REPORT AND RECOMMENDATIONS

OF THE NEVADA COMMISSION ON NUCLEAR PROJECTS

Presented to

The Governor and Legislature

Of the State of Nevada

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Table of Contents

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Brian Knudsen

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About the Commission

The Nevada Legislature created the Commission in 1985 to assure that the health, safety, and welfare of Nevada's citizens and the State's unique environment and economy are adequately protected from any federal high-level nuclear waste repository and related activities in the state. The seven-member Commission advises the Governor and Legislature on nuclear waste matters and oversees activities of the Agency for Nuclear Projects (Agency). The Agency oversees the State's oversight duties as they relate to the U.S. Department of Energy's (DOE's) proposed Yucca Mountain high-level nuclear waste repository project, the federal high-level radioactive waste management program, and other related federal programs.

In the preface to the Commission on Nuclear Projects' first report to the Governor and Legislature in 1986, then Chairman and former Governor Grant Sawyer highlighted the serious task facing DOE and the country as DOE sought to implement the Nuclear Waste Policy Act (NWPA):

> *"Few matters facing the State – or the nation – generate the level and intensity of concern that is elicited by the issue of nuclear waste disposal. Perhaps this is because the ramifications of decisions we make today about how to manage the nation's nuclear waste program have the potential to affect future generations and to impact ecosystems for thousands of years. It is difficult, I think, for any of us to fully grasp the long-term significance of a deep geologic repository for the disposal of highly radioactive materials. Such a repository, if one is built, will represent the first-time mankind has attempted to construct something that must remain functional for over 10,000 years. All of recorded history barely covers that span of time. The pyramids of Egypt, perhaps the longest surviving human engineering project, are 3,000 – 4,000 years old at most. Yet*

DOE has selected Nevada as one of three potential sites to build something … that must not only remain intact for at least 10,000 years, but must retain the structural, geological and hydrological integrity to guarantee that thousands of tons of the most toxic and long-lived substances yet discovered will remain contained and isolated from the rest of the world for the entire time."

Chairman Sawyer went on to set forth what would be the guiding principle underlying the State's approach to the federal high-level radioactive waste program and Yucca Mountain over the years, namely *"… that a nuclear waste repository should not be built until it can be shown, beyond the shadow of a doubt, that the facility can, in fact, do what its advocates claim – isolate radioactive waste from the biosphere for more than 10,000 years – and that the construction and operation of such a facility will be benign in its effects upon the people, the environment and the economy of the state or region within which it would be located.*" The DOE has failed to meet that standard and the State of Nevada continues to oppose the project.

Status of the Yucca Mountain Project

The Department of Energy (DOE) had essentially pivoted away from the Yucca Mountain Project in 2010, but Yucca Mountain remains, by law, the only named location for disposal of the nation's high-level nuclear waste (HLW) and spent nuclear fuel (SNF). There is no repository at the site. There are no waste disposal tunnels, and there are no receiving and handling facilities. The waste disposal container designs have not been approved. The original storage, transport and disposal canister concept, fundamental to DOE's license application, has been abandoned. There is no railroad to the site. The cost to build rail access would be $2.7 billion or more, and the designation of the new Basin and Range National Monument, over

which the proposed rail route traverses, makes DOE's proposed rail route unworkable. All that exists at Yucca Mountain is a single, 5-mile-long exploratory tunnel.

That tunnel was constructed to permit access to the subsurface for the purpose of studying geologic and hydrologic conditions underground as part of site characterization. The tunnel cannot be used for waste storage or disposal. Constructing a repository at Yucca Mountain would require construction authorization from the Nuclear Regulatory Commission and the physical construction of an additional 42 miles of tunnels to accommodate the emplacement limit of 70,000 metric tons of heavy metal (MTHM) of SNF and HLW. To operate the repository, DOE also would need to construct extensive new surface facilities for waste receipt and handling.

DOE's Yucca Mountain U. S. Bureau of Land Management (BLM)-authorized public land order withdrawing the Yucca Mountain site from the public domain expired in 2010. Similarly, the 308,600-acre land withdrawal for the 300-plus mile-long Caliente rail corridor expired in 2015. Unless Congress enacts federal land withdrawal legislation, any effort to restart the Yucca Mountain project or the Caliente rail alignment would require DOE to restart BLM's administrative processes for land withdrawal.

Yucca Mountain Won't Work

Yucca Mountain is an unsuitable site for a geologic repository. The storage tunnels would be located in fractured rock above the water table and would inevitably leak dangerous radionuclides into the groundwater. The rapidly flowing groundwater would transport these radionuclides offsite to where the water is used for a variety of purposes, including farming. The location of Yucca Mountain is a uniquely exposed site for proposed surface facilities to stage and handle nuclear waste because it is vulnerable to military aircraft crashes flying out of

Nellis and Creech Air Force bases. The Yucca site itself is within an earthquake and volcanic hazard zone. Yucca Mountain is one of the country's worst possible repository sites from transportation safety, cost, and railroad access perspectives.

DOE's repository design and operations plan, as contained in its still pending NRC license application, cannot fix what is wrong with Yucca Mountain. Five key aspects are unworkable:

1. DOE's proposes a hot repository design which would keep underground temperatures above the boiling point of water for about 1,000 years. This design fails to prevent groundwater contamination and may, in fact, exacerbate contamination by altering groundwater flow pathways and chemistry. The hotter waste needed for DOE's design concept also creates major problems for waste acceptance, and for safety during transportation, packaging, and emplacement.
2. DOE's proposes robotic installation of 11,500 titanium drip shields, one over each waste package 100 plus years after the waste has been emplaced. This design plan relies on unproven technologies, and even if the drip shields are perfectly installed, they cannot be guaranteed to prevent groundwater contamination. The drip shield design also places the burden on future generations to commit the substantial resources required to implement drip shield construction and emplacement.
3. DOE's proposed waste management system relies entirely on a hardware design - the transport, aging and disposal (TAD) canister - that was unfeasible when the license application was submitted in 2008 and is now completely obsolete. The inability of DOE to develop and implement the TAD canister design makes every other aspect of DOE's repository operations plan a failure.

4. DOE's proposed Caliente Railroad is unworkable. Even if the route could be adjusted to avoid the Basin and Range National Monument, nuclear waste trains would still travel through downtown Las Vegas and nuclear waste trucks would still be required to travel along the Las Vegas Beltway. DOE's proposed transportation plan is of particular concern because it ignores the safety and security recommendations of the National Academy of Sciences (NAS) and grossly underestimates routine radiation impacts, the consequences of severe accidents, and the risk of terrorist attacks that could release radioactive materials along the transportation routes.
5. DOE's proposed Yucca Mountain repository cannot solve the nation's nuclear waste disposal needs. SNF stored at U.S reactors presently exceeds 89,000 metric tons of uranium (MTU). By 2050, the amount of SNF and other high-level radioactive wastes requiring disposal will exceed 150,000 MTU. Current law imposes a 70,000 MTU limit on total waste emplacements at Yucca Mountain. If additional waste were to be emplaced in Yucca Mountain, the repository design in the DOE license application would need to be extensively reworked.

The federal government has estimated that about 14.5 billion has already been spent on Yucca Mountain. DOE estimated in December 2012 that going forward with Yucca Mountain would require another $82.5 billion for construction, operation, and closure, for a total cost just under $97 billion.[1] Extrapolating that figure to account for inflation, the current estimated cost to develop Yucca Mountain is $119 billion dollars. To begin actual construction, DOE would need

[1] J.T. Carter, Back End Fuel Cycle Cost Comparison, Prepared for U.S. DOE, Nuclear Fuel Storage and Transportation Planning Project, Dec. 21, 2012, FCRD-UFD-2013-000063, Rev 1, page B-22; See also DOE, *Analysis of the Total System Life Cycle Cost of the Civilian Radioactive Waste Management Program, Fiscal Year 2007*, DOE/RW-0591, Washington, DC (July 2008), wherein costs are estimated in 2007$. The estimated cost for the Caliente rail line found on pages 27-28 is $2.69 billion in 2007$, including $40 million spent in 2004-2006.

the Nuclear Regulatory Commission (NRC) to approve the license application and grant construction authorization. The State of Nevada will continue to vigorously contest that application.

Congressional Activity

Yucca Mountain remains the only high-level nuclear waste repository candidate site authorized by federal law. However, Congress has appropriated no new Yucca Mountain funding for over a decade, possibly signaling Congress' desire to end the program and find viable alternatives. While Nevada's congressional delegation played a key role in defunding Yucca Mountain, it is nevertheless clear that congressional support for the project has diminished over the years. The Trump Administration attempted to restart Yucca Mountain in 2017, but Congress again refused to fund it. In February 2020, President Trump, during a speech delivered in Las Vegas, indicated that he had given up on Yucca Mountain. Presently, the Biden Administration has since focused its attention on developing consent-based federal interim storage. Thus, although Nevada remains concerned that DOE's current focus should be on consent-based siting for both interim and permanent waste solutions, the Biden Administration unequivocally opposes the Yucca Mountain project. Still, some members of Congress, particularly those who represent states with significant stockpiles of SNF, and nuclear industry leaders continue to support the Yucca Mountain project. Some may choose Yucca Mountain as a convenient "default" solution, especially if there appear to be no viable alternatives. As Yucca Mountain remains the only high-level waste repository designated by federal law, Nevada should support amending the NWPA, continue to oppose funding to restart Yucca Mountain, and continue preparing to defeat the Yucca Mountain license application if the NRC licensing adjudication resumes. Nevada must remain vigilant.

In 2023, Nevada expects Congress to consider new comprehensive authorizing legislation to restructure the federal high-level nuclear waste program. The U.S. Senate has for the past eight years considered legislation that would remove the nuclear waste program from DOE along with other feasible alternatives to Yucca Mountain. This is the approach taken in the Nuclear Waste Administration Act of 2019 (S. 1234) introduced April 30, 2019, by Senator Lisa Murkowski (R-AK), co-sponsored by Senators Lamar Alexander (R-TN), and Diane Feinstein (D-CA). S. 1234 would have created a new waste management organization, the Nuclear Waste Administration (NWA), to replace the DOE program, and establish a consent-based siting process. A re-worked S. 1234 provides for the construction and operation of interim storage facilities by 2029, and a geologic repository for permanent disposal by 2052. Senator Catherine Cortez Masto further proposed amending S. 1234 to allow Nevada to enter into a written consent agreement between DOE and Nevada and affected local and tribal governments before the NWA could legally construct a repository at Yucca Mountain.

The U.S. House of Representatives has considered legislation crafted by former Representative John Shimkus of Illinois that would have compelled DOE to resume the Yucca Mountain repository project on an expedited schedule, as well as new licensing rules that would have short-circuited Nevada's ability to fully protect the state's environment and economy. H.R. 2699, the Nuclear Waste Policy Amendments Act of 2019, introduced in the House in May 2019, is nearly identical to the Shimkus bill of the same name, which passed the House in 2018. The Agency has worked closely with the Nevada congressional delegation and prepared detailed analyses of S. 1234 and H.R. 2699. The departure of prominent Yucca advocates from Congress (e.g., Rep. Shimkus and Sen. Alexander) may open the door to new policy initiatives. In 2021,

efforts were made to both fund and to kill Yucca Mountain in Congress. Neither effort made progress and the policy deadlock continues.

The NRC's Yucca Mountain Licensing Process

Congress has failed to appropriate any new funds for DOE's or NRC's Yucca Mountain programs since federal fiscal year 2010. Pursuant to court order, NRC must expend all available remaining Yucca Mountain funds appropriated in previous years, even though those funds are insufficient to complete the Yucca Mountain licensing proceeding.

In July and August 2022, new NRC Commissioners, Annie Caputo, and Brad Crowell, former director of Nevada's Department of Conservation and Natural Resources, were appointed and confirmed by the Senate. With the addition of Ms. Caputo and Mr. Crowell, the Commission has a full complement of members.

Uncertainty over whether deadly high-level radioactive waste will be shipped through and entombed in Nevada, against its will, has loomed over its citizens and the economy for thirty-five years (Congress selected Yucca Mountain as the only potential repository site in 1987). Nevada believes strongly that the time has come to put this long dormant and unproven federal project out of its misery so that Nevada can devote its attention and resources to other matters, and the United States can move forward with better, more viable solutions for the disposal of high-level radioactive waste.

In September 2022, Nevada initiated a strategy to end the NRC licensing proceeding. There are at least three uncontested deficiencies in DOE's license application that Nevada believes provide grounds for NRC to summarily dismiss the license application. Because the licensing adjudication is currently suspended, on September 19, 2022, the State filed a motion to lift the current license proceeding suspension. If successful in its motion to reopen the licensing

proceeding for the limited purpose to allow filing of the State's motions, Nevada will then file three motions for summary disposition. The State's motions for summary disposition are limited to straightforward legal issues that do not require discovery or factfinding. The topics of these three motions are as follows:

1. NRC regulations require that the Yucca Mountain repository operations area is located on land that is under the jurisdiction or control of DOE. It is undisputed that the operations area is not under DOE's control or on land permanently withdrawn for DOE's use as a repository.
2. The proposed above-ground facilities containing high-level radioactive waste must be designed to withstand aircraft crashes unless the crash probability is less than one in ten thousand before permanent closure. DOE determined that the crash probability was sufficiently low only by relying on United States Air Force flight restrictions over and near Yucca Mountain. However, these flight restrictions do not exist. Because DOE has not secured these flight restrictions, the license application (LA) cannot be granted.
3. NRC regulations require DOE to consider human-induced climate change. When DOE filed its application, DOE failed to consider human-induced climate change by instead relying on an NRC regulation that allowed it to exclude certain climatic changes from consideration. Subsequently, in a different case, an NRC licensing board ruled that this regulation does not apply to human-induced climate change. Thus, DOE must consider human-induced climate change in the Yucca Mountain LA. DOE has failed to meet this requirement.

Assuming at least one of these motions for summary disposition is granted, the State will move to have DOE's license application denied for failure to comply with NRC licensing requirements. Although Nevada is reasonably optimistic about its NRC motion strategy, the current motion to lift the licensing suspension remains pending.

Recent Developments

GAO Report

On September 23, 2021, the Government Accountability Office (GAO) released a report with detailed recommendations about congressional actions needed to manage the nation's broken nuclear waste program. The GAO report, Commercial Spent Nuclear Fuel: Congressional Action Needed to Break Impasse and Develop a Permanent Disposal Solution (GAO-21-603), contains recommendations that closely mirror the recommendations made by the Nevada Commission on Nuclear Projects and the Blue-Ribbon Commission on America's Nuclear Future in 2012. These recommendations include:

1. Create a consent-based siting program for nuclear waste disposal and storage facilities;
2. Assure continuity of spent fuel management;
3. Restructure the Nuclear Waste Fund to ensure consistent funding; and
4. Direct DOE to develop an integrated waste management strategy.

The GAO report is significant in that it does not recommend restarting the Yucca Mountain program. This intentional omission suggests that Nevada's arguments against the program continue to influence decision makers.

Consent Based Siting

The Yucca Mountain program is a failure on many counts, but perhaps its most profound failing was not seeking Nevada's consent when Congress selected the site in 1987. Recognizing this flaw, many who have examined the failing national nuclear waste program since Yucca

Mountain was defunded in 2010, advocate a consent-based approach to siting nuclear waste repositories and interim storage facilities. The Blue-Ribbon Commission (BRC) made "consent-based siting" a cornerstone of its recommendations. In response to the 2012 BRC Report to the Secretary of Energy, DOE, beginning in 2016, conducted a series of public meetings to gather input and begin to craft a consent-based siting program. This effort led to DOE publishing *Draft Consent-Based Siting Process for Consolidated Storage and Disposal Facilities for Spent Nuclear Fuel and High-Level Radioactive Waste* in January 2017.

DOE's work on consent-based siting was dropped in 2018 when President Donald Trump took office. It was not until President Joe Biden took office and Congress appropriated money for it in 2020 that DOE resumed consent-based siting work. Now, with the objective of siting federal consolidated interim storage facilities rather than repositories, DOE published a Request for Information (RFI) in December 2021 that posed sixteen questions to the public on various facets necessary for an effective consent-based siting program. The Agency, along with hundreds of commenters, provided comments to DOE. In September 2022, DOE released a summary of the comments it received. One of the major themes gleaned from comments received by DOE is that a functioning repository program is necessary and needs to run parallel to a consent-based siting program for interim storage facilities. Potential volunteers for interim facilities need the assurance that any interim facility will not become a "de facto" permanent facility.

Interim Storage

The Agency monitors the two pending private industry proposals for SNF and HLW consolidated interim storage facilities in New Mexico and Texas. If developed, these facilities invite the prospect of a large-scale nuclear waste transportation program that would be operated by private entities rather than DOE. The Agency has collaborated with the Western Interstate

Energy Board High-Level Radioactive Waste Committee (WIEB HLRWC) to provide extensive comments on NRC's environmental impact statements produced for these two facilities' license applications. The Agency remains committed to working with western partners to ensure that any SNF/HLW transportation program is run as safely and uneventfully as possible, regardless of the ultimate planning entity or the actual shipper. Should either of the two private interim sites proceed to development, the waste will be stored in relatively close proximity to Yucca Mountain. Without an alternative disposal program or other identified repository sites, there may be a strong incentive to revive the Yucca Mountain program. Both Texas and New Mexico have initiated litigation challenging the proposed interim facilities, and the outcome of this litigation remains uncertain. The NRC has approved the license for the Texas site and is expected to approve the license for the New Mexico site in 2023.

Agency Activities

The Agency's routine work, with legal support provided by the Office of the Nevada Attorney General, focuses on preparations for adjudicatory hearings before the NRC on DOE's Yucca Mountain license application. Nevada's expert team has crafted and prioritized repository safety contentions which challenge, among other things, the likely release of radioactive contamination into groundwater and National Environmental Policy Act (NEPA) contentions regarding the impacts of thousands of rail and truck shipments traversing Nevada.

The Agency monitors DOE activities across the entire spectrum of nuclear waste and nuclear materials management. There are often interrelated areas where the Agency's expertise has proved vital to the State of Nevada's interests.

Filing Motions

As discussed above, the Nevada Attorney General's Office, through its outside nuclear counsel (Egan, Fitzpatrick, Malsch and Lawrence), filed a motion with the NRC regarding the Yucca Mountain licensing proceeding. If the initial motion is successful, three additional motions will be filed and any one of them would provide grounds for NRC to summarily deny DOE's Yucca Mountain license application.

While the NRC adjudicatory hearing process has been suspended since September 30, 2011, due to lack of adequate appropriations funding, the NRC has retained approximately $400,000 left in Yucca Mountain funds. This amount is far less than what would be required to complete the full adjudicatory licensing process. The basis for the State's motion to reopen the adjudicatory hearing process for a limited purpose would be that (1) the NRC has the funding to entertain Nevada's few, straightforward motions for summary disposition, and (2) unlike any potential motions that might be filed by DOE, Nevada's motions have the possibility of concluding the licensing process altogether.

If successful in its motion to reopen the licensing proceeding, the State will then file three motions for summary disposition. The State's motions for summary disposition are limited to straightforward legal issues that do not require any additional discovery or factfinding to occur. If any one of these motions for summary disposition is granted, the State will move the NRC to summarily deny DOE's license application.

In addition to filing the motion, the Agency produced a series of written articles, explanatory podcasts and YouTube videos describing the State of Nevada's position on Yucca Mountain. They are available at the state website and at www.yuccamountainproject.com.

Addressing Plutonium Storage at NNSS

In June 2020, the Agency and the Attorney General's Office successfully settled a widely publicized dispute over DOE's use of the former Nevada Test Site (now the Nevada National Security Site or "NNSS") to store weapons-grade plutonium designated for production and use in nuclear weapon pit production. In September 2022, Senator Cortez Masto announced that DOE and the National Nuclear Security Administration (NNSA), ahead of the 2026 deadline provided for in the settlement agreement, completed removal of all weapons-grade plutonium from the NNSS.

Earlier, in July 2018, DOE issued a Supplement Analysis (SA) - an environmental document prepared under NEPA summarily authorizing DOE's shipment of one metric ton of weapons-grade plutonium to the NNSS for staging (and ultimate use as plutonium pits in nuclear weapons) without the need for any new environmental analysis. 2 While DOE characterized this plutonium to be weapons-grade, DOE failed to specify the physical form of the plutonium, and failed to adequately evaluate the safety and environmental impacts of its transportation and storage. The SA did not include any information regarding when the plutonium would be removed from Nevada. From Nevada's perspective, the plutonium was being unsafely transported to Nevada for indefinite storage at an unsafe facility. DOE's proposal could not go unchallenged.

In November 2018, Nevada filed a lawsuit alleging that DOE violated NEPA when it concluded it could ship up to one metric ton of weapons-grade plutonium to the Device Assembly Facility (DAF) at the NNSS without additional environmental analysis. Nevada v. United States Department of Energy and the National Nuclear Security Administration (DOE/NNSA), et al., (U. S. District Court, No. 3:18-cv-0569-MMD-CBC). In its filing, Nevada

sought an injunction to prevent any shipments of plutonium until the court had ruled on Nevada's legal challenge.

Shockingly, shortly after the hearing on Nevada's request for injunction, DOE admitted that one-half metric ton of weapons-grade plutonium had already been shipped to Nevada and was being stored at the DAF at the NNSS. Nevada then supplemented its lawsuit to allege that storage of one half-metric ton of plutonium, which DOE surreptitiously shipped to Nevada under DOE's contested NEPA analysis, created a public nuisance.

In June of 2020, Nevada and DOE agreed to a settlement to conclude the case. As part of that settlement, DOE agreed to commence removal of the one-half metric ton of plutonium at the NNSS in 2021, and complete removal by 2026. Further, DOE agreed not to ship any additional plutonium that may originally have been contemplated in its NEPA analysis. As part of the terms of the settlement, Nevada agreed to voluntarily dismiss its case without prejudice. On Sep 26th, 2022, Sen. Cortez-Masto was informed by the DOE that the plutonium had, in fact, been removed from NNSS.

Advancing Technical Programs

In response to the 2019 Ridgecrest, California earthquake, the Agency created a project through an interlocal agreement with the University of Nevada, Reno (UNR) to analyze and evaluate seismic risk at the proposed Yucca Mountain repository site. Significant advances in paleo-seismology, geochronology, fault identification by remotely sensed methods, and the scientific community's general understanding of the regional tectonic architecture of the last two decades suggest that previous studies conducted at Yucca Mountain may not completely describe the seismic hazards in the region.[2] The report concludes that additional studies must be

[2] The complete report is available for download at https://pubs.nbmg.unr.edu/Review-of-Yucca-Mountain-p/r059.htm

conducted to fully understand the seismic risks at the proposed Yucca Mountain repository site. Modern high-resolution topographic imagery (lidar) is the industry standard for site characterization for major infrastructure projects yet was not available during the Yucca Mountain site characterization. Acquisition of lidar for the region surrounding Yucca Mountain will help improve the accuracy of mapping and identifying seismic faults. Obtaining lidar for the entire Yucca Mountain region is estimated to cost about $1 million. The Agency assisted in requesting and securing federal funding for lidar data acquisition in Nevada. The Agency also entered another interlocal agreement with UNR to create an expert compilation of data and research regarding seismic risk and geology at the proposed Yucca Mountain high level waste repository site.

The Agency continues to support research at the University of Nevada, Las Vegas on Yucca Mountain volcanism risks and related repository performance issues. Ongoing research is being conducted to demonstrate that explosive volcanism is a hazard for Yucca Mountain during the lifetime of the proposed repository and must be considered in risk assessment studies. There are two aspects of this ongoing research. First, the issue of explosive volcanism occurring in the vicinity of Yucca Mountain and whether it will cause a direct threat to the proposed Yucca Mountain repository. Second, the issue is whether ashfall at or near the proposed Yucca Mountain repository from distant explosive eruptions over southern Nevada will create a hazard to operations at Yucca Mountain and could affect transportation of nuclear waste to the site.

Agency Planning Programs

Under DOE's proposed national plan for Yucca Mountain, transportation of SNF and HLW may, if implemented, affect much of the nation for a half-century or more. The details are enumerated in the final supplemental environmental impact statement (FSEIS), part of the

license application DOE submitted to the NRC in 2008. Under current federal law, the amount of SNF and HLW that can be buried at Yucca Mountain is limited to 70,000 metric tons of heavy metal (MTHM).[3] This term refers to the amount of uranium or plutonium in the fuel before use in a reactor, and this amount would constitute about half the expected national total by 2055 that would require geologic disposal in a repository. Proponents would like to amend the law to eliminate this limit, so that virtually all the nation's high level nuclear waste would become eligible for disposal in Yucca Mountain.

The DOE Proposed Plan for Transportation to Yucca Mountain

DOE's FSEIS optimistically assumes a "mostly rail" transportation scenario, with about 95 percent of the intended repository inventory shipped in dedicated trains - special trains "dedicated" to hauling only one type of freight, in this case, highly radioactive spent nuclear fuel, and high-level radioactive waste resulting from the reprocessing of spent nuclear fuel. These dedicated trains would consist of 2 to 4 locomotives and 3 to 5 cask cars, separated by an equal number of buffer cars, and a personnel car carrying armed guards. However, DOE's stated plan to use dedicated trains is not guaranteed, and federal rail regulations allow SNF and HLW to be shipped by rail in general freight service. Shipping SNF as general freight would significantly increase the number of shipments, result in increased risks of radiation exposures even in incident-free transport, and heighten the risk of accidents or sabotage overall.

Because of developments in how utility companies have managed SNF in the 13 years since DOE submitted its license application to NRC in 2008, the use of legal weight trucks for transport of SNF to a repository has become less and less likely. Most utilities have, or are in the

[3] DOE, *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-0250F-S1 (June 2008), pages S-7 to S-8. Available on-line at https://energy.gov/sites/prod/files/EIS-0250-S1-FEIS-01-2008.pdf

process of, moving SNF out of storage pools and into dry cask storage in independent spent fuel storage installations (ISFSI) at reactor sites. Such facilities utilize very large storage containers or dual-purpose storage-transport containers that cannot be shipped using legal weight trucks. This has significantly complicated the entire system for transporting SNF nationwide.

Under the NWPA limit of 70,000 MTHM, DOE would ship 9,500 rail casks in 2,800 trains, and 2,650 trucks hauling one cask each, to Yucca Mountain over 50 years. If the capacity limit were increased to 150,000 MTHM, DOE would ship about 21,900 rail casks in about 6,700 trains, and 5,025 truck casks, to Yucca Mountain.[4] Prospectively, over five decades or more, one or more loaded cask(s) would travel to Yucca Mountain by rail or truck from one of 76 sites around the country. Nevada has challenged DOE's assumption that 95 percent of the SNF could be shipped by rail. If, instead, a more realistic 20 percent were to be shipped by truck, there could be one or more truck shipments daily or every other day.

Many political jurisdictions, and communities totaling millions of Americans, would be impacted by shipments to Yucca Mountain under DOE's proposal. Most of the nation's spent fuel and high-level waste is currently stored at 76 sites in 34 states. The "representative routes" identified by DOE from these sites to Yucca Mountain are shown in Figure 2. These routes would use 22,000 miles of railways and 7,000 miles of highways, traversing more than 40 states and the tribal lands of at least thirty Native American tribes, the District of Columbia, and 960 counties with a 2010 Census population of about 175 million.[5] Between 10 and 12 million people

[4] DOE, *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-0250F-S1 (June 2008), pages 6-8, 8-41. Available on-line at https://energy.gov/sites/prod/files/EIS-0250-S1-FEIS-01-2008.pdf

[5] F. Dilger, *Counties Potentially Affected by High-level Nuclear Waste Shipments to Yucca Mountain, NV* (April 12, 2012), available on-line at http://www.state.nv.us/nucwaste/news2012/pdf/nv2012dilger_counties.pdf

live within the radiological region of influence for routine shipments, that is, within one-half mile (800 meters) of these rail and highway routes.[6]

The Agency works cooperatively with other western states on transportation safety through the WIEB's HLRWC. In 2017-2020, the WIEB HLRWC published ten policy papers that set out the western states' expectations about what a large-scale SNF/HLW transportation program would require. Agency personnel were key co-authors and contributors on these policy papers, which have since been cited in numerous reports related to SNF/HLW transportation. The Agency continues to collaborate with the WIEB HLRWC by attending meetings, participating on National Transportation Stakeholder's Forum working groups, and adding Nevada's voice to western regional policy comments on all facets of SNF/HLW transportation.

[6] R.J. HALSTEAD, F.C. DILGER, "Repository Transportation Planning, Risk Management, and Public Acceptance: Lessons Learned," *Proc. IHLRWMC*, Albuquerque, NM, Pp. 408-415 (2011), available on-line at http://www.state.nv.us/nucwaste/news2011/pdf/ANS2011halstead.pdf

Findings of the Commission

The next two years are critical.

Both the science and the politics of Yucca Mountain have been characterized by repeated mistakes. This Commission, the Agency for Nuclear Projects, and the Nevada Attorney General's office have been closely involved with the Yucca Mountain project and the federal high-level radioactive waste program for over three decades. In the next two years, decisions made by the federal government will have profound implications not only for the Yucca Mountain project and the State of Nevada, but also for prospects for finding a successful solution to the nation's nuclear waste dilemma. Some key lessons learned that the Commission believes important are summarized below.

The remainder of 2022 and 2023 will continue to be a major political battlefield for the State of Nevada's struggle against the Yucca Mountain high-level nuclear waste repository.

The Biden Administration has indicated that it does not support the Yucca Mountain project. However, without new legislation, the Yucca Mountain program remains the law, despite an over ten-year hiatus in funding. Without new legislation, Nevada remains the ONLY site in the United States under consideration for spent fuel disposal. As the BRC and the GAO have concluded, congressional action is needed to fix this problem. The "on and off" switch seen at DOE to address consent-based siting exemplifies the lack of consistency in U.S. policy toward commercial spent fuel disposal and points to the need for legislative changes directing consent-based siting.

Meanwhile, influential nuclear industry trade associations and professional societies have joined congressional supporters in urging the Biden Administration and Congress to resurrect the DOE repository program and provide new funding for DOE's and NRC's Yucca Mountain

licensing activities as soon as possible. These forces have, to varying degrees, opposed the previous DOE efforts to implement the BRC recommendations, generally qualifying any support for consent-based siting of storage facilities by conditioning it on the resurrection of the Yucca Mountain repository program.

Over the next two years, and especially over the next six months, the State of Nevada must closely follow developments in Washington and prepare for the possible reconstitution of the DOE Office of Civilian Radioactive Waste Management and the possible resumption of a multiple year NRC licensing proceeding.

Recent developments regarding spent nuclear fuel storage have eliminated the argument that the Yucca Mountain repository is needed to continue nuclear power plant licensing.

Over the past two decades, almost all operating (and shutdown) nuclear power plants in the United States have either begun storing spent nuclear fuel in dry storage systems or are currently planning to acquire or construct such systems. In 2014, NRC determined by rulemaking that spent nuclear fuel can be safely managed at reactors, in on-site dry storage systems, for up to 160 years. The NRC rule and environmental findings were upheld by the U.S. Court of Appeals for the District of Columbia Circuit in 2016. The NRC Continued Storage Rule eliminates the argument that the licensing of Yucca Mountain is required to ensure the continued licensing of nuclear reactors. The future of Yucca Mountain and the future of nuclear power in the United States now have been separated.

Over the past two years, there have been positive developments regarding joint public-private efforts to provide consolidated interim storage for spent nuclear fuel in states that have indicated their willingness to consider consenting to host such facilities. NRC has approved license applications for interim storage in Andrews County, Texas, and will likely approve an

application in Eddy and Lea Counties, New Mexico. These proposed facilities would store spent nuclear fuel from commercial nuclear power plants for 40 years or more in dry storage systems similar to, and in some cases the same as, those being used for storage at reactor sites. Important details about these proposed facilities are still unresolved, especially regarding formal host state consent arrangements, use of the Nuclear Waste Fund to pay the cost of interim storage, and transportation impacts.

The Blue-Ribbon Commission on America's Nuclear Future recommendations provide a sound basis for restructuring the U.S. nuclear waste program.

In the past three Congresses, the Senate Energy and Natural Resources Committee has considered comprehensive legislation, including the Nuclear Waste Administration Act, to restructure the nation's nuclear waste program following the BRC's recommendations. S. 1234 was sponsored by Republican Senators Lisa Murkowski of Alaska, and Lamar Alexander of Tennessee, and Democrat Diane Feinstein of California. In its most recent version, S. 1234 is not acceptable to the State of Nevada because it would continue the status quo regarding Yucca Mountain. Nevada Senators Catherine Cortez Masto and Jacky Rosen attempted to amend S. 1234 along the lines of the Nuclear Waste Informed Consent Act, introduced by the Nevada congressional delegation. After extending the consent process to Nevada, the 118th Congress should resume action to implement the BRC recommendations, giving the highest priority to taking the federal nuclear waste program out of DOE, creation of a consent-based process for siting high-level nuclear waste storage and disposal facilities, and adoption of measures to enhance transportation safety and security. The following findings of the Commission, based on past experience with Yucca Mountain, support these priorities for congressional action.

The U.S. Department of Energy was probably the wrong entity to implement the federal high-level radioactive waste program and placing the program within DOE may have doomed it from the start.

The original Nuclear Waste Policy Act of 1982 was a complex piece of legislation that sought to balance numerous competing interests and constituencies. The character of DOE, its historic culture of secrecy, its 'top down' decision-making, its schedule-driven approach as mandated by Congress, and its apparent inability to work cooperatively with states and communities, made DOE a poor choice to implement a program that demands difficult compromises as contemplated by the Act.

In Nevada, DOE created a hostile atmosphere almost from the beginning by interfering with the State's Yucca Mountain oversight program and activities. The State was forced to go to court in 1984 to secure its independent oversight role. In 1985, the Ninth Circuit Court of Appeals strongly admonished DOE, finding that allowing DOE to approve or disapprove the state's oversight work would be akin to "permitting the fox to guard the chicken coop."[7] Even after the court ruling, DOE continued to interfere with Nevada's oversight by restricting use of funds, hampering personnel access to the site, and withholding needed data and information.

DOE rejected the advice of its Alternative Means of Financing and Managing (AMFM) Panel, which recommended in 1984 that the program be moved from DOE to a quasi-governmental corporation to insulate it from political influences and to provide the program with

[7] State of Nevada, Ex Rel., Robert R. Loux, Director of the Nevada Nuclear Waste Project Office v. John Herrington, Secretary of the United States Department of Energy, 777 F.2d 529 (9th Cir. 1985).

stability and continuity over the long period of time that would be required to site, construct and operate one or more repositories.[8]

The heavy-handed manner by which DOE has implemented the Yucca Mountain program, DOE's history of organizational and institutional problems over the years, and most recently, DOE's 2018 secret shipments of weapons-grade plutonium from South Carolina to the NNSS, will make it extremely difficult for DOE to ever obtain the level of trust and confidence necessary to manage a successful program in the future.

The Nuclear Waste Policy Act of 1982, as amended in 1987(the NWPA), institutionalized an adversarial relationship between DOE and the State of Nevada.

The 1987 amendments to the original Nuclear Waste Policy Act fundamentally altered the already contentious relationship between DOE and the State of Nevada. DOE viewed the amended act, designating Yucca Mountain as the sole candidate site for the first repository, as a directive to do whatever it took to make Yucca Mountain work regardless of known geotechnical problems. DOE went from asking, "Is Yucca Mountain a suitable site?" to "What do we need to do to make the site work?" That quickly evolved into, *what regulations and standards have to be changed* and *how do we engineer the facility so as to overcome its deficiencies*?[9]

The technical objectivity of DOE's Yucca Mountain investigations deteriorated over time as more unfavorable findings surfaced. DOE's site characterization program appeared to be

[8] Section 303 of the Nuclear Waste Policy Act of 1982 required the Secretary of Energy "to 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." The section was in response to concerns, even as early as 1982, that housing the waste program in a federal agency would doom it to failure due to the undue influence of politics and the vagaries of changing administrations. The AMFM Panel released its report, "Managing Nuclear Waste – A Better Idea," in December 1984, which concluded that "[t]he Panel's preferred long-term alternative to the Office of Civilian Radioactive Waste Management (OCRWM) for managing the nation's high-level radioactive waste program is a public corporation chartered by Congress."

[9] This led to a series of ever-more-exotic engineering fixes. For example, the current license application includes covering all the waste canisters with 11,500 titanium drip shields to protect them from rock fall and highly corrosive groundwater. But there is no guarantee that the billions of dollars needed for the drip shields will be appropriated, and the drip shields themselves are only proposed to be installed 80 to 100 years AFTER the waste is put into the mountain. Since the site is physically and radiologically too hot for humans, sophisticated, not-yet-developed robotics would be needed to install the shields inside of the tunnels with no margin for error.

designed to NOT identify anything that might disqualify the site. Despite this bias, potentially disqualifying conditions were revealed at the site (i.e., fast groundwater pathways, unacceptable levels of radioactive gas releases, recent volcanism, potential seismicity, etc.). To avoid having to address these issues, DOE scrapped its own site evaluation guidelines[10] and replaced them with a performance assessment approach that allows unfavorable attributes of the site to be minimized. Unfavorable technical findings and DOE's treatment of them led the State to conclude that Yucca Mountain is an unsuitable and unsafe site. It became impossible for Nevada to even consider cooperating with DOE.

Safety concerns, as an aspect of the State's obligation to protect its citizens and the environment, underscore the major reason that Nevada has not sought economic benefits under provisions of the amended NWPA. The NWPA's statutory benefit language[11] makes it impossible for Nevada to consider cooperating with DOE. Because the State of Nevada is duty bound to protect the public health and safety of its citizens, successive Nevada Attorneys General have concluded that Nevada would compromise its rights to fully participate in critical safety and environmental hearings during NRC licensing if it even began to negotiate with DOE for a benefits package. Moreover, the Act limits economic benefits to a paltry $10 million a year after license approval and $20 million a year once waste is shipped to Yucca Mountain. In 2018, when Representative Shimkus attempted to legislate economic benefits for the State of Nevada and Nevada counties as part of H.R. 3053, the House of Representatives Rules Committee made it clear that Congress could not legislate such contractual obligations binding future congresses.

[10] The original Nuclear Waste Policy Act of 1982 required DOE to promulgate guidelines for the evaluation of potential repository sites that contained specific qualifying and disqualifying conditions. DOE issued its siting guidelines in 1984. However, DOE subsequently scrapped those guidelines and replaced them with a Total System Performance Assessment approach in the Yucca Mountain license application that involves a collective assessment of risk rather that an examination of specific geologic, hydrologic, and related conditions occurring at the site.

[11] "The State or Indian tribe that is party to such [benefits] agreement waive its rights under title I to disapprove the recommendation of a site for a repository." NWPAA, Subtitle F – Benefits Agreements Section, 171(b)(2).

Yucca Mountain failed for many reasons, but a critical element was unquestionably the forced nature of the siting process.

In 1987, Congress directed that Yucca Mountain is the only repository site to be studied. DOE used that directive as the basis for pushing ahead with the project, even when the data showed serious flaws in the site and despite strong and determined opposition from the State. Provisions of the amended Act allowing state disapproval of siting decisions did not protect Nevada. As a small-population state, with four electoral votes at the time, Nevada could hardly expect to obtain support from two-thirds of the voting members in both the House and Senate needed to sustain the State's veto. The Bush Administration was determined to force the site on Nevada in 2002, and members of Congress from other states were anxious to protect themselves from a new repository siting effort. In the years leading up to 2002, there was little incentive for DOE to work with or listen to Nevada. DOE believed all along that Congress would not sustain Nevada's veto. If DOE had been required to obtain the State's informed consent to continue with the project, Yucca Mountain would have been disqualified years earlier, saving billions of dollars, and DOE would have had to move on to identify a location that was technically suitable.

Congress shares a large portion of the blame for the failure of the federal high-level radioactive waste program.

The original 1982 NWPA was a complex law that sought to balance a variety of competing and often conflicting interests. It was not perfect, but the Act represented an unprecedented set of compromises agreed to by diverse affected parties. Implementation of the 1982 Act might have succeeded eventually if politics had not intervened in the siting process. With enactment of the 1987 amendments naming Yucca Mountain as the only site to be investigated to house a repository, Congress itself essentially doomed the process. Congress

failed to hold DOE's feet to the fire and allowed DOE to subvert the technically based site selection process intended by the original act.[12] While the process of selecting a site for a geologic repository cannot be completely insulated from politics, new strategies are needed to minimize political influence and increase the likelihood that a sound, scientifically based, and publicly acceptable process can go forward.

Transportation is the Achilles heel of the national nuclear waste management program; additional safety and security measures, recommended by the BRC, are required.

After studying DOE's approach to Yucca Mountain transportation, and after receiving comments from Nevada and other affected parties, the National Academy of Sciences (NAS) published an expert consensus report in 2006 on the radiological and social impacts of SNF and HLW transportation.[13] The NAS report recommended implementation of major safety and security enhancements before the commencement of any large-scale shipping campaigns under the NWPA, as amended. In the BRC's final 2012 report, twelve major NAS recommendations were incorporated. The BRC also added an overarching recommendation that all shipments to storage facilities or repositories under the NWPA should be fully regulated by the NRC to eliminate DOE's self-regulation of shipments.[14] The recommended measures include shipping the oldest fuel first to reduce radiological impacts; full-scale testing of shipping packages as part

[12] During the election cycle of 1986, the Reagan Administration, responding to political pressure from eastern states that had potential sites being examined for a second repository, directed DOE to suspend the second repository program, an important component in the Act to ensure regional equity. In 1987, powerful states with potential first repository sites (especially Louisiana, Texas and Washington) successfully managed to gut the carefully crafted selection process for the first repository, get their states off the hook, and single out Nevada's Yucca Mountain based on political considerations [i.e., Nevada's political weakness vs. the clout of Senate Energy Committee Chairman J. Bennett Johnston (LA), House Speaker Jim Wright (TX) and House Majority Leader Tom Foley (WA)]. A detailed history of nuclear waste politics between 1982 and 1987 is provided in R.J. Halstead, A. Mushkatel, and K. Thomas, "Remaking the U.S. Nuclear Waste Program: A Window of Opportunity for Change?" Waste Management 2015, Proceedings of the Conference, Phoenix, AZ (March 15-19, 2015), available at http://www.state.nv.us/nucwaste/news2016/pdf/WM2015_RemakingWasteProgram.pdf

[13] NAS Committee on Transportation of Nuclear Waste, *Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*, Washington, DC: The National Academies Press (2006)

[14] BRC, *Report to the Secretary of Energy* (January 2012), Pp. 82-84, brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf

of package performance evaluations; immediate implementation of Section 180(c) of the NWPA to provide financial and technical assistance to corridor states and tribes; requiring DOE to maximize use of rail transportation and minimize truck shipments; and requiring DOE to identify and make public its suite of preferred shipping routes as soon as practicable to support state, tribal, and local planning and preparedness. The WIEB, comprised of Governors' appointees from ten major western states, has recently approved policy papers calling for implementation of the NAS and BRC recommendations before any large-scale shipping campaigns to nuclear waste storage or disposal facilities.

Recommendations of the Nevada Commission on Nuclear Projects

The Commission believes that the next two years will be critical for the State of Nevada to prevent the resurrection of the Yucca Mountain repository program, and to protect the State's interests if the NRC licensing proceeding is restarted. Nevada expects continued and concerted efforts by Yucca Mountain supporters to restore the DOE repository program and restart the NRC licensing proceeding.

It will also be a critical time for the nation to establish a new consent-based approach to site selection for nuclear waste storage and disposal facilities. At this pivotal juncture, it is extremely important that Yucca Mountain lessons learned over the past three decades are not lost and, more significantly, are not repeated. To that end, the Commission offers the following recommendations:

Recommendation: Governor-elect Lombardo should continue to communicate clearly and unambiguously to the Biden Administration and to Congress that Nevada remains steadfast in its opposition to any attempt to resurrect the defunct Yucca Mountain project or otherwise bring spent nuclear fuel and high-level radioactive waste into Nevada.

Yucca Mountain is an Unsafe Site

There must be no misunderstanding of Nevada's position regarding the Yucca Mountain project on the part of the Biden Administration and Congress. Yucca Mountain is an unsafe site for a geologic repository, and transportation of high-level nuclear waste to Yucca Mountain would pose unacceptable risks to citizens across the nation and to Nevada's citizens, the State's environment and its economy. Making the State's position unambiguously clear is especially important in light of Nye County's and other Yucca proponents' vigorous advocacy of the project.

Recommendation: The Governor and Legislature must continue to assure that the Attorney General and the Agency for Nuclear Projects have sufficient funds to effectively represent Nevada in NRC's Yucca Mountain licensing proceeding.

Continued Support is needed for Nevada's Efforts

NRC's first-of-a-kind Yucca Mountain licensing proceeding before the NRC is legally and procedurally complex, technically demanding, highly specialized, and will likely be lengthy. In order for the State of Nevada to protect its interests and assure that the 218 already admitted[15] serious safety and environmental contentions are adequately addressed and adjudicated, the Agency and the Attorney General must have adequate resources. Since 2008, when DOE's license application was submitted to NRC, the State of Nevada has spent about $44.3 million on licensing and licensing-related activities. $26.4 million of these dollars came from State of Nevada funds, and $17.9 million from the federal Nuclear Waste Fund. Depending on how NRC's proceeding is structured and how the process is scheduled, it is estimated that the State

[15] As noted earlier in this report, the State currently has 218 contentions already admitted in the proceeding. Another 30 - 50 new contentions are currently being prepared for submission when and if the licensing adjudicatory proceeding resumes.

could need approximately $8 million to $10 million per year over the course of four to five years. While this is a significant amount of money, it pales in comparison to the $330 million NRC estimates it will need over 3-5 years, and the $1.66 billion DOE has said it would need if Yucca Mountain licensing is resumed. In the past, Congress has provided some federal funding for state oversight and licensing preparation and to support participation by affected local and tribal governments. Given the uncertainties surrounding Yucca Mountain in the new Congress, however, Nevada cannot be assured of any specific level of federal financial support. The Legislature has appropriated the funds requested by the Agency and the Attorney General in their biennial budget requests for FY 2020 and FY 2021. Those requests contain best estimates of what Nevada will require to engage in the early phases of a restarted Yucca Mountain licensing proceeding. However, it is almost certain that additional resources will be needed if and when full-scale NRC and DOE licensing activities resume.

Recommendation: The Governor, the Agency, and the Legislature should continue to work with Nevada's congressional delegation to amend the NWPA, as amended, to implement the recommendations of the BRC, especially those provisions to administer consent-based siting for nuclear waste storage and disposal facilities, and the need for measures to enhance transportation safety and security.

An Integrated Approach to Nuclear Waste Management is Critical

The State of Nevada has, over the past three decades, demonstrated convincingly that Yucca Mountain is an unsafe and unworkable site for a geologic repository for spent fuel and high-level radioactive waste. The Commission believes that Nevada has an excellent chance of prevailing in the NRC's licensing proceeding (when and if it resumes). But the Commission understands that the country must realistically address the larger nuclear waste problem. The

Commission endorses a new, integrated and strategic approach to high-level nuclear waste management that encompasses the following elements based on the recommendations of the BRC:

1. Terminate the current Yucca Mountain program for good. If Yucca Mountain is under consideration, the broken federal program will not and cannot be fixed.
2. Enact the Nuclear Waste Informed Consent Act, H.R. 1544 and S. 649, the legislation sponsored by Nevada's congressional delegation, to extend consent to Nevada by requiring a written consent agreement with a host state's Governor, affected counties and Indian tribes, prior to construction of a geologic repository. Alternatively, the Commission recommends amending S. 1234, the Nuclear Waste Administration Act, to provide consent provisions equal to those proposed in H.R. 1544 and S. 649.
3. Fix the broken nuclear waste program by taking the program out of the DOE organization, instituting a consent-based siting process for both repositories and interim storage facilities, developing one or more consolidated interim storage facilities, promulgating new generic, scientifically based repository performance standards, and eventually initiating a new repository site search when a workable framework for such an endeavor is in place.
4. Reexamine the costs of interim storage at consolidated sites and at reactors, and geologic disposal in various host geologic media and design configurations and assess the need for reinstating the annual nuclear waste fee, and various proposals for appropriating funds from the Nuclear Waste Fund.
5. Address host community concerns about SNF stored at shutdown reactors, including safety improvements, compensation, and related issues. Appropriate actions could

include the federal government's assumption of responsibility for shutdown sites, and/or taking title to spent nuclear fuel in dry storage facilities at reactors.

6. Implement all transportation safety and security measures recommended by NAS and the BRC, including shipping the oldest fuel first, conducting full-scale testing of transportation casks, selecting modes and routes in cooperation with states and tribes (as full partners), and providing financial assistance to states, local governments and tribes along shipping routes to prepare for and adequately respond to SNF and HLW shipments.
7. Institute a major new National Academy of Sciences and Engineering study to address alternative waste disposal methods (such as deep borehole disposal) and implications of new reactor technologies for the entire nuclear fuel cycle.

The Commission believes it is time for the country to finally move past the current failed repository program. Yucca Mountain is, in fact, the single greatest impediment to solving the waste problem, and moving the country forward with sound and workable solutions like those recommended by the BRC.

Recommendation: In the event that Congress appropriates new funds for DOE and NRC Yucca Mountain licensing activities and/or enacts legislation to resurrect the Yucca Mountain program, the Agency for Nuclear Projects and the Governor should develop plans for a major public information program on the radiological and social impacts of transporting spent nuclear fuel and high-level radioactive waste to Yucca Mountain, including the 2006 findings and recommendations of the National Academy of Sciences regarding transportation safety and security.

Reprocessing is not the answer

The Commission believes that the State of Nevada has developed technically sound objections related to the safety and suitability of the proposed Yucca Mountain repository site and is positioned to make a compelling case in any restarted NRC licensing proceeding. However, Nevada must also be prepared to address the fact that Yucca Mountain is not just a Nevada issue but will affect the entire country through the unprecedented nuclear waste shipping campaign that would be necessary to bring spent nuclear fuel and high-level radioactive waste to a Nevada repository.

DOE and the commercial nuclear industry have gone to great lengths to downplay the transportation impacts of the repository program and to obscure the risks faced by thousands of communities in the 44 states that would be traversed by nuclear waste shipments to Yucca Mountain. DOE, the Nuclear Energy Institute, and the nuclear industry generally, have so far failed to acknowledge the radiological and social impact findings of the 2006 National Academy of Sciences report, and failed to implement the safety and security measures recommended by the NAS and adopted by the BRC in 2012. A national information campaign to inform states and cities of the significant radiological and social impacts of transporting spent nuclear fuel and high-level radioactive waste would alleviate the support for prospective forced-siting approaches that may be considered in Congress.

Such a campaign would require adequate resources to be effective. A similar effort was undertaken leading up to the vote in Congress to override Governor Guinn's 2002 veto of the presidential site recommendation decision. While Congress did not ultimately sustain Nevada's notice of disapproval, the public information initiative was successful in raising awareness of the transportation risks associated with Yucca Mountain and made the override vote much closer

than expected. The Commission continues to believe that such an effort is essential to a successful strategy for opposing the Yucca Mountain project. We urge the Governor and Legislature to support funding for a national information initiative in the event the project is restarted.

This last point needs to be reconsidered:

The Governor and Legislature must resist any efforts to promote reprocessing and reprocessing-related facilities at Yucca Mountain. The Commission has previously observed that there are efforts underway within Nevada to seek support for modifying the current Yucca Mountain nuclear waste repository project by combining it with a spent nuclear fuel reprocessing facility, an interim or temporary nuclear waste storage site, and other nuclear waste-related activities. The Commission expects that proponents of these proposals will make a concentrated effort before and during the 2023 Legislative session to lobby legislators and Nevada's new governor to support such a project. As the Commission has documented and the Agency for Nuclear Projects has demonstrated repeatedly, reprocessing of spent nuclear fuel at or near Yucca Mountain is simply not feasible technologically, economically, and environmentally.

There are no civilian nuclear reactors or stockpiles of commercially generated spent nuclear fuel in Nevada to justify reprocessing activities in the State. In addition, the high earthquake risk, the vast amounts of water required to "reprocess" spent fuel, and the impacts of waste transportation into and out of such facilities make reprocessing entirely unacceptable for Nevada. As the Commission has noted in prior reports, if Yucca Mountain is unsuitable and unsafe for a nuclear waste repository (and it is), the Yucca site is even more unsuitable for activities such as reprocessing and storage of spent nuclear fuel and high-level radioactive waste.

Conclusion

The Governor and Legislature should reject appeals to support such facilities, insist that the federal government abandon the dangerous and ill-considered Yucca Mountain project, and embrace the recommendations of the BRC for scientifically based selection of sites for nuclear waste storage and disposal using a process that requires the consent of the host state and local governmental and tribal jurisdictions. The Commission considers proposals for reprocessing, waste storage, and other activities in combination with or co-located at Yucca Mountain to be thinly veiled attempts to facilitate the importation of spent nuclear fuel and high-level waste into Nevada, thereby circumventing the State's long-standing, soundly based and so far successful opposition to the Yucca Mountain project.

The Yucca Mountain site is not and never has been an appropriate nuclear waste repository site. There are substantial technical and administrative obstacles to restarting the project. In addition, Yucca Mountain will not adequately address the nation's ultimate needs for nuclear waste disposal. Despite these seemingly insurmountable hurdles, Congress has not amended the 1987 law, nor has it passed needed provisions to establish an integrated nuclear waste program. Because Congress has failed to enact alternatives to the failed Yucca Mountain repository, the possibility remains of an attempt to implement the Yucca Mountain project. Additionally, new reactor designs for small modular or "advanced" reactors generate different waste types that may not be compatible with existing repository designs. As a result, a new repository design is needed. The sensible solution is to terminate Yucca Mountain and begin a new repository selection process.

References

Blue Ribbon Commission on America's Nuclear Future. "Blue Ribbon Commission on America's Nuclear Future: Report to the Secretary of Energy." Washington DC, 2012. www.brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf.

Carter, J.T. "Back End Fuel Cycle Cost Comparison, Prepared for U.S. DOE, Nuclear Fuel Storage and Transportation Planning Project," December 21, 2012.

Department of Energy. "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-0250F-S1," June 2008.

Dilger, Fred. "Counties Potentially Affected by High-Level Nuclear Waste Shipments to Yucca Mountain, NV," April 12, 2012. http://www.state.nv.us/nucwaste/news2012/pdf/nv2012dilger_counties.pdf.

Halstead, Robert, and Fred Dilger. "Repository Transportation Planning, Risk Management, and Public Acceptance: Lessons Learned." Proceedings of the International Radioactive Waste Conference, 2011. http://www.state.nv.us/nucwaste/news2011/pdf/ANS2011halstead.pdf.

Halstead, Robert, Alvin Mushkatel, and Kathleen Thomas. "Remaking the U.S. Nuclear Waste Program: A Window of Opportunity for Change?" In *Waste Management 2015, Proceedings of the Conference*. Phoenix, AZ: Waste Management Symposium, 2015. http://www.state.nv.us/nucwaste/news2016/pdf/WM2015_RemakingWasteProgram.pdf.

National Academy of Sciences. *Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States*. Washington DC: National Academies Press, 2006.

Nevada Nuclear Waste Project Office v. John Herrington, Secretary of the United States Department of Energy, No. 777 F.2d 529 (n.d.).