 19, 2018) (ADAMS Accession No. ML18208A465) at 2.

[144] 10 C.F.R. § 2.309(f)(1)(vi).

The Joint Petitioners allege that the applicant intends to enter into a contract with the U.S. Department of Energy (DOE) wherein DOE would take title to the nuclear waste and be responsible for transporting it to the CISF.[145] The Joint Petitioners rely on this premise to assert that "Holtec thus will not construct the CISF without financial guarantees from the U.S. Department of Energy."[146]

But the same key portions of the application that the Joint Petitioners quote make clear, to the contrary, that the Applicant may instead enter into contracts with nuclear plant owners, not necessarily with DOE.[147] For example, Joint Petitioners excerpt a statement that provides: "Additionally, as a matter of financial prudence, Holtec will require the necessary user agreements in place (from the DOE *and/or the nuclear plant owners*) that will justify the required capital expenditures by the Company."[148] The Joint Petitioners likewise quote a draft license condition proposed by the Applicant, which contains the same option: "In accordance with 10 C.F.R. 72.22, the construction program will be undertaken only after a definitive agreement with the prospective user/payer for storing the used fuel (USDOE *and/or a nuclear plant owner*) at HI-STORE CIS has been established."[149] In short, the Joint Petitioners' contention relies entirely on reading out of the application the acknowledgement that the Applicant may obtain its funding by enter into contracts with utilities rather than with DOE. A petitioner's misreading of a document cannot form the basis for an admissible contention.[150] Here, the Joint Petitioners' own

[145] Joint Petition at 32–33.

[146] *Id.* at 34.

[147] *Id.* at 32–33.

[148] *Id.* at 32 (quoting "HI-STORE CIS Facility Financial Assurance & Project Life Cycle Cost Estimates," (ADAMS Accession No. ML18058A608) at 3 (emphasis added)).

[149] Joint Petition at 33 (quoting License Condition No. 17 of Holtec's proposed draft license (ADAMS Accession No. ML17310A223) (emphasis added)).

[150] *Georgia Institute of Technology* (Georgia Tech Research Reactor), LBP-95-6, 41 NRC 281, 300 (1995).

references to the application simply contradict their claim that the application relies exclusively on DOE funding for financing facility construction.

The Joint Petitioners also rely on various public statements that the Applicant has made reflecting its future plans to attempt to enter into a contract with DOE.[151] However, because the potential future plans of the applicant do not present a genuine dispute regarding the actual content of the current application, it is inadmissible.[152] Since the Joint Petitioners have failed to demonstrate any genuine dispute with the applicant regarding financial dependence on DOE, the contention is inadmissible.[153]

Since the Joint Petitioners have failed to demonstrate a genuine dispute with the applicant, contrary to 10 C.F.R. § 2.309(f)(1)(vi), this contention should be dismissed.

Don't Waste Michigan Contention 3

The Environmental Report contains a gross underestimation of the volume of low-level radioactive waste ("LLRW") that will be generated by the use of concrete and other materials for bunkering of the SNF canisters, and by replacement of the canisters themselves during the operational life of the CISF. Besides providing a distorted view of the waste management obligations the project will create, the financial burdens arising from creation, oversight and disposition of millions of additional tons of LLRW causes a seriously inaccurate picture of the true costs of constructing, operating and decommissioning the Holtec CISF.

In Proposed Contention 3, the Joint Petitioners assert that the Environmental Report underestimates the volume of low level radioactive waste that will be produced at the facility. Specifically, the Joint Petitioners assert that the concrete used in the facility, in addition to some surrounding soil, may over the life of the facility become low level radioactive waste.[154] The Joint

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[151] Joint Petition at 34.

[152] *See e.g. Duke Energy Corp.* (McGuire Nuclear Station Units 1 and 2 Catawba Nuclear Station Units 1 & 2,) CLI-02-14, 55 NRC 278, 294 (contentions that are based on projected changes to a license, not currently before the NRC in any proceeding or application, are not sufficient to support admission of a contention).

[153] *See* 10 C.F.R. § 2.309(f)(1)(vi).

[154] Joint Petition at 38.

Petitioners further question the ability of the Applicant to decontaminate storage casks and canisters after operation.[155]

Contention 3 is inadmissible, because the Joint Petitioners' fundamental claim regarding the amount of material that may become low level waste is unsupported by sufficient facts or expert opinions, contrary to 10 C.F.R. § 2.309(f)(1)(v), and the Joint Petitioners fail to show that a genuine dispute has been presented with the application, contrary to 10 C.F.R. § 2.309(f)(1)(vi).

Even assuming some material such as concrete or soil becomes contaminated as the contention posits, the Joint Petitioners have not provided facts or expert testimony to support its broad assertion that the Environmental Report "grossly underestimates" the amount of waste. Petitioners assert that "most or all of the 8,000,000 tons of concrete and other subgrade fill materials used for waste containment will become LLRW"[156] and that "discarded canisters instantly become LLRW."[157] But the Joint Petitioners provide no supporting evidence or expert opinion that would explain how *all* material used in the ISFSI structures, or even a significant amount of material at the site, would become activated, nor do the Joint Petitioner explain why it is unreasonable to assume that the empty casks cannot be decontaminated as described in Environmental Report Section 4.11.5.[158] Even so, "mere speculation nor bare or conclusory assertions, even by an expert, alleging that a matter should be considered will suffice to allow the admission of a proffered contention."[159]

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[155] Joint Petition at 36–43.

[156] Joint Petition at 38.

[157] Joint Petition at 42.

[158] ER at 4-44.

[159] *FirstEnergy Nuclear Operating Co.* (Davis-Besse Nuclear Power Station Unit 1), LBP-12-27, 76 NRC 583, 595 (2012) (citing *Fansteel*, CLI-03-13, 58 NRC at 204–05 (2003)).

Furthermore, throughout the contention the Joint Petitioners inconsistently refer to the systems and processes they are criticizing in the application, such as the distinction between waste canisters and the casks in which they would be stored. For example, one portion of the contention discusses waste from contaminated "concrete and canisters," but later, on the same page, the petition refers to the waste generated "at such time as the [spent nuclear fuel] *casks* are withdrawn from their burial pits to be transported elsewhere."[160] On the subsequent page, after highlighting the Environmental Report's discussion of cask decontamination, the contention challenges the applicant's confidence in decontamination of *canisters*.[161] Additionally, the contention asserts the creation of low level radioactive waste when "the obligatory step of repackaging SNF at Holtec is performed," despite the fact that the application itself does not propose or contemplate repackaging operations as part of the license.[162] The Joint Petitioners further speculate that issues with "transfer activity" will not only occur, but the resulting "scratching and gouging of the walls of the *casks*" will lead to accelerated corrosion of the "canisters."[163] The precise event, type of damage, and corrosion pathway that the Joint Petitioners posit is unclear to the Staff.

These inconsistencies, and the Joint Petitioners' apparent confusion regarding the design and processes defined in the application, underscore the speculative nature of the claims. And the imprecision of the concerns in turn fails to clearly explain the nature of the Joint Petitioners' dispute with the application, let alone establish its materiality.[164] Absent some form

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[160] Joint Petition at 38. The Staff notes that in the proposed design, a canister, not a concrete cask, would be withdrawn from the cavity enclosure container. *See* SAR, Figure 3.1.1, Pages 3-10 – 3-15.

[161] Joint Petition at 39.

[162] Joint Petition at 41-43. *See* SAR, Section 10.3, at 10-10 – 10-22, for a discussion of expected operations, which the Joint Petition neither cites nor disputes.

[163] Joint Petition at 43.

[164] 10 C.F.R. 2.309(f)(1)(v), (vi). *See Private Fuel Storage*, CLI-04-22, 60 NRC at 139 (noting that although a petitioner is not expected "to prove its contention at the admissibility stage, [the Commission] do[es] require that it show a genuine dispute warranting a hearing").

of supporting facts or expert opinion, the Joint Petitioners' bare claims that millions of tons of material will be activated and become LLW, or that the ability of Holtec to decontaminate concrete storage casks is "scientifically-unsupported," do not constitute admissible grounds for the contention. In sum, because the Joint Petitioners have neither provided sufficient facts or expert opinion for its assertions, nor in turn explained how the speculative concerns about LLW volume materially contradict the designs, procedures, and analyses in the application, the contention is inadmissible.

Don't Waste Michigan Contention 4

Holtec has defined a site-specific spent nuclear fuel storage facility that does not qualify for the exclusions from NEPA scrutiny conferred by the Waste Storage GEIS. Consequently, severe accident mitigation during transportation to and from the Holtec CISF and at the CISF, and SNF and GTCC storage and management operations at the CISF site, may not be treated as generic issues and excused from consideration within the EIS.

Contention 4 avers that the generic impact findings of the NRC's Continued Storage Rule do not apply to the Holtec facility and that Holtec must conduct a site-specific environmental analysis of certain environmental impacts.[165] To the extent the Joint Petitioners are asserting that the Holtec ER is required to provide a site-specific analysis for impacts during the term of the proposed CISF license, they are correct. But the application contains such a site-specific analysis, and the NRC's Continued Storage Rule does not require otherwise. Therefore,

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The Joint Petitioners also assert that additional waste may be created "in the event of delivery of defective…or otherwise contaminated" casks or containers. Joint Petition at 37–38. Such an assertion relies on the assumption that licensees will fail to comply with the Commission's rules in Part 71 and the [Department of Transportation] regulations, but the Joint Petition has provided no facts that would demonstrate the likelihood of such a scenario. Given the presumption that licensees will comply with applicable regulations, mere speculation as to such a scenario is insufficient to support an admissible contention. *Curators of the University of Missouri*, CLI-95-8, 41 NRC 386, 400 (1995).

[165] *See* Joint Petition at 46. The Joint Petitioners' initial statement of the contention specifically requests site-specific analysis of "severe accident mitigation during transportation" as well as waste "storage and management operations" at the site. Because the Joint Petitioners fail to even mention these two specific topics again in Contention 4, let alone provide supporting bases, the Commission must likewise find these claims inadmissible. *See* 10 C.F.R. § 2.309(f)(1)(ii) & (v).

Contention 4 fails to demonstrate a genuine dispute with the application on a material issue of law or fact.[166]

The NRC's Continued Storage Rule (*i.e.*, 10 C.F.R. § 51.23) permits an applicant's ER to omit from discussion "the environmental impacts of spent nuclear fuel storage in . . . an ISFSI for the period following the term of the . . . ISFSI license."[167] In the NRC's Generic Environmental Impact Statement (GEIS) in support of the Continued Storage Rule, the NRC generically evaluated the impacts of continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor.[168] The impact determinations in the GEIS are "deemed incorporated" in any relevant EIS authored by the NRC Staff.[169] Importantly, the Continued Storage Rule provides that it "does not alter any requirements to consider the environmental impacts of spent fuel storage during the term of . . . a license for an ISFSI in a licensing proceeding."[170]

The Joint Petitioners claim that the Holtec CISF's storage capacity and policy of returning damaged canisters to the reactor facility are both inconsistent with the Continued Storage GEIS. Although the Joint Petitioners do not appear to directly challenge the conclusions in the Continued Storage and GEIS (an effort that would be inadmissible as a collateral challenge to an NRC regulation),[171] Contention 4 nonetheless misunderstand the application of the Continued Storage Rule to Holtec's ER. The GEIS evaluated the environmental impacts of

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[166] *See* 10 C.F.R. § 2.309(f)(1)(vi).

[167] 10 C.F.R. § 51.23(b).

[168] "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel, Final Report," NUREG-2157 Vol. 1 (ADAMS Accession No. ML14196A105) ("Continued Storage GEIS"); *see* 10 C.F.R. § 51.23(a).

[169] 10 C.F.R. § 51.23(b).

[170] 10 C.F.R. § 51.23(c).

[171] *See* 10 C.F.R. § 2.335(a) ("no rule or regulation of the Commission, or any provision thereof . . . is subject to attack by way of discovery, proof, argument, or other means in any adjudicatory proceeding" without a petition for a waiver in subparagraphs (b), (c), and (d)").

away-from-reactor storage and made certain assumptions, including that an away-from-reactor ISFSI would have a similar storage capacity to the previously-licensed Private Fuel Storage (PFS) facility and also that the construction of a dry transfer system (DTS) would take place "sometime after the ISFSI is built."[172] In explaining these assumptions, the GEIS acknowledged the need for site-specific analysis for impacts occurring during the construction and operation of a specifically licensed storage facility, which are distinct from the timeframe and activities analyzed by the GEIS:

> While the NRC assumes that any proposed away-from-reactor ISFSI would likely be similar to the assumed generic facility . . . from the standpoint of the size, operational characteristics, and location of the facility, *the NRC would evaluate the site-specific impacts of the construction and operation of any proposed facility as part of that facility's licensing process*. This review would not reanalyze the impacts of continued storage of the spent fuel, but would incorporate the impact determinations of this GEIS, as stated in 10 C.F.R. 51.23(b).[173]

Therefore, the ER must (as it does) evaluate the site-specific impacts from the proposed ISFSI. Specifically, the ER evaluates the impacts for storage of 100,000 MTUs of spent fuel (in contrast to the 40,000 MTUs generically evaluated in the GEIS).[174] The Joint Petitioners fail to explain how the ER's *site-specific* analysis contradicts the GEIS. As for the construction of a DTS, Holtec's plan to return damaged or contaminated fuel during its initial 40-year license term does not contradict the assumption in the GEIS regarding the construction of a DTS. To be sure, the GEIS assumed that a DTS would be built during the long-term storage timeframe (*i.e.*, 160 years after the licensed life for reactor operations) and noted that "[a] license would have to request authorization from the NRC to build and operate the DTS, during initial licensing of the ISFSI, or as a later, separate action.[175] As the Joint Petitioners note, Holtec does not seek to

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[172] Continued Storage GEIS at 5-1, 5-2 (Section 5.0).

[173] GEIS at 5-2 (Section 5.0) (emphasis added).

[174] ER at 1-1. Note that the Joint Petitioners reference 173,600 MTUs, *see* Joint Petition at 48, which does not appear in the ER.

[175] GEIS at 5-4 & n.2 (Section 5.0).

build a DTS during the CISF's initial 40-year license term. Neither the GEIS nor NRC regulations require otherwise.

The Joint Petitioners' legal arguments in support of Contention 4 are also inapposite. Namely, the Joint Petitioners claim that the NWPA does not authorize the proposed CISF, that it is not an ISFSI, and that it is therefore not "covered" by the Continued Storage GEIS. As discussed in the NRC Staff's response to Contention 2, Joint Petitioners' legal argument relies entirely on reading out of the application Holtec's acknowledgement that it may operate the CISF by obtaining funding from utilities rather than with DOE. Further, the Continued Storage GEIS makes no assumptions with respect to the ownership of spent nuclear fuel at an away-from-reactor storage facility.[176] Neither do the NRC's regulations in 10 C.F.R. Part 72, which broadly define an ISFSI as a "complex designed and constructed for the interim storage of spent nuclear fuel."[177]

In sum, because Contention 4 is premised on Joint Petitioners' misapprehension of the application of the NRC's Continued Storage Rule to the Holtec license application (and because it fails to contradict the ER's site-specific impact analysis for the period of Holtec's proposed licensed activity), Contention 4 fails to raise a genuine dispute with the ER on a material issue of law or fact.[178] And to the extent those claims constitute a collateral challenge to the Continued Storage Rule or the adequacy of the impact analysis in the GEIS, they are outside the scope of this proceeding.[179] The Commission should therefore dismiss the contention.

Don't Waste Michigan Contention 5

Horizontal hydraulic fracturing ("fracking") is certain to occur underneath the Holtec site.

[176] *See* Continued Storage GEIS at 2-18 (Section 2.1.3).

[177] 10 C.F.R. § 72.3.

[178] 10 C.F.R. § 2.309(f)(1)(vi).

[179] 10 C.F.R. § 2.309(f)(1)(iii).

> *Holtec has acquired mineral rights to a depth of 5,000 feet to part of its site from Intrepid, a potash mining firm. However, within the boundaries of the Holtec site there are mineral leases held by at least half a dozen oil and gas drilling firms and Mosaic Potash, a mining firm. There is no indication in the Environmental Report of any control over present or potential potash mining or oil and gas drilling. And the very area where the concrete bunkers containing SNF casks will be located, fracking activity can be carried on below 5,000 feet. Typical oil and gas wells in the*
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> *Permian Basin region in which Holtec is located are 8,000 or more feet deep. The mineral interests are inadequately disclosed, and the realistic prospects for mineral development immediately surrounding and underneath the Holtec site, and their implications for inducing or expediting geological problems and groundwater movement beneath the site, are inadequately disclosed in the ER.*

In this contention, the Joint Petitioners assert that the ER inadequately discloses mineral interests at, underneath, and surrounding the Holtec site. The Joint Petitioners rely on a map entitled the "Eddy Lea Alliance Site Mineral Conflict Analysis 9-16-15" to support their assertion that "at least half a dozen oil and gas drilling firms"[180] have mineral interests within the boundaries of the site which are undisclosed in the ER.[181] The Joint Petitioners also assert that the implications of these mineral interests for the site, such as the presence of corrosive groundwater and soils[182] or induced earthquakes from fracking,[183] are inadequately disclosed in the ER. The Joint Petitioners assert that the ER does not comply with 10 C.F.R. §§ 72.103(f), 72.90, and 72.94.[184]

This contention is inadmissible as it fails to satisfy the contention admissibility requirements of 10 C.F.R. § 2.309(f)(1)(iv)-(vi).

First, the Joint Petitioners fail to provide support for their assertion that the ER inadequately discloses mineral interests held within the boundaries of the site, as required by 10

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[180] Joint Petition at 49.

[181] *Id.* at 49–50.

[182] *Id.* at 49, 52.

[183] *Id.* at 49.

[184] *Id.* at 54–55.

C.F.R. § 2.309(f)(1)(v). The Joint Petitioners reference the following statement in the ER and allege that it is "misleading or suspect"[185]: "With regard to potential future drilling on the Site, Holtec has an agreement with Intrepid Mining LLC (Intrepid) such that Holtec controls the mineral rights on the Site and Intrepid will not conduct any potash mining on the Site. Additionally, any future oil drilling or fracking beneath the Site would occur at greater than 5,000 feet depth . . ."[186] As the basis for their assertion, the Joint Petitioners rely on a map. The Joint Petitioners maintain that the map shows that "[w]ithin the boundaries of the Holtec site there are mineral leases held by at least the following firms as of 2015: Yates Petroleum Corporation, Abo Petroleum Corporation, Fasken Land & Minerals Ltd., Devon Energy Production Company, LP, Manzano Energy Partners II LLC, OGC Operating LLC and Mosaic Potash, a mining firm."[187] However, the map does not support the Joint Petitioners' contention. Instead, when the Joint Petitioners' map is compared against Figure 3.1.2 of the ER,[188] it is clear that the asserted mineral interests of those companies lie *outside—and not inside*—the boundaries of the CISF site, contrary to the Joint Petitioners' claim. "A document put forth by an intervenor as the basis for a contention is subject to scrutiny both for what it does and does not show."[189] As the Joint Petitioners offer no other basis for their assertion that there are undisclosed mineral interests in the boundaries of the site, the Joint Petitioners fail to provide support for their assertion and fail to meet the requirements of 10 C.F.R. § 2.309(f)(1)(v).

Second, contrary to 10 C.F.R. § 2.309(f)(1)(vi), the Joint Petitioners fail to raise a genuine dispute with the applicant on a material issue of law or fact. The Joint Petitioners assert

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[185] *Id.* at 50.

[186] ER at 3-2.

[187] Joint Petition at 50.

[188] ER at 3-5.

[189] *Yankee Atomic Electric Co.,* (Yankee Nuclear Power Station), LBP-96-2, 43 NRC 61, 90 (1996); *rev'd in part on other grounds*, CLI-96-7, 43 NRC 235 (1996).

that "[t]he ER does not faithfully report the true story of land ownership and mineral rights interest nor admit the likelihood that throughout the occupation of the site by Holtec International for purposes of interim SNF storage, fracking and mining will take place, adjacent to and beneath the occupied parts of the Holtec property."[190] However, the Joint Petitioners fail to identify and controvert portions of the ER, which acknowledge oil and gas development near the site. For example, Section 3.1.2 of the ER states, "[t]he oil and gas industry is well established in the area surrounding the Site, with producing oil and gas fields, support services, and compressor stations. Nearly all phases of oil and gas activities have occurred in the locality. These phases include seismic exploration, exploratory drilling, field development (comprised of production and injection wells) and other sundry activities associated with hydrocarbon extraction."[191] Furthermore, the ER acknowledges that oil drilling and fracking will occur beneath the site. It states, "any future oil drilling or fracking beneath the Site would occur at greater than 5,000 feet depth, which ensures there would be no subsidence concerns."[192] In sum, the Joint Petitioners fail to identify or controvert the discussion on oil and gas development in the "Surrounding Land Use" section of the ER and the ER's assertion that oil and gas development will occur 5,000 feet below the site without subsidence concerns. "Any contention that fails directly to controvert the application or that mistakenly asserts the application does not address a relevant issue can be dismissed."[193] Having failed to controvert the application's discussion on surrounding land use and future oil and gas drilling, this contention fails to raise a genuine dispute with the application on a material issue of law or fact.

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[190] Joint Petition at 51–52.

[191] ER at 3-2.

[192] ER at 3-2; *see also* SAR at 2-54.

[193] *See Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Unit 3), LBP-08-9, 67 NRC 421, 433 (citing *Sacramento Mun. Util. Dist.* (Rancho Seco Nuclear Generating Station), LBP-93-23, 38 NRC 200, 247–48 (1993), *review declined*, CLI-94-2, 39 NRC 91 (1994)).

This contention is also inadmissible as the Joint Petitioners fail to demonstrate that issues raised in the contention are material to the findings the NRC must make, in accordance with 10 C.F.R. § 2.309(f)(1)(iv). Although the Joint Petitioners assert inadequacies with the ER, the Joint Petitioners' primary concerns with respect to groundwater appear to be safety related.[194] For example, the Joint Petitioners assert that "[t]here is no investigation in the ER into the chemical status of water and soils and their possibly corrosive effects on steel casks, as well as their corrosive effect on the concrete bunkers, and other artificial substrate materials."[195]

However, that safety analysis, such as the CISF's ability to resist corrosion, which the Joint Petitioners allege is missing from the ER, is located in the SAR. Contrary to the Joint Petitioners' allegation that there only exists a "faith-based insistence"[196] that the corrosive groundwater and soil will not come into contact with the casks and that "the effects of natural and/or human-added corrosives in the soil are not incorporated into any plan for mitigating or halting otherwise inevitable corrosion to the casks themselves, and the engineered support structures surrounding the casks," the applicant in the SAR asserts otherwise.[197] The SAR states that the steel cavity enclosure container which contains the SNF "is substantially sequestered from the native soil through two engineered features: . . . [a] thick reinforced concrete Enclosure Wall surrounds the [vertical ventilated modules] array and, along with the Support Foundation pad, provides a physical separation (water intrusion protection) to the CECs[; and] . . . [t]he subgrade in contact with the CECs is either a 'free flow' concrete or an

[194] To the extent the Joint Petitioners claim that Holtec has ignored groundwater impacts from pollution, *see* Joint Petition at 53, the ER discusses these impacts at 4-12 (concluding that "[s]urface runoff from the Site . . . would not reach groundwater"). Therefore, contrary to 10 C.F.R. § 2.309(f)(1)(vi), this aspect of the contention fails to controvert the application.

[195] Joint Petition at 52.

[196] *Id*.

[197] *Id.* at 53.

engineered fill selected to provide a non-aggressive environment around the CECs."[198] Without having specifically controverted this analysis in the SAR, the Joint Petitioners' claims amount to mere speculation and fail to demonstrate that the issue raised in the contention is material to the findings the NRC must make in the EIS to support the licensing action in accordance with 10 C.F.R. § 2.309(f)(1)(iv).

The same is true for the Joint Petitioners' assertions with respect to induced seismicity. Both the ER and the SAR contain discussions on seismic information.[199] However the Joint Petitioners fail to reference either discussion. Furthermore, both documents contain a discussion of accidents analyzed, including earthquakes, which were evaluated in the SAR for their consequence to the structural, thermal, shielding, criticality, confinement, and radiation protection performance of structures, systems, and components specific to the CISF, and the HI-STORM UMAX system, and the results of those analyses are summarized in the ER.[200] Importantly, the ER states that none of the accident events "would result in release of any radioactive material."[201] Because the Joint Petitioners fail to identify and controvert these analyses and explain why, if the Joint Petitioners' concerns were considered, the earthquakes analyzed would be non-bounding, the Joint Petitioners' assertions amount to speculation and do not raise a genuine dispute with the application on a material issue of law or fact.

In sum, because this contention does not meet the requirements of 10 C.F.R. § 2.309(f)(1)(iv) -(vi), this contention is inadmissible.

Don't Waste Michigan Contention 6

The Holtec CISF is a major component of a large plan to aggregate SNF in southeastern New Mexico for purposes of reprocessing. A radioactively "dirty"

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[198] SAR at 17-23.

[199] *See* ER at 3-13 – 3-14; SAR, Rev. 0A at 2-87 – 2-90.

[200] SAR 15-7 – 15-17; ER at 4-55 – 4-56.

[201] ER at 4-56.

industrial activity, reprocessing has been omitted from analysis and disclosure of cumulative environmental impacts.

In this contention, the Joint Petitioners assert that the Applicant's "cumulative effects" analysis fails to consider "plans for a reprocessing facility" associated with the Holtec CISF. As evidence of such future reprocessing plans, the Joint Petitioners reference a 2015 slide show given by a Holtec representative to the New Mexico State Legislature;[202] a 2017 newspaper article;[203] and a 2008 "Draft Global Nuclear Energy Partnership Programmatic Environmental Impact Statement" completed by the Department of Energy.[204] According to the Joint Petitioners, because reprocessing of SNF has been identified by Holtec as an activity associated with the aggregation of SNF in southeastern New Mexico, because members of the Eddy-Lea Energy Alliance (the local governmental entity that owns the Holtec site) advocate for reprocessing, and because there are industrial resources in the region which could be harnessed for reprocessing, reprocessing must be discussed as a cumulative impact in accordance with 40 C.F.R. §§ 1508.7 and 1508.25.[205]

This contention is inadmissible because the Joint Petitioners have failed to show that a genuine dispute exists with the applicant on an issue of material fact or law in accordance with 10 C.F.R. § 2.309(f)(1)(vi). Although the Joint Petitioners correctly note that a cumulative impact analysis must include "the incremental impact of the action when added to other past, present,

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[202] Joint Petition at 55 (citing to John Heaton, Chairman ELEA, LLC, "A Centralized Interim Storage Facility for Used Nuclear Fuel," https://www.nmlegis.gov/handouts/RHMC%20080216%20Item%205%20Interim%20Storage--Eddy-Lea%20County%20Alliance.pdf, *also available at* https://bit.ly/2REDT2m) ("Holtec Slideshow").

[203] Joint Petition at 55–56 (citing Ralph Vartabedian, *1,800 Tons of Radioactive Waste has an Ocean View and Nowhere to Go*, LA Times (Jul. 2, 2017, 3:00 AM), http://www.latimes.com/local/california/la-me-stranded-nuclear-waste-20170702-htmlstory.html, *also available at* https://lat.ms/2t5EfEI ("LA Times article").

[204] Joint Petition at 56 (citing DOE, "Draft Global Nuclear Energy Partnership Programmatic Environmental Impact Statement (GNEP PEIS; DOE/DIS-0396)," (Oct. 2008), https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/EIS-0396-DEIS-2008.pdf, *also available at* https://go.usa.gov/xP9ry ("DOE/EIS-0396").

[205] Joint Petition at 57–59.

and reasonably foreseeable future actions,"[206] this requirement is not without its limits. In *Kleppe v. Sierra Club*, the Supreme Court explained that an environmental impact statement need only include other related actions when those actions have been formally proposed and are pending before an agency.[207] Specifically, the Supreme Court stated, NEPA "speaks solely in terms of Proposed actions; it does not require an agency to consider the possible environmental impacts of less imminent actions when preparing the impact statement on proposed actions."[208]

The Commission has also long recognized this ripeness requirement and held that, consistent with NEPA's "rule of reason," projects that are not concrete or reasonably certain, but are instead "merely contemplated," do not warrant consideration in the cumulative impact analysis.[209] And the Commission recently reiterated that a possible future action must "be in a sufficiently advanced stage to be considered a 'proposal' for action that 'bring[s] NEPA into play.'"[210]

At best, the evidence proffered by the Joint Petitioners reflects speculation about the potential for (or benefits of) future reprocessing activities. They identify no pending proposal for a reprocessing facility that would meet the Commission's standard for ripeness. The Holtec slide show merely notes that the CISF "Provides the most flexibility for recycling, research, and disposal."[211] Additionally, the "Draft Global Nuclear Energy Partnership Programmatic Environmental Impact Statement" makes clear that it is but "a first, important step in deciding

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[206] 40 C.F.R. § 1508.7.

[207] 427 U.S. 390, 410 (1976).

[208] *Id*. at 410 n. 20. The Supreme Court further explained, "Should contemplated actions later reach the stage of actual proposals, impact statements on them will take into account the effect of their approval upon the existing environment; and the condition of that environment presumably will reflect earlier proposed actions and their effects." *Id.*

[209] *McGuire*, CLI-02-14, 55 NRC at 295.

[210] *Strata Energy, Inc*, (Ross In Situ Recovery Uranium Project), CLI-16-13, 83 NRC 566, 577 (2016) (quoting *McGuire/Catawba*, CLI-02-14, 55 NRC at 295).

[211] Holtec Slideshow at 4.

whether and how to recycle spent nuclear fuel. . . . [And] [a]t this time, DOE is not proposing project-specific or site-specific actions. . . ."[212] Lastly, the LA Times article offers no additional detail except to suggest a political appetite for such a project in the area.[213] These expressions of interest fall far short of a pending proposal as required by *Sierra Club v. Kleppe* and the Commission's application of the *Kleppe* standard.

For the reasons discussed above, the Joint Petitioners have failed to demonstrate that the applicant's cumulative impacts analysis must consider the environmental impacts of a potential reprocessing facility. Because the Joint Petitioners fail to raise a genuine dispute with the ER on an issue of material fact or law in accordance with 10 C.F.R. § 2.309(f)(1)(vi), this contention is inadmissible.

Don't Waste Michigan Contention 7

Holtec's "HI-STORE philosophy" of "Start Clean/Stay Clean," whereby incoming shipments of canisters that are contaminated, leaking or otherwise compromised will be returned to the originating power plant for dispositioning, is illegal under NRC regulations and the Atomic Energy Act. It is unlawful to knowingly ship containers with radiation on exposed or external surfaces. Once delivered to the site, leaky and/or contaminated canisters must remain at Holtec–but Holtec expressly intends to return such canisters to their points of origin. Leaking or otherwise compromised shipping containers would likewise present an immediate danger to the corridor communities through which they would travel back to their nuclear power plant site of origin, likely violating numerous additional NRC and DOT regulations

In Proposed Contention 7, the Joint Petitioners raise a concern with Holtec's proposed "start clean/stay clean policy."[214] Contention 7 asserts that such a policy is unlawful and that such rejections and shipments constitute a danger that the application has not addressed.

[212] DOE/EIS-0396 at S-2.

[213] The article quotes the mayor of Hobbs, Sam Cobb, as stating "We believe if we have an interim storage site, we will be the center for future nuclear fuel reprocessing."

[214] Joint Petition at 61.

The contention is inadmissible because the Joint Petitioners have not provided a clear basis for their contention, have raised issues outside the scope of the proceeding, and have not provided sufficient factual information or expert testimony to support their claims.[215]

As a threshold matter, NRC and Department of Transportation have issued rules in 10 C.F.R. Part 71 and 49 C.F.R. Part 173, Subpart I, addressing the requirements of transportation packages and shipments. Challenges to the acceptability of Part 71 requirements or the ability of shippers to meet these requirements are outside the scope of this proceeding under 10 C.F.R. §§ 2.335(a) and 2.309(f)(1)(iii),[216] and the Joint Petitioners present no factual support for an assumption that either fuel received at the facility or transported from the facility would fail to comply with those requirements.[217] Indeed, as the Commission held in *Oyster Creek*, "this agency has declined to assume that licensees will contravene our regulations."[218]

The Joint Petitioners' assumption that canisters could be received or transported in violation of Part 71 requirements lacks support and fails to demonstrate a genuine dispute with the application. The portion of the application relied on by the Joint Petitioners states that

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[215] 10 C.F.R. § 2.309(f)(1)(iii), (v).

[216] *See* Holtec International's HI-STORE Consolidated Interim Storage Facility for Interim Storage of Spent Nuclear Fuel, 83 Fed. Reg. 32,919 at 32,920 (July 16, 2018) (providing notice that this application is for "a specific license pursuant to Part 72"); *GPU Nuclear, Inc.* (Oyster Creek Nuclear Generating Station), CLI-00-6, 51 NRC 193, 207 (2000).

[217] Additionally, the Staff notes that the Joint Petitioners appear to conflate the terms cask and canister. *See, e.g.* Joint Petition at 62 (discussing the "policy of shipping such *casks* back to the point of origin"). In the proposed design, as quoted in the Joint Petition, the metallic canisters, not casks, may be returned.

[218] 51 NRC at 207. The NRC Staff also notes that the Commission has previously found inadmissible a similar contention regarding speculation as to the environmental effects of a similar policy (regarding defective or defectively sealed canisters) proposed by the applicant in *Private Fuel Storage*. *See Private Fuel Storage*, CLI-04-22, 60 NRC at 138–139. There, the Commission found that particularly in light of prior generic determinations that transportation accidents causing accidental canister breach were not credible, to show a genuine dispute the petitioner would "have to give the Board reason to believe that contamination from a defective canister could find its way outside of the cask." *Id.* On the facts of that case, the Commission further agreed with the applicant that the applicant's associated quality assurance plans would, without allegations to the contrary, make it "highly improbable that a seriously contaminated canister or cask would arrive" at the site, and that a shipping cask can serve "as sufficient containment for the return trip." *Id.* at 138.

canisters exceeding the limits set by site requirements will be "returned to the originating power plant for dispositioning."[219] The Joint Petitioners appear to believe that such containers would necessarily fail to meet Part 71 transportation requirements.[220] The proposed license requires that after arrival at the facility "gas in the cavity of Transport Cask containing the loaded canister will be tested for Krypton-85 gas" and that the concentration "shall be less than 10^{-4} µCi/cc prior to unloading the canister."[221] However, a shipment's failure to meet the proposed site requirements would not inherently contravene standards in 10 C.F.R. § 71.47 for radiation levels at the external surface of the package.[222] Accordingly, the Joint Petitioners fail to show that the wording of the application implies a conflict with Part 71 or DOT regulations. Their assumption that such a practice would be implemented in a manner contrary to Part 71 and DOT requirements is simply unsupported speculation and fails to demonstrate a genuine dispute with the applicant on a material issue.[223]

Consequently, the Joint Petitioners have not provided support for their assumption that the statement in the application conflicts with existing safety standards for transportation established by regulation. Nor does the petition explain a basis for why such a practice would create any increased risk of the applicant either receiving or shipping canisters and casks in

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[219] SAR, Section 3.1.4.6 at 3-7.

[220] The Joint Petitioners have claimed it is unlawful "to ship containers with radiation on exposed or external surfaces." Joint Petition at 61.

[221] Proposed TS at 5-5. *See also* SAR, Section 10.3.3.1, Table 10.3.3.

[222] For example, the confinement boundary for the HI-STAR 190 is the overpack, not the boundary of the canister. So long as other conditions of the transportation package certificate are met, material inside the package can be shipped. *See* HI-STAR 190, Certificate No. 9373, (ADAMS Accession No. ML17222A082) ("The overpack is a right circular cylinder featuring a containment vessel formed by a nickel steel shell welded to a nickel steel baseplate and to a nickel steel top forging. . . The overpack provides the containment boundary, the helium retention boundary, gamma and neutron radiation shielding, and heat rejection capability of the package.").

[223] *See Private Fuel Storage*, CLI-04-22, 60 NRC at 138–139. *See also Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site*),* LBP-07-3, 65 NRC 237, 253 (2007) ("[N]either mere speculation nor bare or conclusory assertions, even by an expert, alleging that a matter should be considered will suffice to allow the admission of a proffered contention.") (*citing Fansteel*, CLI-03-13, 58 NRC at 203).

contravention of existing regulatory limits, let alone that it would create a "viable mechanism by which significant radioactive materials would migrate off-site."[224]

In sum, the proposed contention amounts to unsupported speculation that the applicant (or other licensees responsible for transportation) will not comply with applicable regulations; such conclusory allegations are not suitable for resolution in this proceeding.[225] Consequently, the contention is inadmissible under 10 C.F.R. § 2.309(f)(1)(iii), (v), and (vi).

Don't Waste Michigan Contention 8

In several places in the ER, Holtec states that "Table 4.9.1" provides data tending to show minimal radiation dangers from transporting the casks of spent nuclear fuel. The data is not narratively reproduced in the ER. The missing table undermines Holtec's basis for claiming minimal effects from transporting SNF and GTCC waste.

The Joint Petitioners contend that Holtec omitted Table 4.9.1 from its environmental report (ER) and that the table is not narratively reproduced.[226] Namely, the Joint Petitioners identify three places in Chapter 4 of the ER that reference Table 4.9.1, and they assert that the table's omission from the ER both undermines Holtec's position that the transportation of SNF will cause minimal radiation effects on the public and deprives the public from assessing these effects.[227]

Contrary to the Joint Petitioners' claim, Table 4.9.1, titled "Annual Incident-Free Transportation Impacts," is included in the ER, immediately following the references that Joint Petitioners cite as the basis for the omission. The table shows results of the incident-free analysis of transporting 500 canisters of spent nuclear fuel (SNF) annually.[228]

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[224] Joint Petition at 62.

[225] *See Entergy Nuclear Operations, Inc.* (Indian Point, Unit 2), CLI-16-5, 83 NRC 131, 136 (2016).

[226] The format in which the information is presented, whether in narrative, table, or another format, is immaterial to the staff's review. Thus, the contention does not satisfy the admissibility standard of 10 C.F.R. § 2.309(f)(1)(iv), which requires the contention be material to the NRC's review.

[227] Joint Petition at 64.

[228] ER at 4-37.

To meet the admissibility standards of 10 C.F.R. § 2.309(f)(1)(vi), a petitioner "must make a minimal showing that material facts are in dispute, thereby demonstrating that an 'inquiry in depth' is appropriate."[229] Consistent with that threshold, an "erroneous assertion of an omission fails to satisfy the requirements of 10 C.F.R. § 2.309(f)(1)(vi)."[230] Therefore, because the Joint Petitioners do not present a genuine dispute over whether Table 4.9.1 is missing from the ER, Contention 8 should be rejected.

Don't Waste Michigan Contention 9

There is only one map published in the Environmental Report that shows any of the routes which will be taken for delivery of SNF and GTCC waste to Holtec, and it only mentions transport of radioactive material from two reactors. The information provided comes nowhere near disclosure of a 20-year transport campaign of an estimated 10,000 cask deliveries.

In the proposed contention, the Joint Petitioners allege a contention of omission that all potential transportation routes must be provided in the Environmental Report, and that currently, the Environmental Report does not include this information. The Joint Petitioners argue that this information is needed "for Petitioners to meaningfully participate in the NEPA process," and to understand the scope of the transportation impacts, "there must be unconditional disclosure of probabl[e] transportation routes."

The contention is inadmissible because the Joint Petitioners have not demonstrated that the allegedly omitted information represents a genuine dispute with the application on a material issue of law or fact, contrary to 10 C.F.R. § 2.309(f)(1)(vi).

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[229] *Gulf States Utilities Co.* (River Bend Station, Unit 1), CLI-94-10, 40 NRC 43, 51 (1994) (citing Final Rule, Rules of Practice for Domestic Licensing Proceedings – Procedural Changes in the Hearing Process, 54 Fed. Reg. 33,168, 33,171 (Aug. 11, 1989), quoting *Connecticut Bankers Ass'n v. Board of Governors*, 627 F.2d 245, 251 (D.C. Cir. 1980)).

[230] *Progress Energy Carolinas, Inc.* (Shearon Harris Nuclear Power Plant, Units 2 and 3), LBP-09-8, 69 NRC 736, 743 (2009) (finding that information in an existing design certification rule that is incorporated by reference into the application is not an omission, thus the contention of omission is inadmissible under 10 C.F.R. § 2.309(f)(1)(vi)); *see Georgia Institute of Technology* (Georgia Tech Research Reactor), LBP-95-6 , 41 NRC 281, 300 (1995) ("A petitioner's imprecise reading of a reference document cannot serve to generate an issue suitable for litigation").

The National Environmental Policy Act, NEPA, requires that "agency take a 'hard look' at the environmental consequences before taking a major action."[231] However, in making this hard look and determining the potential effects, an agency must apply a "rule of reason" in dealing with potential uncertainty.[232] In keeping with this rule of reason, agencies may make "reasonable assumptions in its environmental analyses."[233] The Commission has emphasized that for an EIS, the relevant NEPA standard is not whether the assumptions made are "the best or whether it will turn out true, but 'whether the []assumptions of the FEIS were so distorted as to impair fair consideration of those environmental effects.'"[234]

In the Environmental Report Section 4.9.3, the applicant has evaluated three "representative routes" to determine the likely radiological impacts of transportation.[235] The Joint Petitioners do not assert that an ISFSI applicant is either required to specify from which precise reactor sites fuel may ultimately be received, and an ISFSI licensee is not responsible for definitively determining the transportation routes that will ultimately be used. Accordingly, given those uncertainties, the Joint Petitioners fail to explain why their broad demand for disclosure of apparently unlimited possible routes ("unconditional disclosure of probabl[e] routes") rather than the ER's use of representative routes is required by NEPA. Indeed, the NRC has repeatedly used representative routes to evaluate transportation impacts in past Environmental Impact

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[231] *Baltimore Gas & Elec. Co. v. NRDC*, 462 U.S. 87, 97–98 (1983).

[232] *See* National Environmental Policy Act Regulations, 50 Fed. Reg. 32,234 (Aug. 9, 1985) (codified at 40 C.F.R. Part 1502) ("CEQ is concerned that the requirement to prepare a 'worst case analysis' in certain circumstances has been the impetus for judicial decisions which require federal agencies to go beyond the 'rule of reason' in their analysis of potentially severe impacts").

[233] *Inland Empire Pub. Lands Council v. U.S. Forest Serv.*, 88 F.3d 759, 761 (9th Cir. 1996). *See also W. Org. of Res. Councils v. Bureau of Land Mgmt.*, 591 F. Supp. 2d 1206, 1228 (D. Wyo. 2008), aff'd sub nom. *BioDiversity Conservation Alliance v. Bureau of Land Mgmt.*, 608 F.3d 709 (10th Cir. 2010).

[234] *Private Fuel Storage*, CLI-04-22, 60 NRC at 145 (quoting *Louisiana Energy Services, L.P.* (Claiborne Enrichment Center), CLI 98-3, 47 NRC 77, 89 (1998)).

[235] ER Rev. 0 at 4-32 – 4-34.

Statements.[236] The proposed contention asserts that the "transportation aspects of Holtec are of high significance to the completion of the project," and it states that the omitted information is needed for the Joint Petitioners "to participate in the proceeding" and for "the public and emergency response officials to even begin to understand the scope of the Holtec project's transportation side[.]"[237]

But while the Joint Petitioners allude to a wide range of possible transportation modes and routes that could theoretically be analyzed, they fail to state with more specificity why that spectrum renders the applicant's approach in the Environmental Report an unreasonable method of analyzing and informing the public of the potential environmental effects of transportation of fuel to the facility.

Accordingly, the proposed contention fails to demonstrate a genuine dispute with the application on a material issue of law or fact, contrary to 10 C.F.R. § 2.309(f)(1)(vi).

Don't Waste Michigan Contention 10

The Inconsistent Predicted Lengths of the Period of Operation of the CISF Warrant NEPA Scrutiny of Potential for Operations Exceeding 100 Years.

The Joint Petitioners aver that extended operation of the Holtec CISF beyond the long-term storage period identified in the Continued Storage GEIS must be analyzed as a cumulative impact in the ER.[238] Accordingly, Contention 10 requests an analysis of the Holtec CISF as a

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[236] *See e.g.*, Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel, NUREG-2157, at 5-52; Final Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah, NUREG-1714, at 5-39. *See also* 10 C.F.R. § 51.52, Table S-4 (deriving generic effects of transportation and fuel waste for one power reactor based on survey of then-existing power plants).

[237] Joint Petition at 67. Indeed, to the extent that the Joint Petitioners seek to litigate the specific routes that will ultimately be used by shippers, these issues are outside the scope of this proceeding. The Department of Transportation is responsible for overseeing vehicle safety, routing, shipping papers, emergency response, and shipper training. Challenges to DOT regulations and its regulatory scheme are plainly outside the scope of this proceeding. *See Duke Power* Company (Catawba Nuclear Station, Units 1 and 2), LBP-82-51, 16 NRC 167, 172 (1982).

[238] Joint Petition. at 68.

potential permanent repository.[239] This contention raises identical issues as the Joint Petitioners' Contention 4, and similarly represent a direct challenge to the NRC's Continued Storage Rule. Therefore, Contention 10 is inadmissible.[240]

Here, the ER has defined Holtec's proposal as seeking an initial 40-year license, which it anticipates would be followed by two 40-year license renewals pursuant to 10 C.F.R. § 72.42. Contention 10 identifies no internal inconsistency in this description. Accordingly, the ER contains a site-specific analysis of the environmental impacts at the proposed Holtec CISF facility for "approximately 120 years (40 years for initial licensing plus 80 years for life extensions)."[241] Under NEPA, only the impacts arising from the *proposed* action must be analyzed.[242] Of course, the NRC generically evaluated the environmental impacts of waste storage beyond licensed operations of a reactor in the Continued Storage GEIS.[243]

Contention 10 essentially conflates the "long-term timeframe" evaluated in the Continued Storage GEIS with Holtec's proposed license term. In the GEIS, the long-term timeframe evaluated the impacts of continued storage for 100 years after short-term storage; the short-term storage evaluation considered the impacts for the first 60 years beyond a reactor's licensed life for operations.[244] Per the Continued Storage Rule, these impacts need not be evaluated in the ER and will be deemed incorporated into the Staff's EIS.[245] Therefore, aside from Contention 10's challenge to the Continued Storage Rule, the contention also fails to raise any issues that would be material to the Staff's environmental review.[246]

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[239] Joint Petition at 70.

[240] 10 C.F.R. § 2.309(f)(1)(iii).

[241] ER at 1-1.

[242] *See Kleppe v. Sierra Club,* 427 U.S. 390, 406 (1976).

[243] *See* Continued Storage GEIS, Chapter 5; 10 C.F.R. § 51.23(b) (the impact determinations of the Continued Storage GEIS are "deemed incorporated" into the NRC Staff's EIS).

[244] Continued Storage GEIS at 5-4 (Section 5.0).

[245] *See* 10 C.F.R. § 51.23.

[246] 10 C.F.R. § 2.309(f)(1)(iv).

Don't Waste Michigan Contention 11

NEPA Requires Significant Security Risk Analyses for the Massive Spent Nuclear Fuel and Greater-Than-Class-C Wastes Proposed for Interim Storage And Associated Transportation Component at Holtec's New Mexico Facility

Contention 11 presents a disjointed discussion of a variety of issues related to the Holtec CISF application, which appears to rely exclusively on a wide-ranging report by Dr. James Ballard expressing his concerns with the Holtec application. Contention 11 is inadmissible for numerous reasons, most fundamental of which is that the Joint Petitioners have provided neither a "specific statement of the issue" being raised nor a "brief explanation of the basis for the contention," contrary to 10 C.F.R. § 2.309(f)(1)(i) and (ii).

As the Commission noted in its 2014 rule change, the contention admissibility rules exist to "focus litigation on concrete issues and result in a clearer and more focused record for decision."[247] Imprecision in a contention will "render[] it impermissible pursuant to the specificity requirement in 10 C.F.R. § 2.309(f)(1)(i),"[248] and the brief explanation of 10 C.F.R. § 2.309(f)(1)(ii) "should rarely require more than a sentence or two."[249] Similarly, supporting information for a proposed contention "must be specifically identified [and] a petitioner 'may not simply incorporate massive documents by reference as the basis for or as a statement of his contentions.'"[250] The Joint Petitioners' unwieldy Contention 11, consisting of 18 pages of text interspersed with an unfocused collection of 29 separate "sub-contentions" that vaguely "bring[s]

[247] Changes to Adjudicatory Process, 69 Fed. Reg 2182, 2202 (Jan. 14, 2004). *See also Crow Butte Resources, Inc.* (In Situ Leach Facility, Crawford, Nebraska), LBP-15-15, 81 NRC 598, 601.

[248] *Florida Power & Light Company* (Turkey Point Nuclear Generating Plant, Units 6 and 7), LBP-17-2, 85 NRC 14, 31 (2017).

[249] *U.S. Department of Energy* (High-Level Waste Repository), LBP-08-10, 67 NRC 450, 455 (2008). *But see Progress Energy* (Levy County Nuclear Power Plant, Units 1 and 2), LBP-09-10, 70 NRC 51, 100 (2009) (noting that the brief explanation "merely requires an explanation of the rationale or theory of the contention.").

[250] *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Units 2 and 3), LBP-04-15 (2004), *quoting Public Service Company of New Hampshire* (Seabrook Station, Units 1 and 2), CLI-89-3, 29 NRC 234, 240–41 (1989)).

to [ ] notice" a 70 page report," fails to meet this standard.[251] On this basis alone, the contention should be found inadmissible.[252]

i. NEPA evaluation of impacts of terrorism is outside the scope of the proceeding

Moreover, to the extent any common theme is discernible from the multiplicity of claims in the text and the referenced report, it appears to stem from a concern that a terrorist attack must be addressed in the environmental review process.[253] Yet Commission precedent directs that this is an issue outside the scope of the proceeding, contrary to 10 C.F.R. § 2.309(f)(1)(iii). In particular, although the Petition describes the findings of the U.S. Court of Appeals for the Ninth Circuit in *San Luis Obispo Mothers for Peace v. NRC*,[254] the Commission has made clear that outside licensing actions in the Ninth Circuit, the NRC is not required to consider terrorism in its NEPA analysis.[255] In *Oyster Creek*, the Commission reaffirmed its prior holdings that the "proximate cause" test for a "reasonably close causal relationship" between federal agency action and the environmental consequences is the appropriate test for the necessity of a NEPA analysis.[256] Specifically, the Commission held that an NRC licensing action is not a proximate cause of a terrorist act, and as a result, "NEPA does not require the NRC to consider the environmental consequences of hypothetical terrorist attacks on NRC-licensed facilities."[257]

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[251] Joint Petition at 71.

[252] *See Crow Butte*, CLI-09-12, 69 NRC at 552 (noting that "contentions based on little more than guesswork would waste the scarce adjudicatory resources of all involved.").

[253] *See e.g.*, Joint Petition at 71 (summarizing Dr. Ballard's credentials); Joint Petition at 72–73 (referring to impacts of radiological events "whether accidental or caused intentionally by others," and shipments as targets of 'lone wolf' attacks); Joint Petition at 77–79 (discussing *San Luis Obispo Mothers for Peace v. NRC* holding that required consideration of terrorist attacks).

[254] 449 F.3d 1016 (9th Cir. 2006).

[255] *Amergen Energy Company, LLC* (Oyster Creek Nuclear Generating Station), CLI-07-8, 65 NRC 124, 129 (2007).

[256] *Id.* at 129-130 (citing *Metropolitan Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766, 772–75 (1983) and Department of Transportation v. Public Citizen, 541 U.S. 752, 767 (2004).

[257] *Oyster Creek*, CLI-07-8, 65 NRC at 129–30.

This decision was then affirmed by the U.S. Court of Appeals for the Third Circuit, which, in light of potential hypothetical aircraft attacks of a facility, noted that the "NRC controls whether equipment within a facility is suitable for continued operation or could withstand an accident, but it has no authority over the airspace above its facilities."[258] In light of this, the Court held that this lack of control, in combination with the other intervening events that would predicate an attack, makes the "causation chain too attenuated to require NEPA review."[259]

In its decision in *Oyster Creek*, the Commission noted that its decision was based on the same reasoning given prior decisions, including the decision made in *Private Fuel Storage*, CLI-02-25, 56 NRC 340 (2002). In *Private Fuel Storage*, the Commission held that a license for a specific-license ISFSI does not make a terrorist attack reasonably foreseeable, necessitating a review under NEPA.[260] The Commission has likewise reiterated its intention to follow this approach in new reactor construction projects.[261] For these reasons, and given that the proposed facility is not within the Ninth Circuit, the Joint Petitioners have not demonstrated that environmental analysis of the risk of terrorism is an issue within the scope of findings the NRC must make, and therefore, the contention should be held inadmissible under 10 C.F.R. § 2.309(f)(1)(iii).

ii. The contention's other claims and recommendations fail to demonstrate genuine and material disputes with the application

Beyond the overarching lack of clarity and the out-of-scope NEPA terrorism concerns described above, which are sufficient reasons to dismiss the contention, the varied "sub-

[258] *N.J. Dep't. of Envtl. Prot. v. NRC*, 561 F.3d 132, 140 (3d Circuit 2009).

[259] *Id.*

[260] *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-02-25, 56 NRC 340, 348 (2002) (the claimed impact is too attenuated to find the proposed federal action to be the 'proximate cause' of that impact.").

[261] *System Energy Resources, Inc.* (Early Site Permit for Grand Gulf ESP Site), CLI-07-10, 65 NRC 144, 146–47 (2007).

contentions" exhibit similar deficiencies with respect their demonstration that the issues raised are within the scope of the proceeding and constitute genuine disputes with the application on material topics. For example, the Joint Petitioners' concern that the "Holtec licensing proposal does not address the potential that a permanent repository may never open"[262] is a generic challenge to the NRC's Continued Storage Rule at § 51.23 and is accordingly barred by 2.335(a).[263]

Most notably, in all of proposed Contention 11, there is only one reference to a specific section of the application, and even then, it consists solely of a general reference to the ER's introduction section.[264] Indeed, the contention alludes to numerous issues in passing without describing the specific position of the applicant or otherwise controverting the application, contrary to the requirements of § 2.309(f)(1)(vi). For example, one "subcontention" raises concerns over "routine radiation exposures the public will face per shipment and over the lifespan of the CISF,"[265] but nowhere do the Joint Petitioners cite the Environmental Report's analysis in Section 4.9.3 which addresses this precise issue. The contention includes various other references to transportation issues but likewise neither references nor specifically contradicts any of the portions of the application in which transportation impacts are analyzed. A

[262] Joint Petition at 75.

[263] As another example, the statement that "NRC/Holtec should first define DBEs and DBT's for the whole duration of the transportation campaign" appears to raise a generic concern about transportation safety evaluations that should be resolved through rulemaking, rather than an adjudicatory proceeding over the adequacy of a NEPA analysis. Joint Petition at 80. *See South Carolina Electric & Gas Company* (Virgil C. Summer Nuclear Station, Units 2 and 3), LBP-09-2, 69 NRC 87, 103 (2009) (finding that challenges to the adequacy of the design basis threat was outside the scope of the proceeding).

[264] And in the attached Ballard report, the only apparent references to the application itself are abruptly dismissed, rather than explained and clearly controverted as required by 10 C.F.R. 2.309(f)(1)(vi). For example, endnote 11 to the report summarily lists multiple sections of the ER regarding accidents, but dismisses them with the broad observations that "Original analysis of accident potentials as "lacking" or that other information used in the application either "do[es] not substitute for the creation of separate programmatic and site specific EA/EIS for the project as proposed" or does not address deliberate attacks. Ballard Report at 54–55.

[265] Joint Petition at 82.

basic assertion that the application is inadequate or insufficient does not meet the standard of § 2.309(f)(1)(vi), and "a contention that does not directly controvert a position taken by the applicant is subject to dismissal."[266] Other "subcontentions" merely seek to reiterate issues raised in other contentions or summarize the recommendations made by Dr. Ballard in his report. [267] It is the obligation of a petitioner to "read the relevant parts of the license application and show where the application is lacking."[268] Read as a whole, the contention amounts instead to a series of observations or recommendations for the environmental review process rather than concrete issues that are appropriate for adjudication.

For the reasons above, the Joint Petitioners have not satisfied its obligation to provide a clear discussion of issues or demonstrated that the concerns raised are appropriate for a hearing. Consequently, Contention 11 is inadmissible.

Don't Waste Michigan Contention 12

Because of the geologic formations and conditions beneath the Holtec site, there are risks inherent in siting and operating the CIS facility as proposed by Holtec. The ER and SAR in this case do not adequately discuss and evaluate the risks created by these geologic conditions.

In Contention 12, the Joint Petitioners assert that there are risks inherent in siting and operating the Holtec CISF that are inadequately discussed in the ER and the SAR. The Joint Petitioners state that the basis for the contention lies in 10 C.F.R. §§ 51.45 and 72.90 and that the facts supporting the contention are contained in the report of Steven Schafersman, Ph.D.[269]

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[266] *Nuclear Mgmt. Co., LLC* (Palisades Nuclear Power Plant), LBP-06-10, 63 NRC 314, 340–42 (2006).

[267] *See Vogtle,* LBP-07-3, 65 NRC at 253 ("[N]either mere speculation nor bare or conclusory assertions, even by an expert, alleging that a matter should be considered will suffice to allow the admission of a proffered contention.") (*citing Fansteel*, CLI-03-13, 58 NRC at 203).

[268] *Arizona Pub. Serv. Co.* (Palo Verde Nuclear Generating Station, Units 1, 2, and 3), CLI-91-12, 34 NRC 149, 156 (1991).

[269] Joint Petition at 88. The Staff understands the contention as relying exclusively on the information in the Schafersman report; the summary on page 88 of the Joint Petition itself provides no further context for the underlying rationale.

This contention is inadmissible because the Joint Petitioners fail to provide sufficient information to show that a genuine dispute exists with the applicant on a material issue of law or fact as required by 10 C.F.R. § 2.309(f)(1)(vi). For contentions alleging inadequacy of the information in the application, 10 C.F.R. § 2.309(f)(1)(vi) plainly states that petitioners "*must include references to specific portions of the application (including the ER and SAR) that the petitioner disputes* and the supporting reasons for each dispute" (emphasis added).

Dr. Schafersman's report, which is thirty pages in length, presents a list of reasons for which he asserts the Holtec proposal is "inadvisable." And although the Joint Petitioners' initial statement of this contention claims to be directed at "risks created by…geologic conditions," the issues cited in the report appear to range widely from geologic reasons (including (1) the presence of fresh and saline waters on the area's surface and subsurface; (2) the presence of abundant evaporate karst features in the region; and (3) the presence of petroleum industry activity in the area, including exploration, drilling, fracking and wastewater injection) to "scientific, economic, political and anecdotal reasons" (including that (1) the proposal involves nuclear waste surface storage; (2) the nuclear waste will not be moved a second time; (3) an externality benefit and cost analysis; (4) a risk analysis; (5) transportation risks; and (6) storage canister failure).

However, because the report contains no specific references to any part of the application (including the SAR and ER), it fails to explain how any of Dr. Schafersman's observations assert a genuine dispute with the application, as required by 10 C.F.R. § 2.309(f)(1)(vi). Although the ER and SAR contains detailed discussions on various facets of the environment at and around the site, including the surface water and groundwater resources[270]; the geologic features of the region and soils[271]; and the presence of oil and gas activity,[272] the

[270] ER at 3-38 – 3-41; SAR, Rev. 0A at 2-64 – 2-67, 2-84 – 2-87.

[271] ER 3-11 – 3-23; SAR, Rev. 0A 2-3 – 2-5, 2-88 – 2-89.

[272] *E.g.* ER 3-2; SAR, Rev. 0A at 2-7 – 2-12.

Schafersman report fails to discuss the ER and note any specific portions of the application with which he disagrees. Similarly, Dr. Schafersman fails to dispute any specific portion of the SAR. Moreover, even where the report includes figures and diagrams – some of which appear to be excerpted from the application[273] – the report does not specify how Dr. Schaferman's observations contradict either those facts or the way in which the application relies on them for its analyses or conclusions. As noted by the Commission, "it is simply insufficient" for a petitioner to "expect the Board on its own to discern what particular issue a petitioner is raising, including what section of the application, if any, is being challenged as deficient and why."[274]

In 1989, the Commission amended 10 C.F.R. Part 2 to raise the threshold for admissible contentions[275] such that only "intervenors with genuine and particularized concerns participate in NRC proceedings."[276] Noted in that rule and repeated in Commission case law, is the requirement that a petitioner "must 'read the pertinent portions of the license application . . . [and] *state the applicant's position and the petitioner's opposing view.*'"[277] "[A] generalized assertion, without specific ties to NRC regulatory requirements, or to safety in general….do not provide adequate support demonstrating the existence of a genuine dispute of fact or law."[278]

Finally, this contention fails to demonstrate that many of the issues raised in Mr. Schafersman's report are within the scope of the proceeding and material to findings the NRC must make in accordance with 10 C.F.R. § 2.309(f)(1)(iii)-(iv). For example, much of the report

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[273] *See e.g.*, Schafersman Report at 14.

[274] *USEC Inc.* (American Centrifuge Plant), CLI-06-10, 63 NRC 451, 457 (2006).

[275] *See* Rules of Practice for Domestic Licensing Proceedings—Procedural Changes in the Hearing Process, 51 Fed. Reg. 24,365, 24,366 (July 3, 1986) (proposed rule); 54 Fed. Reg. at 33,170.

[276] *Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2 and 3), CLI-99-11, 49 NRC 328, 334 (1999).

[277] *Millstone*, CLI-01-24, 54 NRC at 358 (2001) (emphasis added) quoting 54 Fed. Reg. at 33,170; *see also Yankee Atomic Energy Corp.* (Yankee Nuclear Power Station), CLI-96-7, 43 NRC 235, 248–49 (1996) ("For a contention to be admissible, a petitioner must refer to the specific portion of the license application being challenged, state the issue of fact or law associated with that portion, and provide a "basis" of alleged facts or expert opinions . . . .").

[278] *U.S. Department of Energy* (High-Level Waste Repository), CLI-09-14, 69 NRC 580, 588 (2009).

focuses on the suitability of the site for storage beyond the licensing period ("it is very likely that, when the high-level nuclear waste is buried in its storage canisters, the waste will never be moved a second time as claimed and reach a final and safe storage site deep underground in a remote mountain composed of igneous rock.")[279] As stated previously, the feasibility of a permanent repository (or the analysis of impacts of SNF storage beyond the licensed term, which are governed by the Continued Storage rule) is beyond the scope of this proceeding. Similarly, the report's discussion on "Externality Benefit and Cost Analysis" appears to raise generalized policy concerns about possible legislation and the appropriate role of government in regulation of externalities[280], topics which are likewise outside the scope of the proceeding.[281]

In sum, the NRC Staff opposes the admission of this contention in that it fails in its entirety to satisfy the requirements of 10 C.F.R. § 2.309(f)(1)(vi) and, additionally, fails to show how various claims in the Schafersman report are either in the scope of the proceeding or material to the findings the NRC must make on the application, contrary to 10 C.F.R. § 2.309(f)(1)(iii) and (iv).

Don't Waste Michigan Contention 13

The Joint Petitioners seek to adopt all of the Sierra Club's contentions. 10 C.F.R. § 2.309(f)(3) permits the co-sponsoring of contentions where the petitioners designate a single representative for those contentions with "the authority to act" with respect to those contentions.

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[279] Schafersman Report at 21. *See also id.* at 25 ("The primary reason the risks are unacceptable is because either (1) the nuclear wastes will be moved twice, thus unavoidably more than doubling the risks of transportation and the costs of a second transport and storage, or (2) the transported waste will ultimately be stored at the surface site in New Mexico permanently, becoming the de facto final repository for the SNF/HLNW.")

[280] *See, e.g., id.* at 22 ("Our poorly-regulated American free enterprise system—our vaunted 'mixed economy' or 'regulated capitalism'—allows corporation to *privatize gains and socialize losses* due to weak regulation based on ignoring sound economic theory."), 23–26.

[281] It is well established that "a petitioner cannot seek to use a specific adjudicatory proceeding to …'express generalized grievances about NRC policies.'" *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Unit 3), CLI-08-17, 68 NRC 231 (*quoting Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2, and 3), CLI-99-11, 40 NRC 328, 334–35 (1999)*; Peach Bottom*, ALAB-216, 8 AEC at 21.

The Joint Petitioners have not done that here, either individually or jointly with the Sierra Club. Therefore, the NRC Staff opposes the Joint Petitioners' request to adopt the Sierra Club's contentions until the parties jointly designate a representative.

3. NAC International Inc.

NAC Contentions 1 and 2

The Holtec CISF license application inadequately substantiates its design basis analyses concerning normal, off-normal, and accident events, which are required to demonstrate compliance with 10 C.F.R. Part 72, including Subparts E, F and G (and related acceptance criteria in NUREG 1567), as it lacks required design and safety information on the NAC canisters to be housed in the CISF UMAX casks.

The Holtec CISF license application omits technical information required under NRC regulations, including but not limited to 10 C.F.R. § 72.24, about the design and safety performance of NAC canisters within its UMAX casks.

NAC's two safety contentions purport to challenge the Holtec CISF license application's analysis of the interaction between the HI-STORM UMAX cask (previously approved by NRC via a Certificate of Compliance (CoC)) and non-Holtec canisters (specifically, the canisters manufactured by NAC).[282] But NAC fails to demonstrate that these contentions are within the scope of this licensing proceeding.[283] NAC correctly notes that there are two relevant licensing actions at issue: the (1) Holtec CISF license application, and (2) HI-STORM UMAX CoC amendment application. Neither proceeding involves NAC canisters. Therefore, Contentions 1 and 2 are inadmissible.[284]

As NAC concedes, the CoC for Holtec's HI-STORM UMAX cask only permits storage of two types of canisters in the cask—*i.e.*, the MPC-37 and MPC-89—both of which are Holtec

[282] NAC Petition at 11.

[283] 10 C.F.R. § 2.309(f)(1)(iii).

[284] *Id.* Further, NRC regulations expressly limit the scope of hearings regarding Part 72 ISFSI licenses from including "design of a spent fuel storage cask for which NRC approval . . . has been issued or is being sought." 10 C.F.R. § 72.46(e).

canisters.[285] Holtec is currently seeking an amendment to the HI-STORM UMAX CoC to include one type of Orano cask (*i.e.*, the NUHOMS 24PT1-DSC canister).[286] However, this CoC amendment request is not seeking approval to store NAC canisters nor is it within the scope of the instant licensing proceeding.[287] Moreover, because the HI-STORM UMAX cask is the only CoC referenced in the Holtec CISF license application, the later incorporation of any additional CoC amendment would require an amendment to the CISF license application (or to the license, if one were already issued).

Simply put, NAC's Contentions 1 and 2 both challenge the Holtec CISF's safety analysis based on the absence of information concerning NAC canisters. Because Holtec does not seek NRC approval to store NAC canisters, such an analysis is not required. Therefore, NAC's safety contentions are outside the scope of this licensing proceeding.[288]

NAC Contention 3

The Holtec CISF license application incorrectly omits a design alternatives analysis on the speculative grounds that the UMAX cask system is the only such system that is capable of including as contents all non-Holtec canister types.

Contention 3 disputes the ER's statement regarding design alternatives that the HI-STORM UMAX cask is the "only licensed technology with the universal capability to store all spent nuclear fuel from all commercial reactors."[289] The ER eliminated from detailed analysis design alternatives to "use the AREVA, NAC, and Energy*Solutions* systems."[290] NAC points out that the HI-STORM UMAX CoC does not necessarily include such "universal" capability. Indeed,

[285] NAC Petition at 14–15.

[286] *See* NAC Petition at 15, n.16; "Request for Amendment 3 of Holtec UMAX CoC No. 1040," (Aug. 30, 2016) (ADAMS Accession No. ML16250A393).

[287] *See* 10 C.F.R. § 72.46(e).

[288] 10 C.F.R. §§ 2.309(f)(1)(iii) & 72.46(e).

[289] ER at 2-17.

[290] *Id.*

as previously discussed in the NRC Staff's response to NAC Contentions 1 and 2, the HI-STORM UMAX CoC has been approved for only two Holtec canisters to date. Therefore, to the extent that the ER's basis for eliminating these design alternatives from detailed analysis is unclear, the NRC Staff does not oppose the admissibility of Contention 3.

However, notwithstanding NAC's proffer of an admissible contention, its petition should not be granted because, as explained above, NAC has not demonstrated standing.[291]

4. The Sierra Club and Beyond Nuclear, Inc.

Sierra Club Contention 1 & Beyond Nuclear Contention 1

> *Beyond Nuclear: The NRC must dismiss Holtec's license application and terminate this proceeding because the application violates the NWPA. The proceeding must be dismissed because the central premise of Holtec's application – that the U.S. Department of Energy ("DOE") will be responsible for the spent fuel that is transported to and stored at the proposed interim facilities – violates the NWPA. Under the NWPA, the DOE is precluded from taking title to spent fuel unless and until a permanent repository has opened. 42 U.S.C. §§ 10222(a)(5)(A), 10143.*[292]
>
> *Sierra Club: The NRC has no authority to license the Holtec CIS facility under the NWPA nor the AEA. Holtec has said DOE must take title to the waste, but the NWPA does not authorize DOE to take title to spent fuel in an interim storage facility. The AEA has no provision for licensing a CISF.*[293]

Both the Beyond Nuclear proposed contention and the substantially similar Sierra Club Proposed Contention 1 are admissible in part. The Sierra Club contention is inadmissible to the extent it more broadly challenges Part 72 regulations that allow for any away-from-reactor ISFSIs.

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[291] 10 C.F.R. § 2.309(a).

[292] Beyond Nuclear Petition at 20–21.

[293] Sierra Club Petition at 10–11.

i. To the extent the Petitioners have asserted an inconsistency between the ER and the SAR regarding the extent of the applicant's intended reliance on a future contract with DOE, they have identified an admissible contention.

The Petitioners identify several places in the SAR wherein the Applicant states that it may enter into a contract either with DOE or nuclear plant licensees.[294] Notwithstanding the statements in the SAR, the Petitioners correctly note that the ER states in several places that it will enter into a contract with DOE wherein DOE will be responsible for taking title to the waste and for transportation of the waste to the site.[295] To the extent the Petitioners' contentions challenge this inconsistency between the ER and SAR, the Staff agrees the contentions are admissible.[296]

ii. Petitioner Sierra Club's broader assertion that interim away-from-reactor waste storage facilities are not permissible under the Atomic Energy Act or the Nuclear Waste Policy Act does not raise an issue within the scope of the proceeding.

The Sierra Club appears to contend broadly that the AEA and the NWPA do not allow away-from-reactor ISFSIs and thus any consolidated interim storage facility application (regardless of who may have title to the stored waste) is illegal.[297] As NRC regulations in Part

[294] Beyond Nuclear Motion at 16, n.4.

[295] *See* Beyond Nuclear Motion at 16 (citing the ER at 1-1 and 3-104), Sierra Club Petition at 11 (citing the ER at Section 1.0).

[296] Both Petitioners appear to interpret this inconsistency as requiring a conclusion that DOE would be the sole customer for the CISF, as represented in the ER, rather than that either DOE or nuclear plant owners may be the users of the CISF, as stated in the SAR. *See, e.g.*, "HI-STORE CIS Facility Financial Assurance & Project Life Cycle Cost Estimates," (ADAMS Accession No. ML18058A608) at 3. While the Staff agrees that the contention is admissible because resolution of the inconsistency is material to the staff review, the Staff considers it premature to take a position on how the applicant will address the inconsistency.

[297] *See, e.g.,* Sierra Club Petition at 10, 14, 16–17 ("The AEA has no provision for licensing a CISF."; "Nor does the AEA give the NRC authority to license an ISFI [sic.] away from the site of a reactor."); 13 ("In fact, the NWPA does not even contemplate an interim storage facility away from the reactor site.").

72 provide for the licensing of away from reactor ISFSIs,[298] this argument amounts to a generic challenge to NRC regulations that is precluded by 10 C.F.R. § 2.335 and is thus beyond the scope of this proceeding.[299] Moreover, this issue has already been ruled upon by the D.C. Circuit, which held that the NRC has the authority to license privately owned away-from-reactor spent nuclear fuel storage facilities pursuant to the AEA, and that the NWPA neither repealed nor superseded that licensing authority.[300] Therefore, the Sierra Club's challenge to the NRC's authority to license all away-from-reactor ISFSIs is outside the scope of the proceeding.

Conclusion

To the extent these contentions allege an inconsistency between the ER and the SAR, they are admissible. To the extent the Sierra Club seeks to challenge the legality of all away-from-reactor ISFSIs, its contention is inadmissible as outside the scope of this proceeding.

Sierra Club Contention 2

The Holtec environmental report, in attempting to describe the purpose and need for this project, claims that CIS is safer and more secure than storing the waste at the reactor site. However, the environmental report cites no evidence or data to support this assertion. An agency cannot rely on self-serving statements, especially ones with no supporting data, from the prime beneficiary of the project.

In Contention 2, Sierra Club asserts that the ER contains self-serving statements about the safety and security of CIS that are unsubstantiated. The Petitioner asserts that the agency cannot rely on those statements and argues that the ER and subsequent EIS must examine the

[298] *See generally* 10 C.F.R. Part 72; *see also id.* §§ 72.32(a) & 72.46(d) (specifically referring to requirements related to ISFSIs not co-located with a power reactor).

[299] 10 C.F.R. §§ 2.335, 2.309(f)(1)(iii); *see Private Fuel Storage*, CLI-02-25, 56 NRC at 392 ("Congress, in enacting the Atomic Energy Act (AEA), gave the NRC authority to license privately owned, away-from-reactor (AFR) facilities.").

[300] *See Bullcreek v. NRC*, 359 F.3d 536, 543 (D.C. Cir. 2004). The D.C. Circuit observed that although "the AEA does not specifically refer to the storage or disposal of spent nuclear fuel, it has long been recognized that the AEA confers on the NRC authority to license and regulate the storage and disposal of such fuel. *Id. at* 538 (citing *Pac. Gas & Elec. Co. v. State Energy Res. Conservation & Dev Comm'n,* 461 U.S. 190, 207 (1983); *Illinois v. Gen. Elec. Co.,* 683 F.2d 206, 214–215 (7th Cir. 1982); *Jersey Cent. Power & Light Co. v. Township of Lacy*, 772 F.2d 1103, 1112 (3d Cir. 1985).

relative safety of HOSS at reactor sites.[301] In support of its contention, the Sierra Club points to a 2003 report by Dr. Gordon Thompson, "Robust Storage of Spent Nuclear Fuel: A Neglected Issue of Homeland Security." The Sierra Club concludes that "[a]t this point, until an environmental impact statement (EIS) is prepared by the NRC, the statement of purpose and need in the ER is inadequate."[302]

This contention is inadmissible as the Petitioner has failed to provide sufficient information to show that a genuine dispute exists on a material issue of law or fact and have failed to demonstrate that the issue raised is material to the findings the NRC must make in accordance with 10 C.F.R. § 2.309(f)(1)(vi) and (iv), respectively.

An applicant is required to include in its ER, and an agency is required to include in its NEPA analysis, a brief statement on the purpose and need of a proposed action.[303] NUREG 1748, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, Section 6.1 provides guidance on an ER's purpose and need section. It states that this section "describes the underlying need for the proposed action and should not be written merely as a justification of the proposed action, nor to alter the choice of alternatives. . . . Examples of need include a benefit provided if the proposed action is granted or descriptions of the detriment that will be experienced without approval of the proposed action. In short, the need describes what will be accomplished as a result of the proposed action."[304]

However, when the Applicant's purpose and need section is reviewed in context, the Petitioner fails to show that their disagreement with this sole sentence constitutes a genuine dispute with the application on a material issue of fact or law. The ER notes several purposes

[301] Sierra Club Petition at 19.

[302] *Id.* at 20.

[303] 10 C.F.R. § 51.45(b); 10 C.F.R. Part 51, App. A § 4.

[304] NUREG-1748 at 6-1.

for the proposed CISF. It explains that "[m]any policymakers and stakeholders in the communities that host shutdown reactors want to have the SNF removed to complete decommissioning of the site and to allow for more beneficial uses of the land. . . . so that the remaining lands can be returned to Greenfield status."[305] It states that "three nuclear power plants have been shut down and are in the process of being decommissioned and nine nuclear power plants across the U.S. have been decommissioned . . . to levels that would allow for unrestricted release of the site in accordance with the NRC's License Termination Rule."[306] And the ER identifies other potential objectives as well, including alleviating significant costs to surveil, maintain, and provide emergency preparedness and physical security at ISFSIs and alleviating the need to construct new or expanded ISFSIs at operating sites.[307] In short, the ER asserts a range of potential objectives describing what will "be accomplished as a result of the proposed action."[308] In that context, the Petitioner fails to show how a disagreement solely with the ER's statement of safer storage renders the purpose and need section deficient as a basis for evaluating a reasonable range of potential benefits or detriments of, and alternatives to, the proposed action. For example, the Petition does not articulate how its posited lack of support for that particular assertion could adversely affect the reasonableness of any of the alternatives actually considered in the application. The contention thus does not demonstrate that the challenge to the cited sentence is ultimately a genuine and material dispute with the totality of the ER's statement of purpose and need.

The contention also asserts that the ER must therefore evaluate the relative safety of implementing "HOSS" at reactor sites, to "substantiate" the purpose and need for the project.

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[305] ER at 1-5.

[306] *Id*.

[307] *Id.*

[308] NUREG-1748 at 6-1.

However, because the Petitioner has not demonstrated the materiality of its challenge to the purpose and need statement (for the reason stated above), the Petition likewise does not demonstrate that such substantiation via analysis of HOSS is material to the Staff's environmental review or otherwise required by NEPA.[309]

For these reasons, the Petitioner has failed to show that a genuine dispute exists on a material issue of law or fact and have failed to demonstrate that the issue raised is material to the findings the NRC must make in accordance with 10 C.F.R. § 2.309(f)(1)(vi) and (iv). Therefore, the contention is inadmissible.

Sierra Club Contention 3

The statement in the ER that CIS is safer and more secure than storage at a reactor site contradicts the NRC's Continued Storage Rule, which concludes that spent radioactive fuel can be safely stored at a reactor site indefinitely. Therefore, there is no basis for accepting the statement in the ER, and there is no purpose and need for the Holtec project.

In Contention 3, the Sierra Club avers that the ER's "Purpose and Need" statement contradicts the NRC's Continued Storage Rule and thereby undercuts any purpose or need for the Holtec facility. No such contradiction exists. Even if it did, Holtec's "Purpose and Need" statement—taken as a whole—sets forth several purposes of the proposed Holtec facility. Accordingly, Contention 3 fails to demonstrate a claim material to the Staff's review and fails to demonstrate a genuine dispute of law or fact with the Applicant.[310]

[309] And to the extent this aspect of the Petitioner's claim could be interpreted as an argument that HOSS must be considered as an alternative to the proposed action, it fails to reference or challenge the discussion of alternatives in Chapters 2, 4 or 9 of the ER and thus would not meet the standards for an admissible challenge. "Any contention that fails directly to controvert the application or that mistakenly asserts the application does not address a relevant issue can be dismissed," as a failure to raise a genuine dispute with the application on a material issue of law or fact in accordance with 10 C.F.R. § 2.309(f)(1)(vi). *See Millstone*, LBP-08-9, 67 NRC at 433 (citing *Rancho Seco*, LBP-93-23, 38 NRC at 247–48).

[310] *See* 10 C.F.R. § 2.309(f)(1)(vi).

NRC regulations require an EIS to include a description of the purpose of, and a discussion of the need for, a proposed action.[311] NRC Staff guidance regarding the preparation of the purpose and need analysis in the ER and the NRC Staff's EIS states that an applicant and Staff's treatment of this subject should explain "why the proposed action is needed," going on to indicate that the discussions should describe the underlying need for the proposed action and "should not be written merely as a justification of the proposed action, nor to alter the choice of alternatives."[312] In short, an applicant should describe what will be accomplished as a result of the proposed action.[313]

Here, the ER's "Purpose and Need" section states that the Holtec CISF would "serve[] a national strategic need by providing for an orderly transfer of SNF from the decommissioned shutdown sites to a safer and more secure centralized storage location."[314] Further, the ER states that the Holtec CISF would permit decommissioning of reactor sites so they "can be returned to Greenfield status," reduce costs of operating at-reactor ISFSIs related to "surveillance, maintenance, emergency preparedness, and physical security," and "alleviate the need to construct new or expanded ISFSIs" at operating reactors.[315]

Contention 3 challenges a single statement in the ER—that the Holtec CISF would provide a safer and more secure centralized storage location. The sole basis for this contention is the Sierra Club's alleged contradiction between this statement and the NRC's Continued Storage Rule and GEIS. But the Continued Storage GEIS did not perform any qualitative analysis of the safety benefits of at-reactor vs. away-from-reactor consolidated storage, nor did

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[311] 10 C.F.R. Part 51, App. A. § 4.

[312] NUREG-1748 at 5-2 (Section 5.1.1).

[313] *Id.*; *see Shaw AREVA Enrichment Services, LLC* (Eagle Rock Enrichment Facility), LBP-11-26, 74 NRC 499, 524 (2011).

[314] ER at 1-5 (Section 1.2).

[315] *Id.*

it endorse any particular storage method. Rather, the GEIS analyzed the environmental effects of the continued storage of spent fuel at both reactor sites and away-from-reactor ISFSIs. Therefore, the Sierra Club fails to demonstrate how Contention 3's assertion of a contradiction with the GEIS is material to the Staff's environmental review.[316]

In addition, the ER reference to the benefits of centralized storage is only one component of the Applicant's purpose and need discussion. Contention 3 fails to acknowledge, let alone dispute, the accompanying considerations described by the Applicant as the bases for its purpose and need. Thus, even if Contention 3 had identified a material contradiction in the ER regarding the asserted safety benefits, it fails to demonstrate a genuine and material dispute with the totality of Holtec's purpose and need discussion.[317]

Sierra Club Contention 4

Operation of the CIS site as proposed by Holtec would necessitate the transportation of the radioactive waste from reactor sites to the CIS facility. Transportation from the reactors to the CIS site carries substantial risks. These risks must be evaluated in the ER.

Sierra Club Contention 4 asserts that the Applicant's discussion of transportation risks is inaccurate.[318] The Petitioner relies on a 2001 report by Matthew Lamb and Marvin Resnikoff[319] that evaluated the radiological consequences of the 2001 Baltimore Tunnel Fire, had it involved spent nuclear fuel.[320] Dr. Resnikoff, as stated in the Petition, estimates the consequences of a hypothetical accident as "approximately 1250 times Holtec's estimate."[321] The Petitioner further

[316] 10 C.F.R. § 2.309(f)(1)(iv); *see Georgia Tech Research Reactor*, LBP-95-6 , 41 NRC at 300 ("A petitioner's imprecise reading of a reference document cannot serve to generate an issue suitable for litigation").

[317] 10 C.F.R. § 2.309(f)(1)(vi).

[318] Sierra Club Petition at 22.

[319] As supplemented by Petitioner's claims regarding Dr. Resnikoff's updated conclusions. Sierra Club Petition at 25.

[320] Sierra Club Petition at 24–26.

[321] Sierra Club Petition at 25.

disputes the applicant's reliance on three other documents: "DOE's 2008 risk estimate"[322], NUREG-1714, and NUREG-2157.[323]

At the admissibility stage, Petitioner does not have to prove its contention.[324] Accordingly, the Staff does not oppose the admission of Contention 4 to the extent it challenges the adequacy of the applicant's environmental analysis of the potential radiological consequences of a hypothetical transportation accident.[325]

By contrast, to the extent the contention is intended to raise environmental or safety concerns regarding the threshold likelihood of such a transportation accident,[326] the Petitioner has not proffered sufficient facts or expert opinions to demonstrate a genuine dispute with the applicant. In that regard, the Petition includes only a brief assertion that the 2008 study "does not incorporate recent information about rail fires and expanded traffic of oil tanker cars." But the petition does not reference information that would buttress such a claim, nor does it clearly explain how such accidents could actually cause a release of radiological material to the environment.[327] In fact, with respect to the only incident cited by the Petitioner, the 2001 Baltimore Tunnel Fire, the Commission has previously determined that that event is bounded by

[322] Sierra Club Petition at 25. Staff presumes this is referring to U.S. Department of Energy Report, DOE/EIS-0250F, "Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada" (ML081750191 (package)).

[323] Sierra Club Petition at 26–27.

[324] *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-04-22, 60 NRC 125, 139 (2004).

[325] *See Sierra Club v. Watkins*, 808 F. Supp. 852, 868–69 (D.C. Cir. 1991) (explaining the relationship between the probability and the consequences of an accident under NEPA). *But see Private Fuel Storage*, CLI-04-22, 60 NRC at 136 (noting, in connection with a contention admissibility determination involving a different waste storage facility, that "the Commission has determined generically that accidental canister breach is not a credible scenario.").

[326] Sierra Club Petition at 22-23 ("These risks must be evaluated in the ER.").

[327] *See Private Fuel Storage*, CLI-04-22, 60 NRC at 136–37 (finding contention inadmissible where the petitioner "ha[d] not put forth any previously unconsidered accident scenario that could result in a canister becoming damaged and beginning to leak.").

the hypothetical accidents in 10 C.F.R. § 71.73, and the Sierra Club provides only speculation that such fires could actually exceed the Part 71 requirements.[328]

Consequently, while the Staff does not oppose the admissibility of the contention to the extent it disputes the Environmental Report's evaluation of the consequences of a hypothetical accident scenario, the Sierra Club has not demonstrated that the contention raises an admissible issue with respect to the likelihood of such an event.

Sierra Club Contention 5

The ER states that waste would be stored at the CIS facility for up to 120 years until a permanent repository is found. The ER and the subsequent EIS must address the purpose and need and the environmental impacts if a permanent repository is not found, and the Holtec facility becomes a de facto permanent repository.

Contention 5 claims that the Holtec ER must address the contingency of the proposed Holtec CISF becoming a *de facto* repository if a permanent repository is not constructed.[329] The Petitioners rely on the D.C. Circuit's decision in *New York v. NRC*.[330] That decision upheld a challenge to the NRC's "Waste Confidence Decision," finding that the NRC's NEPA evaluation was deficient for failing to consider, *inter alia*, the "environmental effects of failing to secure

[328] *See* Compatibility With IAEA Transportation Safety Standards (TS-R-1) and Other Transportation Safety Amendments, 69 Fed. Reg. 3698, 3700 (Jan. 26, 2004) ("For example, in response to the Baltimore Tunnel Fire, the NRC Staff has conducted two sets of independent analyses and has determined that the conditions that existed in the fire would not have caused a breach of a current spent fuel transportation cask design had it been located in the tunnel for the duration of the fire."). *See also* SECY-03-0002; NUREG/CR-6793; NUREG/CR-6886; NUREG/CR-7209 (providing the Staff's evaluations as to the sufficiency of § 71.73 accidents to bound real world accident scenarios). Contentions that challenge the adequacy of the NRC's waste transportation regulations are barred under 10 C.F.R. § 2.335(a), absent a waiver.

The NRC Staff further observes that although the discussion in the contention and supporting facts appears to be focused almost exclusively on accidents, the Environmental Report's discussion of the radiological effects of transportation also addresses incident-free transportation impacts (*see* ER, Section 4.9.3.1 at 4-31 – 4-34), an analysis which the Petition does not appear to specifically cite or controvert and which accordingly does not appear to be within the scope of the proposed contention.

[329] Sierra Club Petition at 27.

[330] *Id.* (citing *New York v. NRC*, 681 F.3d 471 (D.C. Cir. 2012)).

permanent storage" of spent nuclear fuel.[331] In response to the ruling, which remanded the matter to the NRC, the agency developed its Continued Storage Rule and GEIS. The Continued Storage Rule expressly states that the ER is "not required to discuss the environmental impacts of spent nuclear fuel storage in . . . an ISFSI for the period following the term of the . . . ISFSI license." 10 C.F.R. § 51.23(b). Because this is precisely what Contention 5 asks for ("The ER must therefore discuss and analyze the impacts of indefinite storage at the Holtec CIS facility")[332] the contention represents a straightforward—and inadmissible—challenge to the NRC's Continued Storage Rule.[333] The contention is therefore outside the scope of this proceeding, and must be dismissed.[334]

Sierra Club Contention 6

An ER is required to discuss alternatives to the proposed action. Pursuant to NEPA, this includes an examination of the no-action alternative. The discussion of the no-action alternative in the Holtec ER is deficient because it does not discuss safer storage methods at the reactor sites, such as HOSS, nor does it acknowledge the NRC's Continued Storage Rule that concludes that waste can be safely stored at the reactor site indefinitely. Furthermore, the ER states that the no-action alternative is a reasonable alternative that would satisfy the purpose and need for the project.

Contention 6 asserts that the Holtec ER's discussion of the "no action alternative" is deficient because it does not discuss the NRC's Continued Storage rule or the use of hardened on-site storage (HOSS). The Sierra Club fails to demonstrate why either discussion is material

[331] *New York v. NRC*, 681 F.3d at 471.

[332] Sierra Club Petition at 29.

[333] *See* 10 C.F.R. § 2.335(a) ("no rule or regulation of the Commission, or any provision thereof . . . is subject to attack by way of discovery, proof, argument, or other means in any adjudicatory proceeding" without a petition for a waiver as provided for elsewhere in that section). Of note, the U.S. Court of Appeals for the D.C. Circuit upheld the Continued Storage Rule and GEIS. *See New York v. NRC*, 824 F.3d 1012 (D.C. Cir. 2016).

[334] 10 C.F.R. § 2.309(f)(1)(iii).

to the NRC's environmental review of the no-action alternative and also fails to demonstrate a genuine dispute with the application.[335]

An ER's discussion of alternatives must be "sufficiently complete" to aid the NRC in developing and exploring appropriate alternatives in the EIS and must also be presented in comparative form.[336] The ER should also include consideration of the economic, technical, and other benefits and costs of the proposed action and its alternatives.[337] NRC guidance requests that applicants address the "no-action alternative," which is a discussion of the results from a lack of action, to serve as a "baseline" for comparing alternatives.[338]

Here, contrary to the Sierra Club's assertion that the no-action alternative is "blandly dismissed,"[339] the ER contains an analysis of the no-action alternative, including a description of the potential environmental impacts of the no-action alternative.[340] And the Sierra Club's assertion that the ER contains "no discussion of the relative benefits and costs" likewise fails to demonstrate a genuine dispute with the application, as the ER specifically compares the costs of the no-action alternative with the costs of the proposed action.[341] Specifically, in ER Section 9.2.1, entitled "No-Action Alternative Costs," Holtec provides the costs for storage of 5,000 MTUs and 100,000 MTUs respectively.[342] In Tables 9.2.1 through 9.2.5, the ER compares the No-Action Alternative's costs to those of the proposed action, which Holtec summarized in Section 9.2.2.[343] In short, the Sierra Club refers only to Section 2.1 of the ER but does not

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335 *Id.* §§ 2.309(f)(1)(iv), (vi).

336 *Id.* § 51.45(b)(3).

337 *Id.* § 51.45(c).

338 NUREG-1748 at 3-9 (Section 3.4.4) and 5-6 (Section 5.2.3).

339 Sierra Club Petition at 31.

340 ER at 2-1, 4-57.

341 Sierra Club Petition at 31.

342 ER at 9-5.

343 ER at 9-6.

acknowledge, let alone controvert, the Applicant's associated analysis in Chapters 4 and 9.[344] Finally, the Sierra Club incorrectly claims that the Continue Storage Rule "concludes that spent fuel can remain at the reactor site indefinitely." The Continued Storage GEIS simply analyzed the *environmental impacts* of continuing to store spent fuel after the end of the licensed life for operations of a reactor.[345]

Further, Contention 6 fails to demonstrate how an analysis of HOSS[346] would be material to the NRC Staff's evaluation of alternatives. A dispute at issue is "material" if its resolution would make a difference in the outcome of the licensing proceeding.[347] The ER's discussion of the no-action alternative must simply evaluate the environmental impacts of the status quo—in this case, the proposed facility not being constructed and operated. Because a decision not to license the proposed Holtec CISF would neither require nor foreclose the possibility of at-reactor storage methods such as HOSS, the Sierra Club fails to explain how evaluating HOSS in the ER would be necessary for the analysis of the no-action alternative. Therefore, the Petitioner fails to show why the issues raised in Contention 6 are material to the findings the NRC must make to support its review of the Holtec application.[348]

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[344] *See Millstone*, CLI-01-24, 54 NRC at 358.

[345] Continued Storage GEIS at 1-1. As explained above in response to Sierra Club Contention 3, the Continued Storage GEIS did not include any qualitative analysis of the safety benefits of at-reactor vs. away-from-reactor consolidated storage, nor did it endorse any particular storage method. And as explained above in response to Sierra Club Contention 5, to the extent the Sierra Club is again asserting that the ER must contain a discussion of the impacts (or costs and benefits) of storage beyond the licensed life of a facility, that represents a challenge to the rule that is precluded by 10 C.F.R. § 2.335(a) and is outside the scope of this proceeding.

[346] Notably, except for a passing reference to a report by Dr. Gordon Thompson in Contention 2, the Sierra Club makes no effort to explain the relevance of HOSS to the Holtec application or provide any legal basis for why Holtec would be required to discuss it in the ER. *See* 10 C.F.R. §§ 2.309(f)(1)(i), (v).

[347] *Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2, and 3), CLI-99-11, 49 NRC 328, 333–34 (1999) (citing 54 Fed. Reg. at 33,172).

[348] 10 C.F.R. § 2.309(f)(1)(iv).

Sierra Club Contention 7

Holtec relies heavily on the assertion that the Blue Ribbon Commission on America's Nuclear Future (BRC) has recommended CIS as the answer to the country's nuclear waste problem. On the contrary, the BRC report should not be viewed uncritically and does not necessarily deserve blind support in assessing the Holtec application. Holtec's ER therefore mischaracterizes both the BRC report's conclusions and the relative risks of CIS versus onsite storage. The EIS must therefore independently and fully address the relative risks and benefits of both storage options.

Contention 7 claims that the Holtec ER mischaracterizes the Blue Ribbon Commission on America's Nuclear Future report's conclusions. The ER mentions the Blue Ribbon Commission's report several times, primarily in the "History and Background" section.[349] However, the ER's sole analysis related to the Blue Ribbon Commission is a statement that the no-action alternative "would not be supportive of . . . the recommendations from the Blue Ribbon Commission."[350] Contrary to 10 C.F.R. § 2.309(f)(1)(iv), the Sierra Club does not demonstrate how Holtec's statements regarding the Blue Ribbon Commission's report would be material to the NRC Staff's review or represent a genuine dispute with the application. A dispute is "material" if its resolution would make a difference in the outcome of the licensing proceeding.[351] As discussed above in response to Contention 6, the Petitioner neither referenced nor controverted the ER's ultimate explanation of the impacts of the no-action alternative or the comparison of alternatives, and thus fails to demonstrate a material dispute with the application. Having failed to address that analysis and comparison, the Petitioner fails to demonstrate why a more "close and critical" discussion regarding the Blue Ribbon Commission report's view on safety and security risks of at-reactor and away-from-reactor storage (particularly if, as the Petitioner appears to assert, both approaches are equivalently safe) would alter the analysis

[349] *See* ER at 1-3.

[350] ER at 2-1.

[351] *Oconee*, CLI-99-11, 49 NRC at 333–34 (citing 54 Fed. Reg. at 33,172).

and conclusions in the ER regarding the environmental impacts of the no-action alternative or otherwise. Therefore, Contention 7 is inadmissible.[352]

Sierra Club Contention 8

10 C.F.R. § 72.30 establishes requirements for decommissioning interim storage facilities. An application for licensing a CIS facility must contain a decommissioning plan explaining how the plan will satisfy the requirements in the regulation. The application for the Holtec CIS facility does not comply with these requirements because the amount of funds Holtec says it will collect over the anticipated life of the project fall way short of what Holtec says are necessary for decommissioning.

In Contention 8, the Sierra Club challenges whether Holtec's decommissioning plan provides reasonable assurance that funds will be available to decommission the proposed CISF. NRC regulations require ISFSI applications to include "[i]nformation on how reasonable assurance will be provided that funds will be available to decommission the ISFSI" and a detailed cost estimate.[353] Holtec's application states that "[a] decommissioning fund will be established by setting aside a fixed dollar amount per MTUs stored at the HI-STORE facility."[354] However, Holtec does not specify the number of MTUs used in its calculation, which could vary depending on the contents of the canisters that the Holtec CISF would receive.[355] Therefore, to the extent that the Petitioner challenges the funding amount necessary for decommissioning under the regulations, the NRC Staff does not oppose the admissibility of Contention 8.

Sierra Club Contention 9

The containers in which the waste will be transported to and stored at the Holtec CIS site are designated for a design life of 60 years and a service life of 100 years and may present an unacceptable danger of radioactive release if they are required to remain after the end of their designated service life. Therefore, the

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[352] 10 C.F.R. § 2.309(f)(1)(iv).

[353] 10 C.F.R. §§ 72.30(b)(1)-(2).

[354] SAR at 13-6.

[355] *See* "HI-STORE CIS Facility Financial Assurance & Project Life Cycle Cost Estimates," (ADAMS Accession No. ML18058A608) at p. 5 (Section 2.2).

ER must examine the environmental impact of the containers being used beyond their approved service life.

The Sierra Club claims that the ER must discuss the environmental impacts of Holtec's HI-STORM UMAX canister storage systems being used beyond their service life because of the possibility of "indefinite storage" at the Holtec CISF.[356] The impacts regarding the continued storage of spent fuel beyond the license term of an ISFSI have already been evaluated by the NRC in the Continued Storage GEIS.[357] Moreover, the Continued Storage Rule is clear that the ER is "not required to discuss the environmental impacts of spent nuclear fuel storage in . . . an ISFSI for the period following the term of the . . . ISFSI license."[358] The Sierra Club effectively challenges whether the ER needs to include an evaluation of the possibility of indefinite storage of HI-STORE UMAX casks, which is an inadmissible challenge to the Continued Storage Rule.[359]

Also, to the extent Contention 9 presents a safety issue, the Sierra Club fails to articulate a factual basis or to state a genuine dispute with the application on a material issue.[360] The NRC certified the Holtec HI-STORM UMAX cask for a period of 20 years.[361] Certificates may be renewed for periods up to 40 years.[362] The Final Safety Analysis Report for the HI-STORM UMAX cask provides that the design life for the cask is 60 years and the service life is 100 years.[363] The Sierra Club points to a statement by Holtec's CEO regarding the ability to repair

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[356] Sierra Club Petition at 38.

[357] *See generally* Continued Storage GEIS at 5-1 (Section 5.0, "Environmental Impacts of Away-From-Reactor Storage).

[358] 10 C.F.R. § 51.23(b).

[359] 10 C.F.R. §§ 2.309(f)(1)(iii) & 2.335; s*ee Duke Energy Corporation* (Oconee Nuclear Station, Units 1, 2, and 3), CLI-99-11, 49 NRC 328, 334 (1999).

[360] 10 C.F.R. § 2.309(f)(1)(vi).

[361] *See* 10 C.F.R. § 72.214 (Certificate Number 1040).

[362] 10 C.F.R. § 72.240(a).

[363] Final Safety Analysis Report on the HI-STORM UMAX Canister Storage System (ADAMS Accession No. ML16193A339) at 2-80 (Table 2.3.1).

canisters.[364] But Contention 9 offers no facts or expert opinion regarding whether the canisters are likely to need repair or whether Holtec must demonstrate the ability to repair damaged canisters. The SAR states that "[i]n the unlikely event of significant damage to the ISFSI, possibly from a Beyond-the-Design Basis earthquake, the situation may warrant removal and visual inspection of the canister, and repair or replacement of the damaged ISFSI areas."[365] Further, NRC regulations require SNF to be packaged in a matter that "allows handling and retrievability without the release of radioactive materials to the environment."[366] The SAR provides that the HI-STORM UMAX cask "will allow the retrieval of the [canisters] under all conditions of storage."[367]

In addition, Contention 9 alleges that the "NRC staff has admitted that once a crack starts in a canister, it can grow through the wall in 16 years."[368] The public meeting summary referenced by the Sierra Club included a discussion regarding the specific safety concerns of stress corrosion cracking,[369] which the SAR specifically evaluates.[370] Contention 9 makes no attempt to explain how the SAR's analysis or conclusions with respect to stress corrosion cracking are deficient. Rather, the Sierra Club concludes, without any basis, that the containers cannot be inspected. To the contrary, the SAR discusses both surveillance activities and routine maintenance of the HI-STORM UMAX casks in order to identify and resolve any issues.[371]

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[364] Sierra Club Petition at 41.

[365] SAR at 3-19.

[366] 10 C.F.R. § 72.122(h)(5); *see also* 10 C.F.R. § 72.122(l) (requiring storage systems to be designed to allow "ready retrieval" of fuel "for further processing or disposal).

[367] SAR at 5-12.

[368] Sierra Club Petition at 41.

[369] *See* Summary of August 5, 2014, Public Meeting With Nuclear Energy Institute (ADAMS Accession No. ML14258A081) at 4.

[370] *See, e.g.*, SAR at 17-28, 18-10.

[371] SAR at 3-19.

In sum, Contention 9 all but ignores the SAR's discussion of retrievability, as well as inspection and maintenance activities. Therefore, Contention 9 fails to articulate a factual basis or to establish a genuine dispute with the application and warrants dismissal pursuant to 10 C.F.R. § 2.309(f)(1)(v) and (vi).

Sierra Club Contention 10

> *The proposed Holtec CIS facility will accept Greater Than Class C (GTCC) waste. NRC regulations specify that GTCC waste must be disposed of in a geologic repository licensed by the NRC, unless the Commission approves an alternative land-based disposal. The Holtec facility will not be a geologic repository. The NRC has not established regulations for approving land-based disposal of GTCC waste. The proposed Holtec CIS facility does not comply with the requirement for a geologic repository or land-based disposal for GTCC waste. Therefore, a license cannot be issued for this facility.*

Contention 10 asserts that the Holtec CISF proposes to accept GTCC waste but cannot be licensed as a "geologic repository." Specifically, Contention 10 alleges that Holtec cannot meet the NRC's regulations in 10 C.F.R. Part 61, "Licensing requirements for land disposal of radioactive waste."[372] But the contention is based on an incorrect factual premise. The Holtec CISF application is not seeking to *dispose* of GTCC waste—rather, Holtec is seeking a license to *store*, on an interim basis, spent nuclear fuel pursuant to the NRC's regulations in 10 C.F.R. Part 72, "Licensing requirements for the independent storage of spent nuclear fuel and high-level radioactive waste, and reactor-related greater than Class C waste." These regulations permit the storage of reactor-related GTCC at an ISFSI via a specific license.[373] Simply put, the NRC's regulations in Part 61 are inapplicable here. Therefore, the Sierra Club's arguments that Holtec's CISF application must address (and cannot comply with) the NRC's Part 61 regulations for "disposal" of waste are immaterial to the NRC Staff's review of the application.[374]

[372] Sierra Club Petition at 42–43.

[373] *See, e.g.*, 10 C.F.R. § 72.2(a)(1); § 72.6(a).

[374] 10 C.F.R. § 2.309(f)(1)(iv).

Sierra Club Contention 11

The ER and the subsequent EIS must evaluate the potential for earthquakes at the Holtec site and the environmental impact of earthquakes. Likewise, the Safety Analysis Report (SAR) must adequately evaluate the earthquake potential of the proposed site. Both the ER and SAR are inadequate in this respect.

The Sierra Club's Contention 11 asserts (1) an environmental claim and (2) a safety claim. As explained below, both are inadmissible because, in contravention of 10 C.F.R. § 2.309(f)(1)(vi), the Sierra Club does not provide sufficient information to show that any dispute that it may have with the applicant is actually on a material issue of law or fact.

i. Contention 11's Environmental Claim is Inadmissible

With respect to its environmental claim, the Sierra Club states that the ER must evaluate the potential for earthquakes at the CIS Facility site as part of its description of the environment affected and its discussion of the environmental impact of the proposed action.[375] The Sierra Club states that the ER "essentially dismisses the likelihood of earthquakes in the area and does not mention any environmental impacts from earthquakes"[376] and "giv[es] the issue fairly short shrift . . . ."[377] Specifically, the Sierra Club faults the ER for "fail[ing] to consider the impact of fracking."[378] The Sierra Club asserts that drilling associated with fracking "induces earthquakes," and it provides "[a] map showing the intense drilling in the area," as well as a Stanford University report "document[ing] the existence of prior earthquakes in southeast New Mexico, and . . . the existence of numerous faults in the area in and around the proposed Holtec

[375] Sierra Club Petition at 44–45.

[376] *Id.* at 45.

The Sierra Club's statement that the ER must evaluate "the environmental impact of earthquakes," Petition at 44, is incorrect; the ER must evaluate the environmental impact of the proposed action. *See* 42 U.S.C. § 4332(C) (requiring "a detailed statement . . . on . . . the environmental impact *of the proposed action* . . .") (emphasis added); 10 C.F.R. § 51.45(b) (requiring an environmental report to discuss "the impact *of the proposed action* on the environment") (emphasis added).

[377] Sierra Club Petition at 47.

[378] *Id.*

site."[379] The Sierra Club concludes that, "as shown by the increase in oil and gas drilling in the area and the Stanford [University] report, the earthquake potential in the area is significant"[380] and, therefore, the ER is deficient because it "relies on historical earthquake data that [are] outdated in light of recent fracking activity that will induce earthquakes in the area."[381]

10 C.F.R. § 51.61 requires the submission of an environmental report by an applicant for a license for storage of spent fuel in an ISFSI and states that the environmental report shall contain the information specified in 10 C.F.R. § 51.45 and shall address the siting evaluation factors contained in Subpart E of 10 C.F.R. Part 72. 10 C.F.R. § 51.45 requires an environmental report to contain, among other things, a description of the "environment affected" and the impacts of the proposed action on the environment. These requirements work together, *i.e.*, the purpose of the description of the environment affected is to set a baseline that can then be used to evaluate the impacts of the proposed action and satisfy NEPA.[382] Further, Subpart E of 10 C.F.R. Part 72 at 10 C.F.R. § 72.100 states that a proposed site must be evaluated with respect to the effects on populations in the region resulting from the release of radioactive materials. Contrary to the Sierra Club's assertions, the ER does, in fact, describe the environment affected and the impact of the proposed action on this environment with respect to earthquakes and the release of radioactive materials.

In Chapter 3, "Affected Environment," the ER states that, according to the U.S. Geological Survey (USGS) earthquake database, 244 historical earthquakes with magnitude 2.5 or greater, including one with magnitude 5.7 and one with magnitude 6.5, have been

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[379] *Id.* at 44–45.

[380] *Id.* at 45.

[381] *Id.* at 47.

[382] *See Vogtle*, 65 NRC at 256 (citing *American Rivers v. Federal Energy Regulatory Commission*, 201 F.3d 1186, 1195 n.15 (9th Cir. 2000)); 42 U.S.C. § 4332 ("all agencies of the Federal Government shall . . . include in every recommendation or report on proposals for . . . major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on . . . the environmental impact of the proposed action . . . .").

documented within a 200-mile radius of the CIS Facility site between 1900 and 2016.[383] The ER also identifies seismic source zones and faults within a 200-mile radius of the site.[384] The ER explicitly discusses seismicity within the vicinity of the site that may potentially be related to fracking activities by stating that "[t]he seismicity in west Texas, southeast of the [s]ite, is hypothesized as being a result of fluid pressure build-up from fluid injection, and consequential reduction in effective stress across pre-existing fractures and associated decrease in frictional resistance to sliding" and that seismic activity west of the site "is suspected to be induced by injection of waste water from natural gas production into deep well or wells . . . ."[385]

Using the affected environment baseline established in Chapter 3, the ER at Chapter 4, "Environmental Impacts," evaluates the environmental impacts of the construction and operation of the CIS Facility, including the environmental impact with respect to earthquakes and the release of radioactive materials. Specifically, the ER states that, due to the relatively shallow depth of excavation, construction "would not induce seismic activity or affect subsurface faults resulting in the accidental discharge of radiological materials or other contaminants to surrounding soils during the operational phase."[386] The ER also states that operation "would not be expected to be impacted from . . . seismic events" due to the site's "relatively low seismic hazard" and the fact that the CIS Facility would be constructed in accordance with the NRC's requirements that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes.[387] Further, the CIS Facility would utilize the Holtec International Storage Module Underground MAXimum Capacity (HISTORM UMAX) Storage System, which the ER states, based on the NRC's prior approval of

[383] ER at 3-13.

[384] *Id.* at 3-13 – 3-14.

[385] *Id.* at 3-13.

[386] ER at 4-6.

[387] *Id.* at 4-7.

the system, can withstand the effects of the design basis earthquake for the site without any release of radioactive materials.[388] Therefore, the ER concludes that the environmental impact of earthquakes would be small.[389]

Given this evaluation in Chapters 3 and 4 of the ER, the Sierra Club's statements that the ER "essentially dismisses the likelihood of earthquakes in the area and does not mention any environmental impacts from earthquakes"[390] and "contains a very short discussion of seismic information"[391] are demonstrably false. The ER discusses the potential for earthquakes in the vicinity of the CIS Facility site and explains the applicant's basis for concluding that earthquakes can be withstood by the proposed storage system without any release of radioactive materials and, thus, that the environmental impact of the proposed action with respect to earthquakes would be small.

Additionally, the Contention 11 environmental claim is inadmissible because, contrary to 10 C.F.R. § 2.309(f)(1)(vi), the Sierra Club does not provide sufficient information to show that the alleged omission of information regarding drilling within the vicinity of the CIS Facility site is actually a material issue of law or fact. A dispute at issue is "material" if its resolution would make a difference in the outcome of the licensing proceeding.[392] The Sierra Club merely asserts, however, that, because there is drilling in the vicinity of the CIS Facility site that may cause earthquakes, "the earthquake potential in the area is significant."[393] This conclusory statement is not sufficient to satisfy the NRC's strict-by-design pleading requirements. Moreover,

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[388] *Id.* at 4-56. *See also* ER at 6-6 – 6-7.

[389] *Id.*

[390] Sierra Club Petition at 45.

[391] *Id.* at 47.

[392] *Oconee*, CLI-99-11, 49 NRC at 333–34 (citing Rules of Practice for Domestic Licensing Proceedings—Procedural Changes in the Hearing Process, 54 Fed. at 33,172); *see also Nuclear Management Co., LLC* (Monticello Nuclear Generating Plant), LBP-05-31, 62 NRC 735, 748–49 (2005) ("'Materiality' requires that the petitioner show why the alleged error or omission is of possible significance to the result of the proceeding.").

[393] Sierra Club Petition at 45.

even if this statement were supported, the Sierra Club does not explain how such "significant" earthquake potential would actually make a difference in the outcome of this licensing proceeding in light of the ER's explanation of why earthquakes can be withstood by the proposed storage system without any release of radioactive materials. The Sierra Club has not demonstrated why any earthquakes that may be caused by drilling within the vicinity of the CIS Facility site would contradict this determination (*e.g.*, why such earthquakes would not be bounded by the facility's design) and thus, in turn, why they would challenge the ER's conclusion that the environmental impact of the proposed action with respect to earthquakes would be small. Therefore, the Contention 11 environmental claim is inadmissible.

ii. *Contention 11's Safety Claim is Inadmissible*

With respect to its safety claim, the Sierra Club states that 10 C.F.R. § 72.103(f) applies to the CIS Facility site and that this regulation requires that the geological, seismological, and engineering characteristics of the site be investigated in sufficient scope and detail to provide sufficient information to support evaluations performed to arrive at estimates of the design earthquake ground motion.[394] The Sierra Club states that the SAR does not comply with this regulation because its evaluation of the earthquake potential at the CIS Facility site is "historical" and "does not take into account the recent increase in drilling for oil and natural gas in the area that creates induced earthquakes."[395] The Sierra Club provides "[a] map showing the intense drilling in the area," and a Stanford University report "document[ing] the existence of prior earthquakes in southeast New Mexico, and . . . the existence of numerous faults in the area in and around the proposed Holtec site."[396]

[394] *Id.* at 45–46.

[395] *Id.* at 44–46.

[396] *Id.* at 44–45.

The SAR discusses that the design basis earthquake for the CIS Facility site was "set to bound the 10,000 year return earthquake" and that, for additional conservatism and to overcome any potential uncertainty or future adjustments to the site seismological data, a "design extended condition earthquake" was also defined for the site, which is two-thirds greater than the design basis earthquake.[397]

As with its environmental claim, Contention 11's safety claim is inadmissible because, contrary to 10 C.F.R. § 2.309(f)(1)(vi), it does not demonstrate why it represents a dispute actually on a material issue of law or fact. Although the Sierra Club argues that earthquakes caused by drilling within the vicinity of the CIS Facility site should have also been evaluated, it does not explain how or why such an additional evaluation would affect, let alone invalidate, the SAR's conclusion regarding the design basis earthquake and, thus, make a difference in the outcome of the licensing proceeding. In fact, the Sierra Club does not even reference the SAR's discussion of the design basis earthquake. Therefore, the Contention 11 safety claim is inadmissible.

Sierra Club Contention 12

> *The dunes sagebrush lizard, a/k/a sand dune lizard, is an endangered species pursuant to New Mexico state law and regulation. The lizard has a limited range and is specfically adapted to sand dune areas with shinnery oak. The site of the Holtec project is within the lizard's habitat range. The ER submitted by Holtec claims that the lizard is not present in the area of the Holtec site, but that assertion is contrary to the scientific evidence. The ER and the subsequent EIS must evaluate the impact of the Holtec project on the dunes sagebrush lizard and its habitat.*

Contention 12 asserts that the dunes sagebrush lizard, also known as the sand dune lizard, is an endangered species pursuant to New Mexico state law whose habitat range includes the Holtec site.[398] The Petitioner relies primarily on two maps provided as Exhibits 8

[397] SAR at 4-20, 4-25.

[398] Sierra Club Petition at 48.

and 9. The Petitioner asserts that the ER in Sections 3.4.3, 4.4.3, and 4.4.4 makes no mention of the impact of the project on the lizard or its habitat in violation of 10 C.F.R. § 51.45 and NUREG-1748.

This contention is inadmissible as the Petitioner fails to provide adequate support for its claims, as required by 10 C.F.R. § 2.309(f)(1)(v). Fundamentally, the evidence offered by the Petitioner does not support the contention. Namely, the maps presented in Exhibit 8 and 9, which the Petitioner describes as illustrating the habitat range of the dunes sagebrush lizard, are at such a large scale that it is not possible to determine whether either map's portrayal of the habitat range overlaps with the CISF site.[399] Furthermore, the Staff identified that the map replicated in Exhibit 9 is also available online,[400] and when that version is enlarged it fails to show that suitable habitat for the lizard falls within the Holtec CISF site boundary as the Petitioner claims. Specifically, the site lies just west of the Laguna Gatuna,[401] and when the map from Exhibit 9 is enlarged, it does not show that suitable habitat exists west of Laguna Gatuna in the area of the site. "A document put forth by an intervenor as the basis for a contention is subject to scrutiny both for what it does and does not show."[402] Accordingly, notwithstanding the Petitioner's claim that its two exhibits show that the Holtec site is within the dunes sagebrush lizard's habitat range, neither referenced map constitutes support for petitioner's contention. It is the Petitioner's obligation to present the factual information and expert opinions necessary to

[399] Although the page referenced in Exhibit 8 is also available online at page 10, the webpage does not enable magnification. *See* Center for Biological Diversity and Defenders of Wildlife, "Petition to List the Dunes Sagebrush Lizard as a Threatened or Endangered Species and Designate Critical Habitat," (May 8, 2018), https://ecos.fws.gov/docs/petitions/92210/1040.pdf, *also available at* https://go.usa.gov/xP9rV.

[400] "DSL Suitable Habitat; Expanded Area," https://cehmm.maps.arcgis.com/apps/View/index.html?appid=2a395628bd704203b9fbb9648e56b189, *also available at* https://bit.ly/2PqzPkK (last visited Oct. 8, 2018).

[401] *See* ER at 1-9, Figure 1.3.1 "CIS Facility Site Boundaries."

[402] *Yankee Nuclear*, LBP-96-2, 43 NRC at 90 (1996).

support its contention,[403] and as neither map supports its central assertion, the contention fails to meet the requirements of 10 C.F.R. § 2.309(f)(1)(v).

The contention also criticizes two surveys referenced in the ER, asserting that the studies are "not a credible basis for concluding that the [species] is not present at the Holtec site" and that both should be viewed with "skepticism."[404] But absent further factual support asserting the presence of the lizard or suitable habitat at the Holtec site, these criticisms amount to speculation that the lizard may be present; accordingly, the contention does not ultimately directly contradict the ER's conclusion and thus falls short of demonstrating that a genuine dispute exists on a material issue of law or fact in accordance with 10 C.F.R. § 2.309(f)(1)(vi).

For these reasons, Contention 12 is inadmissible.

Sierra Club Contention 13

> *As shown in previous contentions, the Holtec ER is replete with errors, omissions, and blatantly incorrect statements and information. Further, Chapter 12 of the ER shows that a company called Tetra Tech, was the primary preparer of the ER. The only other preparer listed was a subcontracting company that conducted the cultural resource evaluation. Tetra Tech was accused of engaging in widespread fraud with respect to its contract with the United States Navy to clean up radioactive materials at the Hunter's Point Naval Shipyard in San Francisco, California. As such, Tetra Tech's credibility is in question and the credibility of the ER prepared by Tetra Tech likewise is in question.*

Contention 13 generally challenges the ER based on alleged, unspecified errors, omissions, and incorrect statements, as well as the Sierra Club's allegation regarding the credibility of the ER's preparer, Tetra Tech, based on past performance under a contract unrelated to Holtec's application. Specifically, the Sierra Club questions Tetra Tech's credibility based on the firm's past conduct under a contract with the United States Navy to clean up

[403] *See USEC*, CLI-06-10, 63 NRC at 457.

[404] Sierra Club Petition at 50 (discussing Eddy Lea Energy Alliance, "Final Detailed Siting Report, Eddy-Lea Siting Study," (Apr. 28, 2007) (Accession No. ML102440738) and ER, Appendix B, "Ecological Survey Results"). For example, it raises concerns about the expertise of the preparer of the 2007 report, as well as the duration and time of year of the 2016 survey.

radioactive materials at Hunter's Point Naval Shipyard in San Francisco. The Sierra Club asserts that Tetra Tech's past work involved fraud and points to a Notice of Violation and Imposition of Civil Penalty the NRC issued to Tetra Tech in July 2016 for deliberately falsifying soil sample surveys at Hunter's Point.[405] The Sierra Club also asserts that a Navy official found Tetra Tech's soil sampling data at Hunter's Point unreliable.[406]

Contention 13 is inadmissible under 10 C.F.R. § 2.309(f)(1)(vi) because it does not identify a genuine dispute with the application that presents a material issue of law or fact. The Commission puts "strict limits on 'management' and 'character' contentions."[407] To admit a contention based on claims of poor character or integrity, the Commission has found that allegations must link directly to the proposed licensing action and not merely to past activities. In *Millstone*, the Commission expressly stated its expectation that "[w]hen 'character' or 'integrity' issues are raised, we expect them to be directly germane to the challenged licensing action."[408] Here, Contention 13 raises character issues with Tetra Tech based on its past work for a different client at a facility entirely unrelated to Holtec's proposed project. Thus, there is no direct link established between Tetra Tech's alleged past credibility issues and Holtec's ER to serve as the basis for an admissible contention.

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[405] Sierra Club Petition at 53–54; Notice of Violation and Proposed Imposition of Civil Penalty, EN-16-2017, July 24, 2016 (ADAMS Accession No. ML16207A292) ("NOV").

[406] Sierra Club Petition at 53-54 (describing the declaration, attached as Exhibit 10, of an attorney representing Greenaction for Health and Environmental Justice that filed a petition with the NRC, pursuant to 10 C.F.R. § 2.206, to revoke Tetra Tech's materials license because of its work at Hunter's Point. The petition is currently under NRC Staff review.).

[407] *Millstone*, CLI-01-24, 54 NRC at 366 (discussing that Petitioners did not establish that past events during "an earlier era" at the facility raised "any current or directly pertinent 'character' concerns").

[408] *Id.* at 366–67; *See also Southern Nuclear Operating Co.* (Vogtle Electric Generating Plant, Units 3 and 4), CLI-12-2, 75 NRC 63, 84 (2012) (finding that "issues such as past violations of NRC regulations would indicate a deficiency in an application only if they are directly germane to the licensing action, rather than being of simply historical interest"); *Georgia Tech Research Reactor*, CLI-95-12, 42 NRC at 120 (finding that "[a]llegations of management improprieties or poor 'integrity,' of course, must be of more than historical interest: they must relate directly to the proposed licensing action.").

Further, no genuine dispute with regard to a material issue of fact or law is raised where an intervenor relies on the existence of past violations, but then fails to present any information indicating that any person or procedure associated with those past violations will be employed at, or involved with, the proposed facility.[409] Here, the Sierra Club does not show that any specific individuals or practices associated with Tetra Tech's violations at Hunter's Point are associated with Holtec's ER.[410] And Contention 13's broad allegations regarding how Tetra Tech "improperly prepared the ER" consist entirely of summaries of the Sierra Club's other contentions raised with respect to the application. Nothing in those contentions specifically raises an issue of credibility, integrity, or wrongdoing with respect to the ER. Thus, pursuant to 10 C.F.R. § 2.309(f)(1)(vi), Contention 13 is inadmissible.

Sierra Club Contention 14

An accurate thermal evaluation of the HI-STORM UMAX system is imperative to ensure that temperatures within the system will not be conducive to corrosion, cladding and other conditions that would adversely impact the safety of the system. The HI-STORM UMAX system is unique, with both air intake and exhaust vents at the top of the containment cask. The SAR for the Holtec CIS facility does not provide adequate information to determine if the thermal parameters for the HI-STORM system at the Holtec CIS facility will provide for adequate safety.

In Contention 14, the Petitioner raises concerns over the thermal evaluation of the HI-STORM UMAX system, stating that the Safety Analysis Report for this application "does not provide adequate information to determine if the thermal parameters for the HI-STORM system at the Holtec CIS facility will provide for adequate safety."[411] In support of its proposed

[409] *USEC, Inc.* (American Centrifuge Plant), LBP-05-28, 62 NRC 585, 618–19 (2005) (discussing intervenor's failure to show that management personnel allegedly involved in past violations were involved in the activities being contested).

[410] The NRC issued a violation to a Tetra Tech radiation task supervisor, but Petitioner provides no information that this Tetra Tech employee worked on the Holtec ER, nor is the employee mentioned in the ER. *See* NOV at 1 (ADAMS Accession No. ML16207A292).

[411] Sierra Club Petition at 56.

contention, Petitioner states that Chapter 6 of the SAR does not address the UMAX design where air intake and exhaust vents are located at the top of the cask.[412]

However, Contention 14 is inadmissible because it raises issues that are outside the scope of the proceeding and does not raise a genuine dispute with the application in question.[413]

Most significantly, while the Contention makes reference to the Safety Analysis Report Chapter 6 as a whole, it makes no distinction as to whether the claimed issue is related to the site specific design of the HI-STORE facility or the design of the previously certified HI-STORM UMAX design.[414]

The Safety Analysis Report for the HI-STORE Consolidated Interim Storage Facility extensively incorporates by reference the design and analyses from the HI-STORM UMAX design,[415] and each chapter of the SAR identifies which portions of the HI-STORM UMAX design are incorporated by reference.[416] The SAR identifies that the design of the vertical ventilated modules are identical to the UMAX design Option C, with two exceptions.[417]

The HI-STORM UMAX design has been certified by the NRC, and is identified in 10 C.F.R. § 72.214 as an approved storage cask under Certificate Number 1040.[418] 10 C.F.R. § 72.46(e) specifically states that for specific licenses under 10 C.F.R. Part 72, the scope of any public hearing will not include any cask design issues for casks approved under 10 C.F.R. Part

[412] Sierra Club Petition at 57–58.

[413] 10 C.F.R. §§ 2.309(f)(1)(iii), (vi).

[414] Sierra Club Petition at 57–60.

[415] SAR, Table 1.0.3.

[416] *See e.g.*, SAR, Table 6.0.1.

[417] *See e.g.*, SAR, Subsection 6.4.1.

[418] 10 C.F.R. § 72.214 (Certificate Number 1040).

72, Subpart L.[419] Additionally, 10 C.F.R. § 2.335(a) prohibits challenges to rules promulgated by the Commission absent a waiver.[420]

Despite this prohibition, the issues raised in this contention are most directly related to either the cask design approved by rule or to activities beyond those being requested in this application.[421] For example:

- On Petition page 57, the Petition references Chapter 6 of the safety analysis report but then raises concerns over the design of the UMAX cask itself.
- On Petition pages 59–60, the Petitioner raises a concern about the use of high burnup fuel at the facility, without any reference to the application's incorporation of the UMAX, MPC-37, and MPC-89 designs which form the basis for the acceptable material at the facility.[422]
- On Page 60, the Petition raises concerns over potential processes to relocate spent fuel from reactor pools into a UMAX canister after a 2.5 year waiting period. Potential future applications for cask designs and activities that would take place at other licensee facilities are clearly outside the scope of this proceeding and would be subject to other review processes.

[419] 10 C.F.R. § 72.46(e).

[420] 10 C.F.R. § 2.335(a); *Tennessee Valley Authority* (Watts Bar, Unit 2), CLI-15-19, 82 NRC 151, 157 (2015) ("Section 2.335(a) of our regulations prohibits challenges to our rules and regulations in the context of adjudicatory proceedings.")

[421] *See, e.g.*, Sierra Club Petition at 57 (stating the SAR "There is no assurance that the design of the UMAX system accomplishes these goals."); Sierra Club Petition at 58 ("the UMAX cask is unique . . . This is different than the HI-STORM F/W and the HI-STORM 100"); Sierra Club Petition at 59 ("What is not known . . . is the ability of the UMAX cask to dissipate this heat output."); Sierra Club Petition at 59 ("The minimum values of these variables should be conditions of the Certificate of Compliance").

[422] *See, e.g.*, SAR Table 4.0.1, Page 4-3 (noting that the spent fuel and MPCs stored at the site are defined primarily by the UMAX FSAR); Proposed TS Section 2.1 (extensively incorporating limitations from the referenced designs). *See Crow Butte*, CLI-09-12, 69 NRC at 552 ("contentions based on little more than guesswork would waste the scarce adjudicatory resources of all involved").

Consequently, the issues that Petitioner has raised are either issues that are outside the scope of the proceeding, or, where the Petitioner has, in its stated contention alleged deficiencies that are within scope of the proceeding, it has failed to clearly identify what specific concerns are in dispute, as required by 2.309(f)(1)(vi).

Finally, the Petition mentions the need for access to proprietary information as a basis for intervention.[423] The Petitioner was afforded the opportunity to request access to this proprietary information through procedures established by the Commission, but declined to do so.[424]

Accordingly, Contention 14 should be found inadmissible because it does not raise a genuine dispute with the application and raises issues outside the scope of this proceeding under 10 C.F.R. § 2.309(f)(1)(vi) and (iii).

Sierra Club Contention 15

The ER fails to adequately determine whether shallow groundwater exists at the site of the proposed CIS facility. It is important to make this determination in order to assess the impact of a radioactive leak from the CIS facility on groundwater.

In Contention 15, the Petitioner asserts that the ER fails to adequately determine whether shallow groundwater exists at the site, which the Petitioner asserts is necessary to assess the impact of a radioactive leak from the CISF facility. According to the Petitioner, "[t]he Applicant claims there is probably no shallow groundwater at the site."[425] However, the Petitioner asserts that Holtec has not done the field investigations necessary to make this

[423] Sierra Club Petition at 58–59 ("It will obviously be necessary for Sierra Club to be allowed to intervene and conduct discovery in order to obtain this information.").

[424] 83 FR 32,919, 32,922 (July 16, 2018). In addition to the period initially allowed in the Federal Register notice for such requests, the Secretary of the Commission subsequently extending the timeframe for such requests until August 30th, 2018. Holtec International (Consolidated Interim Storage Facility), Order of the Secretary (Aug. 20, 2018) (ML18232A577).

[425] Sierra Club Petition at 60.

determination.[426] As support for the contention, the Petitioner relies on the declaration of George Rice, a groundwater hydrologist.[427]

This contention is inadmissible because the Petitioner fails to provide adequate support for its claims, as required by 10 C.F.R. § 2.309(f)(1)(v), and fails to raise a genuine dispute with the Applicant, as required by 10 C.F.R. § 2.309(f)(1)(vi). The Petitioner's asserted concern regarding shallow groundwater rests on the following premise: "If contaminants leak from the facility, they could be transported by shallow groundwater underlying the site."[428] However, Mr. Rice has not provided any information to explain the basis for the threshold assumption that contaminants might leak from the facility in the first place, contrary to 10 C.F.R. § 2.309(f)(1)(v). "[N]either mere speculation nor bare or conclusory assertions, even by an expert, alleging that a matter should be considered will suffice to allow the admission of a proffered contention."[429] Lacking that explanation, the contention fails to articulate a factual basis for the Petitioner's concern with shallow groundwater as a contamination pathway.

Indeed, with respect to that threshold assumption, the Petitioner fails to identify, let alone controvert, portions of the ER in which the Applicant asserts that a contaminant leak from the canister is not credible. In discussing potential pathways to radiation, the ER notes, "There is no air pathway because the casks are sealed by being welded shut. There is *no potential for a liquid pathway* because the SNF contains no liquid component and the casks are sealed to prevent any liquids from contacting the SNF assemblies."[430] It further explains, "The lid of the canister is double sealed, and consists of a closure lid to shell weld (lid-to-shell) and a closure ring to shell weld (ring-to-shell). In order for a leak to the environment to occur, both the primary

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[426] *Id.*

[427] Expert Declarations, George Rice (Sept. 10, 2018) ("Rice Declaration").

[428] Sierra Club Petition at 60; Rice Declaration at 1.

[429] *Vogtle,* LBP-07-3, 65 NRC at 253 (*citing Fansteel*, CLI-03-13, 58 NRC at 203).

[430] ER at 1-7 (emphasis added).

and secondary welds must be leaking. Because the confinement boundary is welded and the temperature and pressure of the canister are within the design limits, no discernible leakage is credible."[431]

Likewise, the Petitioner fails to controvert Section 4.13 of the ER, which considers the impacts of off-normal events[432] and accidents[433] and their potential consequences to the proposed CISF. Such events are evaluated in the SAR for their consequence to the structural, thermal, shielding, criticality, confinement, and radiation protection performance of structures, systems, and components specific to the CISF, and the HI-STORM UMAX system, and the results of those analyses are summarized in the ER.[434] Importantly, the ER states that none of the off-normal events[435] or accident events "would result in release of any radioactive material."[436]

In determining contention admissibility, "[a]ny contention that fails directly to controvert the application or that mistakenly asserts the application does not address a relevant issue can be dismissed."[437] Having failed to controvert the application's analysis regarding radioactive releases, this contention fails to raise a genuine dispute with the application on a material issue of law or fact.

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[431] *Id.* at 4-47.

[432] Off-normal events evaluated include off-normal pressure, off-normal environmental temperature, leakage of one seal, partial blockage of the air inlet plenum, and hypothetical non-quiescent wind. *Id.* at 4-55.

[433] Accidents analyzed include a fire accident, partial blockage of MPC basket vent holes in long-term storage, a tornado, flood, earthquake, 100 percent fuel rod rupture, confinement boundary leakage, an explosion, lightning, 100 percent blockage of air inlets, burial under debris, extreme environmental temperature, and a HI-TRAC VW transfer cask handling accident. *Id.* at 4-55 – 4-56.

[434] SAR at 15-7 – 15-17; ER at 4-55 – 4-56.

[435] ER at 4-55.

[436] *Id.* at 4-56.

[437] *See Millstone*, LBP-08-9, 67 NRC at 433 (citing *Rancho Seco*, LBP-93-23, 38 NRC at 247–48.

In sum, because this contention does not meet the requirements of 10 C.F.R. § 2.309(f)(1)(v) and (vi), this contention is inadmissible.

Sierra Club Contention 16

The ER does not contain any information as to whether brine continues to flow in the subsurface under the Holtec site.

In Contention 16, the Petitioner asserts that the ER does not contain any information as to whether brine continues to flow in the subsurface under the Holtec site. The Petitioner states that two brine disposal facilities once operated in the northeast portion of the Holtec site and that a 2007 water sample south of the Holtec site contained brine.[438] The Petition states that the subsurface movement of brine "is important because brine could cause corrosion of the containers holding the radioactive waste and cause leaks in the containers."[439] The Petitioner relies on the declaration of Mr. Rice,[440] who states that the applicant has not addressed basic questions such as "do the springs/seeps that were flowing in 2007 continue to flow? Is brine moving along perched zones in the alluvial materials, or along the alluvium/Dockum interface? Could the brine come into contact with the canisters?"[441] The Petitioner also asserts that because Holtec envisions the CISF operating for at least 120 years, beyond the period for which the containers are certified, "there is no evaluation for the corrosion potential of the containers from brine in the groundwater after the period for which the containers are certified."[442]

This contention is inadmissible because the Petitioner fails to provide adequate support for its claims, as required by 10 C.F.R. § 2.309(f)(1)(v), and fails to raise a genuine dispute with the applicant, as required by 10 C.F.R. § 2.309(f)(1)(vi). The Petitioner's asserted concern

[438] Sierra Club Petition at 62 (citing ER § 3.5.2.1).

[439] *Id.* at 62.

[440] *Id.* at 63.

[441] George Rice Declaration at 29.

[442] Sierra Club Petition at 63.

regarding shallow groundwater rests on the premise that "brine could cause corrosion of the containers holding the radioactive waste and cause leaks in the containers."[443] However, contrary to 10 C.F.R. § 2.309(f)(1)(v), the Petition provides no information to support the assumption that brine could come into contact with the canister and cause corrosion, let alone to an extent that could cause leaks. Notably, Mr. Rice's declaration, on which the contention exclusively relies, does not even refer to corrosion. "[N]either mere speculation nor bare or conclusory assertions, even by an expert, alleging that a matter should be considered will suffice to allow the admission of a proffered contention."[444] Lacking that explanation, the contention fails to articulate a factual basis for the Petitioner's concern with brine detection.

Moreover, the Petitioner fails to acknowledge, let alone dispute, portions of the SAR in which the applicant asserts that that there is no pathway for groundwater intrusion in the installation, contrary to 10 C.F.R. § 2.309(f)(1)(vi). The SAR explains that spent nuclear fuel is contained in a steel canister which resides within a steel cavity enclosure container (CEC).[445] Notably, the SAR states, "the CEC is a close-bottom, open top, thick walled cylindrical vessel that has no penetrations or openings. Thus, groundwater has no path for intrusion into the interior space of the CEC."[446] Furthermore, the array of vertical ventilated modules is surrounded by a "thick reinforced concrete Enclosure Wall," which along with the support foundation pad, "provides a physical separation (water intrusion protection) to the CECs."[447] Because the Petitioner fails to controvert portions of the SAR in which the applicant asserts that groundwater has no path for intrusion, this contention is inadmissible. As stated previously,

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[443] *Id.* at 62.

[444] *Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site*),* LBP-07-03, 65 NRC 237, 253 (2007) (*citing Fansteel*, CLI-03-13, 58 NRC at 203).

[445] *See* SAR at 1-11; *see also* Figure 1.2.2(a) at 1-24.

[446] SAR at 1-14.

[447] *Id.* at 17-24.

"[a]ny contention that fails directly to controvert the application or that mistakenly asserts the application does not address a relevant issue can be dismissed,"[448] as a failure to raise a genuine dispute with the application on a material issue of law or fact in accordance with 10 C.F.R. § 2.309(f)(1)(vi).

In sum, Contention 16's reliance on Mr. Rice's declaration fails to identify factual or expert support for the Petitioner's claim, and fails to constitute a genuine dispute with the applicant, contrary to 10 C.F.R. § 2.309(f)(1)(v) and (vi).

Sierra Club Contention 17

> *The ER and SAR do not discuss the presence and implications of fractured rock beneath the Holtec site. These fractures could allow radioactive leaks from the CIS facility to enter groundwater or for the brine described in Contention 16 to corrode the containers contained the radioactive material.*

In Contention 17, the Petitioner notes that geologic boring logs have identified fractured rock beneath the area of the Holtec site. The Petitioner alleges that fractures could allow radioactive leaks from the CIS facility to rapidly enter groundwater or provide a means for the brine described in Contention 16 to corrode the containers.[449] The Petitioner asserts that neither the ER nor the SAR discuss the fractured rock under the site which the Petitioner alleges must be discussed in accordance with 10 C.F.R. §§ 51.45 and 72.103.[450] In support of the contention, the Petitioner relies solely on a declaration from Mr. Rice.[451]

For the same reasons discussed above in the Staff's response to Contentions 15 and 16, Contention 17 is inadmissible.[452] Specifically, this contention is inadmissible because the Petitioner fails to provide adequate support for its claims, as required by 10 C.F.R.

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[448] *See Millstone*, LBP-08-9, 67 NRC at 433 (citing *Rancho Seco*, LBP-93-23, 38 NRC at 247–48 (1993).

[449] Sierra Club Petition at 63–64.

[450] *Id.* at 64–65.

[451] *Id.* at 64.

[452] *See supra* Staff Response at 95–102.

§ 2.309(f)(1)(v), and fails to raise a genuine dispute with the Applicant, as required by 10 C.F.R. § 2.309(f)(1)(vi). The Petitioner asserts that "fractures could rapidly convey contaminants to underlying groundwater."[453] However, the Petitioner's contention again rests upon a threshold premise that contaminants may leak from the facility, a premise for which Mr. Rice has provided no support, contrary to 10 C.F.R. § 2.309(f)(1)(v). Although Mr. Rice explains the basis for his claim that fractured rock exists on the site,[454] he fails to explain how contaminants may leak in the first place and thus why his concerns regarding transport through fractures would represent a material deficiency in the application. It is the petitioner's responsibility "to provide the necessary information to satisfy the basis requirement for the admission of its contentions and demonstrate that a genuine dispute exists within the scope of th[e] proceeding."[455]

Here, the ER and the SAR assert that a contaminant leak from the canister is not credible and a pathway for groundwater intrusion does not exist. For example, the ER states that "The lid of the canister is double sealed, and consists of a closure lid to shell weld (lid-to-shell) and a closure ring to shell weld (ring-to-shell). In order for a leak to the environment to occur, both the primary and secondary welds must be leaking. Because the confinement boundary is welded and the temperature and pressure of the canister are within the design limits, no discernible leakage is credible."[456] Further, the SAR asserts that the proposed CISF will have "zero effluent release."[457] Although the Petitioner criticizes as "insufficient" two sections

[453] Rice Declaration at 6.

[454] Rice Declaration at 6 n. 34–36.

[455] *Baltimore Gas & Electric Co.* (Calvert Cliffs Nuclear Power Plant, Units 1 and 2), CLI-98-14, 48 NRC 39, 41 (1998).

[456] ER at 4-47.

[457] SAR at 1-12; *see also* SAR at 1-14 ("[T]he CEC is a closed-bottom, open top, thick walled cylindrical vessel that has no penetrations or openings. Thus, groundwater has no path for intrusion into the interior space of the CEC."); SAR at 17-23 ("A thick reinforced concrete Enclosure Wall surrounds the [vertical ventilated modules] array and, along with the Support Foundation pad, provides a physical separation (water intrusion protection) to the CECs."

of the SAR that discuss geologic characteristics (Section 2.6.1 and 2.6.4),[458] Mr. Rice neither mentions nor disputes the SAR's analyses and conclusions with respect to the potential for contaminant leaks and groundwater intrusion. As previously noted, "[a]ny contention that fails directly to controvert the application or that mistakenly asserts the application does not address a relevant issue can be dismissed."[459] Accordingly, having failed to controvert the application's analysis regarding radioactive releases and thus the predicate for Contention 17's asserted concerns regarding transport of contaminants through fractures, the Petitioner has failed to establish a genuine dispute with the application on a material issue in accordance with 10 C.F.R. § 2.309(f)(1)(vi).

Sierra Club Contention 18

The Santa Rosa Formation is an important aquifer in the area of the Holtec site. It is used for domestic water supply, stock watering and irrigation. The Holtec ER has not adequately determined and discussed the possibility that waste-contaminated groundwater could reach the Santa Rosa Formation.

In its Contention 18, the Sierra Club states that the "ER has not adequately determined and discussed the possibility that waste-contaminated groundwater could reach the Santa Rosa Formation," which is "an important aquifer in the area of the [CIS Facility] site . . . used for domestic water supply, stock watering and irrigation."[460] The Petitioner bases the contention on the statements that it is "based on the declaration of George Rice" and that the ER "mentions the Santa Rosa Formation, but contains no discussion of it nor any of the points raised in Mr. Rice's report."[461] The Declaration of Mr. Rice, in turn, only adds that, at the CIS Facility site, "the top of the Santa Rosa is approximately 215 feet below land surface," "[m]onitor well B101 is

[458] Sierra Club Petition at 64–65 (referring to SAR Section 2.6.4's statement that "conditions at the Site are not conducive to karst development").

[459] *See Millstone*, LBP-08-9, 67 NRC at 433 (citing *Rancho Seco*, LBP-93-23, 38 NRC at 247–48).

[460] Sierra Club Petition at 65.

[461] *Id.* at 65–66.

completed in the Santa Rosa, and the depth of water in the well is about 250 feet," and "[t]he quality of this water has not been determined."[462]

The ER discusses the affected environment with respect to groundwater in Section 3.5.2. The ER, in apparent agreement with the Sierra Club, states that groundwater in the region (southern Lea County) "is an essential resource . . . used for drinking, irrigation, and industrial processes" and that aquifers within the vicinity of the CIS Facility site include those in the "Santa Rosa Sandstone" and are "important sources of groundwater . . . ."[463] The SAR states that "[n]o potable groundwater is known to exist in the immediate vicinity of the [s]ite."[464] The ER also states that near surface "[g]roundwater encountered on the east side of the [s]ite is brackish" and that "[n]o groundwater has been encountered on the west side of the [s]ite."[465] The ER then discusses the environmental impacts of the proposed action of the construction and operation of the CIS Facility to groundwater in Section 4.5. This discussion includes the determination that "[i]mpacts to groundwater would not be expected, due to the depth of groundwater (300 to 400 feet) and the fact that the CIS Facility would not release pollutants, including radionuclides, during normal operations" because the "storage system design and construction, along with environmental monitoring of the ISFSI Pad combine to make the potential for contaminant release from the CIS Facility extremely low."[466] The ER also states that the CIS Facility would not release any radioactive material even when subjected to "the effects of all credible and hypothetical accident conditions and natural phenomena . . . ."[467]

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[462] Declaration of Mr. Rice at 7.

[463] ER at 3-39.

[464] SAR at 2-83.

[465] ER at 3-39.

[466] *Id.* at 4-12 – 4-13.

[467] *Id.* at 4-56.

Furthermore, in discussing potential pathways to radiation, the ER notes, "There is no air pathway because the casks are sealed by being welded shut. There is *no potential for a liquid pathway* because the SNF contains no liquid component and the casks are sealed to prevent any liquids from contacting the SNF assemblies."[468] It further explains, "The lid of the canister is double sealed, and consists of a closure lid to shell weld (lid-to-shell) and a closure ring to shell weld (ring-to-shell). In order for a leak to the environment to occur, both the primary and secondary welds must be leaking. Because the confinement boundary is welded and the temperature and pressure of the canister are within the design limits, no discernible leakage is credible."[469]

Contention 18 is inadmissible because, contrary to 10 C.F.R. § 2.309(f)(1)(vi), the Sierra Club does not provide sufficient information to show that any dispute that it may have with the applicant is actually on a material issue of law or fact. A dispute at issue is "material" if its resolution would make a difference in the outcome of the licensing proceeding.[470] The ER's finding that the proposed action of constructing and operating the CIS facility would not be expected to impact groundwater is based on two, independent determinations, *i.e.*, (1) the depth of groundwater and (2) that the CIS Facility would not release radioactive material under either normal or accident conditions.[471] Contention 18 appears to address only the former of these independent bases by raising "the possibility that waste-contaminated groundwater could reach the Santa Rosa Formation"[472] and by relying on Mr. Rice's statement regarding the depth to water in a monitor well within the Santa Rosa Formation.[473]

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[468] *Id.* at 1-7 (emphasis added).

[469] *Id.* at 4-47.

[470] *Oconee*, CLI-99-11, 49 NRC at 333–34 (citing 54 Fed. Reg. at 33,172).

[471] ER at 4-13, 4-56.

[472] Sierra Club Petition at 65.

[473] Rice Declaration at 7.

Contention 18 does not, however, challenge the ER's other independent basis that the CIS Facility would not release radioactive material during normal or accident conditions. As with Contentions 15–17, contrary to 10 C.F.R. § 2.309(f)(1)(v), the Sierra Club thus fails to articulate factual support for the threshold premise of Contention 18, that contamination may be released from the facility.[474] And without having either acknowledged or challenged the applicant's determination that the CIS Facility would not release radioactive material during normal or accident conditions, the Sierra Club fails to show that its assertion that "the Santa Rosa Formation . . . must be evaluated with respect to whether waste-contaminated groundwater could impact the Santa Rosa aquifer" and Mr. Rice's assertion that "the possibility that waste-contaminated groundwater could reach the Santa Rosa Formation cannot be dismissed" constitute a genuine dispute with the applicant on a material issue of law or fact.

In conclusion, because Contention 18 does not meet the requirements of 10 C.F.R. § 2.309(f)(1)(v) and (vi), it is inadmissible.

Sierra Club Contention 19

Holtec performed two sets of packer tests in the Santa Rosa Formation to estimate the hydraulic conductivity (permeability) of the formation. These tests were conducted in conjunction with the preparation of the ER. It does not appear from the report of Holtec's consultant that these tests were conducted properly. Therefore, the ER has not presented an adequate evaluation of the affected environment.

In its Contention 19, the Sierra Club states that "Holtec performed two sets of packer tests in the Santa Rosa Formation to estimate the hydraulic conductivity (permeability) of the formation" and that "[i]t does not appear from the report of Holtec's consultant that these tests were conducted properly."[475] This argument is "based on the declaration of George Rice,"[476]

[474] *See supra* Staff Response at 95–102.

[475] Sierra Club Petition at 66.

[476] *Id.* at 67.

who states three reasons why he believes that the tests were not conducted properly.[477] The Rice Declaration asserts that "the applicant does not appear to have followed several of the recommendations in the [U.S. Bureau of Reclamation's Field Manual]."[478] The Sierra Club concludes that "the results of the packer tests are unreliable"[479] and that, therefore, "the ER has not presented an adequate evaluation of the affected environment."[480]

Contention 19 is inadmissible because it does not demonstrate why its assertion of improperly conducted packer tests in the Santa Rosa Formation is ultimately a dispute on a material issue of law or fact. A dispute at issue is "material" if its resolution would make a difference in the outcome of the licensing proceeding.[481] In apparent agreement with the Sierra Club, the ER states that, with respect to the CIS Facility site, "[t]here are numerous low permeability layers between the surface and the expected groundwater level."[482] Contention 19, however, does not explain how this information is used in the ER, nor why further refinement of this information as calculated by packer tests would be significant to the outcome of the licensing proceeding. Indeed, Mr. Rice observes that "[i]t should be noted that even when the tests are done properly, the values obtained are only semi-quantitative – within an order of magnitude of the actual value."[483] The Sierra Club in turn merely states, without support, that "[t]he permeability of the site is certainly important to assessing whether the site is appropriate for the proposed CIS [F]acility."[484] Without an explanation of how the asserted departures from the "recommendations in the [field] manual"[485] would ultimately have significance for any

[477] Rice Declaration at 8.

[478] *Id.*

[479] Sierra Club Petition at 67.

[480] *Id.* at 66.

[481] *Oconee*, CLI-99-11, 49 NRC at 333–34 (citing 54 Fed. Reg. at 33,172).

[482] ER at 3-39.

[483] Rice Declaration at 8.

[484] Sierra Club Petition at 66.

[485] Rice Declaration at 8.

analysis or conclusion in the ER, the Sierra Club has not demonstrated that the issue constitutes a material dispute, contrary to 10 C.F.R. § 2.309(f)(1)(vi).

In conclusion, because the Sierra Club has not demonstrated that Contention 19 is, in fact, disputing the ER or, even if it were, that its dispute would be material to this proceeding, it is inadmissible.

Sierra Club Contention 20

> *Since the 1990's almost all spent nuclear fuel being generated is high burnup fuel (HBF). HBF causes the cladding to become thinner, creating a higher risk of release of radioactive material. The cladding also becomes more brittle, with additional cracks. This situation causes risks for short-term and long-term dry storage. This issue is not adequately addressed in the SAR and high burnup fuel does not appear to be addressed in the ER at all. Cladding failure due to high burnup fuel is an issue that must be adequately addressed.*

In Contention 20, the Petitioner broadly asserts that the application does not specifically address the transportation and storage risks of high burnup fuel.[486] The Petitioner claims that the issue is not adequately addressed in the Safety Analysis Report and "does not appear to be addressed in the [Environmental Report] at all."[487] In support of its contention, Petitioner claims that high burnup fuel increases the likelihood of radiological impacts, citing two different reports by the Department of Energy and the Nuclear Waste Technical Review Board, and that the "[Environmental Report] and [Safety Analysis Report] must discuss and evaluate the risks of transporting and storing [high burnup fuel] due to deterioration of the cladding from [high burnup fuel].[488]

Contention 20 is inadmissible because the Petitioner has not, under either safety or environmental standards, demonstrated a genuine dispute with the application on a material

[486] Sierra Club Petition at 67.

[487] Sierra Club Petition at 67.

[488] Sierra Club Petition at 68–70.

issue of fact or law or shown that the issues raised are within the scope of the proceeding, contrary to the requirements of 10 C.F.R. § 2.309(f)(1)(vi) and (iii).

Most notably, although the Petition asserts various concerns related to high burnup fuel, it fails to specify what portions of the application the Petitioners deem insufficient, as required by 10 C.F.R. § 2.309(f)(1)(vi).[489] The general topic the contention is concerned with, notably the safety of storage and the potential environmental impacts of transportation, are in fact discussed in SAR's analysis of its thermal evaluation[490] and the Environmental Report's discussion of transportation impacts in Subsection 4.9.3. The contention fails to explain how the arguments in the contention would contradict or undermine any specific aspect of the applicant's analysis. Accordingly, the contention does not provide the parties sufficient notice as to the scope of the contention or how the issue can be resolved through the adjudicatory process, rendering it inadmissible.

i. Transportation and Storage Safety Claims

In regard to transportation safety, the application in question is for a specific-license ISFSI licensed under 10 C.F.R. Part 72.[491] The application does not request approval of a new transportation package design.[492] The safety of fuel transportation is governed by the standards

[489] *See Palo Verde*, CLI-91-12, 34 NRC at 156 (petitioners must "read the relevant parts of the license application and show where the application is lacking."); *Crow Butte*, CLI-09-12, 69 NRC at 552 ("contentions based on little more than guesswork would waste the scarce adjudicatory resources of all involved").

[490] *See* SAR, Chapter 6.

[491] Holtec International's HI-STORE Consolidated Interim Storage Facility for Interim Storage of Spent Nuclear Fuel, 83 Fed. Reg. 32,919 at 32,920 (July 16, 2018) ("By this application, Holtec is requesting authorization to construct and operate the HI–STORE Consolidated Interim Storage (CIS) Facility, in Lea County, New Mexico. If the NRC approves the application and issues a license to Holtec, Holtec intends to store up to 8,680 metric tons of uranium (MTU) of commercial spent nuclear fuel in the HI–STORM UMAX Canister Storage System for a 40-year license term.").

[492] *Id.*

in 10 C.F.R. Part 71 and through regulations issued by the Department of Transportation.[493] Consequently, to the extent the contention seeks to litigate generic safety concerns regarding offsite transportation of spent fuel (whether encompassing HBF or otherwise), such claims are outside the scope of this proceeding.[494]

With respect to the safety of storage of high-burnup fuel, the Holtec HI-STORE CISF application relies heavily on the design of the HI-STORM UMAX system, which is incorporated by reference into the Safety Analysis Report.[495] 10 C.F.R. § 72.46(e) specifically permits an application to "incorporate by reference information on the design of a spent fuel storage cask" that has been approved under 10 C.F.R. Part 72, Subpart L, and that if such a design is incorporated into the application, the scope of any public hearing "will not include any cask design issues."[496]

Here, the petitioner has not clearly identified how the concerns raised are within the scope of the license application and have not been previously generically addressed by regulation. Given the existing regulations governing both transportation safety and cask certification, the petition's generalized assertions of concern about HBF do not demonstrate that the concerns are suitable for resolution in the context of a license-specific adjudication, rather than constituting an impermissible challenge to a rule.

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[493] *See* 10 C.F.R. § 71.0, "Purpose and scope." *See also Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-99-34, 50 NRC 168, 176–177 (1999) (noting that "shipment of spent nuclear fuel [is] governed by Part 71 and do[es] not require a specific license under Part 72").

[494] *See id.* at 176–177; *State of New Jersey* (Department of Law and Public Safety's Requests Dated October 8, 1993), CLI-93-25, 38 NRC 289, 294 (1993); *Trustees of Columbia University in the City of New York*, ALAB–50, 4 AEC 849, 863 (1972) (noting that DOT regulations govern the safety of radioactive material transportation).

[495] SAR, Table 1.0.3, Page 1-7. *See also* SAR at Page 1-11 ("The centerpiece of the HI-STORE CIS facility is the HI-STORM UMAX canister storage system certified in NRC docket # 72-1040."). *See, e.g.*, SAR, Table 6.0.1, Page 6-3 (identifying which specific portions of the HI-STORM UMAX design are incorporated into Chapter 6).

[496] 10 C.F.R. § 72.46(e); § 2.335(a). *See also Turkey Point*, LBP-01-6, 53 NRC at 158–60, aff'd, CLI-01-17, 54 NRC 3 (2001) (finding contentions out of scope when they impermissibly challenged the Commissions' regulations).

Additionally, for both the safety of transportation and storage of high burnup fuel, Petitioner has not raised a genuine dispute of material fact with the application.[497] A bare assertion that an application is insufficient or inadequate is insufficient to meet this standard; a Petitioner must read the application, state both the applicant and petitioner's views, and explain the disagreement.[498] Here, the Petition states only that the issue "is not adequately addressed in the SAR" and that the "SAR must discuss and evaluate the risks of transporting and storing [high burnup fuel]."[499] This falls well short of the specificity needed to demonstrate a genuine material dispute.

ii. *Transportation and Storage Environmental Claims*

With respect to the environmental claims, Petitioner has provided a contention of omission, stating that the concern "does not appear to be addressed in the ER at all."[500] If a petitioner proposes a contention of omission, and the allegedly missing information is included in the license application, the proposed contention will have failed to raise a genuine dispute.[501] Even assuming that the potential environmental impacts of high burnup fuel are within the scope of the environmental review, the Petition fails to raise a genuine dispute of material fact because potential impacts of transportation and storage are described in the Applicant's Environmental Report and the Petition fails to specify how its claims regarding high burnup fuel actually contradict the ER.

First, with respect to transportation, as stated earlier, general requirements that govern transportation of spent fuel are established in the Commission's regulations in 10 C.F.R. Part 71 and regulations promulgated by the Department of Transportation. According to the

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[497] 10 C.F.R. § 2.309(f)(1)(vi).

[498] *Millstone*, CLI-01-24, 54 NRC at 358; *Palisades*, LBP-06-10, 63 NRC at 340–42.

[499] *See* Sierra Club Petition at 67, 70.

[500] Sierra Club Petition at 67.

[501] *See Millstone*, LBP-04-15, 60 NRC at 95.

Environmental Report, the analysis Holtec performed on the consequences of incident-free transportation is based upon the maximum dose rate permitted for exclusive use shipments.[502] The Petition fails to articulate a dispute with the applicant's approach this analysis. And to the extent the Petition contends that doses from shipments that comply with these transportation regulations are inadequately protective, such a challenge would fall outside the scope of this hearing as an impermissible collateral attack on the rule itself and the associated NEPA review.[503]

Moreover, the Petitioner has not acknowledged, let alone contradicted, the analysis of the radiological impact of accidents provided in the Environmental Report. Section 4.9.3.2 of the ER discusses the potential radiological consequences of transportation accidents and appears to be derived from the EIS prepared by the Department of Energy in support of the application for a repository at Yucca Mountain.[504] This FSEIS, in Section 6.1.8, makes clear that the analysis of environmental impact from accidents was based on 60,000 MWd/MTHM (megawatt-day per metric ton of heavy metal) for PWR fuel and 50,000 MWd/MTHM for BWR spent fuel, placing it within the range of "high burnup fuel" established by the Petitioner.[505] The Petitioners' failure to specify a dispute with the contents of the application thus lacks the necessary support for a contention of omission with respect to the environmental impacts of transportation or storage of spent fuel.

Finally, with respect to the environmental impacts of high burnup fuel storage, the Petitioner, in alleging an omission, has not demonstrated a genuine dispute with the application.

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[502] 10 C.F.R. § 71.47; ER at 4-32 ("RADTRAN assumes the maximum dose rate allowed for exclusive use shipments under NRC regulations (10 C.F.R. § 71.47 (b) (3)) and estimates the potential impacts to the populations located within one-half mile along either side of the transportation routes.").

[503] 10 C.F.R. § 2.335.

[504] ER at 4-34; DOE/EIS-0250F, "Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada" (ML081750191 (package))) ("Yucca FSEIS").

[505] Yucca FSEIS, Section 6.1.8; Sierra Club Petition at 67.

Storage of high burnup fuel is subject to the same standards as other forms of spent fuel, and Section 4.12 and 4.13 of the Environmental Report discusses the impacts to public and occupational health from facility operation and accidents. In making its determination that the radiological impacts are small, the applicant relies on the safety analyses performed in support of the HI-STORM UMAX system for both normal operation and accident analyses.[506] The HI-STORM UMAX system and the MPC-37 and MPC 89 canisters allow for the storage of high-burnup fuel and have been found to meet the requirements of Part 72.[507] The Petitioner has not provided a basis as to why the Applicant's reliance on such analyses are improper.

In short, the Petitioner fails to articulate specific HBF-related deficiencies in the ER's existing description of the UMAX system and its analysis of radiological impacts from storage and transportation, and instead only summarily asserts that concerns with HBF must be "discuss[ed] and evaluate[d]" in the ER. Such an issue does not present a concrete, focused issue for litigation, and therefore, the Petitioner has not put forward an admissible contention.[508]

Consequently, because Contention 20 either raises issues that are not within the scope of the hearing or fails to provide sufficient information to demonstrate a genuine dispute with the application, it must be found inadmissible.

Sierra Club Contention 21

There is no experimental support for the safe transportation and storage of HBF. Holtec must show that safety is assured not only for hypothetical accident conditions, but also for real life accident conditions. Holtec has not done that in this case.

[506] ER, Sections 4.12 and 4.13.

[507] See *also* § 72.214; Proposed TS Section 2.1; UMAX FSAR Revision 3, Section 4.4.8 (ADAMS Accession No. ML16193A339).

[508] *Peach Bottom*, ALAB-216, 8 AEC at 20–21.

In Contention 21, the Petitioner contends that for both transportation and storage[509] of high burnup fuel, "Holtec must show that safety is assured not only for hypothetical accident conditions, but also for real life accident conditions," and that Holtec has not done so in its application.[510] The Petition appears to base this claim on statements in Interim Staff Guidance 11, Revision 3, which, in addition to providing guidance on Part 72, noted that at that time, the staff was developing guidance for transportation of high burnup fuel.[511]

Contention 21 is inadmissible, as it raises issues outside the scope of the proceeding (including impermissible challenges to NRC regulations), fails to explain how the issue is material to the findings the staff must make on the application, and fails to raise a genuine dispute with the application on a material issue of fact, contrary to 10 C.F.R. § 2.309(f)(1)(iii), (iv), and (vi), respectively.

As a threshold matter, the Petition focuses on portions of a staff guidance document that concern how to meet regulations in 10 C.F.R. Part 71 regarding the licensing of transportation packages. The Holtec CISF application is for a specifically licensed independent spent fuel storage installation; it is not an application for a certificate of compliance for a transportation package.[512] Accordingly, to the extent the Petition is challenging the safety of activities that would not be granted by the license being sought, it is outside the scope of this proceeding.[513]

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[509] The Staff notes that while storage is mentioned in the proposed contention, the discussion in the basis and supporting facts is only directed toward transportation. Without more information, the Petitioner has not provided sufficient information to meet the 2.309(f)(1) standards with respect to storage.

[510] Sierra Club Petition at 70.

[511] Sierra Club Petition at 70–72; ISG-11 Revision 3 at 1–2 (ML033230244).

[512] *See* Holtec International's HI-STORE Consolidated Interim Storage Facility for Interim Storage of Spent Nuclear Fuel, 83 Fed. Reg. 32,919 (July 16, 2018) ("By this application, Holtec is requesting authorization to construct and operate the HI–STORE Consolidated Interim Storage (CIS) Facility, in Lea County, New Mexico."). The application does include a small amount of transportation from the time the shipment is received on-site to the cask transfer building. *See also* SAR, Section 10.3.3.1.

[513] 38 Fed. Reg. 32,920 (July 16, 2018) (". . . Holtec is requesting authorization to construct and operate the HI–STORE Consolidated Interim Storage (CIS) Facility, in Lea County, New Mexico."); *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-825, 22 NRC 785, 790–91 (1985) (noting that the scope of the proceeding is defined by the Commission in its initial hearing notice).

Similarly, to the extent the contention's statements that transportation of HBF must consider "real life accident conditions"[514] and that "[high burnup fuel] should not be transported until Holtec can assure that it is safe" are suggesting that existing 10 C.F.R. Part 71 regulations are inadequate, challenges to the regulatory scheme of transportation packages constitutes an impermissible rule under 10 C.F.R. § 2.335(a) and should be rejected absent a waiver.[515] In any event, Part 71 requires that transportation packages meet certain standards including various hypothetical accident conditions identified in 10 C.F.R. § 71.73 which were chosen specifically to appropriately encompass the conditions of "real world accidents."[516]

For similar reasons, the Petitioners have failed to explain why the concern in Contention 21 is material to the findings the staff must make on the Holtec application. The Petition quotes ISG-11 as stating that "until further guidance is developed, the transportation of high burnup commercial spent fuel will be handled on a case-by-case basis" and the Petition asserts that "Holtec has not met this test."[517] But as noted above, the Petition does not articulate why the quoted portions of the guidance document regarding transportation packages concern regulations that are relevant to the instant licensing action, and in any event, staff guidance documents do not create legal requirements, but define a permissible means of meeting a regulation.[518]

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[514] Sierra Club Petition at 70.

[515] 10 C.F.R. § 2.335(a); *Watts Bar*, CLI-15-19, 82 NRC at 157 ("Section 2.335(a) of our regulations prohibits challenges to our rules and regulations in the context of adjudicatory proceedings.").

[516] Compatibility With IAEA Transportation Safety Standards (TS-R-1) and Other Transportation Safety Amendments, 69 Fed. Reg. 3698, 3700 (Jan. 26, 2004) ("The [hypothetical] conditions bound (or are more severe than) those conditions that would be expected in the vast majority of real world accidents and therefore provide protection for the cask designs.")

[517] Sierra Club Petition at 72.

[518] *See* ISG-11, Revision 3, at 3–4 (ADAMS Accession No. ML033230244) (noting that while the guidance in the ISG provides guidance on meeting the requirements of Part 72, applications that differ "may require additional justifications by the applicant.").

Finally, the Petition fails to demonstrate a genuine dispute with the application. Indeed, the Petition does not clearly state whether the issues raised are environmental or safety in nature; the initial statement of the contention claims that "Holtec must show safety is assured," but the subsequent discussion and conclusion alludes to what must be addressed in the Environmental Report.[519] Notably, it contains no reference to any portion of the application; it makes only a passing reference to the Environmental Report and includes no discussion of what analysis was presented in the application, let alone what "real life accident" is supposedly left unaddressed.[520] As discussed earlier in the response to Contention 20, the Environmental Report, in evaluating the radiological impacts of incident-free transportation, assumes the maximum dose rate permitted by NRC regulations.[521] Contention 21 does not acknowledge that evaluation, let alone explain a disagreement with it. Therefore, whether the contention is construed as one of omission or adequacy, the Petitioner has not raised a genuine dispute with the contents of the application.[522]

Consequently, Contention 21 should not be admitted because it raises issues outside the scope of the hearing, fails to explain how the issue is material to the findings the staff must make, and does not raise a genuine dispute with the application.

Sierra Club Contention 22

With high burnup fuel hydrogen absorption into the Zircaloy metal can lead to hydrogen embrittlement (loss of cladding ductility) of the cladding. Vibrations during transport will lead to further degradation of the cladding. Nothing in the Holtec documentation shows that Holtec has addressed this issue in this case.

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[519] Sierra Club Petition at 70, 72.

[520] Sierra Club Petition at 72.

[521] ER at 4-32 ("RADTRAN assumes the maximum dose rate allowed for exclusive use shipments under NRC regulations (10 C.F.R. § 71.47 (b) (3)) and estimates the potential impacts to the populations located within one-half mile along either side of the transportation routes.")

[522] *Millstone*, LBP-04-15, 60 NRC at 89–90. ("Any contention that fails directly to controvert the application, or mistakenly asserts the application does not address a relevant issue, can be dismissed.").

In Contention 22, the Petition claims vibrations during transportation can cause cladding degradation in high burnup fuel and that the Holtec application does not address this concern.[523] In support of the contention, Petitioner states that the Environmental Report has not adequately represented this failure mode in its potential impacts.[524]

This Contention should be found inadmissible because it raises a concern that is outside the scope of the hearing and does not allege sufficient facts demonstrating a genuine dispute with the application.[525]

The contention raises concerns about the potential for degradation of cladding material strength as a result of vibration during transportation of spent fuel.[526] The application in question is for a specifically licensed ISFSI, not for a transportation package certificate of compliance.[527] While the regulations in 10 C.F.R. 72.108 do require consideration of transportation impacts in the environmental review, it does not require that the environmental report prove the safety of transportation packages.[528] 10 C.F.R. 71.71(c)(1)(5) requires that applications for transportation package designs must consider and evaluate the effects of "[v]ibration normally incident to transportation," and 10 C.F.R. 71.73 requires applicants to demonstrate that the package can adequately address a variety of hypothetical accident conditions.[529] To the extent that the petition is disputing the adequacy of this rule to address these conditions, such a challenge is impermissible under 10 C.F.R. § 2.335(a).[530]

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[523] Sierra Club Petition at 72.

[524] Sierra Club Petition at 72–73.

[525] 10 C.F.R. § 2.309(f)(1)(iii), (vi).

[526] Sierra Club Petition at 72.

[527] 83 Fed. Reg. 32,919, 32,920 (July 16, 2018) ("The NRC received an application from Holtec for a specific license pursuant to part 72 of title 10. . .").

[528] 10 C.F.R. Part 71.

[529] *See* 10 C.F.R. § 71.51(a). It is unclear, aside from vibrations during transportation, exactly what "real life accident conditions" Petitioner refers to on Page 73.

[530] Additionally, if the petition is attempting to assert that fuel will be transported which will not meet NRC or DOT regulations, the Commission has made clear that without allegations to the contrary, a Board

Beyond that, the Petition does not proffer sufficient information to demonstrate a genuine dispute with the application. Aside from stating that the Environmental Report "has not adequately" evaluated an increased likelihood of radiological impacts, the Petition provides no reference to what was provided by the applicant in the Environmental Report or why what the applicant presented is insufficient.[531] The Environmental Report has provided a discussion on the radiological impacts of incident-free transportation that takes into account the maximum dose rate allowed for exclusive use shipments,[532] and the Environmental Report's discussion on the consequences of accidents reference to studies that do take into account the transportation of higher burnup fuel.[533] Without at least some citation to the Environmental Report and what the asserted omission or deficiency is, the Petitioner has not supplied sufficient information to meet the standards of 2.309(f)(1)(vi).

Consequently, Contention 22 is inadmissible because it raises issues outside the scope of the proceeding and fails to articulate a genuine dispute with the application.

Sierra Club Contention 23

> *Spent fuel cladding must be protected during storage against degradation that leads to gross ruptures in the fuel or the fuel must be otherwise confined such that the degradation of the fuel during storage will not pose operational safety problems with respect to its removal from storage. It is the responsibility of the licensee to ensure that fuel placed in dry storage meets the design-basis conditions. If HBF develops gross cladding defects during transportation, Holtec has not described how such defects could be detected. If HBF develops gross cladding defects and the fuel cannot be accepted at a waste repository, the fuel will remain at the proposed CIS facility indefinitely.*

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should decline to assume licensees will contravene regulations. *See Oyster Creek*, CLI-00-6, 51 NRC at 207.

[531] Sierra Club Petition at 73. *See Millstone*, CLI-01-24, 54 NRC at 358.

[532] ER at 4-32 ("RADTRAN assumes the maximum dose rate allowed for exclusive use shipments under NRC regulations (10 C.F.R. § 71.47 (b) (3)) and estimates the potential impacts to the populations located within one-half mile along either side of the transportation routes.")

[533] ER at 4-34. *See also supra* Staff Response at 106–112.

In Contention 23, the Sierra Club raises a concern that Holtec would be unable to detect defects that occur as a result of damage during transportation, and that as a result, the damaged fuel would never be able to leave the HI-STORE facility.[534]

This Commission should find Contention 23 inadmissible because it does not articulate a genuine dispute with the application and it raises issues that are outside the scope of the proceeding.

Most notably, while the Petition portrays 10 C.F.R. § 72.122(h)(1) as the basis for this contention, it fails to acknowledge, let alone dispute, the portion of the application that specifically discusses the applicant's receipt inspection process and how it intends to meet 10 C.F.R. § 72.122(h)(1).[535] Section 9.2 of the Safety Analysis Report describes Holtec's proposed process by which canisters containing spent fuel are received and maintained when they arrive at the facility.[536] When canisters arrive on site, the applicant states the canister must not have been subjected to any incident beyond what the canister was qualified for and that the canister will be leak tested.[537] Section 17.14 of the Safety Analysis Report also specifically states that the regulatory requirements of 10 C.F.R. § 72.122(h)(1) are met by maintaining the cladding within the ISG-11, Revision 3, temperature limits through the design of the storage system and the selection of materials.[538]

[534] Sierra Club Petition at 73–74.

[535] SAR, Sections 9.2, 17.14.

[536] SAR, Section 9.2, Pages 9-4 – 9-7.

[537] SAR at 9-5 – 9-6.

[538] SAR, Section 17.14, Page 17–32. Interim Staff Guidance 11 (ISG-11) Revision 3 was issued in 2003 and provides more specific criteria for evaluating compliance with 72.122(h)(1). ISG-11 specifically identifies maximum temperature limits as one permissible method of meeting this regulation, even for high fuel burnups. ISG-11 at Pages 2–3 (ML033230244) (e.g., "For all fuel burnups (low and high), the maximum calculated fuel cladding temperature should not exceed 400°C. . .").

The Petition does not address the safety analysis report but simply asserts that "Holtec has not described how such defects could be detected."[539] Moreover, while the contention also appears to imply that fuel will be removed from canisters at the facility,[540] the application makes clear that spent fuel will at all times be kept in the original canister.[541] In sum, having failed to acknowledge pertinent portions of the application and specify how its assertions about cladding defects represents a deficiency in the analysis, the contention fails to demonstrate a genuine dispute with the application, contrary to 10 C.F.R. § 2.309(f)(1)(vi).

Additionally, the petition makes no clear distinction as to what aspect of the application or facility feature it takes issue with.[542] To the extent the contention seeks to require the applicant to oversee the activities of other licensees who may handle initial fuel transfer from a reactor, transportation to the facility, and later transportation and storage at a repository – as distinct from a CISF licensee's responsibility under 10 C.F.R. § 72.122(h)(1) for protection during storage – it is outside the scope of the hearing, contrary to 10 C.F.R. § 2.309(f)(1)(iii). Likewise, as stated in 10 C.F.R. § 72.46(e), generic challenges to already approved spent storage cask designs are outside the scope of this hearing.[543]

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[539] Sierra Club Petition at 74. The contention appears to largely just repeat a definition of "Gross Cladding Defect" from NUREG-1536, Revision 0, "Standard Review Plan for Dry Cask Storage Systems." (January 2007). Revision 1 to this SRP was issued in 2010 and this definition is no longer in the latest revision. The latest revision of NUREG-1536, Revision 1, indicates in Section 4.1 that the primary method of preventing gross rupture is by adequately maintain temperature limits. Regardless, this application is primarily being reviewed pursuant to NUREG-1567, the Standard Review Plan for Dry Storage Facilities.

[540] Sierra Club Petition at 75 ("from selection and inspection of the fuel before loading until the fuel is unloaded form the cask").

[541] *See* SAR, Section 13.2 ("Canisters are already welded shut and sealed to prevent leaks at the generator facility."); ER at 1-7 ("There is no air pathway because the casks are sealed by being welded shut. There is no potential for a liquid pathway because the SNF contains no liquid component and the casks are sealed to prevent any liquids from contacting the SNF assemblies.").

[542] Sierra Club Petition at 74–75. ("It is the responsibility of the licensee to ensure that fuel placed in dry storage meets the design-basis conditions" and "When HBF within a Holtec canister is transported a repository and the canister is unloaded. . . Holtec has not specified how such fuel would be managed.")

[543] 10 C.F.R. § 72.46(e).

Consequently, Contention 23 should be found inadmissible for failure to meet 10 C.F.R. § 2.309(f)(1)(iii) and (vi).

Sierra Club Contention 24

Because of the high heat output of fuel within MPC-37 canisters, there is a long decay time before shipments to the Holtec CIS facility can occur. The loading of the MPC-37 is quite complicated. It is unclear when reactors will be allowed to ship the MPC-37 to the Holtec facility. There is a serious risk of radioactive contamination if the radioactive waste is shipped too soon. Information that would inform the public and analysts has been withheld as being proprietary information. Neither the Holtec ER or SAR contain sufficient information to assess the risk of shipping the MPC-37 canisters.

Contention 24 raises concerns over the timing and feasibility of shipments of MPC-37 canisters to Holtec, and it contends there is an unassessed risk to the public regarding the likelihood of contamination. Additionally, the Petition raises concerns regarding the unavailability to the public of more detailed cask information.

The contention must be found inadmissible because the petition has not demonstrated that the issues raised are material to the proceeding or has not raised a genuine dispute with the application.

First, the contention appears to be premised primarily on concerns about the ability of licensees other than the applicant to comply with their licenses and regulations, issues which are not material to the decision in this case.[544] The Commission has held that there is a presumption of compliance with the Commission's regulations, stating that in the absence of evidence that an applicant is likely to violate a regulation, "this agency has declined to assume that licensees will contravene our regulations."[545] In contrast, Contention 24 relies on multiple speculative assumptions that different licensees will not comply with applicable requirements, including that due to the "complicated" loading requirements for the MPC-37, reactor licensees

[544] Sierra Club Petition at 76–78.

[545] *See Oyster Creek*, CLI-00-6, 51 NRC at 207.

may not comply with the canister's loading parameters,[546] and that other licensees will load and ship canisters before they can meet the decay heat load requirements of the MPC-37.[547] Finally, while the Petitioner does not reference any details of the HI-STORE application, the contention implies that canisters that may be stored at the facility will not meet the proposed license and technical specifications and associated specific requirements on contents, configurations, and heat limits for those canisters.[548]

Given the presumption of compliance with applicable requirements, unsupported speculation that this licensee and other licensees will not comply with applicable rules cannot support an admissible contention.[549]

In any event, the contention does not specify any aspect of the analysis in the ER or SAR with which the Petitioner disagrees. Absent an articulated disagreement with the application, the contention's speculation regarding implementation of cask loading procedures or when canisters could be shipped to a Holtec facility fails to demonstrate either that the issue is material to the staff's review or that there is a genuine dispute with the application.[550]

Lastly, the Petitioner also mentions multiple times that the cask information it believes would inform this contention has been withheld as proprietary and is not publicly available.[551] Petitioner was afforded the opportunity to request access to such information through

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[546] Sierra Club Petition at 76 ("The loading for the MPC-37 is quite complicated, so it may be an issue whether utilities can follow the prescriptions outlined by Holtec").

[547] Sierra Club Petition at 78 ("this raises the issue of when the reactors will be allowed to ship the MPC-37 canisters to the Holtec CIS facility.").

[548] *See* Proposed TS Section 2.1, Table 2-1, Table 2-2. (Pages 2-1 – 2-3) (requiring the "spent nuclear fuel . . . stored in canisters . . . shall meet the following requirements," including fuel burnup and decay heat limits).

[549] *See Oyster Creek*, CLI-00-6, 51 NRC at 207; *Crow Butte Resources*, CLI-09-12, 69 NRC at 552 ("contentions based on little more than guesswork would waste the scarce adjudicatory resources of all involved"). *See also Private Fuel Storage*, CLI-04-22, 60 NRC at 138-39 (finding that a petitioner did not demonstrate a material dispute when it failed to acknowledge in its proposed contention the applicant's quality assurance measures).

[550] 10 C.F.R. § 2.309(f)(1)(iv), (v).

[551] Sierra Club Petition at 76, 80–82.

procedures established in the Federal Register Notice providing the opportunity to request a hearing and petition to intervene.[552] The Petitioner declined to do so.[553]

Accordingly, the proposed contention should not be admitted under 10 C.F.R. § 2.309(f)(1)(iv) and (vi).

Sierra Club Contention 25

The Sierra Club seeks to adopt all of the contentions in the Joint Petition. 10 C.F.R. § 2.309(f)(3) permits the co-sponsoring of contentions where the petitioners designate a single representative for those contentions with "the authority to act" with respect to those contentions. The Sierra Club has not done that here, either individually or jointly with the Joint Petitioners. Therefore, the NRC Staff opposes the Sierra Club's request to adopt the Joint Petitioners contentions until the parties jointly designate a representative.

[552] Holtec International HI-STORE Consolidated Interim Storage Facility for Interim Storage of Spent Nuclear Fuel, 83 Fed. Reg. 32,919, 32,922 (July 16, 2018).

[553] Indeed, in addition to the period initially allowed in the Federal Register notice for such requests, the Secretary of the Commission subsequently extending the timeframe for such requests until August 30th, 2018. Holtec International (Consolidated Interim Storage Facility), Order of the Secretary (Aug. 20, 2018) (ML18232A577).

Conclusion

For the foregoing reasons, the NRC Staff respectfully requests the Commission to grant, in part, the petitions filed by Beyond Nuclear and the Sierra Club, and to dismiss the petitions filed by NAC, AFES, and the Joint Petitioners.

Respectfully submitted,

/Signed (electronically) by/

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Executed in Accord with 10 CFR 2.304(d)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of HOLTEC INTERNATIONAL (Consolidated Interim Storage Facility)	Docket No. 72-1051

CERTIFICATE OF SERVICE

Pursuant to 10 C.F.R § 2.305 (as revised), I hereby certify that copies of the foregoing "NRC Staff's Consolidated Response to Petitions to Intervene and Requests for Hearing Filed By Alliance For Environmental Strategies, Beyond Nuclear, Inc., Don't Waste Michigan, et al., NAC International Inc., and The Sierra Club," dated October 9, 2018, have been served upon the Electronic Information Exchange (the NRC's E-Filing System), in the above-captioned proceeding, this 9th day of October, 2018.

Respectfully submitted,

/Signed (electronically) by/

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Dated in Rockville, MD
this 9th day of October 2018

Affidavit

COPY

State of California, County of San Diego

My legal name is Nina J. Babiarz, and my occupation is as an Energy and Transportation Consultant. Additionally, I serve as an active Board member and public advocate for Public Watchdogs, a 501(c)3 non-profit. I am presently 66 years old, and my current address is 8520 Tio Diego Place, La Mesa CA 91942.

On Wednesday, October 10, 2018 at approximately 9:35 am PST, I telephoned Eric J. Simpson at the Nuclear Regulatory Commission to inquire as to why I could not find a NRC event report filed by Southern California Edison (SCE) for an 'unsecured load event' which I understood occurred in July 2018. This event was in addition to the previously disclosed August 3, 2018 "near miss" unsecured load event at the San Onofre Nuclear Generating Station (SONGS) which was revealed at Edison's Community Engagement Panel (CEP) meeting on August 9, 2018 by Safety Professional, David Fritch. Mr. Simpson's title, according to the August 17th NRC Inspection Charter is "CHP (Certified Health Physicist), Fuel Cycle and Decommissioning Branch Division of Nuclear Materials Safety" at the United States Nuclear Regulatory Commission (NRC), Arlington Texas.

Mr. Simpson is the first official listed on the August 17, 2018 NRC Charter to Evaluate the Near-Miss Load Drop Event at San Onofre Nuclear Generating Station (SONGS).[1] I had previously spoken to Mr. Simpson on Friday September 7th regarding the August 3rd NRC termed 'near miss' event prior to the September 10-14th implementation of the NRC inspection at SONGS.

During our October 10th conversation, Simpson verbally confirmed that there was an "unsecured load event" at SONGS in July 2018, by stating: "the NRC is processing Pre-decision Information" on the July unsecured load event and also that "the NRC has not acted on it yet" nor has the NRC "urged Edison to file an event report as was done after the August 3rd near miss.

Simpson's specific references as to how the "nature of the (July) event" was "a different situation than that of the August 3rd (NRC termed near miss)" prompted my response that those are the details that the public has a right to know.

Simpson went on to explain to me that 'the event's cause will possibly be revealed in the upcoming release of the inspection report.' I replied that this does not absolve Edison's legal responsibility to report the event. Nor does it preclude the the NRC's responsibility to acknowledge the fact that an event occurred. I insisted that Edison should be required to comply with Federal law and file a written event report of the July unsecured load to be posted to the NRC website.

According to Title 10 Code of Federal Regulations § 70.50 *Reporting Requirements*, part (b)[2]states: "Each licensee shall notify the NRC as soon as possible but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits …"

> (2) An event in which equipment is disabled or fails to function as designed when:
>
> > i) The equipment is required by regulation or licensee condition to prevent releases exceeding regulatory limits, to prevent exposures to radiation and radioactive materials exceeding regulatory limits, or to mitigate the consequences of an accident;

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[1] See attached INSPECTION CHARTER TO EVALUATE THE NEAR-MISS LOAD DROP EVENT AT SAN ONOFRE NUCLEAR GENERATING STATION at https://www.nrc.gov/docs/ML1822/ML18229A203.pdf

[2] Title 10 Code of Federal Regulations § 70.50 Reporting Requirements, **Subpart G** Part (b)— Special Nuclear Material Control Records, Reports, and Inspections https://www.nrc.gov/reading-rm/doc-collections/cfr/part070/part070-0050.html.

At this time, only the second of the two "unsecured load events" (August 3rd) has been reported. Moreover, it took Edison 42 days for "Event 53605" to be filed on the NRC Event Notification Report Page and not available to the public until September 17, 2018. [3]

There are no other reports. Edison is in violation of Federal Law.

CFR § 70.50 Reporting requirements

> (b) ***Twenty-four hour report.*** Each licensee shall notify the NRC within 24 hours after the discovery of any of the following events involving licensed material: …
>
> (2) An event in which equipment is disabled or fails to function as designed when:
>
> (i) The equipment is required by regulation or licensee condition to prevent releases exceeding regulatory limits, to prevent exposures to radiation and radioactive materials exceeding regulatory limits, or to mitigate the consequences of an accident;

It is my testimony that on Wednesday, October 10, 2018, Mr. Simpson in his official capacity at the NRC confirmed that Southern California Edison, the owners and operators of the failed SONGS nuclear reactor, are in violation of Federal law. It is my belief, based on my extensive conversations with Mr. Simpson, that Federal law is not, and will not be enforced by the NRC at SONGS. Therefore, I ended my conversation with Mr. Simpson by requesting that that he and those at the NRC who are responsible for regulating Southern California Edison's activities related to the burial of their toxic, radioactive nuclear waste reconsider its position of concealing from the public that an unsecured load event occurred in July by requiring Edison to file a written report stating that it did and the specific circumstances it occurred.

I hereby state that the information stated above is true to the best of my knowledge.

Nina J. Babiarz — 10/17/18

Nina J. Babiarz — Date

_____ __/__/__

Notary Public — Date

_____

Titles and Rank

_____

Date of Commission Expiry

SEE ATTACHMENT FOR OFFICIAL NOTARIZATION

[3] See NRC Event Notification Report, September 17, 2018 Event number 53605 at https://www.nrc.gov/reading-rm/doc-collections/event-status/event/2018/20180917en.html

CALIFORNIA ALL- PURPOSE CERTIFICATE OF ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California }

County of San Diego }

On October 17th, 2018 before me, Jason Boughner, Notary Public
(Here insert name and title of the officer),

personally appeared Nina J Babiarz,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

JASON BOUGHNER
COMM. # 2254015
NOTARY PUBLIC-CALIFORNIA
SAN DIEGO COUNTY
MY COMM. EXP. AUG. 14, 2022

Notary Public Signature (Notary Public Seal)

ADDITIONAL OPTIONAL INFORMATION

DESCRIPTION OF THE ATTACHED DOCUMENT

(Title or description of attached document)

(Title or description of attached document continued)

Number of Pages ____ Document Date____

CAPACITY CLAIMED BY THE SIGNER

- ☐ Individual (s)
- ☐ Corporate Officer

(Title)

- ☐ Partner(s)
- ☐ Attorney-in-Fact
- ☐ Trustee(s)
- ☐ Other ____

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