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REVIEW OF THE BLUE RIBBON COMMISSION ON AMERICA'S NUCLEAR FUTURE DRAFT RECOMMENDATIONS

HEARING

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
JOINT WITH THE
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

THURSDAY, OCTOBER 27, 2011

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REVIEW OF THE BLUE RIBBON COMMISSION ON AMERICA'S NUCLEAR FUTURE DRAFT RECOMMENDATIONS

THURSDAY, OCTOBER 27, 2011

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
JOINT WITH THE
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, DC.

The Subcommittees met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Paul Broun [Chairman of the Subcommittee on Investigations and Oversight] presiding.

RALPH M. HALL, TEXAS
CHAIRMAN

EDDIE BERNICE JOHNSON, TEXAS
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES
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Joint Hearing:
Subcommittee on Investigations & Oversight
Subcommittee on Energy & Environment

Review of the Blue Ribbon Commission on America's Nuclear Future Draft Recommendations

Thursday, October 27, 2011
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Witnesses

Mr. Jack Spencer, Research Fellow, Nuclear Energy Policy, Heritage Foundation

Dr. Peter Swift, Distinguished Member of the Technical Staff, Sandia National Laboratory

Dr. Roger Kasperson, Professor and Distinguished Scientist, Clark University

Mr. Gary Hollis, Chairman, Nye County Board of County Commissioners

Mr. Rick McLeod, Executive Director, Savannah River Site Community Reuse Organization

Dr. Mark Peters, Deputy Laboratory Director for Programs, Argonne National Laboratory

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
Joint Hearing:
Subcommittee on Investigations & Oversight
Subcommittee on Energy & Environment

HEARING CHARTER

Review of the Blue Ribbon Commission on America's Nuclear Future Draft Recommendations

Thursday, October 27, 2011
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Purpose

On Thursday, October 27, 2011, at 10:00 a.m. in Room 2318 of the Rayburn House Office Building, the Committee on Science, Space, and Technology's Energy & Environment and Investigations & Oversight Subcommittees will hold a hearing titled *"Review of the Blue Ribbon Commission on America's Nuclear Future Draft Recommendations."* The purpose of this hearing is to examine the recommendations contained in the Blue Ribbon Commission on America's Nuclear Future (BRC) Draft Report to the Secretary of Energy. Additionally, the Subcommittees will consider science and technology issues associated with spent nuclear fuel management.

Witnesses

- **Mr. Jack Spencer,** Research Fellow, Nuclear Energy Policy, Heritage Foundation
- **Dr. Peter Swift,** Distinguished Member of the Technical Staff, Sandia National Laboratory
- **Dr. Roger Kasperson,** Professor and Distinguished Scientist, Clark University
- **Mr. Gary Hollis,** Chairman, Nye County Board of County Commissioners
- **Mr. Rick McLeod,** Executive Director, Savannah River Site Community Reuse Organization
- **Dr. Mark Peters,** Deputy Laboratory Director for Programs, Argonne National Laboratory

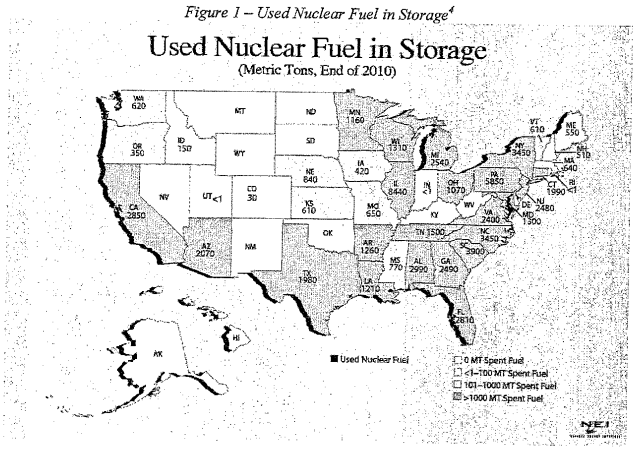
Nuclear Waste Management Policy Background

All nuclear related activity, be it related to research, commercial, military or otherwise, generates waste byproducts of varying radioactivity. These byproducts range from low-level waste such as tools, equipment, and clothing to high-level waste such as used fuel and reactor components. Under the Low-Level Radioactive Waste Policy Act, first enacted in 1980 and amended in 1985,

each state is responsible for low-level radioactive waste generated within its borders.[1] In contrast, the federal government is responsible under the Nuclear Waste Policy Act of 1982 (NWPA) for the disposal of high-level waste (as defined in 42 U.S.C. 10001).[2]

Today, 104 commercial nuclear power reactors generate approximately 20 percent of the United States electricity needs. Each reactor uses about 20 metric tons of uranium fuel per year, and collectively the industry creates 2,000 to 2,400 metric tons of spent fuel on an annual basis (one metric ton is about 2,200 pounds).[3] This spent nuclear fuel, considered high-level waste, is currently stored at the generation site in spent fuel pools (to cool the most recently used fuel rods) or in above ground dry casks.

Figure 1 – Used Nuclear Fuel in Storage[4]



[1] P.L. 96-573 and P.L. 99-240.

[2] 42 U.S.C. §10001 Section 12 - The term "high-level radioactive waste" means - (A) the highly radioactive material resulting 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 (B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.

[3] *"Blue Ribbon Commission on America's Nuclear Future Draft Report to the Secretary of Energy,"* p. 14, July 29, 2011. Accessible at: http://brc.gov/sites/default/files/documents/brc_draft_report_29jul2011_0.pdf

[4] Nuclear Energy Institute, "Used Nuclear Fuel in Storage," 2010. Accessible at: http://www.nei.org/filefolder/Used_Nuclear_Fuel_Map_2010.jpg

In addition to storage at operating nuclear reactors, spent nuclear fuel is also currently held at nine decommissioned U.S. reactor sites throughout the country.[5] Storage of spent fuel at decommissioned sites is disproportionately expensive, estimated to be $4.5 to $8 million per year[6], as security is still necessary to guard the waste. The most notable of these sites is Maine Yankee, located in Wiscasset, ME, which stores 542 metric tons of heavy metal (MTHM). Zion reactors 1 & 2 are in the process of decommissioning the site, which when completed will store approximately 1,019 MTHM.[7] The Department of Energy (DOE) currently manages radioactive material at multiple locations in the United States, with the largest located in Hanford, Washington followed by the Savannah River Site, South Carolina, and Idaho National Laboratory.

History of the Waste Isolation Pilot Plant[8]

The Waste Isolation Pilot Plant (WIPP), located 26 miles southeast of Carlsbad, New Mexico, currently serves as the world's only deep geological repository for long-lived nuclear waste. WIPP is operated by DOE and only accepts radioactive waste from defense programs. WIPP does not receive high-level waste, but material that contains radioactive transuranic elements such as plutonium.

In 1974, local officials sought consideration of the site, prompting the selection of WIPP for exploratory work. In 1979, Congress passed a law stipulating WIPP would not serve as permanent disposal of spent fuel. However, the Congressional action did not assuage the State of New Mexico's full concerns regarding the projects, which filed suit against the Federal Government to halt construction of the facility. Once the lawsuit was resolved, DOE continued moving forward with WIPP. In 1987, DOE announced the facility would open the following year; however, ongoing difficulties and litigation led to further delays. EPA certified WIPP met the regulatory thresholds for disposal of waste and the facility received its first shipment of waste in 1999. As of June 2010, WIPP "had received 8,641 shipments for a total waste volume of approximately 68,200 cubic meters."[9]

History of a Deep Geological Repository

Establishment of a deep geological repository has long been the most agreed upon method by numerous credible scientific bodies, such as the National Academies of Science, to permanently dispose of radioactive waste. Detailed study and consideration of this approach began in the 1970s, when the U.S. government undertook a serious review of geological repositories, focusing on three specific sites: Yucca Mountain, Nevada; Hanford, Washington; and Deaf Smith County, Texas.

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[5] A list of decommissioned sites and quantities of stranded fuel can be found in the BRC Draft Report, p. 40.
[6] BRC Draft Report, p. 41.
[7] BRC Draft Report, p. 40.
[8] Condensed from BRC Draft Report, p. 21
[9] Ibid.

Enactment of the NWPA in 1982 furthered this effort by providing a statutory framework to govern the disposal of U.S. high-level waste.[10] The Act directed the Federal government to assume ownership of civilian high-level nuclear waste and a one- mil (or one-tenth of one cent) per kilowatt-hour fee of nuclear generated electricity was mandated to provide funding for development of the eventual site.[11] Since no long-term storage facilities were available, it was expected that existing locations where nuclear waste was stored would continue to store that waste until a more permanent solution became available.[12]

To advance study and development of a permanent disposal solution, the Act established the Office of Civilian Radioactive Waste Management (OCRWM) within DOE and tasked it with the study of potential storage locations, taking into account criteria including but not limited to geology, seismic risk, proximity to water supplies, and nearby populations. The Secretary of Energy was required to provide to the President a list with a minimum of five sites that met these criteria.[13]

In 1987, DOE ultimately judged Yucca Mountain, located approximately 100 miles from Las Vegas, to have the "best overall prospects for being considered a suitable repository site,"[14] and the NWPA was amended to focus long-term storage facility efforts at the site.

Additional key dates in the development of a permanent geological repository in the United States[15] include:

- **1957:** the first recommendation for the disposal of radioactive waste in a permanent geologic repository.
- **1982:** Congress passes the Nuclear Waste Policy Act of 1983 (NWPA), which centralized the long-term management of nuclear waste and mandated the construction of a safe and permanent nuclear waste repository.
- **1984:** DOE publishes a draft environmental assessment of the Yucca Mountain Project.
- **1985:** DOE's Office of Civilian Radioactive Waste Management (OCRWM), submits the "Mission Plan for the Civilian Radioactive Waste Management Program" which sets overall goals, objectives, and strategy to dispose of spent nuclear fuel and high-level waste.

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[10] P.L. 97-425.

[11] Although no long-term facility has been opened, this fee is still required by law to be paid by civilian reactor operators. Some utilities have successfully sued the federal government to reclaim the money paid so far since no waste storage facility has been opened.

[12] Current spent fuel storage locations can be found at http://www.nrc.gov/waste/spent-fuel-storage/locations.html.

[13] See *Supra* note 10.

[14] Hearing titled "Nuclear Waste Program" Committee on Energy and Natural Resources, U.S. Senate, June 29, 1987. Available at: www.archive.org/stream/nuclearwasteprog04unit/nuclearwasteprog04unit_djvu.txt

[15] A more detailed timeline and description of events can be found in the Majority Staff Report of the House Science, Space, and Technology Committee, *"Yucca Mountain: The Administration's Impact on U.S. Nuclear Waste Management Policy,"* June 2011. Accessible at: http://science.house.gov/sites/republicans.science.house.gov/files/documents/Letters/Yucca%20Mountain%20-%20The%20Administration%27s%20Impact%20on%20U.S.%20Nuclear%20Waste%20Management%20Policy%20FULL.pdf

- **1986:** DOE issues a report on multi-attribute utility analysis to rank possible sites on pre-closure and post-closure technical guidelines.
- **1987:**, Congress amends the NWPA by designating Yucca Mountain as the only site to be considered as a repository.
- **December 1998:** DOE publishes five volumes assessing the viability of the Yucca Mountain Project.
- **February 2002:** OCWRM releases *"Yucca Mountain Science and Engineering Report: Technical Information Supporting Site Recommendation Consideration."*
- **February 2002:** DOE publishes 15-chapter Environmental Impact States required by the NWPA in accordance with the National Environmental Policy Act.
- **April, July 2002:** Congress reaffirms the selection of Yucca Mountain as a high-level radioactive waste repository.
- **May 2002:** Secretary of Energy Abraham recommends Yucca Mountain as the site of the high-level waste repository. President Bush formally recommends Yucca Mountain to Congress.
- **June 3, 2008:** DOE submits the License Application for a High-Level Waste Geologic Repository at Yucca Mountain (License Application) to the U.S. Nuclear Regulatory Commission (NRC).

Recent Events Relating to a High-Level Waste Repository

In order to proceed with construction of Yucca Mountain, the NRC must first approve the DOE License Application for the site. This approval is contingent upon the site meeting detailed scientific and technical criteria defined in NRC regulations that govern permanent disposal of nuclear waste.

In February 2010, DOE announced its intention to withdraw the License Application for Yucca Mountain. Additionally, the Administration declared it would dismantle OCRWM by the end of the fiscal year. While concurrently establishing the BRC, DOE formally filed the motion on March 3, 2010 with the NRC to withdraw the License Application. The NRC's Atomic Safety and Licensing Board (ASLB) rejected DOE's Motion to Withdraw on June 29, 2010, stating DOE did not have the authority under the NWPA to withdraw the License Application. The ASLB decision was appealed to the full Commission and on September 9, 2011, the Commission issued a decision stating that the Commission was evenly divided on the appeal and directed the ASLB to complete all necessary and appropriate case management activities.[16]

Until further regulatory or legal action is taken to permit the License Application to move forward or be withdrawn, it remains pending before the Commission. As a result, no long-term nuclear waste management program is currently in place. The Administration has stated its intention to wait for the BRC Final Report to inform future policy decisions regarding the direction of America's nuclear waste management policy.

[16] U.S. Nuclear Regulatory Commission, Memorandum and Order CLI-11-07, Docket No. 63-001-HLW, ASLBP 09-892-HLW-CAB04, September 9, 2011.

Background on the Blue Ribbon Commission's Draft Report

On January 29, 2010, President Obama issued an Executive Order (Appendix A) directing the Secretary of Energy to establish a Blue Ribbon Commission on America's Nuclear Future to "conduct a comprehensive review of policies for managing the back of the nuclear fuel cycle, including all alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel and nuclear waste."[17] The BRC was directed not to consider a number of issues in its report. Specifically, the BRC did not "rende[r] an opinion on the suitability of the Yucca Mountain site or on the request to withdraw the license application for Yucca Mountain" or identify any sites to conduct activity related to a waste management system.[18]

The 15 member Commission operates under the authority outlined in the Advisory Committee Charter.[19] The BRC held numerous open meetings and site visits in an effort to operate the BRC in an "open and inclusive manner"[20] The BRC and its subcommittees held 26 public meetings and 11 site visits[21] prior to the release of the Draft Report, and received over 2000 public comments from a wide variety of stakeholders and interested parties on all aspects considered under the BRC's Charter.[22]

Blue Ribbon Commission Subcommittee Structure and Recommendations

The BRC was divided into three subcommittees: Reactor and Fuel Cycle Technology (RFCT), Transportation & Storage (TS), and Disposal.

The Reactor and Fuel Cycle Technology Subcommittee was formed to consider issues relating to the "evaluation of existing fuel cycle technologies and R&D programs."[23] The Subcommittee specifically evaluated the options using criteria to include "cost, safety, resource utilization and sustainability, and the promotion of nuclear nonproliferation and counter-terrorism goals."[24] The RFCT Subcommittee submitted its draft report on June 20, 2011, centering on four key recommendations:

> (1) "provide stable, long-term (Research, Development, and Demonstration) RD&D support for advanced reactor and fuel cycle technologies," to achieve both near-term safety improvements and performance of existing light-water reactor technology and longer-term efforts to identify potential "game-changing" nuclear technologies and systems;

[17] The White House, *"Memorandum for the Secretary of Energy: Blue Ribbon Commission on America's Nuclear Future*," January 29. 2010. Accessible at: http://brc.gov/index.php?q=page/executive-order
[18] BRC Draft Report, p. vi.
[19] The Advisory Committee Charter is Appendix B and the full list of membership and subcommittee assignments is Appendix C.
[20] Blue Ribbon Commission on America's Nuclear Future, *"About the Commission."* Accessible at: http://brc.gov/index.php?q=page/about-commission
[21] The full list of meetings and events can be found at: http://brc.gov/index.php?q=calendar/
[22] Public Comments can be found at: http://brc.gov/index.php?q=comments
[23] Blue Ribbon Commission on America's Nuclear Future Advisory Committee Charter. Accessible at: http://brc.gov/index.php?q=page/charter
[24] Ibid.

(2) coordination of energy policies and programs across the federal government and more federal support for energy-related research, development, demonstration, and deployment;
(3) additional RD&D funding for the NRC to "accelerate a regulatory framework and supporting anticipatory research for novel components of advanced nuclear energy systems;" and
(4) continued international leadership to address global non-proliferation concerns and improve safety and security of nuclear facilities and materials worldwide.[25]

The Transportation and Storage Subcommittee addressed the question, "[s]hould the United States change the way in which it is storing used nuclear fuel and high level waste while one or more final disposal locations are established?"[26] The TS Subcommittee issued its report on May 31, 2011, focusing on seven key recommendations:

(1) expeditiously establishing consolidated interim storage facilities;
(2) continued research on current storage technologies;
(3) removal of spent fuel stored at decommissioned reactor sites;
(4) establishment of a new quasi-governmental waste management organization;
(5) a "science-based, consent-based, transparent, phased, and adaptive" approach to "develop and implement all aspects of the spent fuel and waste management system;"
(6) continued coordination for the transport of spent fuel and high-level waste; and
(7) restructuring the manner in which the Nuclear Waste Fund (NWF) is accessible.[27]

The Disposal Subcommittee addressed five issues contained in the BRC Charter:

- Options for permanent disposal of used fuel and/or high-level nuclear waste, including deep geological disposal;
- Options to make legal and commercial arrangements for the management of used nuclear fuel and nuclear waste in a manner that takes the current and potential full fuel cycles into account;
- Options for decision-making processes for management and disposal that are flexible, adaptive, and responsive; options to ensure that decisions on management of used nuclear fuel and nuclear waste are open and transparent, with broad participation; and
- The possible need for additional legislation or amendments to existing laws, including the Nuclear Waste Policy Act of 1982, as amended.[28]

---

[25] Blue Ribbon Commission on America's Nuclear Future, "*Reactor and Fuel Cycle Technology Subcommittee Report to the Full Commission*," June 20, 2011. Accessible at: http://brc.gov/sites/default/files/documents/rfct_fullreport_rev20june11.pdf
[26] Blue Ribbon Commission on America's Nuclear Future "Transportation & Storage." Accessible at: http://brc.gov/index.php?q=subcommittee/transportation-storage
[27] Blue Ribbon Commission on America's Nuclear Future, "*Transportation and Storage Subcommittee Report to the Full Commission,*" May 31, 2011. Accessible at: http://brc.gov/sites/default/files/documents/draft_ts_report_6-1-11.pdf

The Disposal Subcommittee also made seven recommendations to the BRC:

> (1) moving forward with the development of one or more permanent deep geological facilities for permanent disposal of high-level nuclear waste;
> (2) establishment of a new single-purpose organization to handle the transportation, storage, and disposal of nuclear waste;
> (3) access of that organization to the balance of the NWF;
> (4) a new approach to site and develop nuclear waste management and disposal facilities in the United States that is consent-based, transparent, phased, adaptive, and standards- and science-based;
> (5) joint coordination of regulatory responsibilities and safety standards between the U.S. Nuclear Regulatory Commission and the U.S. Environmental Protection Agency;
> (6) involvement of key stakeholders, including all affected levels of government, and providing the respective stakeholders direct authority over aspects of regulation, permitting, and operations in order to protect interests and generate confidence; and
> (7) retaining the Nuclear Waste Technical Review Board for independent technical advice and review.[29]

Blue Ribbon Commission Draft Report

On July 29, 2011, the BRC released the Draft Report for public comment. The public comment period concludes on October 31, 2011. The Draft Report incorporates the recommendations of the three subcommittees and provides additional policy context and commentary. The Draft Report notes, "[t]he Commission was asked to recommend a better strategy for managing the back end of the nuclear fuel cycle in the United States. We have concluded that the central flaw or gap in the U.S. program to date has been its failure, despite decades of effort, to develop a permanent disposal capability as required by the NWPA."[30]

Specifically, the BRC Draft Report identifies the following high-level recommendations:[31]

> "The Blue Ribbon Commission concludes that the United States needs a new, integrated strategy for managing the back end of the nuclear fuel cycle, including, in particular, a new approach to siting nuclear waste storage and disposal facilities. The strategy we recommend has seven key elements:
>
> 1. An approach to siting and developing nuclear waste management and disposal facilities in the United States that is adaptive, staged, consent-based, transparent, and standards- and science-based.

[28] Blue Ribbon Commission on America's Nuclear Future, *"Disposal Subcommittee Report to the Full Commission Draft,"* June 1, 2011. Accessible at http://brc.gov/sites/default/files/documents/draft_disposal_report_06-01-11.pdf
[29] Ibid.
[30] BRC Draft Report p. 30
[31] BRC Draft Report p. xv

2. A new, single-purpose organization to develop and implement a focused, integrated program for the transportation, storage, and disposal of nuclear waste in the United States.
3. Assured access by the nuclear waste management program to the balance in the Nuclear Waste Fund and to the revenues generated by annual nuclear waste fee payments.
4. Prompt efforts to develop, as expeditiously as possible, one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste.
5. Prompt efforts to develop, as expeditiously as possible, one or more consolidated interim storage facilities as part of an integrated, comprehensive plan for managing the back end of the nuclear fuel cycle.
6. Stable, long-term support for research, development, and demonstration (RD&D) on advanced reactor and fuel cycle technologies that have the potential to offer substantial benefits relative to currently available technologies and for related workforce needs and skills development.
7. International leadership to address global non-proliferation concerns and improve the safety and security of nuclear facilities and materials worldwide."

Additional Findings and Recommendations are included in Appendix D.

Legislative Requirements, Near-Term Actions, and Legal Considerations of the BRC Draft Report

The BRC Draft Report notes that in order to fully implement many of the recommendations, Congress must take legislative action. Many of the required changes in law would necessitate changing the NWPA. The most significant recommendation would require the NWPA to authorize a "new consent-based process to be used for selecting and evaluating sites and licensing consolidated storage and disposal facilities in the future."[32] Other proposed legislative changes include "authorizing consolidated interim storage facilities, establishing a new waste management organization, ensuring access to dedicated funding, and promoting international engagement to support safe and secure waste management."[33] The Draft Report did not provide any legislative text for the necessary statutory changes.

While key recommendations will require specific legislative action, the BRC suggests some actions can be accomplished with near-term, non-legislative steps. Those areas include modifying the manner in which the Nuclear Waste Fee is collected, preparing to implement consolidated storage, continuing the development of regulations associated with transporting spent fuel, "keep[ing] a repository program moving forward through valuable, non-site specific activities,"[34] and "develop[ing] a RD&D plan and roadmap for taking the borehole disposal concept to the point of a licensed demonstration."[35]

[32] BRC Draft Report, p. 5.
[33] Ibid.
[34] BRC Draft Report, p. 134.
[35] Ibid.

To help identify which near-term actions can be taken within the bounds of existing law, BRC staff requested a "Legal Analysis of Commission Recommendations for Near-Term Actions."[36] The Legal Analysis considered the recommendations relating to the initial development of consolidated interim storage facilities, the modification of the order in which DOE receives spent commercial fuel, and how to alter the timing and method in which the nuclear waste fee is paid.

The analysis concluded that these recommendations can be implemented under existing law. The document suggests a legal issue may arise should DOE formally designate a Monitored Retrievable Storage (MRS) facility[37] to serve as consolidated interim storage for nuclear waste.[38] Further, legal authority exists to alter the order in which DOE would accept spent nuclear fuel, permitting DOE to first accept spent fuel currently located at decommissioned reactor sites.

The NWF currently holds a balance of approximately $25 billion; however it is currently difficult to access and utilize the NWF.[39] The Legal Analysis identifies certain near-term actions in which the NWF could be made available for funding activities associated with the creation of a consolidated storage facility.[40]

Public Comment Period and Final Report

Between the release of the Draft Report and the conclusion of the public comment period, the BRC will hold five regional public meetings to specifically solicit feedback and public comment on the Draft Report. The BRC will review public comments and deliver the final report to the Secretary of Energy on or before January 29, 2012.

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[36] Van Ness Feldman, "*Legal Analysis of Commission Recommendations for Near-Term Actions*," to Blue Ribbon Commission on America's Nuclear Future, July 29, 2011, revised October 11, 2011. Accessible at http://brc.gov/sites/default/files/documents/20111011_legal_authorities_memo_revised_final_clean_1.pdf

[37] The NWPA provides DOE authority to site, construct and operate a Monitored Retrievable Storage (MRS) facility. A MRS facility could store spent fuel and high-level waste, but would be designed to permit for continuous monitoring, management and retrieval of the materials, rather than permanent storage. In 1987, Congress amended the NWPA prohibiting construction of a MRS facility prior to the licensing of a permanent repository.

[38] Van Ness Feldman, p. 3.

[39] A detailed explanation of how the Nuclear Waste Fund is administered and budgetary restrictions can be found in the BRC Draft Report, Chapter 8.

[40] Van Ness Feldman, p. 13.

Appendix A

Executive Order Creating the Blue Ribbon Commission on America's Nuclear Energy Future

THE WHITE HOUSE Office of the Press Secretary
For Immediate Release January 29, 2010
January 29, 2010

MEMORANDUM FOR THE SECRETARY OF ENERGY
SUBJECT: Blue Ribbon Commission on America's Nuclear Future

Expanding our Nation's capacity to generate clean nuclearenergy is crucial to our ability to combat climate change, enhance energy security, and increase economic prosperity. My Administration is undertaking substantial steps to expand the safe, secure, and responsible use of nuclear energy. These efforts are critical to accomplishing many of my Administration's most significant goals.

An important part of a sound, comprehensive, and long-term domestic nuclear energy strategy is a well-considered policy for managing used nuclear fuel and other aspects of the back end of the nuclear fuel cycle. Yet the Nation's approach, developed more than 20 years ago, to managing materials derived from nuclear activities, including nuclear fuel and nuclear waste, has not proven effective. Fortunately, over the past two decades scientists and engineers in our country and abroad have learned a great deal about effective strategies for managing nuclear material. My Administration is committed to using this advanced knowledge to meet the Government's obligation to dispose of our Nation's used nuclear material.

Accordingly, I request that you establish a Blue Ribbon Commission on America's Nuclear Future (Commission) and appoint its members. Those members should include recognized representatives and experts from a range of disciplines and with a range of perspectives, and may include participation of appropriate Federal officials. The Commission's business should be conducted in an open and transparent manner.

The Commission should conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle, including all alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel and nuclear waste. This review should include an evaluation of advanced fuel cycle technologies that would optimize energy recovery, resource utilization, and the minimization of materials derived from nuclear activities in a manner consistent with U.S. nonproliferation goals.

In performing its functions, the Commission should consider abroad range of technological and policy alternatives, and should analyze the scientific, environmental, budgetary, economic, financial, and management issues, among others, surrounding each alternative it considers. Where appropriate, the Commission may also identify potential statutory changes.

The Commission should provide an interim report to you within18 months of the date of this memorandum, and that report should be made available for public comment. The Commission should provide a final report to you within 24 months of the date of this memorandum. The

Department of Energy shall provide funding and administrative support for the Commission, as you determine appropriate, so that it can complete its functions within these time periods. Additionally, all executive departments and agencies shall provide such information and assistance to the Commission as you or the Commission may request for purposes of carrying out the Commission's functions, to the extent permitted by law. Nothing in this memorandum shall be construed to require the disclosure of classified, proprietary, law enforcement sensitive, or other information protected under governing law. This memorandum shall be implemented consistent with applicable law and subject to the availability of appropriations. This memorandum is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or inequity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.

You are hereby authorized and directed to publish this memorandum in the Federal Register.

BARACK OBAMA

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Appendix B

Blue Ribbon Commission Charter

Blue Ribbon Commission on America's Nuclear Future
U.S. Department of Energy

Advisory Committee Charter

1. **Committee's Official Designation**. Blue Ribbon Commission on America's Nuclear Future (the Commission).

2. **Authority**. The Commission is being established in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C. App. 2, and as directed by the President's Memorandum for the Secretary of Energy dated January 20, 2010: Blue Ribbon Commission on America's Nuclear Future. This charter establishes the Commission under the authority of the U.S. Department of Energy (DOE).

3. **Objectives and Scope of Activities.** The Secretary of Energy, acting at the direction of the President, is establishing the Commission to conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle, including all alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel, high-level waste, and materials derived from nuclear activities. Specifically, the Commission will provide advice, evaluate alternatives, and make recommendations for a new plan to address these issues, including:
The Commission will produce a draft report to the Secretary and a final report within the time frames contained in paragraph 4.

a. Evaluation of existing fuel cycle technologies and R&D programs. Criteria for evaluation should include cost, safety, resource utilization and sustainability, and the promotion of nuclear nonproliferation and counter-terrorism goals.

b. Options for safe storage of used nuclear fuel while final disposition pathways are selected and deployed;

c. Options for permanent disposal of used fuel and/or high-level nuclear waste, including deep geological disposal;

d. Options to make legal and commercial arrangements for the management of used nuclear fuel and nuclear waste in a manner that takes the current and potential full fuel cycles into account;

e. Options for decision-making processes for management and disposal that are flexible, adptive, and responsive;

f. Options to ensure that decisions on management of used nuclear fuel and nuclear waste are open and transparent, with broad participation;

g. The possible need for additional legislation or amendments to existing laws, including the Nuclear Waste Policy Act of 1982, as amended; and

h. Any such additional matters as the Secretary determines to be appropriate for consideration.

4. **Description of Duties.** The duties of the Commission are solely advisory and are as stated in Paragraph 3 above.
A draft report shall be submitted within 18 months of the date of the Presidential memorandum directing establishment of this Commission; a final report shall be submitted within 24 months of the date of that memorandum. The reports shall include:

a. Consideration of a wide range of technological and policy alternatives, and should analyze the scientific, environmental, budgetary, financial, and management issues, among others, surrounding each alternative it considers. The reports will also include a set of recommendations regarding policy and management, and any advisable changes in law.

b. Recommendations on the fees currently being charged to nuclear energy ratepayers and the recommended disposition of the available balances consistent with the recommendations of the Commission regarding the management of used nuclear fuel; and

c. Such other matters as the Secretary determines to be appropriate.

5. **Official to Whom the Committee Reports.** The Commission reports to the Secretary of Energy.

6. **Agency Responsible for Providing the Necessary Support.** DOE will be responsible for financial and administrative support. Within DOE, this support will be provided by the Office of the Assistant Secretary for Nuclear Energy or other Departmental element as required. The Commission will draw on the expertise of other federal agencies as appropriate.

7. **Estimated Annual Operating Cost and Staff Years.** The estimated annual operating cost of direct support to, including travel of, the Commission and its subcommittees is $5,000,000 and requires approximately 8.0 full-time employees.

8. **Designated Federal Officer.** A full-time DOE employee, appointed in accordance with agency procedures, will serve as the Designated Federal Officer (DFO). The DFO will approve or call all of the Commission and subcommittee meetings, approve all meeting agendas, attend all Commission and subcommittee meetings, adjourn any meeting when the DFO determines adjournment to be in the public interest. Subcommittee directors who are full-time Department of Energy employees, as appointed by the DFO, may serve as DFOs for subcommittee meetings.

9. **Estimated Number and Frequency of Meetings.** The Commission is expected to meet as frequently as needed and approved by the DFO, but not less than twice a year.

   The Commission will hold open meetings unless the Secretary of Energy, or his designee, determines that a meeting or a portion of a meeting may be closed to the public as permitted by law. Interested persons may attend meetings of, and file comments with, the Commission, and, within time constraints and Commission procedures, may appear before the Commission.

   Members of the Commission serve without compensation. However, each appointed non-Federal member may be reimbursed for per diem and travel expenses incurred while attending Commission meetings in accordance with the Federal Travel Regulations.

10. **Duration and Termination.** The Commission is subject to biennial review and will terminate 24 months from the date of the Presidential memorandum discussed above, unless, prior to that time, the charter is renewed in accordance with Section 14 of the FACA.

11. **Membership and Designation**. Commission members shall be experts in their respective fields and appointed as special Government employees based on their knowledge and expertise of the topics expected to be addressed by the Commission, or representatives of entities including, among others, research facilities, academic and policy-centered institutions, industry, labor organizations, environmental organizations, and others, should the Commission's task require such representation. Members shall be appointed by the Secretary of Energy. The approximate number of Commission members will be 15 persons. The Chair or Co-Chairs shall be appointed by the Secretary of Energy.

12. **Subcommittees**.

a. To facilitate functioning of the Commission, both standing and ad hoc subcommittees may be formed.

b. The objectives of the subcommittees are to undertake fact-finding and analysis on specific topics and to provide appropriate information and recommendations to the Commission.

c. The Secretary or his designee, in consultation with the Chair or Co-Chairs, will appoint members of subcommittees. Members from outside the Commission may be appointed to any subcommittee to assure the expertise necessary to conduct subcommittee business.

d. The Secretary or his designee, in consultation with the Chair or co-Chairs will appoint Subcommittees.

e. The DOE Committee Management Officer (CMO) will be notified upon establishment of each subcommittee.

13. **Recordkeeping**. The records of the Commission and any subcommittee shall be handled in accordance with General Records Schedule 26, Item 2 and approved agency records disposition schedule. These records shall be available for public inspection and copying, subject to the Freedom of Information Act, 5 U.S.C. 552.

14. **Filing Date**.

Date filed with Congress: March 1, 2010
Carol A. Matthews
Committee Management Officer

Appendix C

List of Blue Ribbon Commission Members and Subcommittee Structure[41]

- **Lee Hamilton** - Co-Chair
- **Brent Scowcroft** - Co-Chair
- **Mark Ayers** - President, Building & Construction Trades Department, AFL-CIO
- **Vicky A. Bailey** - Principal, Anderson Stratton Enterprises, LLC
- **Albert Carnesale** - Chancellor Emeritus and Professor, UCLA
- **Pete V. Domenici** - Senior Fellow, Bipartisan Policy Center; former U.S. Senator (R-NM)
- **Susan Eisenhower** - President, Eisenhower Group, Inc.
- **Sen. Chuck Hagel** - Distinguished Professor, Georgetown University; Former U.S. Senator (R-NE)
- **Jonathan Lash** – President, World Resources Institute
- **Allison Macfarlane** - Associate Professor of Environmental Science and Policy, George Mason University
- **Richard A. Meserve** - President, Carnegie Institution for Science and Senior Of Counsel, Covington & Burling LLP; former Chairman, U.S. Nuclear Regulatory Commission
- **Ernie Moniz** - Professor of Physics and Cecil & Ida Green Distinguished Professor, Massachusetts Institute of Technology
- **Per Peterson** - Professor and Chair, Department of Nuclear Engineering, University of California - Berkeley
- **John Rowe** - Chairman and Chief Executive Officer, Exelon Corporation
- **Phil Sharp** - President, Resources for the Future

Reactor and Fuel Cycle Technology

Co-Chair(s):	Ex Officio(s):
Per Peterson	Brent Scowcroft
Pete V. Domenici	Lee Hamilton

Albert Carnesale
Susan Eisenhower
Allison Macfarlane
Richard A. Meserve
Ernie Moniz
Phil Sharp

Transportation and Storage

[41] For full biographies see: http://brc.gov/index.php?q=commission-members

Co-Chair(s):
Phil Sharp
Richard A. Meserve

Ex Officio(s):
Brent Scowcroft
Lee Hamilton

Mark Ayers
Vicky A. Bailey
Albert Carnesale
Pete V. Domenici
Ernie Moniz
John Rowe

Disposal

Co—Chair(s:)
Chuck Hagel
Jonathan Lash

Ex officio(s):
Brent Scowcroft
Lee Hamilton

Mark Ayers
Vicky A. Bailey
Susan Eisenhower
Allison Macfarlane
Per Peterson
John Rowe

Appendix D

ADDITIONAL FINDINGS AND RECOMMENDATIONS[42]

- The current division of regulatory responsibilities for long-term repository performance between the U S. Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency is appropriate and should continue. The two agencies should develop new, site-independent safety standards in a formally coordinated joint process that actively engages and solicits input from all relevant constituencies.
- The jurisdictions of safety and health agencies should be clarified and aligned. New site-independent safety standards should be developed by the safety and health agencies responsible for protecting nuclear workers through a coordinated joint process that actively engages and solicits input from all relevant constituencies. Efforts to support uniform levels of safety and health in the nuclear industry should be undertaken with federal, industry, and joint labor–management leadership. Safety and health practices in the nuclear construction industry should provide a model for other activities in the nuclear industry.
- The roles, responsibilities, and authorities of local, state, and tribal governments (with respect to facility siting and other aspects of nuclear waste disposal) must be an element of the negotiation between the federal government and the other affected units of government in establishing a disposal facility. All affected levels of government (i.e., local, state, tribal, etc.) must have, at a minimum, a meaningful consultative role in important decisions; additionally, states and tribes should retain—or where appropriate, be delegated—direct authority over aspects of regulation, permitting, and operations where oversight below the federal level can be exercised effectively and in a way that is helpful in protecting the interests and gaining the confidence of affected communities and citizens. At the same time, local, state, and tribal governments have responsibilities to work productively with the federal government to help advance the national interest.
- Recognizing the substantial lead-times that may be required in opening one or more consolidated storage facilities, dispersed interim storage of substantial quantities of spent fuel at existing reactor sites can be expected to continue for some time. The Commission sees no unmanageable safety or security risks associated with current methods of storage (dry or wet) at existing sites in the United States. However, to ensure that all near-term forms of storage meet high standards of safety and security for the multi-decade-long time periods that they are likely to be in use, active research should continue on issues such as degradation phenomena, vulnerability to sabotage and terrorism, full-scale cask testing, and other matters.
- The Commission recommends that the National Academy of Sciences (NAS) be tasked with carrying out an assessment of the lessons learned from Fukushima and their implications for conclusions reached in earlier NAS studies on the safety and security of spent fuel and high-level waste storage arrangements.
- Spent fuel currently being stored at shutdown reactor sites should be "first in line" for transfer to consolidated interim storage.
- Although regulatory standards for different types of facilities will differ, the new organization should be responsible for developing consolidated interim storage and permanent disposal facilities and should apply the same principles of decision making to

[42] BRC Draft Report, p. xv

all aspects of the waste management program (i.e., science-based, consent-based, transparent, phased, and adaptive).

- Siting processes for future waste management facilities should include a flexible and substantial incentive program.
- The current system of standards and regulations governing the transport of spent fuel and other nuclear materials has functioned well, and the safety record for past shipments of these types of materials is excellent. However, planning and coordination for the transport of spent fuel and high-level waste is complex and should commence at the very start of a project to develop consolidated storage capacity.
- The federal government should take steps to resolve ongoing litigation between the Department of Energy and the utilities regarding fuel acceptance as expeditiously as possible.
- A well-designed federal RD&D program will enable the United States to retain a global leadership position in nuclear technology innovation. Public and private RD&D efforts should focus on two distinct areas of opportunity:
    - Near-term improvements in the safety and performance of existing light-water reactor technology, as currently deployed in the United States and elsewhere as part of a once-through fuel cycle, and in the technologies available for storing and disposing of spent nuclear fuel and high-level waste.
    - Longer-term efforts to advance potential "game-changing" nuclear technologies and systems that could achieve very large benefits across multiple evaluation criteria compared to current technologies and systems.
- A portion of federal nuclear energy RD&D resources should be directed to the NRC to accelerate a regulatory framework and supporting anticipatory research for novel components of advanced nuclear energy systems. An increased degree of confidence that new systems can be successfully licensed is important for lowering barriers to commercial investment.

Chairman BROUN. The Subcommittee on Investigations and Oversight as well as the Subcommittee on Energy and Environment will come to order.

Good morning. Welcome to today's hearing entitled "Review of the Blue Ribbon Commission on America's Nuclear Future Draft Recommendations." In front of you are packets containing the written testimony, biographies and Truth in Testimony disclosures for today's witness panel. Before we get started, since this is a joint hearing involving two Subcommittees, I want to explain how we will operate procedurally so that all Members understand how the question-and-answer period will be handled. As always, we will alternate between the majority and minority Members, and allow all Members an opportunity for questioning before recognizing a Member for a second round of questions if we have time for those second rounds. We will recognize those Members of either Subcommittee present at the gavel in order of seniority on full Committee and those that come in after the gavel will be recognized in order of their arrival. I now recognize myself for five minutes for an opening statement.

On January 29, 2010, the President directed the Secretary of Energy to establish a Blue Ribbon Commission to "conduct a comprehensive review of policies for managing the back of the nuclear fuel cycle, including all alternatives for the storage, processing and disposal of civilian and defense use nuclear fuel and nuclear waste."

Over the last year and a half, the Commission held numerous meetings and site visits around the country in a transparent and open manner, to hear a wide array of stakeholder input. I was pleased that the Commission recognized the importance of this issue in my community and came down to Georgia and South Carolina last winter and listened to the concerns held by a variety of organizations. On July 29th, the Commission released its draft recommendations, announced it will seek comments on that draft until October 31, and indicated that it will meet its deadline to deliver a final report by January 29, 2012. That is a novel idea, meeting a deadline. This hearing allows the Committee to hear expert opinions on the Commission's draft report and weigh in accordingly.

At the same time the Administration formed the BRC, the Department of Energy announced its intention to withdraw the Yucca Mountain license application before the Nuclear Regulatory Commission. Shortly thereafter, Secretary Chu promised that the BRC would have the authority to explore a "full range of scientific and technical options." Unfortunately it appears that promise was broken. Co-Chair Lee Hamilton said Secretary Chu made it "quite clear that nuclear waste storage at Yucca Mountain is not an option, and that the Blue Ribbon Commission will be looking at better alternatives."

While the BRC charter does not expressly prohibit the consideration of Yucca Mountain, it is not surprising that the BRC draft recommendations ignore the 900-pound gorilla in the room. That 900-pound gorilla, not 800-pound but 900-pound gorilla, or more appropriately the $15 billion gorilla, was actually recommended by Secretary Chu months before he joined this recommendation. He

made the recommendation of Yucca Mountain. Given the long-standing acknowledgement of the need for a permanent deep geological repository, it should come as no surprise that the BRC still called for a geological repository to be expeditiously developed.

Many of the Commission's other recommendations, such as the development of a quasi-governmental organization and the manner in which the Nuclear Waste Fund, which finances activities to store spent nuclear fuel, is administered are very interesting. I look forward to working with the Commission and the Administration on these recommendations, particularly the research, development and demonstration provisions that fall within this Committee's jurisdiction.

Ensuring a sustained, viable and safe nuclear sector is an important part of a balanced energy portfolio, and that is enabled by responsible public and private investments in research and development. In Georgia alone, almost a quarter, 24.7 percent, of its electricity generation comes from nuclear energy. Two power stations, Hatch and Vogtle, have the capacity to generate over 4,000 megawatts of emissions-free energy.

That nuclear power production also produces spent fuel. There is already a significant amount, 2,410 metric tons, of commercial spent fuel currently stored in Georgia awaiting disposition, fuel that the people of Georgia have already paid over $700 million to dispose of. On top of the fees paid by ratepayers, the American taxpayers are on the hook for $12 billion in liabilities, due to the Federal Government's inability to meet their legal obligation to accept spent nuclear fuel. This liability is likely to skyrocket in future years in the absence of federal action.

In addition to the fuel stored at Georgia's nuclear reactors, the Savannah River Site also houses a great deal of radioactive material as a result of its contributions to our Nation's nuclear weapons program. I am concerned that the BRC interim storage recommendations will be used to make the Savannah River Site a de facto repository without any of the scientific study that Yucca Mountain has undergone. This concern has long been recognized and was the reason why in 1987 Congress prohibited the construction of such a facility prior to a license being issued for a permanent geological repository.

This distrust brings me to another point. This Administration has long claimed that it makes its decisions based on science. In 2008, the President stated that he would "restore the basic principle that government decisions should be based on the best available, scientifically valid evidence, not on the ideological predispositions of agency officials or political appointees." Also, just last year, the President's Press Secretary stated this: "I think what has taken Yucca Mountain off the table in terms of a long-term solution for a repository for our nuclear waste is the science. The science ought to make these decisions."

After reviewing the NRC's evaluation of whether Yucca Mountain meets regulatory standards, I have trouble reconciling those two statements.

At this point, I would like to enter into the record a majority staff report titled Yucca Mountain: The Administration's Impact on

U.S. Nuclear Waste Management Policy. Without objection, so ordered.

[The information may be found in Appendix 2.]

Chairman BROUN. The report pointedly highlights the NRC's independent evaluation of Yucca Mountain determined the proposed repository meets all applicable safety requirements, including those related to human health and groundwater protection, and the scientific performance goals set forth by the regulatory agencies.

While I believe the Commission's draft recommendations offer an opportunity to explore innovative policy options, the fact that the Commission was precluded from addressing Yucca Mountain limits the usefulness of the report. Any serious review of spent fuel management has to recognize the decades of research and billions of dollars, taxpayers' dollars, in investment to ready Yucca Mountain to accept spent nuclear fuel. Let us also not forget that Yucca Mountain is designated by law as the Nation's spent fuel repository. I hope that the Commission members take this into consideration as they prepare their final report.

[The prepared statement of Mr. Broun follows:]

PREPARED STATEMENT OF REPRESENTATIVE PAUL C. BROUN, CHAIRMAN, SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

On January 29, 2010, The President directed the Secretary of Energy to establish a Blue Ribbon Commission to "conduct a comprehensive review of policies for managing the back of the nuclear fuel cycle, including all alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel and nuclear waste."

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Many of the Commission's other recommendations, such as the development of a quasi-governmental organization and the manner in which the Nuclear Waste Fund, which finances activities to store spent nuclear fuel, is administered are very interesting. I look forward to working with the Commission and the Administration on these recommendations, particularly the Research, Development, and Demonstration provisions that fall within this Committee's jurisdiction. Ensuring a sustained, viable, and safe nuclear sector is an important part of a balanced energy portfolio, and that is enabled by responsible public and private investments in research and development. In Georgia alone, almost a quarter (24.7%) of its electricity generation

comes from nuclear energy. Two power stations—Hatch and Vogtle—have the capacity to generate over 4,000 megawatts of emission-free energy.

That nuclear power production also produces spent fuel. There is already a significant amount (2,410 metric tons) of commercial spent fuel currently stored in Georgia awaiting disposition—fuel that the people of Georgia have already paid over $700 million to dispose of. On top of the fees paid by ratepayers, the American taxpayers are on the hook for $12 billion in liabilities, due to the Federal Government's inability to meet their legal obligation to accept spent nuclear fuel. This liability is likely to skyrocket in future years in the absence of federal action.

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While I believe the Commission's draft recommendations offer an opportunity to explore innovative policy options, the fact that the Commission was precluded from addressing Yucca Mountain limits the usefulness of the report. Any serious review of spent fuel management has to recognize the decades of research and billions of dollars in investment to ready Yucca Mountain to accept spent nuclear fuel. Let's also not forget that Yucca Mountain is designated by law as the Nation's spent fuel repository.

I hope that the Commission Members take this into consideration as they prepare their final report.

Chairman BROUN. With that, now I will recognize—and I welcome our new Ranking Member, Mr. Tonko, and I recognize you, my friend, for five minutes. I look forward to working with you on this Committee.

Mr. TONKO. Thank you. Thank you, Chairman. I appreciate the trust shown by the Democrats of the Committee to have me serve as their Ranking Minority Member for the Subcommittee on Investigations and Oversight, and I do look forward to a productive working relationship.

On November 4, 2008, the citizens of this country chose then-Senator Barack Obama to serve as President of these United States. He received 53 percent of the popular vote and the largest absolute number of votes of any candidate in our country's history.

As a candidate, he had promised very clearly that Yucca Mountain would not be used as a nuclear waste repository. After taking office he took steps to keep that promise. That is politics, but that is the kind of politics that lies at the heart of a functioning democracy. Apparently, President Obama's position on Yucca will not be reversed even in the unlikely event that Congressman Paul or Governor Romney or Governor Perry wins the 2012 Presidential elec-

tion. In the Republican candidates' debate in Nevada last week, all three of them said that they would not open Yucca either.

The decision to close Yucca Mountain was not driven by science, and it is a fiction to pretend that it was. The change that this—the charge, rather, that this is an example of a lack of scientific integrity only stands as an argument one way, if you can sell the idea that somehow the decision-making on Yucca always hinged on science, and that the new Administration abandoned that path or somehow skewed the science to support a favored outcome.

The truth is that the actual decision process surrounding Yucca has always been political. The Administration's decision to close Yucca was a position advocated by a Presidential candidate and then supported by a majority of American voters. In the United States democratic system, we also call that a mandate for change.

How was Yucca selected to become the Nation's permanent nuclear waste repository in the first place? You can look at the entire body of the majority's report, almost 40 pages long, but one critical term is missing. It was popularly referred to in more colloquial terms but we might otherwise call it the "Forget Nevada" amendment. The majority's report does not mention this Amendment that came back from a House-Senate Conference Committee in 1987.

In 1987, two of the leading alternative sites had powerful political patrons. Texas had a site in Speaker Wright's district. Washington State had a site in Majority Leader Foley's district. It may not be too much of a shock to learn that those sites were pulled out of the competition by Congress, thereby leaving Yucca Mountain as the only alternative. At the time, Harry Reid, a former member of the I&O Subcommittee, was in his first year as a Senator from Nevada. Two decades later, the situation has changed in remarkable ways, but with predictable consequences.

Let me be clear: it was not science that led Yucca to be selected, but rather political muscle exercised by highly influential Members of this House and the Senate. However, none of this is in the Majority Staff's report.

After the 1987 Amendments to the Nuclear Waste Policy Act, the only site that DOE was authorized to characterize and develop was Yucca Mountain. Politicians told scientists where they could look. The State of Nevada, aside from a very small number of people, never accepted this imposition by Washington, DC. The State has always felt it was unfair to the people of Nevada. In the face of a claim of injustice, questions about science seem small.

Candidate Obama recognized the procedural failings in trying to force a waste repository on the State. His statement on Yucca speaks of science, but the core of his position was about fairness, justice and equity. His statement reads, in relevant part, "States should not be unfairly burdened with waste from other States."

The Majority Staff report does not quote this portion of Mr. Obama's position. By ignoring this foundational claim, the Majority Staff report distorts a key problem with Yucca: that 49 States ganged up on one State. In such a situation, the most important quality of the site is not its geology and it is not its hydrology, but the fairness of how the site was selected in the first place. In other words, this is a partially—this is partially a States' rights issue.

Science can provide facts about a changing world, but making policy is about weighing the anticipated consequences of policy options against a complex set of values and interests. To try to claim that Yucca is solely about science defaces the history of that site, the motives of President Obama, and even the positions of leading Republican Presidential candidates such as Governor Romney, Governor Perry and Congressman Paul.

Nevada has successfully pushed back and now has a political weight that they lacked back in 1987. I don't want to say that Yucca will never be used as a repository for waste, but if it is opened, it should be because Nevadans are willing to take the waste, not because 49 States have forced it on them.

With that, Mr. Chairman, I yield back.

[The prepared statement of Mr. Tonko follows:]

PREPARED STATEMENT OF REPRESENTATIVE PAUL TONKO,
RANKING MINORITY MEMBER,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

Mr. Chairman, I thank you for your welcome, and I look forward to a productive working relationship.

On November 4, 2008, the citizens of the United States chose Barack Obama to serve as our President. He received 53% of the popular vote and the largest absolute number of votes of any candidate in the country's history.

As a candidate he had promised, very clearly, that Yucca Mountain would not be used as a nuclear waste repository. After taking office he took steps to keep that promise. That is politics, but that is the kind of politics that lies at the heart of a functioning democracy.

Apparently, Mr. Obama's position on Yucca will not be reversed even in the unlikely event that Mr. Paul or Mr. Romney or Mr. Perry wins the 2012 Presidential election. In the Republican candidates' debate in Nevada last week, all three of them said that they would not open Yucca either.

The decision to close Yucca Mountain was not driven by science, and it is a fiction to pretend that it was. The charge that this is an example of a lack of scientific integrity only stands as an argument one way—if you can sell the idea that somehow the decision making on Yucca always hinged on science, and that the new Administration abandoned that path or somehow skewed the science to support a favored outcome.

The truth is that the actual decision process surrounding Yucca has always been political. The Administration's decision to close Yucca was a position advocated by a Presidential candidate and then supported by a majority of American voters. We might otherwise call that a mandate for change.

How was Yucca selected to become the Nation's permanent nuclear waste repository in the first place? You can look at the entire body of the Majority's report—almost 40 pages long—but one critical term is missing. Please excuse the colloquial nature of my comment, but the Majority's report does not even mention the "Screw Nevada" amendment, as it was popularly known, that came back from a House-Senate Conference Committee in 1987.

In 1987, two of the leading alternative sites had powerful political patrons. Texas had a site in Speaker Wright's district. Washington had a site in Majority Leader Foley's district. It may not be too much of a shock to learn that those sites were pulled out of the competition by Congress, thereby leaving Yucca Mountain as the only alternative. At the time, Harry Reid, a former Member of this I&O Subcommittee, was in his first year as a Senator from Nevada. Two decades later, the situation has changed in remarkable ways, but with predictable consequences.

Let me be clear, it was not science that led Yucca to be selected, but political muscle exercised by highly influential Members of the House and the Senate. However, none of this is in the Majority Staff's report.

After the 1987 Amendments to the Nuclear Waste Policy Act, the only site that DOE was authorized to characterize and develop was Yucca Mountain. Politicians told scientists where they could look.

The State of Nevada, aside from a very small number of people, never accepted this imposition by Washington, DC. The State has always felt it was unfair to the people of Nevada. In the face of a claim of injustice, questions about science seem

small. Candidate Obama recognized the procedural failings in trying to force a waste repository on the State. His statement on Yucca speaks of science, but the core of his position was about fairness, justice and equity. His statement reads, in relevant part, "States should not be unfairly burdened with waste from other states."

The Majority staff report does not quote this portion of Mr. Obama's position. By ignoring this foundational claim, the Majority staff report distorts a key problem with Yucca: that 49 States ganged up on one State. In such a situation, the most important quality of the site is not its geology or hydrology, but the fairness of how the site was selected in the first place.

In other words, this is a States' rights issue.

Science can provide facts about a changing world, but making policy is about weighing the anticipated consequences of policy options against a complex set of values and interests. To try to claim that Yucca is solely about science defaces the history of the site, the motives of President Obama and even the positions of leading Republican Presidential candidates such as Mr. Romney, Mr. Perry and Mr. Paul.

Procedural justice represents one of those qualities that distinguishes democracy from despotism. When you ignore fairness, people push back, as the representatives of the people of Nevada have done.

Nevada has successfully pushed back and now has a political weight that they lacked in 1987. I don't want to say that Yucca will never be used as a repository for waste, but if it is opened, it should be because Nevadans are willing to take the waste, not because 49 States have forced it on them.

With that, Mr. Chairman, I yield back.

Chairman BROUN. Thank you, Mr. Tonko.

I would like to ask unanimous consent that the gentleman from California, Mr. Garamendi, be allowed to sit on the dais with the Committee and participate in the hearings. Hearing no objection, so ordered.

Now I recognize Dr. Harris for his opening statement. Doctor, you are recognized for five minutes.

Mr. HARRIS. Thank you very much, Mr. Chairman.

I first want to thank our witnesses for being here this morning as the Subcommittees review the draft recommendations of the Blue Ribbon Commission on America's Nuclear Future.

Nuclear energy is an integral component of America's energy portfolio. One hundred four currently operating commercial nuclear reactors deliver a clean, affordable and reliable energy source that supplies 20 percent of America's electricity. That electricity generation, along with America's nuclear weapons programs, produces radioactive waste that the Federal Government has a longstanding statutory responsibility to accept and permanently dispose of.

It is important to recognize how we arrived at this point. For more than 30 years, Yucca Mountain, Nevada, has been extensively studied to determine if a permanent, geologic repository for high-level radioactive waste can safely be constructed and operated. Taxpayers spent approximately $15 billion on this effort, and in 2008, the Department of Energy submitted an 8,600-page application to the Nuclear Regulatory Commission proposing that it could indeed be done safely. NRC scientific and technical staff reviewed this application in equally excruciating detail, and agreed with the Department of Energy.

Yet, despite this investment and decades of scientific work, the DOE has sought to withdraw its application on political, not technical grounds, asserting only that Yucca Mountain "isn't a workable option" and the NRC Chairman has halted all work on the application review and refused to allow for finalization of the technical review.

Now, the argument that campaign promises and politics should always trump sound policy is belied by Guantanamo Bay, for instance. This is the Science Committee, not the Politics Committee, and this hearing is not only justified but owed to the American public who longs for solutions not beholden to politics.

President Obama's unilateral decision to discard decades of the scientific community's hard work and ignore the current law on the books has thrown United States nuclear waste management policy into disarray.

This brings us to the Blue Ribbon Commission, established by President Obama in concurrence with his dismantling of existing nuclear waste management structure. The BRC is specifically tasked to review policies associated with managing the back end of the nuclear fuel cycle and related issues of storage, processing and disposal of both civilian and defense nuclear waste.

In July, the BRC issued its draft report to the Secretary of Energy and will release its final report by the end of January 2012. I would first like to recognize the good work put in by the members of the Commission in drafting this report. It contains valuable ideas that Congress should consider and work to be a thoughtful partner in advancing.

For example, I support the BRC's interest in long-term support for research, development and demonstration of advanced reactor and fuel cycle technologies that could reduce the amount of high-level radioactive waste produced and change how that waste is managed.

The potential contributions of the BRC, however, appear to be limited by politics. Upon initiating the panel's work, Commission Co-Chair Lee Hamilton said that Secretary of Energy Chu "made it quite clear that nuclear waste storage at Yucca Mountain is not an option, and that the Blue Ribbon Commission should be looking at better alternatives." This action by the Administration is striking not only in its audacity; it is also simply irrational to suggest a "better alternative" can be identified without a direct comparison to the current plan for which an alternative is being sought.

To its credit, the Commission calls for expeditious development of a permanent geologic repository, but turning a blind eye to the elephant in the room that is Yucca Mountain will render all its efforts fundamentally flawed. Unless and until the Federal Government honors its legal obligation to proceed in good faith with disposal of high-level radioactive waste, the long-term viability of nuclear energy to meet growing electricity demands remains in doubt.

The Blue Ribbon Commission still has an opportunity to impact this future direction, and I hope today's hearing provides it with informative and useful guidance toward that end.

Today I welcome hearing evaluations of and recommendations on the Commission's draft report, and Mr. Chairman, I yield back the balance of my time.

[The prepared statement of Mr. Harris follows:]

PREPARED STATEMENT OF REPRESENTATIVE ANDY HARRIS, CHAIRMAN, SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

I want to thank our witnesses for being here this morning as the Subcommittees review the draft recommendations of the Blue Ribbon Commission on America's Nuclear Future.

Nuclear energy is an integral component of America's energy portfolio. One hundred four currently operating commercial nuclear reactors deliver a clean, affordable, and reliable energy source that supplies 20 percent of America's electricity. That electricity generation, along with America's nuclear weapons programs, produces radioactive waste that the Federal Government has a longstanding statutory responsibility to accept and permanently dispose of.

It is important to recognize how we arrived at this point. For more than 30 years, Yucca Mountain, Nevada, has been extensively studied to determine if a permanent, geologic repository for high-level radioactive waste can safely be constructed and operated. Taxpayers spent approximately $15 billion on this effort, and in 2008 the Department of Energy submitted an 8,600 page application to the Nuclear Regulatory Commission proposing that it could indeed be done safely. NRC scientific and technical staff reviewed this application in equally excruciating detail, and agreed with DOE.

Yet, despite this investment and decades of scientific work, the DOE has sought to withdraw its application on political, not technical grounds—asserting only that Yucca Mountain "isn't a workable option"—and the NRC Chairman has halted all work on the application review and refused to allow for finalization of the technical review. These actions come from political appointees of a President who entered office touting his commitment to "restore the basic principle that government decisions should be based on the best-available, scientifically valid evidence and not on the ideological predispositions of agency officials or political appointees."

President Obama's unilateral decision to discard decades of the scientific community's hard work and ignore the current law on the books has thrown United States nuclear waste management policy into disarray.

This brings us to the Blue Ribbon Commission, established by President Obama in concurrence with his dismantling of existing nuclear waste management structure. The BRC is specifically tasked to review policies associated with managing the back end of the nuclear fuel cycle and related issues of storage, processing, and disposal of civilian and defense nuclear waste.

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The potential contributions of the BRC, however, appear to be limited by politics. Upon initiating the panel's work, Commission Co-Chair Lee Hamilton said that Secretary of Energy Chu "made it quite clear that nuclear waste storage at Yucca Mountain is not an option, and that the Blue Ribbon Commission will be looking at better alternatives."

The action by the Administration is striking not only in its audacity; it is also simply irrational to suggest a "better alternative" can be identified without a direct comparison to the current plan for which an alternative is being sought. To its credit, the Commission calls for expeditious development of a permanent geologic repository, but turning a blind eye to the elephant in the room that is Yucca Mountain will render its efforts fundamentally flawed.

Unless and until the Federal Government honors its legal obligation to proceed with disposal of high-level radioactive waste, the long-term viability of nuclear energy to meet growing electricity demands remains in doubt. The Blue Ribbon Commission still has an opportunity to impact this future direction, and I hope today's hearing provides it with informative and useful guidance toward that end.

I welcome the witnesses' evaluation and recommendations on the Commission's draft report and I yield back the balance of my time.

Chairman BROUN. Thank you, Dr. Harris.

The Chairman now recognizes Mr. Miller, the Ranking Member of the Energy and Environment Subcommittee from North Carolina for your statement.

Mr. MILLER. Thank you, Mr. Chairman.

This is a very odd hearing. We are considering the draft report of a Blue Ribbon Commission with no witnesses from the Commission to explain their tentative findings. They are, to their credit,

seeking comments, presumably some from scientists. To their credit, apparently they want to consider those findings before they issue a final report, and it certainly would be useful for this Committee to hear those comments too, again, many presumably from scientists.

It is very likely, as the Chairs have said, that we will need to rely more on nuclear power in the future. It is kind of hard to imagine an energy future in the next couple generations that does not include more nuclear power. But it is still far more expensive. It is not affordable compared to natural gas, for instance. It is far more expensive than other forms of energy, even with the massive subsidies that it does get from the Federal Government, and with the construction of more nuclear power plants requiring the capital investment of many billions of dollars, which investors have been understandably reluctant to put down, it is not at all clear why we could not wait until the end of January to see the final report of the Commission, comments and all.

And there are still many reasons to be concerned, despite the fact that we obviously are going to have to rely upon nuclear power more in the future, there are many reasons for caution. The experience in Fukushima should underscore that pretty dramatically.

And undoubtedly, one of the unresolved issues is what to do with high-level nuclear waste. We already have 80,000 tons of it, and that figure is growing, that nuclear power plants will continue to produce, and it has to be stored safely somewhere for 10,000 years. That is a long time. But even more important, it doesn't just appear magically at the storage site. We have to get it there. We have to transport it from all over the country, and while it is true, I know, that there is a witness from Nye County who would welcome the economic activity of storing the waste at Yucca Mountain, the people of the nearby town/city of Las Vegas, who know that the bulk of the nuclear waste, high-level nuclear waste, will come through or very near Las Vegas, whether it is transported by rail or by truck, are adamantly opposed to it. The opposition of the people of Nevada is pretty well shown by the adamant opposition of their Congressional delegation, by President Obama's opposition, by the opposition of, as Mr. Tonko has said, three of the leading Republican candidates for President when they were asked in Nevada about it. It is good to be an early primary State and a State that in a general election is now a swing State. You do get a lot of attention as a result. People in national politics care what you think.

And it is also understandable that the people of Nevada are more than a little skeptical about the supposed science that supports this. That has not been the history of the decision to site a high-level nuclear repository in Yucca Mountain. As Mr. Tonko has already said, 25 years ago there were three sites proposed: one in the district of the Speaker of the House, one in the district of the Majority Leader of the House, and then Yucca Mountain. Senator Reid now has a great deal of political influence, but at the time he was in his first year in the Senate. And as Mr. Tonko has said, actually he said the phase, the colloquial phrase at the time was "forget Nevada." We all know what that really was. It wasn't "forget." I had a somewhat more sanitized version in my materials, which was

"screw Nevada," but it was not a real scientifically pristine decision. It was always a decision that was filled with politics.

So yes, we do need to have more science and less politics in this decision. I hope we will get some of that in our Committee's deliberations on this issue, but there is little to suggest it in today's hearing, which seems to be taking place at a very odd time for a decision that will really consider closely the science behind this decision.

I yield back the balance of my time.

[The prepared statement of Mr. Miller follows:]

PREPARED STATEMENT OF REPRESENTATIVE BRAD MILLER,
RANKING MEMBER, SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

This is a very odd hearing. We are considering the draft report of a Blue Ribbon Commission with no witnesses from the Commission to explain even their tentative findings.

It is very likely that we will need to rely on nuclear power more in the future, but with nuclear power still far more expensive than other forms of energy, even with massive subsidies from the Federal Govermnent, and with the construction of nuclear power plants requiring the capital investment of many billions of dollars, which investors have been understandably reluctant to put down, it is not at all clear why we did not wait at least until the Commission issued a final report.

And while it is hard to imagine an energy future for the next couple of generations that does not include more nuclear power, there are still many reasons for caution, as the experience in Fukishuma should underscore.

One ofthe unresolved issues is what to do with the high-level radioactive waste, already 80,000 tons and growing, that nuclear power plants produce. The high-level waste will need to be stored safely for 10,000 years. That's a long time. And we have to figure out how to transport the waste safely to wherever we store it.

Unfortunately, the question of storage of nuclear has always been driven more by politics than by science. We will hear today from local leaders in Nye County, Nevada, who would welcome the economic boost of storing nuclear waste at the proposed Yucca Mountain facility. But the communities that the waste would go through, notably Las Vegas, are adamantly opposed to the proposed Yucca Mountain facility.

The prevailing view of Nevadans is reflected in the Nevada Congressional delegation's opposition, President Obama's opposition, and the opposition of three Republican Presidential candidates when asked in Nevada. It's good to be both an early primary and a swing State in the fall.

And the resentment of Nevadans to the siting of the facility in their State is more than understandable. A quarter century ago, there were at least three proposed sites: one in the district ofthe Speaker of the House, another in the district of the House Majority Leader, and Yucca Mountain. Senator Reid is powerful now, but at the time he was in his first year of service in the Senate. The Amendment to site the facility in Nevada was colloquially called the "screw Nevada" amendment at the time.

We do need more science and less politics in this decision, but there is little to suggest today's hearing is a move towards science, away from politics.

Chairman BROUN. Thank you, Mr. Miller. I think we have a unanimous consent request from Mr. Tonko.

Mr. TONKO. Yes, Mr. Chairman, if you would please yield a moment of time.

Chairman BROUN. Without objection.

Mr. TONKO. Thank you very much, Mr. Chair.

As I am sure you are aware, the *Washington Post* is reporting that former Member of Congress Howard Wolpe passed away on Tuesday. Mr. Wolpe was a Representative from the State of Michigan who served as Chair of the I&O Subcommittee back in 1991 and 1992. He held many landmarks hearings, and his investigative staff was topnotch. Probably the one item that the Representative was very fondest of and best remembered for was his work to stop

the Superconducting Super Collider project. Representative Wolpe worked hard and hand in hand with his Ranking Minority Member to stop that project, and their efforts saved taxpayers, in their opinion, at least $10 billion in construction costs and billions more in operating expenses.

His record as I&O Chair stands among the strongest of any Chair to serve in that role. In my new capacity on this Subcommittee, Mr. Chair, I look forward to emulating his bipartisan spirit and productive working relationship that both he and Mr. Boehlert, Representative Boehlert from my region, conducted, and I appreciate you yielding me that time, and we call to mind and to memory the service of Representative Howard Wolpe.

Chairman BROUN. Thank you, Mr. Tonko, and we pray for his family also.

At this time I would like to introduce our panel of witnesses. Our first witness is Mr. Jack Spencer, Research Fellow in Nuclear Energy Policy at the Heritage Foundation. Our second witness is Dr. Peter Swift, Distinguished Member of the Technical Staff at Sandia National Laboratory. Dr. Swift has worked on geological disposal of radioactive waste since 1989. He worked on the Waste Isolation Pilot Project—that is hard for a Southerner to say all those Ps—from 1989 to 1998, and on the Yucca Mountain project since 1998, serving as the Yucca Mountain Lead Laboratory's Chief Scientist since 2006. Our third witness is Dr. Roger Kasperson, Research Professor and Distinguished Scientist at Clark University. Our fourth witness is Mr. Gary Hollis, who is Chairman of the Nye County Board of County Commissioners. Yucca Mountain is located in his county in Nevada. Our fifth witness is Mr. Rick McLeod, Executive Director of the Savannah River Site Community Reuse Organization. SRS currently stores the second-highest amount of high-level radioactive material in the country. Our final witness is Dr. Mark Peters, Deputy Laboratory Director for Programs at the Argonne National Laboratory. Dr. Peters previously served as Senior Scientific Adviser in the former Applied Science and Technology Directorate, where he supported the Director of the Office of Civilian Radioactive Waste Management. Dr. Peters also served as the Director of Program Development for nuclear waste management technical work at the laboratory's former Chemical Engineering Division. Prior to joining Argonne, he was the Yucca Mountain Project Science and Engineering Testing Project Manager.

As our witnesses should know, spoken testimony is limited to five minutes each, after which the Members of the Committee will have five minutes each to ask questions. Your written testimony will be included in the record of this hearing.

It is the practice of the Subcommittee on Investigations and Oversight to receive testimony under oath. Do any of you have any objection to taking an oath? Anybody, please? Shake your head from side to side or up and down so I can see. Dr. Kasperson, do you have an objection? I don't see your head moving. Okay. Let the record reveal that all witnesses are willing to take an oath. You may be represented by counsel. Do any of you have counsel here today? Anybody have counsel? Mr. Hollis? Dr. Kasperson? Mr. Hollis? No? Okay. Let the record reflect that none of the witnesses has counsel.

Now, if all of you would please now stand and raise your right hand. Do you solemnly swear or affirm to tell the whole truth and nothing but the truth, so help you God? Let the record reflect that all the witnesses participating have taken the oath. Please be seated.

Those bells that you just heard is the sign to us that we just started a vote. For Members' edification, we will go through as many opening statements as we can. We will recess to go for votes. We will recess at about five minutes so that everybody has time to get to the Floor to vote, and we will reconvene at 10 minutes after the last vote is called. So please hurry back so we can get this hearing finished and accomplished and hear from our witnesses and get to questions.

I now recognize our first witness, Mr. Spencer. You are recognized for five minutes. Please keep it within five minutes, and then if you can make it shorter, please do. Your full testimony will be included in the record.

STATEMENT OF MR. JACK SPENCER,

RESEARCH FELLOW, NUCLEAR ENERGY POLICY,

HERITAGE FOUNDATION

Mr. SPENCER. All right. We will do what we can.

Chairmen Broun and Harris, Ranking Members Tonko and Miller, and Members of the Subcommittees, my name is Jack Spencer. I am the Research Fellow for Nuclear Energy Policy at the Heritage Foundation. The views expressed in this testimony are my own and should not be construed as representing the official position of the Heritage Foundation.

The Nuclear Waste Policy Act of 1982 attempted to establish a comprehensive disposal strategy for high-level nuclear waste. This strategy has failed. The government has spent billions of dollars without opening a repository, has yet to receive any waste and is amassing billions of dollars in liability. The strategy codified in the Nuclear Waste Policy Act seemed straightforward and economically sound when it was developed in the early 1980s. It charged the Federal Government with disposing used nuclear fuel in Yucca Mountain and created a structure through which users of nuclear energy would pay a fee for that service. These payments would go to the Nuclear Waste Fund, which the Federal Government could access through Congressional appropriations. What has become clear over time, however, is that this approach was wrought with problems. Nonetheless, it continued to inch forward, providing some confidence that the Nation was moving toward a nuclear waste management solution.

The Obama Administration's anti-Yucca policy, however, had destroyed any such notion. The combination of the Federal Government's historical ineptness and this Administration's actions has undermined all confidence in Washington's ability to meet its legal nuclear waste obligations. To restore this confidence, the Obama Administration established the Blue Ribbon Commission on America's Nuclear Future to develop a new strategy. Though the Administration's actions had added substantial uncertainty to an already unpredictable federal policy on nuclear waste, it does provide an

opportunity to bring about the reform necessary to get America's nuclear waste policy on track.

Unfortunately, the BRC's recommendations as currently drafted will not achieve this because it accepts the basic tenets of the current system; that is that the Federal Government should be responsible for nuclear waste management and that these activities should be financed through a flat fee, largely disconnected from any actual service. Accepting this leads to recommendations that focus more on symptoms than on the underlying flaws. These basic flaws are that, one, waste producers are relieved of their responsibility for waste management. This structure misaligns incentives, responsibilities and authorities. And secondly, that there is no specific price for specific services rendered. Accurate pricing is critical to any efficient marketplace. Nonetheless, the BRC does provide a framework that, with modification, could yield long-term solutions.

For example, the BRC proposes that a federal corporation be responsible for nuclear waste management. Simply moving a function from one government agency to another only perpetuates existing deficiencies. This approach essentially blames current problems on the federal bureaucracy when the actual problem is relegating a commercial activity to a government entity. A better approach is to use the federal corporation to facilitate the transfer of responsibility for nuclear waste management to the private sector. To achieve this, the corporation's responsibilities should be limited to disposing of existing nuclear waste and should get access to the approximately $25 billion paid into the Nuclear Waste Fund to fund its activities. Once this is complete, the corporation should be dissolved or privatized.

Moving forward, the waste disposal fee should be repealed and waste producers should manage their own waste. Utilities would then bear the responsibility and have the freedom to choose how to best manage their waste. This could include direct disposal, reprocessing or some combination thereof. The federal role would be to set and enforce regulatory standards.

Next, I would like to talk a little bit about nuclear waste finance. The BRC correctly spent significant effort on how to finance nuclear waste management. It recommended paying nuclear waste fees into escrow accounts. Only that amount appropriated by Congress would be paid to the Treasury. Though this would protect fees from being used to fund other government priorities, currently a major problem, it falls short of the reform necessary.

A better approach would mandate that nuclear utilities place in escrow adequate funds to dispose of waste stored on site. This would eliminate the federal role in waste financing, ensure that utilities have access to the funds that they have set aside for waste disposal, and protect taxpayers by guaranteeing adequate disposal funds will be available if a plant ever goes out of business.

The final area I would like to address is geologic storage. Unfortunately, the Secretary of Energy directed the BRC to rule out any consideration of Yucca Mountain. Luckily, the BRC charter makes no such prohibitions. Indeed, it does the opposite by directing the BRC to consider all options.

The reality is, is that neither the BRC nor anyone else can make a truly informed decision on Yucca because the NRC has stopped

work on the DOE's application to construct a repository and refuses to release the NRC technical staff's findings regarding the application. Therefore, the most important recommendation the BRC should make is to demand that the NRC complete the Yucca application and publicly release all data generated by the application process. Whether or not the Yucca repository is ever built, the NRC's completed review process will yield unique information that has important future relevance.

That concludes my testimony. I look forward to your questions.

[The prepared statement of Mr. Spencer follows:]

PREPARED STATEMENT OF MR. JACK SPENCER,
RESEARCH FELLOW,
NUCLEAR ENERGY POLICY, HERITAGE FOUNDATION

Chairmen Broun and Harris, Ranking Members Tonko and Miller and Members of the Subcommittees: My name is Jack Spencer. I am the Research Fellow for Nuclear Energy Policy at The Heritage Foundation. The views I express in this testimony are my own, and should not be construed as representing any official position of The Heritage Foundation.

Thank you for inviting me to testify before the Energy & Environment and Investigations & Oversight subcommittees regarding the very important draft recommendations of the Blue Ribbon Commission on America's Nuclear Future.

As we sit here today, there are approximately 440 commercial nuclear reactors operating around the world. One hundred four of them are operating in this country alone. With the exception of a few highly publicized and, I might add, often misunderstood accidents, these reactors have operated safely, cleanly, and to the benefit of society.

This is not to suggest that no problems have ever arisen as the accident in Fukushima, Japan, makes abundantly clear. It is merely to acknowledge the good track record of nuclear power.

Strong, Predictable Policy Is Needed for Nuclear Expansion

Nuclear energy is among America's least expensive electricity sources, emits nothing into the atmosphere, and has a safety record that includes no injuries, much less fatalities. Despite these facts, no new plants have been ordered in the U.S. for three decades.

Given what we know about nuclear energy, there must be some underlying problems that would make investment in this proven technology so scarce. Indeed, today, despite all of the benefits of nuclear power, the industry insists that it will not build new plants without backing from the U.S. taxpayer.

Providing taxpayer support has been the approach of most politicians in recent years. They recognize that nuclear energy has many benefits, and to show their support they propose subsidies. In fact, looking at most of the proposals in recent years, one might conclude that Washington thinks that it can subsidize nuclear energy into commercial viability. Essentially, doing so was the basic premise behind the Energy Policy Act of 2005 (EPACT) proposals. That legislation put forth a series of subsidies to build five or so nuclear plants. That was supposed to help the industry get off the ground so that they could begin privately building plants. While the legislation instigated a series of permit applications to build new plants and even site work at two locations, it has not brought about the advertised nuclear renaissance. Indeed, since the 2005 law passed, quite the opposite has occurred.

Instead of helping the nuclear industry to reestablish itself in the marketplace, the law has merely led to a proliferation of requests for additional taxpayer support. Since EPACT 2005, Congress has introduced a virtual parade of legislation to broaden the Federal Government's support for the nuclear industry. These proposals would increase capital subsidies, use taxpayer money for such activities as workforce development and manufacturing improvements, empower the Department of Energy to decide which technologies should move forward, and create mandates that essentially dictate that nuclear power is used.

One of the basic problems with using subsidies to promote an industry is that it allows both industry and government to ignore the underlying problems, from a business or government standpoint, that give rise to the need for subsidies to begin with. This perpetuates those structural issues and creates a cycle where industry

becomes dependent on Federal Government—and that is where the nuclear industry is today.

I believe that this dependence is not a financial one. Commercial nuclear reactors and the businesses that support them operate profitably in the United States, largely subsidy free, despite an enormous and growing regulatory burden and an organized anti-nuclear opposition. Instead, the U.S. nuclear industry depends on the U.S. government for strong, predictable, and rational policies that govern how the industry operates. It is the lack of these policies that increase the financial risk of new nuclear investment and drives the pursuit of subsidies to counter it.

This dearth of policy falls into two major categories: nuclear waste management and disposal and an antiquated, unpredictable regulatory approach. The Blue Ribbon Commission on America's Nuclear Future attempts to address one of these problems: nuclear waste.

Reforming Spent Nuclear Fuel Management and Disposal

Despite growing political and public support for nuclear power, progress toward actually building any new plants has been a struggle. While the blame for this stagnation often goes to inefficient government subsidy programs, the real problem lies in why those subsidies are necessary to begin with. Chief among these structural problems is the nation's incoherent nuclear waste policy. Ultimately, the lack of a pathway to waste disposal creates substantial unpredictability for nuclear investors. That risk must be offset to allow investment to move forward.

This was a problem prior to the Obama Administration. The Federal Government was legally obliged, according to the Nuclear Waste Policy Act (NWPA) of 1982, as amended, to begin collecting nuclear waste in 1998. Despite collecting approximately $30 billion (fees plus interest) from electricity ratepayers and spending nearly $15 billion (ratepayer and taxpayer funds), it has not collected one atom of nuclear waste. The one bright spot was the progress on Yucca Mountain made by President George W. Bush's Department of Energy (DOE).

The Obama Administration's anti-Yucca policy destroyed this progress. It ignored existing statute, such as the NWPA and the Yucca Mountain Development Act of 2002, which stated clearly that Yucca Mountain shall be the location of the nation's nuclear materials repository. It unilaterally requested the withdrawal of the DOE's permit application for Yucca to the Nuclear Regulatory Commission (NRC). Questions over the legality of this policy are currently under review by the courts.

Meanwhile, in October 2010, former advisor to Senator Harry Reid and current NRC Chairman Gregory Jaczko ordered a stop to all Yucca-related NRC activities. He argued that his authority to close out the Yucca program was derived from President Obama's 2011 budget request. The problem is that neither the House nor the Senate had passed that proposed budget. Further, the order ignores the fact that the NRC's own Atomic Licensing and Safety Board agreed unanimously that the DOE lacked authority to withdraw the application. The Chairman's actions were so unusual and contentious that fellow NRC Commissioners were compelled to publicly denounce the decision.

The combination of federal promises to store nuclear waste, the Obama Administration's policy, and the NRC's actions has resulted in a complete lack of direction on nuclear waste management and a dereliction of responsibility on the part of the Federal Government. This creates substantial government-imposed risk on the nuclear industry, which is the primary obstacle to an expansion of U.S. nuclear power.

The Blue Ribbon Commission on America's Nuclear Future

Understanding that his policy to end the Yucca program without a backup plan would essentially end the American nuclear renaissance before it started, the Obama Administration established the Blue Ribbon Commission on America's Nuclear Future to develop with a plan to manage and dispose of America's nuclear waste.

Unfortunately, the draft recommendations in President Barack Obama's Blue Ribbon Commission on America's Nuclear Future (BRC) [1] fall short of fixing America's nuclear waste policy dilemma. Though some of the recommendations were positive, they would, if implemented, not result in the fundamental reforms necessary for an

[1] Blue Ribbon Commission on America's Nuclear Future, "*Draft Report to the Secretary of Energy*," July 29, 2011, at *http://brc.gov/sites/default/files/documents/brc_draft_report_29jul2011_0.pdf* (August 10, 2011).

economically sustainable and technologically diverse approach to nuclear power to emerge. [2]

While acknowledging the many challenges and failures of America's nuclear waste management and disposal program, the BRC unwisely accepts that the basic structure of the system is sound. This acceptance leads to recommendations that focus more on symptoms than on underlying flaws. Real progress requires first identifying the real problems.

There are three fundamental problems with nuclear waste management in the United States:

- **No long-term geologic storage**. Deep geologic storage like that proposed for Yucca Mountain, Nevada, provides a safe, long-term solution and thus is critical to any comprehensive nuclear waste management plan. To date, despite having spent approximately $15 billion in electricity rate payers' and taxpayers' money on Yucca Mountain and a statutory mandate to do so, the U.S. still has no functional geologic repository for nuclear waste.
- **Waste producers are relieved of their responsibility for waste management**. Private nuclear plant operators produce waste, but under current law the Federal Government is responsible for managing it. This removes the incentive for those who financially depend on waste production, the nuclear utilities, to have any interest in how the waste is managed because the Federal Government is wholly responsible. Washington, however, has proven unable to implement anything close to a workable solution. This outcome is predictable given a structure that fundamentally misaligns incentives, responsibilities, and authorities. The nuclear industry, which is fully capable of running safe nuclear power plants, is likewise fully capable of managing its own waste and should have the responsibility to do so.
- **No specific price for specific services rendered**. Under the current system, nuclear utilities produce waste, then pay the Federal Government a flat fee for an undefined, not-rendered service. Accurate pricing is critical to any efficient market place. Prices provide suppliers and purchasers a critical data point to determine the attractiveness of a product or service, and give potential competitors the information they need to introduce new alternatives.

Although the BRC is missing an opportunity to address major underlying issues, it does provide a framework that, with some modification, could yield a long-term solution. To achieve it, the BRC's final draft should consider the following recommendations.

Nuclear Waste Management Responsibility

The centerpiece of the BRC's recommendations is its proposal to establish a federal corporation "dedicated solely to implementing the waste management program and empowered with the authority and resources to succeed." While the general proposition could help transition the United States toward a more market-based system, the BRC's version will not work because it maintains the current system's basic underpinnings. A government-based entity, separate from waste production, will remain responsible for waste management and disposal, relieving producers of all responsibility, and there would remain no direct connection between services rendered and pricing.

Though the BRC goes to great lengths to define the responsibilities of the new organization, these responsibilities are similar to those of the Department of Energy under the current system. In both cases, the Federal Government is fully responsible for all nuclear waste management and disposal responsibilities. Simply moving a function from one government agency to another (even if the new agency is called a federal corporation) without changing the system fundamentals only perpetuates existing deficiencies while creating the perception of action.

This approach assumes that the basic premise of the current system is correct—that nuclear waste management and disposal falls ideally within the purview of the Federal Government. It essentially blames the current problems on a misplaced federal bureaucracy when the actual problem is relegating a commercial activity to a government bureaucracy. Instead of trying to modify a fundamentally flawed system, the BRC's final report should recommend transferring the responsibility for nu-

[2] Jack Spencer, "*Introducing Market Forces into Nuclear Waste Management Policy*," Statement to the Reactor and Fuel Cycle Technology Subcommittee of the Blue Ribbon Commission on America's Nuclear Future, Heritage Foundation Testimony, August 30, 2010, *http://www.heritage.org/research/testimony/introducing-market-forces-into-nuclear-waste-management-policy*.

clear waste management and disposal away from Washington and toward the private sector.

The BRC's recommendation to create a federal corporation could facilitate that transition to private-sector responsibility. Though the objective should be to remove federal responsibility for nuclear waste management and disposal, near-term privatization is likely not practical. This is because the Federal Government is obligated by virtue of signed contracts to take responsibility for the disposal of nuclear waste produced at existing plants and the nuclear industry, through fees levied on nuclear power users, has already paid $38.5 billion (about $750 million annually) for that service. [3] The result is that the Federal Government is currently responsible for disposing of a total of about 70,000 tons of waste. A federal corporation, limited in scope, could be the correct entity to take responsibility for disposing of that waste.

In preparing its final recommendations, the BRC should emphasize closely realigning incentives, responsibilities, and authorities in nuclear waste management. These recommendations should include:

- **Creating a federal corporation with a limited scope of responsibility, limited duration, and access to the Nuclear Waste Fund**. The federal corporation should have two basic responsibilities. First, it should site a geologic repository. If the repository is located at Yucca Mountain, as current law stipulates, then the federal corporation should assume the Department of Energy's responsibilities of completing the Yucca construction and operation permit application. Once issued, the permit to operate Yucca should be transferred to a non-federal entity to construct and operate the facility. If the Yucca location is deemed technically deficient, the corporation should be responsible for overseeing the selection of a new location. However, the permit application should be prepared by whichever entity will eventually construct and operate the facility.

The corporation's second responsibility should be to assure proper disposal of the existing nuclear waste for which the Federal Government is currently responsible and it should get access to the approximately $25 billion in the Nuclear Waste Fund to finance its activities. This would allow the Federal Government to meet its existing contractual and regulatory waste disposal responsibility while allowing an eventual transfer of waste management responsibility to the private sector. It would also allow the Nuclear Waste Fund to be used for its intended purpose. Most important, however, it would create a significant market demand for privately offered waste management services like storage, transportation, and processing. Businesses would naturally emerge to meet this demand that would then be available for future private waste management operations.

Finally, the transitional federal corporation must be mission specific and its creation must be accompanied by a dissolution plan. Once its two responsibilities are met, it should either be privatized or abolished.

- **Removing the federal role in geologic repository operations**. All geologic repositories should be operated by non-federal entities. The management organizations could be private, for-profit, non-profit, state-based, or a combination thereof. Among their most basic responsibilities would be to set market-driven prices for waste emplacement. Market-driven prices would take waste characteristics, such as heat load, toxicity, and volume as well as repository space into consideration. Waste producers would then have different variables to consider when deciding which fuels to purchase and what nuclear technologies to use as these decisions would affect how they would ultimately manage their waste. It could be most cost effective to place waste directly in the repository for some utilities, while others might find interim storage or another processes to be more economical. Market-based price signals would encourage new technologies, such as small nuclear reactors that have a different waste streams, and services, such as reprocessing, to be introduced as new market demands emerge.
- **Transferring responsibility for management of new waste to waste producers**. As noted above, the Federal Government through the corporation should meet its responsibility to dispose of existing waste. But moving forward, nuclear utilities should be made responsible for waste they produce. This responsibility should be accompanied by a repeal of the fee—1/10 of 1 cent per kilowatt hour of electricity produced at nuclear power plants—paid to the Federal Government for waste disposal. Utilities would then bear the responsibility and also have the freedom to choose how best to manage their waste. The fed-

[3] Nuclear Energy Institute, "Costs: Fuel, Operation, and Waste Disposal," at *http://www.nei.org/resourcesandstats/nuclear_statistics/costs/* (August 10, 2011).

eral role would be to ensure that private waste management activities meet adequate regulatory standards. In essence, waste management would be treated the same way the rest of the nuclear industry is treated. The Federal Government is not responsible for getting the fuel to the reactor and it should not be responsible for removing it.

- **Allowing the federal corporation to broker waste management services**. To further ensure that nuclear waste producers have access to waste management services, the federal corporation could be permitted, for a fee, to broker waste management services for private industry. Transportation, reprocessing or repository emplacement could be offered separately or as a bundled, comprehensive service. This would allow waste producers to hire the federal corporation to contract for waste management services on their behalf. It may be the case as the corporation gains experience and establishes relationships with waste management providers, it can negotiate better terms based on volume, or other variables, for specific services. Or waste producers may simply find the convenience of contracting with the federal corporation to manage its waste is worth a premium. Waste producers would not be obligated to seek waste management services through the federal corporation. This brokering service would only be available as long as the federal corporation is carrying out its chartered mission, and would not justify its existence beyond those specified responsibilities. However, one can imagine a business case where brokering such services could provide the basis for future privatization. Ultimately, while such an arrangement is not necessary, it does provide an additional transition step toward the new, market-based system.
- **Limiting the Federal Government's long-term role to setting broad regulatory guidelines and taking final title of decommissioned repository sites**. Once the federal corporation carries out its mission and is dissolved, the Federal Government should have two roles. First, it should set the broad regulatory guidelines for waste management just as it does for other parts of the nuclear industry. Second, the Federal Government should take final legal possession, what is commonly referred to as "title," of geologic repositories and their contents as they are decommissioned. While private actors should manage nuclear waste and finance its final disposal, including long-term maintenance, only the Federal Government has the guaranteed longevity to credibly take long-term possession and liability for whatever elements of waste end up in geologic repositories after decommissioning, when the repository would be permanently sealed.

Geologic Storage

Of the seven key elements addressed by the BRC, two are dedicated to geologic storage. One calls for a new, consent-based approach to searching out future nuclear waste management facilities, while the other calls for a prompt effort to develop one or more geologic repositories. While clearly stating the need for geologic storage is important, the BRC's charge from the Secretary of Energy to rule out any consideration of the Yucca Mountain facility weakens the utility of its otherwise reasonable recommendations. For this reason, the BRC should address Yucca in its final recommendations, which is allowable per the BRC's charter that gives no direction to preclude Yucca. Indeed, it does the opposite, by directing the BRC to consider all options. It states that the Secretary of Energy established to commission at the direction of the President to:

- conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle, including all alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel, high-level waste, and materials derived from nuclear activities. [4]

Furthermore, the BRC's recommendations on geologic storage reflect its more general flaw—that nuclear waste management should remain within the purview of the Federal Government. These problems can be addressed in the final report by the following actions:

- **Address Yucca Mountain head on**. The BRC should state what it believes should happen with Yucca Mountain based on the best science and evidence available. If its members believe Yucca should be shut down, it should state why and provide a recommendation for disengaging from Yucca. If, on the other

[4] Blue Ribbon Commission on America's Nuclear Future, "Charter," March 1, 2010, at *http://brc.gov/index.php?q=page/charter* (August 10, 2011).

hand, it finds that Yucca should be pursued, perhaps as one of a number of options, then the Commission should provide recommendations on how to move forward. Such a conclusion could reject the current Yucca program while proposing an alternative. Such an alternative could embody the recommendations of the BRC's consent-based approach where the people of Nevada are given control over the future of the Yucca facility. Even though the Secretary of Energy directed the BRC to pretend Yucca Mountain does not exist, nothing in the BRC's charter prevents it from facing facts. For the sake of the Commission's credibility, it must honestly and directly address Yucca in its final conclusions.

- **Demand that the Nuclear Regulatory Commission complete its review of the Department of Energy's Yucca Mountain application**. The reality is that the Blue Ribbon Commission can likely not make a truly informed decision on Yucca Mountain because the Nuclear Regulatory Commission has stopped work on the Department of Energy's application to construct the repository and refuses to release the NRC technical staff's findings regarding the application. Therefore, the single most important recommendation that the BRC could make would be to demand that the NRC complete the Yucca application and publicly release all data generated by the application process. Whether anyone ever builds a repository at Yucca or not, the NRC's completed review process will yield unique information that will have important future relevance. Furthermore, the public and electricity ratepayers deserve to have the application review completed given its $15 billion investment.
- **Limit the Federal Government's responsibility to siting and permitting one geologic repository**. Whether at Yucca or elsewhere, the Federal Government's role should be limited to developing a single geologic repository. This repository should be located at Yucca Mountain unless the NRC deems that site to be technically deficient. Should that be the case, the new site must at least match the capacity of Yucca Mountain, which is sufficient to hold all of the waste produced by America's existing commercial reactors over their expected lifetimes. Once sited and permitted, a non-federal entity should operate the repository. Developing future repositories should be the responsibility of non-federal actors.
- **Rescind recommendation to develop one or more interim storage facilities**. The BRC is correct that interim storage of nuclear waste, like geologic storage, is a critical part of any comprehensive nuclear waste management system. Further, it correctly points out a myriad of reasons why interim storage makes sense, such as allowing for fuel removal from shutdown plants. However, the Federal Government should neither construct such a facility nor mandate that one be built. Instead, private-sector interim storage facilities would emerge to meet the demand for such services in a market-based system. The Federal Government's role should be to ensure that those willing and able to develop appropriate interim storage facilities have an efficient and predictable regulatory environment. The BRC makes very sound recommendations toward this end.

Financing Nuclear Waste Management and Disposal

The BRC correctly spent significant effort on making recommendations on how nuclear waste management should be financed. Indeed, it correctly identifies many of the problems with the current system, namely that it does not work as intended and that continuing to collect fees for services not rendered is patently unfair. It also correctly recognizes that government accounting rules make gaining access to collected funds extraordinarily difficult. Finally, it recognizes that building a sustainable nuclear waste policy program is nearly impossible so long as it relies on the inherently inefficient and unpredictable congressional appropriations process.

Separating finance issues from larger organizational issues is impossible. The two are inherently related. How nuclear waste activities are financed will ultimately depend on who is responsible for its disposal. Therefore, any rational financing scheme must be developed congruently with larger organizational reform. So if one accepts the BRC's general proposition that the Federal Government should remain responsible for nuclear waste management, its recommendations on finance reform make sense. However, since its recommended actions would do little to change the underlying system fundamentals, the same inefficiencies that result from federal control would ultimately resurface.

Similar to its larger organizational recommendations, the BRC does provide a framework from which a more market-based, economically rational system could be constructed. Indeed, the BRC introduces some elements that are critical to a sus-

tainable waste management system. Instead of attempting to modify the current system, the BRC should develop recommendations to allow the United States to transition to a new model for financing nuclear waste management while ensuring that existing resources are used for their intended purposes. To achieve this transition, the BRC's final recommendations should include the following:

- **Congress should immediately begin transferring the Nuclear Waste Fund to the new organization**. The BRC acknowledges that whoever is ultimately responsible for waste management and disposal must gain access to the $25 billion in the Nuclear Waste Fund, and puts forth a basic plan to achieve this. The plan would allow limited access to those funds 10 years after the new organization is established. Near-term operations would be funded through ongoing fee payments. This approach, however, assumes that the new organization would maintain ongoing responsibility for waste management and disposal. Under the modifications proposed in this analysis, the new organization would only be responsible for waste produced to date, and should be funded through fees already paid. Thus, the new organization would need immediate access to the Nuclear Waste Fund, although dispersal could take place over time.
- **Congress should mandate the creation of utility- or plant-specific escrow accounts to fund waste management activities**. An innovative concept in the BRC report is to create escrow accounts held by an independent third party into which nuclear waste fees are paid. Only that amount appropriated by Congress for waste disposal activities would be paid to the U.S. Treasury out of the escrow accounts. This would ensure that only those funds actually being spent on waste disposal would go to the government, thus preventing additional funds from being placed into the Nuclear Waste Fund.

This specific idea is not consistent with the overall reform that is necessary, but the introduction of waste management financed through escrow accounts is consistent with fundamental reform. A better model would mandate that nuclear utilities place in escrow adequate funds to dispose of whatever waste is being stored on site. No funds would ever go to the U.S. Treasury, and congressional appropriators would have no role. Utilities would simply pay for waste management and disposal services on an as-needed basis. This approach would benefit nuclear utilities by ensuring they have access to the funds set aside for waste disposal and it would protect the American taxpayer by making sure adequate disposal funds will be available even if a plant owner goes out of business.

- Congress should repeal the fee paid to the Federal Government for future waste disposal services. Since, under these reforms, existing nuclear waste disposal would be financed through existing nuclear waste fund fees, and future disposal through the privately held escrow accounts, there would be no need to continue paying the nuclear waste fee to the Federal Government.

Building on the BRC's Recommendations

The Blue Ribbon Commission on America's Nuclear Future has an opportunity to resolve America's nuclear waste policy dilemma. While it has provided a credible analysis and introduced some new ideas, it has focused more on the symptoms of America's failed approach to nuclear waste management than addressing the system's structural deficiencies. Nonetheless, its recommendations provide a starting framework that could be modified to address these difficult issues. Moving the responsibility for nuclear waste management away from the Federal Government will be difficult, but it is necessary to for an economically rational, technologically diverse, and sustainable resolution to America's nuclear waste dilemma.

That concludes my testimony.

I look forward to your questions.

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Chairman BROUN. Thank you, Mr. Spencer.

Dr. Swift, I understand you have fairly short testimony. We need to get to the floor, so go ahead, if you would, with your oral testimony. You are recognized.

STATEMENT OF DR. PETER SWIFT, DISTINGUISHED MEMBER OF THE TECHNICAL STAFF, SANDIA NATIONAL LABORATORY

Dr. SWIFT. Thank you. Chairman Broun, Chairman Harris, Ranking Members Tonko and Miller, and the distinguished Members of the Committee, thank you. I am Dr. Peter Swift from Sandia National Laboratories.

In your letter requesting my testimony, you asked me to address three topics. First, you asked me to provide my views on the draft recommendations of the Blue Ribbon Commission regarding the need for a permanent geological repository. Second, you asked me to describe my role as the Chief Scientist for the Yucca Mountain Lead Laboratory. And third, you asked me to describe the various scientific issues and technical conclusions in the Department of Energy's license application for the proposed Yucca Mountain repository.

I will start with the second and third questions, and I will close with my views on the Blue Ribbon Commission's draft recommendations. I am speaking only for myself. Anything I say here today represents my own personal beliefs and does not necessarily represent the position of Sandia National Laboratories or the U.S. Department of Energy. Specifically, I am not here to amend or add to Sandia's technical position with respect to the Yucca Mountain license application. That position remains unchanged from its documentation in the application.

I am a geologist by training, and I have worked for the last 22 years studying how deep geologic repositories for radioactive waste will perform over hundreds of thousands of years. In my role as the Chief Scientist for the Yucca Mountain Lead Laboratory team, I focused on ensuring the integrity and credibility of the scientific basis for the postclosure portions of the license application that the DOE submitted in June 2008. I was extensively involved in interactions with external and internal technical review and oversight groups, and I had a significant role in preparing the application and presenting it to the NRC.

The development of the technical basis for the repository was the work of hundreds of scientists and engineers, spread over decades. When I speak about the work contained in the license application, I am summarizing the contributions of multiple experts who prepared those sections.

What types of political—sorry—of postclosure scientific issues does the application consider? The detailed analyses presented in the application focus on those processes that have a significant potential to affect long-term performance of the repository, but all relevant events and processes, including those that are highly unlikely and those that are shown to have little or no impact on the system, are summarized in the application and evaluated in detail in supporting documents.

Subsections of the application address each of the major processes affecting the repository, including, for example, climate change, groundwater flow, long-term degradation of the waste packages. As required by EPA and NRC regulations, analyses provide an estimate of the mean annual radiation dose that a person living in the vicinity might receive at any time in the next million years. One of the main conclusions of these analyses is that estimated releases and radiation doses to hypothetical future humans are well below the EPA and NRC standards. Overall, the application concludes that there is a significant—sorry—a sufficient technical basis for the NRC to issue a license authorizing construction of the facility. This conclusion was a fundamental basis for the 2008 submittal of the application to the NRC for review.

This brings me to my views on the Blue Ribbon Commission's draft recommendation regarding the need for a permanent geological repository. The Commission observed in their draft report that "every foreseeable approach to the nuclear fuel cycle still requires a means of disposal that assures the very long-term isolation of radioactive wastes." I agree with this observation. Alternative approaches to the nuclear fuel cycle that involve separating and recycling fissile material in irradiated fuel can change the type and character of waste requiring geologic disposal, but they will not eliminate the need. The Commission also concluded in its draft report that "deep geological disposal is the most promising and accepted method currently available." The Commission further noted that disposal could occur either in mined repositories or potentially in deep boreholes. Again, I agree. Research to date in the United States and elsewhere provides confidence that safe and effective disposal facilities could be designed and operated in a range of geologic settings.

Recognizing that there is much to be done to establish the scientific and technical basis for licensing any of the disposal concepts available to us, and also recognizing that the regulatory process essential to ensuring public health and safety may be time-consuming, I strongly support the Blue Ribbon Commission's draft recommendation for "prompt efforts to develop one or more geologic disposal facilities."

Thank you.

[The prepared statement of Dr. Swift follows:]

PREPARED STATEMENT OF DR. PETER SWIFT,
DISTINGUISHED MEMBER OF THE TECHNICAL STAFF,
SANDIA NATIONAL LABORATORY

Chairman Harris, Chairman Broun, Ranking Members Miller and Tonko, and the distinguished Members of the Committee; thank you for the opportunity to testify.

I am Dr. Peter Swift, a Distinguished Member of the Technical Staff at Sandia National Laboratories. [1]

In your letter requesting my testimony, you asked me to address three topics. First, you asked me to provide my views on the draft recommendations of the Blue Ribbon Commission on America's Nuclear Future regarding the need for a permanent geological repository. Second, you asked me to describe my role as the Chief Scientist for the Yucca Mountain Lead Laboratory. Third, you asked me to describe the various scientific issues and technical conclusions in the Department of Energy's License Application for the proposed Yucca Mountain repository.

I'd like to start with the second and third questions, and I'll close with my views on the Blue Ribbon Commission's draft recommendation.

I'm speaking only for myself; anything I say here today represents my own personal beliefs and does not necessarily represent the position of Sandia National Laboratories or the U.S. Department of Energy. Specifically, I am not here to amend or add to Sandia's technical position with respect to the Yucca Mountain License Application. That position remains unchanged from its documentation in the License Application.

I'm a geologist by training, and I've worked for the past 22 years studying how deep geologic repositories for radioactive waste will perform over hundreds of thousands of years. In my role as Chief Scientist for the Yucca Mountain Lead Laboratory team, I focused on ensuring the integrity and credibility of the scientific basis for the postclosure portions of the License Application that the DOE submitted to the Nuclear Regulatory Commission in June 2008. I was extensively involved in interactions with external and internal technical review and oversight groups, and I had a significant role in preparing the application and presenting it to the NRC.

The development of the technical basis for the Yucca Mountain repository was the work of hundreds of scientists and engineers, spread over decades. When I speak about the scientific and technical work contained in the License Application, I'm summarizing the contributions of the multiple experts who prepared the individual sections.

What types of postclosure scientific issues does the application consider? The detailed analyses presented in the application focus on those processes that have a significant potential to affect long-term performance of the repository, but all relevant events and processes, including those that are highly unlikely and those that are shown to have little or no impact on the system, are summarized in the application and evaluated in detail in supporting documents.

Subsections of the application address each of the major processes affecting the repository, including, for example, climate change, groundwater flow, and long-term degradation of the waste packages. As required by EPA and NRC regulations, analyses provide an estimate of the mean annual radiation dose that a person living in the vicinity of the repository might receive at any time in the next million years. One of the main conclusions of these analyses is that estimated releases and radiation doses to hypothetical future humans are well below the EPA and NRC standards. Overall, the application concludes that there is a sufficient technical basis for the NRC to issue a license authorizing construction of the facility. This conclusion was a fundamental basis for the 2008 submittal of the application to the NRC for review.

This brings me to my views on the Blue Ribbon Commission's draft recommendation regarding the need for a permanent geological repository. The Commission observed in their draft report that "every foreseeable approach to the nuclear fuel cycle still requires a means of disposal that assures the very long-term isolation of radioactive wastes from the environment." I agree with this observation. Alternative approaches to the nuclear fuel cycle that involve separating and recycling fissile material in irradiated fuel can change the type and character of waste requiring geologic disposal, but they will not eliminate the need. The Commission also concluded in its draft report that "deep geological disposal is the most promising and accepted method currently available," and the Commission further noted that disposal could occur either in mined repositories or potentially in deep boreholes. Again, I agree. Research to date in the United States and elsewhere provides confidence that safe and effective disposal facilities could be designed and operated in a range of geologic settings.

Recognizing that there is much to be done to establish the scientific and technical basis for licensing any of the disposal concepts available to us, and also recognizing

[1] Sandia is a multiprogram national security laboratory owned by the United States Government and operated by Sandia Corporation for the National Nuclear Security Administration. Sandia Corporation is a subsidiary of the Lockheed Martin Corporation under Department of Energy prime contract no. DE-AC04-94AL85000.

that the regulatory process essential to ensuring public health and safety may be time-consuming, I strongly support the Blue Ribbon Commission's draft recommendation for "prompt efforts to develop one or more geologic disposal facilities."

Thank you.

Summary

I am speaking for myself, and this statement does not necessarily represent the positions of Sandia National Laboratories [1] or the U.S. Department of Energy. My statement neither amends nor adds to Sandia's position regarding the Yucca Mountain License Application, which remains unchanged from its documentation in the License Application.

In my role as Chief Scientist for the Yucca Mountain Lead Laboratory team, I focused on ensuring the integrity and credibility of the scientific basis for the postclosure portions of the License Application that the DOE submitted to the Nuclear Regulatory Commission in June 2008.

The detailed analyses presented in the application focus on the processes that have a significant potential to affect long-term performance of the repository, but all relevant events and processes, including those that are highly unlikely and those that are shown to have little or no impact on the system, are summarized in the application and evaluated in detail in supporting documents. As required by EPA and NRC regulations, analyses provide an estimate of the mean annual radiation dose that a person living in the vicinity of the repository might receive at any time in the next million years.

These analyses conclude that estimated releases and radiation doses to hypothetical future humans are well below the EPA and NRC standards, and that there is a sufficient technical basis for the NRC to issue a license authorizing construction of the facility.

The Blue Ribbon Commission on America's Nuclear Future draft report recommends "prompt efforts to develop one or more geologic disposal facilities." The draft report concludes that "deep geological disposal is the most promising and accepted method currently available" for isolating high-level radioactive wastes, and that disposal could occur either in mined repositories or potentially in deep boreholes. I agree. Research to date in the United States and elsewhere provides confidence that safe and effective disposal facilities could be designed and operated in a range of geologic settings.

Chairman BROUN. Thank you, Dr. Swift.

We have got to go to the floor to vote, so the Committee will now stand in recess until 10 minutes after the last vote.

[Recess.]

Chairman BROUN. We will reconvene the joint Committee meeting.

I now recognize our next witness. Thank you, all of you, for your indulgence in this vote series and appreciate you all staying around. Our next witness is Dr. Kasperson. Doctor, you are recognized for five minutes.

STATEMENT OF DR. ROGER KASPERSON, PROFESSOR AND DISTINGUISHED SCIENTIST, CLARK UNIVERSITY

Dr. KASPERSON. In 2001, the National Academy of Sciences published a major report that represented both an unusually large committee for the academy and also a rather substantial period of time with international representation of leading world scientists as well as prominent engineers and scientists in the United States, and I want to indicate what all that work resulted in, an observa-

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tion by the panel in its report that despite the conversations we may have here today and what will go on about Yucca Mountain and so forth, the major issues are really not geology. There are a number of geological options that would probably work quite well, and the failures and challenges that we are seeing are really connected as the Academy noted in achieving the sort of people-related problems, the societal nature of the issues that are involved. And so while you all have the responsibility of designing the next steps in our national efforts to deal with radioactive waste, you are going to need to give a lot of attention to issues that have been quite neglected in the past.

I might remind you, I have been around long enough to know that Alvin Weinberg, who was a very prominent scientist involved in the early history of radioactive waste management, noted that the problems that he had most underestimated were connected with waste storage and waste disposal and particularly the public interactions that occurred.

Now, there is—if we are honest about it, there are some pretty serious problems to be dealt with in trying to come up with a new program for radioactive waste, and I have noted some of them here. They are what some of us might call deep uncertainty problems that when you are talking about situations where you have really long time frames like 10,000 and 100,000 years, and we don't know what the future of technology and society is going to look at, that there are site-specific problems connected with any site that can be reviewed and considered as a repository site, and so there are things connected with future populations, lifestyles and values, health and medical issues and even the political context itself where we really can't predict very well what is going to happen, and that has implications, I think, for whatever Administration takes this problem on. They are going to have to deal with some of these, some of these issues, and they are not easy issues.

Also, we might note that we have never done, you know, a really high-level waste or spent fuel repository before, so it will be a first-of-a-kind facility. There are also not facilities that exist anywhere in the world at the moment, so our experience is limited, and so we need to understand that somehow the management process is going to need to be evolutionary because that will be the nature of knowledge, will be evolutionary and these uncertainties are going to change over time.

Now, what I do want to focus on particularly is the problem of social trust. Some of you may have seen in yesterday's *New York Times* on the front page that a new *New York Times*/CBS national poll has discovered that social trust has reached—it has been—we have been experiencing long-term erosion in social trust in our country, and in the last few weeks it has hit the low point that has existed at any time in the last 20 or 30 years. The loss of trust is particularly pronounced in the nuclear area, but we must understand that it really cuts across and it is generally responsible and found elsewhere in many other institutions. In other words, the social trust problem is not just a matter of getting the nuclear things right because it is a general problem in our society, and there has been a loss of social trust in institutions, in corporations, in Congress, regrettably, in the Presidency, and so forth, and those things

are—and it is not one particular poll because we now have evidence drawn from a number of different surveys that basically indicate that, and I am just about out of time.

Just to indicate, I can probably give you only one piece of social science research. We actually have a large body of evidence which has been accumulated among scientists and researchers over the past 20 years. This is one example drawn from work by psychologists, and you will see in the upper part of this diagram, those are a whole—don't worry about reading all those things. They are a whole list of actions that can be taken that ought to build trust, and the lower part of the diagram is actions that are taken and events that happen that lose trust. Look at the size of the bars involved. And what we have found, and I will just state it and maybe I will end there, that what we think is that social trust is easily lost and very difficult to recover. And so one of the things that is going to be facing Yucca Mountain or in the next phase of the radioactive waste problem is how do we deal with social trust, and if you are dealing with very feared hazard and one that concerns the public and the social trust in managers is very low, you have got a real problem to deal with, and we are going to need to give that a lot of thought in designing the process of moving forward for radioactive waste.

Thank you.

[The prepared statement of Dr. Kasperson follows:]

PREPARED STATEMENT OF DR. ROGER KASPERSON,
PROFESSOR AND DISTINGUISHED SCIENTIST,
CLARK UNIVERSITY

The management of spent nuclear fuel (SNF) and defense high-level waste (HLW) is a complex socio-technical systems challenge. Coordinated, reliable, and safe performance will be required over very long periods of time within evolving and changing social and technical contexts. To accomplish these goals, a waste management system will involve a host of facilities for interim storage and long-term disposal, a transportation infrastructure, and research and development centers. The complexity of SNF and HLW management will also require an array of robust institutions and procedures. Waste management is multi-institutional, comprising multiple private companies and sectors (e.g., commercial nuclear utilities, trucking and railway companies), multiple government agencies at different levels (local, State, National), non-governmental organizations (NGOs) and other institutional stakeholders, as well as citizens. At the moment, experience of how this will work is limited.

No matter how many checks and balances are put into place, no matter how much information is disclosed, no matter how many instruments for monitoring, evaluation, and oversight are implemented there will ultimately be individuals and groups entrusted to make sure "it all works." Trust and confidence are necessary for stable arrangements in contexts of unequal power, whether in terms of access to information, economic resources, or ability to implement desired actions (Kuhn and Ballard 1999). Stable arrangements, in turn, are essential for the institutional continuity necessary for long-term projects such as the disposal of SNF and HLW.

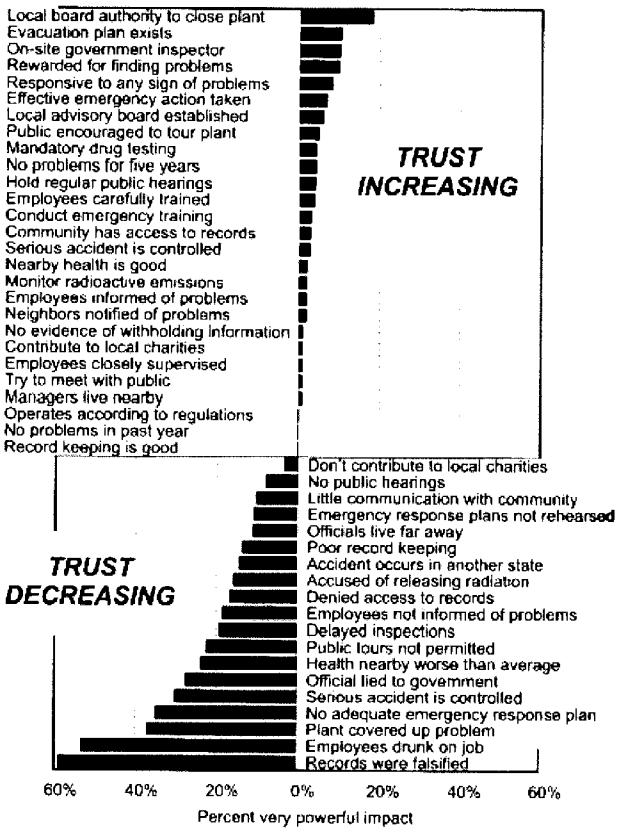
Unfortunately, the principal agencies responsible for nuclear wastes, the Department of Energy (DOE) and the Nuclear Regulatory Commission, are not trusted by majorities of the public in recent public opinion polls (e.g., Whitfield et al. 2009) and other earlier assessments (e.g., DOE 1993, DOE 2000). Social perceptions of missteps and failures in government and private parties' management of nuclear wastes have contributed to long-term erosion of trust and confidence (DOE 1993, DOE 2000, Hewlett 1978, Kraft 1996, NRC 2001, OTA 1985, Pijawka and Mushkatel 1992, Rosa and Clark 1999, Rosa et al. 2010). Reasons include Congressional scrapping of a site selection in the Eastern half of the U.S., Congressional scrapping of technical integrity and equity provisions in the Nuclear Waste Policy Amendments, attempts to coerce Nevada rather than negotiate, failure to clearly de-

fine regulatory criteria in advance and then adapt them to fit existing conditions, attempts to re-negotiate or circumvent compliance with cleanup agreements related to HLW at DOE sites, and treating the public as if its concerns are irrational. In short, social *distrust* is multi-lateral and "widespread in the nuclear waste domain, is deeply seated, reflects broader trends in society, and has a continuing history of events to maintain it." (NRC 2001, pg. 74)

Two reasons for the difficulty of regaining social trust in the context of SNF and HLW management stand out for special attention. First, nuclear waste is thought of in largely negative terms. Changing negative views can be hard. The "affect heuristic" explored in the work of Slovic and colleagues (Finucane et al. 2000, Slovic et al. 2007) suggests that when people like an activity or technology, they tend to view it as having high benefit and low risk. On the other hand, if they dislike it, they see benefits as low and risk as high. Furthermore, recent work on "cultural cognition" reinforces findings that people tend to select and interpret information to support preexisting views, protect values and worldviews (e.g., anti-nuclear or pro-nuclear), or preserve identity with an ideological group (Braman et al. 2005, Kahan et al. 2007). Thus, information intended to educate or persuade is all too often impotent.

Second, evidence suggests that events and activities that erode social trust have a stronger impact on overall levels of trust than do those thought to strengthen social trust (Figure 1). This is often referred to as the "asymmetry of trust" (Slovic 1993). Slovic (1993) found that of the many trust-building actions investigated, only one had a moderate effect: "An advisory board of local citizens and environmentalists is established to monitor the plant and is given legal authority to shut it down if they believe it to be unsafe."

Figure 1. Differential impact of trust-increasing and trust-decreasing events on levels of trust among respondents. Respondents were asked about each event whether it would increase or decrease their trust in the management of a nuclear power plant. They then rated how strongly their trust would be affected (1 = very small impact on trust; 7 = very powerful impact on trust). **Source: Slovic, 1993**.



Note: Only the percentage of respondents giving category 7 ratings (very powerful impact) are shown here

Rebuilding Social Trust

Based upon the sizable literature on social distrust, we offer six recommendations for how nuclear waste management should move forward.

- The planning process should commission a set of focus papers by leading experts on the major social and ethical problems that must be addressed in the evolving approach. These should include options for solutions and their pluses and minuses.
- Social science and policy expertise will be essential (Rosa et al. 2010). We suggest convening a standing advisory committee of leading social scientists and policy analysts with whom nuclear waste planner regularly consult.
- A dual strategy should be adopted. First, planning, including the design of institutional architecture and procedures, should proceed in a way that recognizes the need to perform and be effective in a context of social distrust. It may be that proceeding on the recognition of a deficit in social trust will lay the foundation for transparent, participatory procedures that can rebuild functional, critical social trust over the long term. Second, while working in a context of distrust, there must also be consistent efforts at all levels and in all aspects of nuclear waste policy-making—planning, implementation, and operations—to support the (re)development of critical social trust.

- Given the long, apparently obdurate distrust of the DOE, it is time to think of putting waste management in the hands of alternative institutions. We argue that responsibility should be placed in a public corporation, as many countries have done.
- A premium should be placed on openness, inclusive stakeholder involvement, and truly independent peer review (including impacted communities and knowledgeable, demanding critics) during the planning, decision, and monitoring process for all stages of program development and operation. The role of public involvement and peer review should be clear and meaningful. Independent review by critics.
- Contingent on geological suitability, the approach to siting should emphasize voluntary consent rather than coercion as much as possible.

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GEORGE PERKINS MARSH INSTITUTE

Rebuilding Social Trust in the Management of Radioactive Waste

Testimony presented to the House Committee on Science, Space, and Technology

October 27, 2011

Roger E. Kasperson
Research Professor and Distinguished Scientist
Clark University

CLARK UNIVERSITY 1887

GEORGE PERKINS MARSH INSTITUTE

WHAT ARE THE CHIEF CHALLENGES FOR A SUCCESSFUL SPENT FUEL AND HLW DISPOSAL PROGRAM?

"TODAY THE BIGGEST CHALLENGES TO WASTE DISPOSITION PROGRAMS ARE SOCIETAL IN NATURE. DIFFICULTIES IN ACHIEVING PUBLIC SUPPORT HAVE BEEN SERIOUSLY UNDERESTIMATED IN THE PAST, AND OPPORTUNITIES TO INCREASE PUBLIC INVOLVEMENT AND GAIN PUBLIC TRUST HAVE BEEN MISSED."

NRC, DISPOSITION OF HIGH-LEVEL NUCLEAR WASTE AND SPENT NUCLEAR FUEL. WASHINGTON: NAS, 2001, pp. 29-30.

GEORGE PERKINS MARSH INSTITUTE

RADIOACTIVE WASTE DISPOSAL IS A DEEP UNCERTAINTY PROBLEM

- THE EXTRAORDINARILY LONG TIME FRAMES MAKE A "PROOF OF SAFETY" IMPOSSIBLE;
- THE PHYSICAL AND CHEMICAL PHENOMENA THAT CONTROL SITE AND REPOSITORY EVENTS AND THE NATURE OF OTHER FUTURE EVENTS (E.G.CLIMATE CHANGE);
- FUTURE INTERACTIONS WITH HUMAN SYSTEMS ARE ESSENTIALLY UNKNOWABLE;
  - FUTURE POPULATIONS
  - LIFE STYLES AND VALUES
  - HEALTH AND MEDICAL ISSUES
  - POLITICAL STABILITY

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RADIOACTIVE WASTE DISPOSAL IS A DEEP UNCERTAINTY PROBLEM (cont.)

- THE DISPOSAL FACILITY WILL BE A FIRST-OF-A-KIND FACILITY AND RISKS AND UNCERTAINTIES WILL BE HIGHLY SITE-SPECIFIC;
- IMPLICATION: UNDERSTANDING OF RISKS AND UNCERTAINTY WILL BE EVOLUTIONARY WITH THE PROGRESS OF SCIENCE AND EXPERIENCE

GEORGE PERKINS MARSH INSTITUTE

SOCIAL TRUST— A PRECIOUS RESOURCE

- OVER THE PAST 25 YEARS, DOE AND THE CONGRESS HAVE LOST THE TRUST OF THE PRINCIPAL STAKEHOLDERS AND PUBLICS IN THE MANAGEMENT OF RADIOACTIVE WASTES;
- SOCIAL TRUST ONCE LOST IS NOT EASILY REGAINED AND SO A NEW DISPOSAL PROGRAM WILL PROCEED UNDER CONDITIONS OF HIGH SOCIAL DISTRUST
- THE LOSS OF TRUST IS PRONOUNCED IN THE NUCLEAR AREA BUT IS SYSTEMIC ACROSS SOCIAL INSTITUTIONS IN THE U.S.

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SOCIAL TRUST— A PRECIOUS RESOURCE (cont.)

- WHERE THOSE BEARING RISKS LACK TRUST IN THOSE MAKING DECISIONS, THEY DEMAND A GREATER ROLE IN DECISION MAKING.
- THE INTERACTION AMONG A HIGHLY DREADED HAZARD, LARGE UNCERTAINTIES, AND LOW SOCIAL TRUST CREATES UNUSUALLY DIFFICULT MANAGEMENT AND REGULATORY CHALLENGES.

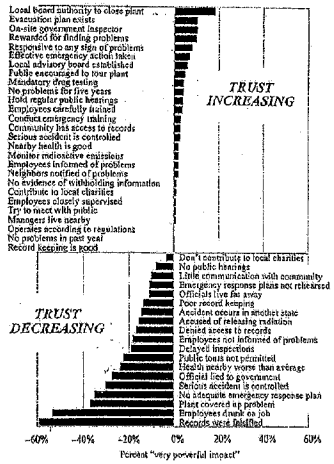

Figure 12. Differential impact of trust-increasing and trust-decreasing events. Note: only percentages of Category 7 ratings (very powerful impact) are shown here. Source: Slovic (1993).

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Six Recommendations for Rebuilding Social Trust

- COMMISSION FOCUS PAPERS ON SOCIAL AND ETHICAL PROBLEMS;
- AN ADVISORY COMMITTEE OF LEADING SOCIAL SCIENTISTS AND POLICY ANALYSTS;
- DESIGN OF INSTITUTIONAL ARCHITECTURE AND PROCEDURES;
- A PUBLIC CORPORATION FOR WASTE MANAGEMENT;
- OPENNESS, STAKEHOLDER INVOLVEMENT, AND INDEPENDENT PEER REVIEWS;
- VOLUNTARY CONSENT RATHER THAN COERCION

Chairman BROUN. Thank you, Doctor.

Mr. Hollis, you are recognized for five minutes.

STATEMENT OF MR. GARY HOLLIS, CHAIRMAN, NYE COUNTY BOARD OF COUNTY COMMISSIONERS

Mr. HOLLIS. Thank you. Mr. Chairman, Members of the Committee, thank you for the opportunity to testify. I am Gary Hollis, Nye County—I am Chairman of the Nye County Board of Commissioners.

In July of 2002, Congress designated Nye County as the site for nuclear waste repository in accordance with the provision of the Nuclear Waste Policy Act, the law Congress enacted to establish our Nation's policy on high-level radioactive waste. The act gives Nye County the authority to oversee federal activities on the repository. It is a duty that I and my fellow commissioners take very seriously.

We have worked with DOE on the science. We have participated in the licensing and carefully followed the deliberation of the Blue Ribbon Commission.

The Nuclear Waste Policy Act is clear. It sets out a process to determine if the repository can be built safely, and in 2008 the DOE submitted a licensing application to the NRC with the assurance that it could be built safely. Two years later, they asked to withdraw that application.

There is no need for the BRC to make alternatives to Yucca Mountain. DOE, NRC and the Obama Administration should comply with the law or change it.

Nye County has been fully engaged with the BRC. We are disappointed that the draft report implies there is no local support in Nevada when it insists that the siting of any repository have the consent of local government and communities.

Mr. Chairman, Yucca Mountain has local support. If the NRC determines it is unsafe to build this repository, Nye County would oppose its construction. If it is found to be safe, we favor its construction. In a very real sense, Nye County is the only community close to Yucca Mountain. At least six rural Nevada counties support continuing the licensing application process to determine that Yucca Mountain can be built safely. The land mass of these counties taken together is larger than many States. By any reasonable geographic definition, Yucca Mountain has the support of the surrounding communities.

The DOE, the ERDA and the AEC spent many years attempting to site a geological repository. The current language in the NWPA has a compromise by Congress to deal with the local support issue, but it also has set up procedures to follow if no local support is found. In other words, Congress carefully considered the possibility that the repository could have to be built despite State or local opposition. Congress determined that building the repository was the national priority and should take—should proceed despite local conditions.

Mr. Chairman, the State of Nevada currently opposes Yucca Mountain. However, in 1975, the Nevada legislature passed a resolution that said in part, and I quote, "The legislature of the State

of Nevada strongly urges the Energy, Research and Development Administration to choose the Nevada Test Site for the storage and processing of nuclear material." In 1987, the State legislature created Bullfrog County that completely enclosed Yucca Mountain with the intent to control the receipts of the benefits of payment. The point is, the State of Nevada at one time was not opposed to dealing with nuclear waste. Follow the money.

It will take decades to study, license and build something other than Yucca Mountain. What if we do not find a willing State? What happens if a State changes its mind? Would the fate of the repository be in jeopardy at every election? Would that violate the consent-based goal? The draft report does not answer these questions.

Finally, Mr. Chairman, as I said earlier, we take our site county responsibilities seriously. We conducted a robust science program to determine if a repository could be built safely. To this date, our studies have shown that the repository can be built safely, but we want an additional confidence that a complete license process will provide. To ignore the science, the law and facts, not to mention the Administration's scientific integrity policy because the BRC says Yucca Mountain does not have local support is an insult to the process and contrary to the rule of law. Yucca Mountain does have local support. My presence here today confirms that.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Hollis follows:]

PREPARED STATEMENT OF MR. GARY HOLLIS, CHAIRMAN, NYE COUNTY BOARD OF COUNTY COMMISSIONERS

Mr. Chairman, Members of the Committee, thank you for the opportunity to testify today about some of the recommendations of the Blue Ribbon Commission. I am Gary Hollis, Chairman of the Nye County Board of Commissioners and one of the County's two liaison Commissioners on Yucca Mountain issues. I have worked at the Nevada Test Site and also worked on Yucca Mountain characterization activities.

As you know, Yucca Mountain is located in Nye County. In July 2002 Congress specifically designated Nye County as the site county for a nuclear waste repository in accordance with provisions of the Nuclear Waste Policy Act—the law Congress enacted to establish our Nation's policies on high-level radioactive waste. The Act also gives Nye County authority to oversee federal activities on the repository. It is a duty that I and my fellow commissioners take very seriously.

As part of Nye County's oversight role, we worked with DOE on the science of the Yucca Mountain project, participated in the licensing proceedings, and carefully followed the deliberations of the Blue Ribbon Commission. Personally, Mr. Chairman, I have questions about the need for the Blue Ribbon Commission.

The provisions of the Nuclear Waste Policy Act are clear. The Act sets out specific procedures and rules to determine if a repository at Yucca Mountain can be built safely. In 2008, when the Department of Energy submitted the license application to the Nuclear Regulatory Commission, it was with their assurance it could be built safely. Two years later DOE tried to withdraw the license application, but not on safety grounds. To me, this is a clear violation of the law. To me, there is no need for a Blue Ribbon Commission to determine alternatives to Yucca Mountain. Instead, DOE, the NRC and the Obama Administration should either obey the clear mandates in the Nuclear Waste Policy Act, or should try to change it.

However, in our oversight role, Nye County has been fully engaged with the Blue Ribbon Commission. We have attended a majority of the Commission's public hearings. We shared our unique and extensive experience and offered thoughtful advice.

IWe are disappointed that the BRC draft report implies there is no local support in Nevada when it insists that the siting of any repository be with the consent of the communities surrounding the project. Mr Chairman, Yucca Mountain has the support of the surrounding communities. Nye County supports completing the licensing process. If the NRC determines it is unsafe to build the repository, and that determination is based on sound science and not political pressure, Nye County

would oppose the construction of the repository. If it is found to be safe, we favor its construction.

Mr. Chairman, Nye County is the third largest county in the United States. In a very real sense Nye County is the only community close to Yucca Mountain. At least six rural Nevada counties support continuing with the license application process to determine if Yucca Mountain can be build safely. Included in my written testimony are resolutions of support from Nye, Esmeralda, Mineral, Lander, Churchill and Lincoln counties. The land mass of these counties, taken together, is larger than many States in this country. By any reasonable geographic definition, Yucca Mountain has the support of the surrounding community.

The DOE, ERDA, and AEC spent many years in unsuccessful attempts to site a geologic repository. The current language in the NWPA was a compromise by Congress to deal with a very difficult problem. The Nuclear Waste Policy Act tries to encourage local support, but it also sets up procedures to follow if no local support is found. In other words, Congress carefully considered the possibility that the repository would have to be built despite local opposition. Congress determined that building the repository was a national priority and should proceed despite local conditions.

It is true that the State of Nevada currently opposes Yucca Mountain. However at one time it supported it. In 1975, the Nevada legislature passed a resolution that said in part:

> "the legislature of the State of Nevada strongly urges the Energy Research and Development Administration to choose the Nevada Test Site for the storage and processing of nuclear material."

In 1987, the State Legislature created a new county that completely enclosed Yucca Mountain. It was called Bullfrog County. The new county had no population, which meant that any payment by the Federal Government for Yucca Mountain would go to the State government. The State fully intended to benefit from the repository.

The point is that the State of Nevada, at one time, was not opposed to dealing with nuclear waste.

It will take decades to study, license, and build something other than Yucca Mountain. What if we do not find a willing state? Or if we find a willing state, what happens if it later changes its mind? If 10 or 15 years into the process, what will happen if there is an election and the new Governor opposes the repository? Would we go back to the drawing board again? Would the fate of the repository be in jeopardy with every local government election? What if the State favors the repository but it is opposed by an outspoken community activist group? Would that violate the consent based goal? The BRC does not answer those questions.

Finally, Mr. Chairman, I want to point out that Nye County, in addition to its oversight role, has conducted a robust science program to determine if the repository can be built safely. The full list of our investigations is in my submitted testimony, but they include extensive study of the underground water aquifer by:

- more than forty boreholes into about 145 water zones and tracer tests to determine underground water flow;
- structural geologic studies;
- development of information on hydrology south of Yucca Mountain that DOE needed to complete its license application;
- underground ventilation measurements and modeling for worker safety; and
- participation, as a cooperating agency, in the preparation of Environmental Impact Statements

In short, Nye County took its site county oversight responsibilities seriously. We have been active participants in the science of Yucca Mountain. To date, our studies have shown that the repository can be built safely. We do not have all the scientific facts, but that is why we want to see the licensing process completed. We want a decision to be made based on science.

To ignore all this science, the law and the facts, not to mention this administration's stated "scientific integrity policy," because the BRC says Yucca Mountain does not have local support, is an insult to the process and contrary to the rule of law. Yucca Mountain does have local support. My presence here today confirms that.

Thank you. I am available to answer any questions you may have. I am here with one of the County's technical professionals. He is available to answer questions as well.

Chairman BROUN. Thank you, Mr. Hollis.

Mr. McLeod, you are recognized for five minutes.

STATEMENT OF MR. RICK MCLEOD,
EXECUTIVE DIRECTOR, SAVANNAH RIVER SITE
COMMUNITY REUSE ORGANIZATION

Mr. MCLEOD. Mr. Chairmen Broun and Harris and Members of the Committee, thank you for the opportunity to testify today regarding the draft recommendations of the President's Blue Ribbon Commission on America's Nuclear Future.

I am Rick McLeod, Executive Director of the Savannah River Site Community Reuse Organization, or SRSCRO. The SRSCRO is a nonprofit regional group supporting economic diversification and job creation in the five-county region of Georgia and South Carolina near the Department of Energy's Savannah River Site, or SRS. Our organization is unique across the DOE complex in that our area of interest covers multiple counties and two States. We have prepared extended remarks for inclusion in the record, but during my time today I would like to focus briefly on four of the Blue Ribbon Commission's draft recommendations.

Let me preface my remarks by saying that the individuals and groups I represent in South Carolina and Georgia continue to believe that the Administration's decision to halt work on Yucca Mountain is wrongheaded and counter to the Nation's long-term best interest. We applaud Congressional efforts, including those of this Committee, specifically the June 2011 report on Yucca Mountain, to scrutinize the Administration's actions with respect to Yucca Mountain and the lack of scientific integrity, openness, and transparency in its determination to terminate the project. Now to the Commission's recommendations.

We fully agree with recommendation number one, which calls for consent-based, transparent and science-based approach to the nuclear waste management solutions. If a science-based approach were followed, we would be completing the Yucca Mountain project today.

We are on record multiple times with our strongly held concerns about high-level defense waste continuing to be stored at the Savannah River Site with no disposition path available and by default becoming the de facto Yucca Mountain.

On the following point, we want to be extremely clear: in its final report, the Blue Ribbon Commission needs to decouple high-level defense waste from commercial spent fuel. The defense waste is different. The quantity is different. The number of locations affected is different. The potential for future use is different. The legal and financial implications for the government are different. Specific separate recommendations are needed for disposition of high-level defense waste and for commercial spent fuel.

Second, we share the view of those who fear that forming some type of federal corporation dedicated to managing nuclear waste could further delay efforts to dispose of the waste, especially defense waste, which had no other disposition path than a geologic repository. Rather than create a new organization, why not simply focus for a shorter period and for less money on just disposing of the waste? We need solutions, not more bureaucracy.

While we appreciate the need for interim storage, our concerns center on the term "interim." When it comes to nuclear waste, this is a relative term that is almost never associated with a fixed time frame. Rather, it can mean anything from 10 years to 500 years or more. "Interim" needs to be clearly and legally defined before communities such as ours can begin to address the potential and advisability of such storage.

In any event, our community would not support interim storage scenario of commercial spent fuel at the Savannah River Site unless a permanent solution is pursued at the same time. This means progress towards a permanent repository for both high-level defense waste and commercial spent fuel and/or a program to reprocess or recycle commercial used nuclear fuel. Community support also requires removal of a sufficient quantity of waste currently stored at SRS and the recommitment of processing used nuclear fuel currently stored at SRS storage pools. These two conditions along with ongoing health and safety monitoring, proper regulatory oversight, both at the local and State level, and a legally binding commitment to a final disposition plan are essential to community support for an interim storage option.

Finally, we strongly urge the Blue Ribbon Commission to amend its recommendation number seven to specifically recognize the critical role of H Canyon at the Savannah River Site in international nonproliferation efforts. H Canyon, as you know, is a one-of-a-kind facility of immense importance to DOE and the Nation. In our view, it is imperative to reinstate H Canyon to operational status, fully funded and fully staffed.

I thank the Committee for its oversight and contribution to the national dialog, and I will be happy to answer any questions.

[The prepared statement of Mr. McLeod follows:]

PREPARED STATEMENT OF MR. RICK MCLEOD,
EXECUTIVE DIRECTOR, SAVANNAH RIVER SITE
COMMUNITY REUSE ORGANIZATION

Mr. Chairman and Members of the Committee, thank you for the opportunity to testify today regarding the draft recommendations of the President's Blue Ribbon Commission on America's Nuclear Future.

I am Rick McLeod, Executive Director of the Savannah River Site Community Reuse Organization—or "SRSCRO."

The SRSCRO is a non-profit regional group supporting economic diversification and job creation in a five-county region of Georgia and South Carolina near the Department of Energy's Savannah River Site.

Our organization is unique across the DOE complex in that our area of interest covers multiple counties and two states.

Blue Ribbon Commission Draft Recommendations

The Blue Ribbon Commission's draft report issued in July included seven recommendations:

1. Develop an approach to siting and developing nuclear waste management and disposal facilities in the U.S. that is "adaptive, staged, consent-based, transparent, and standards- and science-based."

2. Create a new, single-purpose organization to develop and implement a focused, integrated program for the transportation, storage, and disposal of nuclear waste in the U.S.

3. Assure access by the nuclear waste management program to the balance in the Nuclear Waste Fund and to the revenues generated by annual nuclear waste fee payments.

4. Initiate prompt efforts to develop, as quickly as possible, one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste.

5. Initiate prompt efforts to develop, as quickly as possible, one or more consolidated interim storage facilities as part of an integrated, comprehensive plan for managing the back end of the nuclear fuel cycle.

6. Provide stable, long-term support for research, development, and demonstration (RD&D) on advanced reactor and fuel cycle technologies that have the potential to offer substantial benefits relative to currently available technologies and for related workforce needs and skills development.

7. Provide international leadership to address global non-proliferation concerns and improve the safety and security of nuclear facilities and materials worldwide.

Halting Yucca Mountain Is Wrong Decision

First, let me say that the individuals and groups I represent in South Carolina and Georgia continue to believe that the Administration's decision to halt work on Yucca Mountain is wrongheaded and counter to the Nation's long-term best interests.

Our objection to the Administration's Yucca Mountain policy is well-known and highlighted by actions taken by our organization.

- We produced a widely distributed community white paper designed to facilitate discussion and a regional and national consensus on safe, permanent nuclear waste disposal.
- We gathered resolutions from 22 governmental bodies and economic development groups in our region supporting continuation of the Yucca Mountain project.
- We held a well-covered press conference at the National Press Club in Washington to amplify our objections to the Administration's decision.
- We co-sponsored print ads as part of a national campaign to ask our elected officials and candidates where they stand on Yucca Mountain.
- We have communicated frequently with our state and federal elected officials concerning our views and concerns.
- We appeared three times before the President's Blue Ribbon Commission on America's Energy Future.
- Most recently, we joined with 25 other organizations across the country in signing a letter to the U.S. Senate supporting funding resumption of the NRC's review of the Yucca Mountain license application.

In short, we have mounted an extremely proactive community response in an effort to force reconsideration of the government's ill-advised decision to halt work on Yucca Mountain, especially since Congress specifically stated so in the Nuclear Waste Policy Act and Yucca Mountain is still considered the "law" of the land.

DOE Should Reconsider Its Position

We continue to urge DOE to reconsider its position and allow science and engineering—not politics—to establish the most appropriate means for disposal of high-level defense nuclear waste.

And we applaud Congressional efforts—including those of this Committee, specifically the June 2011 report on Yucca Mountain—to scrutinize the Administration's actions with respect to Yucca Mountain and the lack of scientific integrity, openness, and transparency in its determination to terminate the project.

We continue to believe Yucca Mountain was—and is—the right answer for permanent nuclear waste disposal, and its completion should be pursued vigorously, especially for high-level defense waste. We note that the Blue Ribbon Commission did not address Yucca Mountain in its draft report at the direction of the Secretary of Energy. We consider this to be the "missing recommendation."

Transparent, Science-Based Approach Is Needed

With respect to the Blue Ribbon Commission's recommendations, we fully agree with Recommendation #1 which calls for a consent-based, transparent, and science-based approach to waste management solutions.

If a science-based approach were followed with transparency, we would be completing the Yucca Mountain project today.

High-Level Defense Waste Needs Separate Consideration

It should be pointed out that we are on record multiple times with our strongly held concerns that because of the Yucca Mountain decision high-level defense waste will continue to be stored at the Savannah River Site with no disposition path available, thus by default becoming the "de facto" Yucca Mountain.

On this point, we want to be extremely clear. In its final report, the Blue Ribbon Commission needs to de-couple high-level defense waste—including the vitrified waste and used nuclear fuel from foreign and domestic research reactors—from commercial spent fuel.

The waste is different. The quantity is different. The number of locations affected is different. The potential for future use is different. The legal and financial implications for the government are different.

Commercial spent fuel and high-level defense waste should be treated differently based on their unique characteristics and requirements for safe storage and retrieval. Specific, separate recommendations are needed for disposition of high-level defense waste.

New Federal Corporation Will Delay Progress

With respect to the Commission's second recommendation, we share the view of those who fear that forming a federal corporation dedicated to managing nuclear wastes could further delay efforts to dispose of the waste, especially defense waste which has no other disposition path than a geologic repository.

All evidence points to the fact that disposal of defense waste at Savannah River Site is low among the Department of Energy's priorities.

It is also a fact that considerable time, money and effort would have to be devoted to setting up a new federal or quasi-federal organization to oversee disposition.

Rather than create new bureaucracy, why not simply focus for a shorter period and for less money on just disposing of defense waste. A new organization just doesn't seem to be a helpful solution in the current environment. We need solutions, not more bureaucracy.

Nuclear Waste Fund Should Be Used for Its Purpose

Third, we fully agree that access by the nuclear waste management program to the balance in the Nuclear Waste Fund and to the revenues generated by annual nuclear waste fee payments should be assured.

Permanent Geologic Facility Is Needed Soon

Fourth, we also fully agree with the Commission's recommendation that prompt efforts should be initiated to develop, as quickly as possible, one or more permanent deep geological facilities for the safe disposal of spent fuel and high-level nuclear waste. We believe Yucca Mountain is the first of those facilities.

"Interim" Should Be Legally Defined

The Commission's fifth recommendation is that we develop one or more interim storage facilities as quickly as possible.

While we appreciate the need for such storage, our concern centers on the term "interim." When it comes to nuclear waste, this is a relative term that is almost never associated with a fixed time frame.

Rather, it can mean anything—from 10 years to 500 years or more. "Interim" needs to be clearly and legally defined before communities such as ours can begin to address the potential and advisability of such storage.

In any event, our community will not support any interim storage of commercial spent fuel scenario unless a permanent solution is pursued at the same time.

This means progress toward a permanent repository for commercial spent fuel and high-level defense waste and/or a program to reprocess or recycle commercial used nuclear fuel.

Community support also requires removal of a sufficient quantity of waste currently stored at SRS and the re-commitment of processing used nuclear fuel currently stored at SRS in used fuel pools.

These two conditions—along with ongoing health and safety monitoring, proper regulatory oversight both at the local and State level, and a legally binding commit-

ment to a final disposition plan—are essential to community support for an interim storage option for commercial spent fuel at SRS.

Fuel Cycle R&D Is Needed; H Canyon Should Be Utilized

We strongly agree with Recommendation Six which calls for stable, long-term support for research, development, and demonstration on advanced reactor and fuel cycle technologies. Furthermore, we believe the Commission needs to make a specific recommendation regarding the preservation and use of H Canyon as part of this R&D program.

H Canyon, as you know, is a one-of-a-kind facility of immense importance to DOE and the Nation.

- **It is the only large-scale DOE facility** that can stabilize and separate DOE's inventory of complex plutonium materials into a form suitable for disposition.
- **It is the only facility** that can prepare the large and growing inventory of research reactor fuel at the Savannah River Site for disposition, while recovering valuable highly enriched uranium.
- **It is the only facility** that can support engineering development and "hot" testing of alternate nuclear fuel cycles and advanced Small Nuclear Reactors.

We strongly urge the Blue Ribbon Commission to amend its Recommendation Number 7 to specifically recognize the critical role of H Canyon at the Savannah River Site in international non-proliferation efforts.

The Commission should acknowledge that H Canyon is a national treasure that should be fully deployed to complete the original plan of disposing of nuclear materials brought to SRS.

We believe DOE's decision to place H Canyon at the Savannah River Site in modified operational status is short-sighted, especially at a time when critical existing mission needs are unmet.

In our view, it is imperative to reinstate H Canyon to operational status—fully funded and fully staffed.

Nuclear Waste Solution Is Critical National Challenge

As we point out in our Yucca Mountain white paper, the challenge of properly disposing of nuclear waste touches every man, woman and child in America.

It speaks to public safety, to energy independence, to technology and innovation, to global competitiveness and economic leadership and to the political will to do what is right—what must be done for the good of our communities today and of future generations tomorrow.

I thank this Committee for its oversight and contribution to the national dialog. I urge you to carefully consider our comments and urge the Blue Ribbon Commission to incorporate our views into their final report.

Chairman BROUN. Thank you, Mr. McLeod. And if any member of the Committee would like some interpretation, Mr. McLeod and I will be glad to interpret each other for you all. So thank you, Mr. McLeod. I appreciate your testimony.

Dr. Peters, you are recognized for five minutes.

STATEMENT OF DR. MARK PETERS, DEPUTY LABORATORY DIRECTOR FOR PROGRAMS, ARGONNE NATIONAL LABORATORY

Dr. PETERS. Thank you, Mr. Chairman. Good morning. I would like to thank Chairman Broun, Ranking Member Tonko and Members of the Subcommittee on Investigations and Oversight, also Chairman Harris, Ranking Member Miller and Representative Biggert and the other Members of the Subcommittee on Energy and Environment for the opportunity to testify this morning.

My name is Mark Peters and I am the Deputy Laboratory Director for Programs at Argonne National Laboratory. Mr. Chairman, I ask that my full written testimony be entered into the record, and I will summarize it here.

I am honored to be here today to testify about science and technology challenges and opportunities associated with the nuclear fuel cycle, the need to develop new, sustainable technologies to enable America's nuclear energy future, and finally, my perspectives on the BRC draft recommendations.

For decades, the United States has grappled with the multiple challenges of crafting a long-term solution for the management of legacy and future used nuclear fuel. Over this past year, these persistent challenges have taken on new urgency as the accident at Japan's Fukushima Daiichi nuclear power plant has focused international attention on the safety and security of used nuclear fuel storage. Today as we consider the BRC's draft recommendations, it is critically important for us to take a close look at the many challenges that must be addressed if we are to succeed in managing our used nuclear fuel.

I concur with the BRC's draft recommendation to move forward expeditiously with siting, licensing and operating a storage and disposal system to manage legacy and future used nuclear fuel. I believe this is an important and necessary step toward enabling a sustainable nuclear energy future. A storage and disposal system is required in any nuclear fuel cycle.

I also strongly support the BRC recommendation to conduct a robust advanced fuel cycle R&D program to inform future domestic fuel cycle options and maintain U.S. leadership in the global nuclear energy and fuel cycle enterprise. Yet while I understand the BRC's conclusion that it is premature to seek consensus on the policy question of whether the United States should commit to closing the fuel cycle, I believe the BRC's omission of this issue will result in a missed opportunity to inform our nuclear waste policy going forward.

Given the necessary linkages between fuel cycle technologies and ultimate disposition of nuclear waste, I believe it is vital to make advanced nuclear fuel cycle R&D a critical component of our long-term strategy for nuclear waste management, and that our national strategy must simultaneously address issues of economics, uranium resource utilization, nuclear waste minimization and a strengthened nonproliferation regime.

This is an increasingly urgent issue. At present, nuclear energy is the sole proven, reliable, abundant, affordable, and carbon-free source of electricity generation for the United States and the world. Our current nuclear-generating capacity is not sufficient to support the goals of our energy system going forward. Additionally, most existing nuclear power plants in the United States will reach the end of their operating licenses in the next few decades, so we must work swiftly and urgently to extend, replace, and add to the nuclear energy-generating capacity in the United States.

To a great extent, our future capacity for nuclear energy generation will depend on our ability to safely dispose of nuclear waste, and perhaps even more importantly, to assure the public of the safety and security of our used nuclear fuel. Failure to find new workable solutions to the continuing problem of nuclear waste management will have serious long-term ramifications for our national economy and future global competitiveness.

Real technological progress in addressing these challenges is possible only within the context of a thoughtful, consistent policy for nuclear waste management, one that acknowledges the reality that a once-through fuel cycle may not be sustainable if global nuclear energy generation increases substantially. Our national policy must include substantial support for an advanced fuel cycle R&D program that is focused on outcomes, that is closely integrated with storage and disposal efforts, and that ultimately leads to down-selection, demonstration, and deployment of effective advanced fuel cycle technologies.

To that end, the United States should conduct a science-based advanced nuclear fuel cycle research, development, and demonstration program to evaluate recycling, transmutation, and disposal technologies that minimize proliferation, environmental, health, and safety risks. This program should be carried out through robust public-private partnerships involving the Department of Energy, its national laboratories, universities and industry, and it should be conducted with a sense of urgency and purpose. My written testimony provides a more specific set of recommendations to advance nuclear fuel cycle R&D.

I thank you, and I would be pleased to answer any of your questions.

[The prepared statement of Dr. Peters follows:]

PREPARED STATEMENT OF DR. MARK PETERS,
DEPUTY LABORATORY DIRECTOR FOR PROGRAMS,
ARGONNE NATIONAL LABORATORY

Summary

The Blue Ribbon Commission's (BRC) draft recommendation to move forward expeditiously with siting, licensing, and operating a storage and disposal system to manage legacy and future used nuclear fuel is an important and necessary step to enabling a sustainable nuclear energy future. A storage and disposal system is required in any nuclear fuel cycle. The BRC recommendation to conduct a robust advanced fuel cycle R&D program to inform future domestic fuel cycle options and maintain United States leadership in the global nuclear energy and fuel cycle enterprise is also important. Given the necessary linkages between fuel cycle technologies and ultimate disposition of nuclear waste, it seems most rational and efficient to address the challenges of advanced fuel cycle technologies concurrently with the broader policy questions of America's nuclear waste management program. Real progress in addressing these challenges is possible only within the context of a thoughtful, consistent policy for nuclear waste management, one that acknowledges the reality that a once-through fuel cycle will not be sustainable if global nuclear energy generation increases substantially.

Our national policy must include substantial support for a robust advanced fuel cycle research and development program that is focused on outcomes, that is closely integrated with storage and disposal efforts, and that ultimately leads to down-selection, demonstration, and deployment of effective advanced fuel cycle technologies. To that end, the United States should conduct a science-based, advanced nuclear fuel cycle research, development, and demonstration program to evaluate recycling and transmutation technologies that minimize proliferation risks and environmental, public health, and safety impacts. This program should be carried out through robust public-private partnerships involving the Department of Energy (DOE), its national laboratories, universities, and industry, and it should be conducted with a sense of urgency and purpose.

Introduction

For decades, the United States has grappled with the multiple challenges of crafting a long-term solution for the management of legacy and future used nuclear fuel. Over this past year, these persistent challenges have taken on new urgency,

as the accident at Japan's Fukushima Daiichi nuclear power plant has focused international attention on the safety and security of used nuclear fuel storage. Today, as we consider the BRC draft recommendations on America's nuclear energy future, it is critically important for us to take a close look at the scientific and technological challenges that must be addressed if we are to succeed in managing our used nuclear fuel.

We must keep in mind, however, that real technical progress is possible only within the context of a thoughtful, consistent policy for nuclear waste management. Our national policy must include substantial support for a robust advanced fuel cycle research and development program that is focused on outcomes, that is closely integrated with storage and disposal efforts, and that ultimately leads to down-selection, demonstration, and deployment of effective advanced fuel cycle technologies. Only a reasoned plan for research, development, and deployment can lead to a decision on a preferred fuel cycle technology that will enable safe, sustainable expansion of the U.S. nuclear fleet.

I concur with the BRC recommendation for prompt action regarding siting, licensing, and operation of storage and disposal systems to manage used nuclear fuel. Yet while I understand the Commission's conclusion that it is premature to seek consensus on the policy question of whether the United States should commit to closing the fuel cycle, I believe the BRC draft report's omission of this issue will result in a missed opportunity to inform U.S. nuclear waste policy going forward. As the draft report notes: "Future evaluations of potential alternative fuel cycles must account for linkages among all elements of the fuel cycle, (including waste transportation, interim storage and disposal)." Given those necessary linkages between fuel cycle technologies and ultimate disposition of nuclear waste, it seems most rational and efficient to address the challenges of advanced fuel cycle technologies concurrently with the broader policy questions of America's nuclear waste management program.

To that end, as I have testified previously to the House of Representatives, I believe that the United States should conduct a science-based, advanced nuclear fuel cycle research, development, and demonstration program to evaluate recycling and transmutation technologies that minimize proliferation risks and environmental, public health, and safety impacts. This program should be carried out through robust public-private partnerships involving the Department of Energy (DOE), its national laboratories, universities, and industry, and it should be conducted with a sense of urgency and purpose. To be most effective, this program must support evaluation of alternative national strategies for commercial used nuclear fuel disposition in close conjunction with ongoing efforts to site and develop a permanent geologic repository(s).

Sustainable Nuclear Energy

The ongoing challenge of America's nuclear waste management program must not be considered in a vacuum. World energy demand is increasing at a rapid and largely unsustainable pace; each year, humans consume an average of 15 trillion watts of electricity and release over 30 gigatons of carbon into the atmosphere, and worldwide energy use is expected to soar over the coming decades. To satisfy national and worldwide energy demand, reduce greenhouse gas emissions, and protect the environment, energy production must evolve from current reliance on fossil fuels to a more balanced, sustainable approach based on abundant, clean, and economical energy sources. At present, nuclear energy is the sole proven, reliable, abundant, affordable, and "carbon-free" source of electricity generation for the United States and the world. However, our current capacity for nuclear generation is not sufficient to support the goals of reliable, carbon-free, and affordable energy. Additionally, most existing nuclear power plants in the United States will reach the end of their operating licenses in the next few decades. At present, it is extremely unlikely that renewable energy sources, such as solar, wind, hydro, and geothermal energy, will be sufficient to replace that reliable, base-load capacity when those nuclear power plant licenses expire. So we must work swiftly and urgently to devise economically viable, environmentally responsible means to extend, replace, and add to the generating capacity of America's 104 existing nuclear power plants, which now produce nearly 20% of our electricity.

As we seek to expand our portfolio of sustainable energy sources, we must take into account the national and international response to the accident at the Fukushima Daiichi nuclear power plant, which occurred in the aftermath of the devastating earthquake and tsunami that struck northeastern Japan on March 11, 2011. The Fukushima accident has led to worldwide uncertainty about the future of nuclear power; in response, Germany, Switzerland, and Italy have announced plans to phase out or cancel all existing and future reactors. To a great extent, our

future capacity for nuclear energy generation will depend on our ability both to safely dispose of nuclear waste and—perhaps even more importantly—to assure the public of the safety and security of our used nuclear fuel. Failure to find new, workable solutions to the continuing problem of nuclear waste management will have serious long-term ramifications for our national economy and future global competitiveness.

In considering the draft recommendations of the Blue Ribbon Commission, I believe it is vital to make advanced nuclear fuel cycle research a critical component of our long-term strategy for nuclear waste management, and that our national strategy must simultaneously address issues of economics, uranium resource utilization, nuclear waste minimization, and a strengthened nonproliferation regime. All of these issues will require both systems analysis and substantial, consistent investments in research and development, demonstration, and test and evaluation, with those efforts directed toward the ultimate goal of a closed fuel cycle for waste and resource management.

Used Nuclear Fuel Management

It is the composition of used nuclear fuel that make its ultimate disposal challenging. Fresh nuclear fuel is composed of uranium dioxide (about 96% Uranium-238, and 4% Uranium-235). During irradiation, most of the Uranium-235 is fissioned, and a small fraction of the Uranium-238 is transmuted into heavier elements known as transuranics. The used nuclear fuel contains about 93% uranium (mostly Uranium-238), about 1% plutonium, less than 1% minor actinides (neptunium, americium, and curium), and about 5% fission products. Uranium, if separated from the other elements, is relatively benign, and could be disposed of as low-level waste or stored for later re-use. However, some of the other byproducts raise significant concerns:

- The fissile isotopes of plutonium, americium, and neptunium are potentially usable in weapons and therefore raise proliferation concerns. However, used nuclear fuel remains intensely radioactive for more than 100 years. Without the availability of remote handling facilities, these isotopes cannot be readily separated, essentially protecting them from diversion.
- Three isotopes, which are linked through a decay process (Plutonium-241, Americium-241, and Neptunium-237), are the major contributors to long-term radiotoxicity (100,000 to 1 million years). Hence, they are potential significant dose contributors in a repository, and also major contributors to the long-term heat generation that is a key design limit to the amount of waste that can be placed in a given repository space.
- Certain fission products (notably cesium and strontium) are major contributors to any storage or repository's short-term heat load, but their effects can be mitigated through engineering controls.
- Other fission products, such as Technetium-99 and Iodine-129, also contribute to long- term potential dose in a repository.

The time scales required to mitigate these concerns are daunting: several of the isotopes of concern will not decay to safe levels for hundreds of thousands of years. Thus, the solutions to long-term disposal of used nuclear fuel are limited to three options (not necessarily mutually exclusive): the location of a geologic environment that will remain stable for that period; the identification of waste forms that can contain these isotopes for that period; or the destruction of these isotopes. These three options underlie the major fuel cycle strategies that are currently being developed and deployed in the United States and abroad.

The nuclear fuel cycle is a cradle-to-grave framework that includes uranium mining, fuel fabrication, energy production, and nuclear waste management. There are two basic nuclear fuel-cycle approaches. An open (or once-through) fuel cycle, as currently envisioned by the United States, involves treating used nuclear fuel as waste, with ultimate disposition of the material in a geologic repository (see Figure 1).

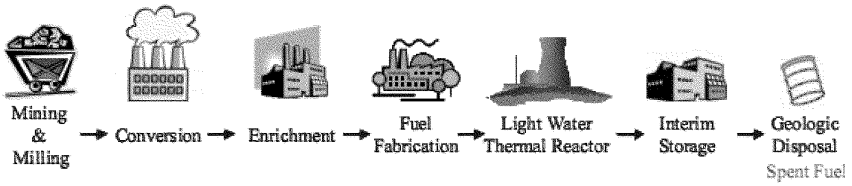

Figure 1. Open (or once-through) nuclear fuel cycle

In contrast, a closed (or recycle) fuel cycle, as currently planned by other countries (e.g., France, Russia, and Japan), treats used nuclear fuel as a resource, separating and recycling actinides in reactors and using geologic disposal for remaining wastes (see Figure 2).

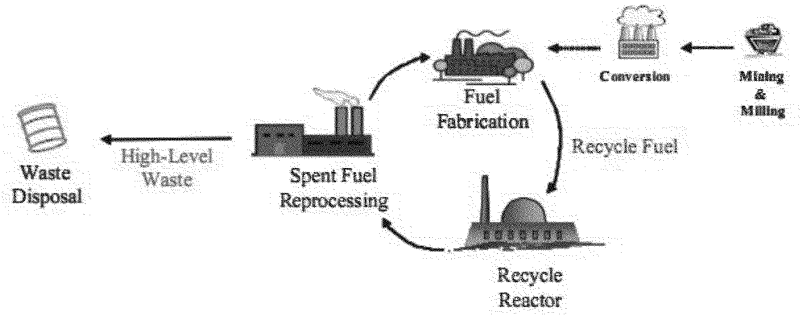

Figure 2. Closed nuclear fuel cycle (or reprocessing/recycling)

The open nuclear fuel cycle relies on disposition of used nuclear fuel in a geologic repository that must contain the constituents of that fuel for hundreds of thousands of years. Several countries have programs to develop these repositories. This approach is considered safe, provided suitable repository locations and space can be found. As noted in the BRC draft report, the challenges of long-term geologic disposal of used nuclear fuel are well recognized and are related to the uncertainty about both the long-term behavior of used nuclear fuel and the geologic media in which it is placed.

For the closed nuclear fuel cycle, limited recycle options are commercially available in France, Japan, and the United Kingdom. These nations currently use the Plutonium and Uranium Recovery by Extraction (PUREX) process, which separates uranium and plutonium and directs the remaining transuranics to vitrified waste, along with all the fission products. In this process, uranium is stored for eventual reuse and plutonium is used to fabricate mixed-oxide fuel that can be used in conventional reactors. Used mixed-oxide fuel currently is not reprocessed, though the feasibility of mixed-oxide fuel reprocessing has been demonstrated. It is typically stored for eventual disposal in a geologic repository. Although a reactor partially loaded with mixed-oxide fuel can destroy as much plutonium as it creates, this approach results in increased production of americium, a key contributor to the heat generation in a repository.

This limited recycle approach has two significant advantages:

- It can help manage the accumulation of plutonium.
- It can significantly reduce the volume of used nuclear fuel and high-level waste destined for geologic disposal. For example, the French experience indicates that this limited recycling can achieve volume reductions by a factor of 5 to 10.

However, there are several disadvantages to the PUREX process:

- It imposes a small economic penalty by increasing the net cost of electricity a few percent.
- The separation of pure plutonium in the PUREX process is considered by some to be a proliferation risk.
- This process does not significantly improve the use of the repository space (the improvement is around 10%, as compared to many factors of 10 for closed fuel cycles).
- This process does not significantly improve the use of natural uranium (the improvement is around 15%, as compared to several factors of 10 for closed fuel cycles).

Full recycle approaches are currently being researched in France, Japan, China, Russia, South Korea, India, and the United States. These typically comprise three successive steps: an advanced separations technology that mitigates the perceived disadvantages of PUREX, partial recycle in conventional reactors, and closure of the fuel cycle in fast reactors. Note: the middle step can be eliminated and still attain the waste management benefits; inclusion of the middle step is a fuel cycle system-level consideration.

The first step, using advanced separations technologies, allows for the separations and subsequent management of high-purity product streams. These streams are:

- Uranium, which can be stored for future use or disposed of as low-level waste.
- A mixture of plutonium and neptunium, which is intended for partial recycle in conventional reactors, followed by recycle in fast reactors.
- Separated fission products intended for short-term storage, possibly for transmutation, and for long-term disposal in specialized waste forms.
- The minor actinides (americium and curium) for transmutation in fast reactors.

The advanced separations approach has several advantages:

- It produces minimal liquid waste forms and eliminates the issue of the "waste tank farms."
- Through advanced monitoring, simulation, and modeling, it provides significant opportunities to detect misuse and diversion of weapons-usable materials.
- It provides the opportunity for significant cost reduction.
- Finally, and most importantly, it provides the critical first step in managing all hazardous elements present in the used nuclear fuel.

The second step—partial recycle in conventional reactors—can expand the opportunities offered by the conventional mixed-oxide approach. In particular, it is expected that, with significant R&D effort, new fuel forms can be developed that could burn up to 50% of the plutonium and neptunium present in used nuclear fuel. Some studies also suggest that it might be possible to recycle fuel in these reactors many times—i.e., reprocess and recycle the irradiated advanced fuel—and further destroy plutonium and neptunium; other studies also suggest possibilities for transmuting americium in these reactors. Nevertheless, the practicality of these schemes is not yet established and requires additional scientific and engineering research. The advantage of the second step is that it reduces the overall cost of the closed fuel cycle by consuming plutonium in conventional reactors, thereby reducing the number of fast reactors needed to complete the transmutation mission of minimizing hazardous waste. As mentioned above, this step can be entirely bypassed, and all transmutation performed in advanced fast reactors, if recycle in conventional reactors is judged to be undesirable.

The third step, closure of the fuel cycle using fast reactors to transmute the fuel constituents into much less hazardous elements, and advanced reprocessing technologies to recycle the fast reactor fuel, constitutes the ultimate step in realizing sustainable nuclear energy. This process will effectively destroy the transuranic elements, resulting in waste forms that contain only a very small fraction of the transuranics (less than 1%) and all fission products. These technologies are now being developed in the U.S. at Argonne National Laboratory and Idaho National Laboratory, with parallel development internationally (e.g., Japan, France, and Russia).

Several disadvantages have been noted for a closed fuel cycle, including:

- Increased cost. (Note that, in practice, closed fuel cycle processes actually would have limited economic impact; the increase in the cost of electricity would be less than 10%.)

- Expected increased generation of low-level waste, although this increase might be addressed successfully through improved technologies.
- Management of potentially weapons-usable materials may be viewed as a proliferation risk.

These disadvantages can be addressed through a robust research, development, and demonstration program focused on advanced reactors and recycling options. In the end, the full recycle approach has significant benefits:

- It can more effectively utilize repository space.
- It can effectively increase the use of natural uranium.
- It eliminates the uncontrolled buildup of isotopes that are a proliferation risk.
- An advanced reactor and associated processing plant can be deployed in small co-located facilities that minimize the risk of material diversion during transportation.
- A fast reactor does not require the use of very pure, weapons-usable materials, thus decreasing proliferation risk.
- Finally, full recycle can usher the way towards full sustainability to prepare for a future time when uranium supplies may become increasingly difficult to obtain.

In summary, the overarching challenge associated with the choice of any fuel cycle option is used nuclear fuel management. While geologic repositories will be needed for any type of nuclear fuel cycle, a closed fuel cycle would result in very different use of a repository. For reprocessing to be beneficial (as opposed to counterproductive), it must be followed by recycling, transmutation, and destruction of the long-lived radiotoxic constituents (i.e., plutonium, neptunium, americium). Reprocessing (with PUREX) followed by thermal-recycling (mixed-oxide [MOX] fuel in light water reactors [LWRs]) is well established, but is only a partial solution. It is not at all clear that the United States should embark on this path, especially since we have not made a large investment in a PUREX/MOX infrastructure. (N.B. The U.S. is proceeding with a plan to reduce excess-weapons plutonium inventory using MOX in LWRs.) In contrast, advancement of fast reactor technology for transuranic recycling and consumption would maximize the benefits of waste management and also allow essential progress toward the longer-term goal of sustainable use of uranium (and subsequently thorium) with fast reactors. These differences illustrate the importance of integrating advanced fuel cycle technology research and development into any national plan to address nuclear waste management.

As we approach this subject, we also must remember that, while there is no urgent need to deploy recycling today, a once-through fuel cycle will not be sustainable if global nuclear energy generation increases substantially. To maximize the benefits of nuclear energy in an expanding nuclear energy future, it will be necessary to close the fuel cycle.

Detailed Discussion

Argonne National Laboratory

Located 25 miles southwest of Chicago, Argonne National Laboratory is a direct descendant of the University of Chicago's Metallurgical Laboratory, where Enrico Fermi and his colleagues created the world's first controlled nuclear chain reaction. Appropriately, Argonne's first mission 64 years ago was to develop nuclear reactors for peaceful purposes. Managed by the UChicago Argonne, LLC for the U.S. Department of Energy, Argonne has grown into a multidisciplinary laboratory with a unique mix of world-class scientists and engineers and leading-edge user facilities, working to create new technologies that address the most important scientific and societal needs of our nation.

Argonne's experience over many years of research and development in the advancement of nuclear energy positions it as a leader in the development of future generation reactors and fuel cycle technologies. A primary goal of Argonne's nuclear energy research program is to advance the sustainable use of nuclear energy through research and development of technologies that enable waste minimization, enhanced resource utilization, competitive economics, and increased assurance of reliability, safety, and security. Expertise in reactor physics, nuclear and chemical engineering, computational science and engineering, and fuel cycle analysis is applied in the assessment and conceptual development of advanced nuclear energy systems that meet these important goals.

In collaboration with other DOE laboratories and universities, Argonne is advancing a science- and simulation-based approach for optimizing the design of advanced nuclear energy systems and assuring their safety and security. This approach seeks increased understanding of physical phenomena governing system behavior and incorporates this understanding in improved models for predicting system performance in operating and off-normal situations. Once validated, these models allow the simulation and optimization of system design and operation, to enhance safety assurance and cost competitiveness with alternative energy supply options. They also promise to accelerate the demonstration of commercially attractive systems in partnership with industry.

Primarily, the DOE's Office of Nuclear Energy (DOE-NE), through its Fuel Cycle Research and Development program, supports Argonne's waste management and reprocessing research and development activities. The objective of Argonne's research in this area is to develop and evaluate separations and treatment processes for used nuclear fuel that will enable the transition from the current open fuel cycle practiced in the U.S. to a sustainable, environmentally acceptable, and economic closed fuel cycle.

Our research focuses on the science and technology of chemical separations for the treatment of used fuel from both commercial and advanced nuclear reactors, used fuel characterization techniques, and waste form engineering and qualification. Ongoing projects related to reprocessing and waste management include:

- Using advanced modeling and simulation coupled with experiments to optimize the design and operation of separations equipment.
- Exploring an innovative one-step extraction process for americium and curium, radionuclides that are major contributors to nuclear waste toxicity, to reduce the cost of used-fuel treatment.
- Further developing pyrochemical processes for used fuel treatment. These processes enable the use of compact equipment and facilities, treatment of used fuel shortly after discharge from a reactor, and reduction of secondary waste generation.
- Developing highly durable and leach-resistant waste forms of metal, glass, and ceramic composition for safe, long-term disposal.

In addition, Argonne's nuclear science and engineering expertise utilizes theory, experiment, and modeling and simulation in the assessment and conceptual development of innovative, advanced reactors operating with a variety of coolants, fuel types, and fuel cycle schemes. Argonne also leads U.S. development of innovative technologies that promise to reduce the cost of fast-neutron reactors and increase their reliability. These technologies include high-performance fuels and materials; compact, low-cost components for the heat transport systems; advanced power conversion and refueling systems; and improved capabilities for in-service inspection and repair.

Argonne's research into the behavior of irradiated fuels and materials supports the U.S. Nuclear Regulatory Commission (NRC) in the regulation of industry initiatives to extend the operational lifetime and optimize the operation of existing and evolutionary nuclear reactors. Leading-edge systems analysis and modeling capabilities are used to assess the relative merits of different advanced nuclear energy systems and fuel cycles for various domestic and global scenarios of energy demand and supply consistent with environmental constraints and sustainability considerations. Argonne also has expertise in the components of nuclear technology that are critical for national security and nonproliferation, including the conversion of research reactors to low-enrichment fuels, technology export control, risk and vulnerability assessments, and national-security information systems.

Current Nuclear Waste Reprocessing Technologies

PUREX

As discussed above, current commercial used nuclear fuel reprocessing technologies are based on the PUREX process, a solvent extraction process that separates uranium and plutonium and directs the remaining minor actinides (neptunium, americium, and curium) along with all of the fission products to vitrified waste. The PUREX process has over 50 years of operational experience. For example, the La Hague reprocessing facility in France treats used fuel from domestic and foreign power reactors. The plutonium recovered is recycled as a mixed-oxide fuel to generate additional electricity. This technology is also used for commercial applications in the United Kingdom and Japan.

There are a number of drawbacks to the PUREX system. PUREX does not recover the minor actinides (neptunium, americium, curium, and heavier actinide elements), which compose a significant fraction of the long-term radiotoxicity of used fuel. Advanced reactors can transmute and consume minor actinides if they are separated from other fission product elements, but incorporation of minor actinide separations into existing PUREX facilities adds complexity and is outside commercial operating experience. Moreover, existing international facilities do not capture fission gases and tritium; these are discharged to the environment within regulatory limits. Although plutonium is recycled as mixed oxide fuel, this practice actually increases the net discharge of minor actinides. Finally, the production of pure plutonium through PUREX raises concerns about materials security and proliferation of nuclear weapons-usable materials.

PYROPROCESSING

Pyroprocessing is currently being used at the Idaho National Laboratory to treat and stabilize used fuel from the decommissioned EBR-II reactor. The key separation step, electrorefining, recovers uranium (the bulk of the used fuel) in a single compact process operation. Ceramic and metallic waste forms, for active metal and noble metal fission products respectively, are being produced and have been qualified for disposal in a geologic repository. However, the demonstration equipment used for this treatment campaign has limited scalability. Argonne has developed conceptual designs of scalable, high-throughput equipment as well as an integrated facility, but to date only a prototype advanced scalable electrorefiner has been fabricated and successfully tested.

Advanced Reprocessing Technologies

Research on advanced reprocessing technologies focuses on processes that meet U.S. non-proliferation objectives and enable the economic recycling of long-lived actinides in used fuel, while reducing the amount and radiotoxicity of high-level wastes that must be disposed. Main areas of research include:

- Aqueous-based Process Design—Current studies target the simplification of aqueous processes that can recover the long-lived actinides as a group in one or two steps.
- Pyrochemical-based Process Design—Present work is focused on development of scalable, high-throughput equipment and refining our understanding of the fundamental electrochemical process. We are targeting greater control of the composition of the recovered uranium/transuranic alloy, which will facilitate safeguards consistent with U.S. non-proliferation goals.
- Off-gas Treatment—Environmental regulations limiting the release of gaseous fission products require the development of materials that will efficiently capture and retain volatile fission products. Because these volatile fission products are generally difficult to retain, development of novel materials with strong affinities for specific fission products is essential.
- Product/Waste Fabrication—This development effort includes concentrating the product streams and recovery/recycle of process fluids, solidification of products for both waste form and fuel fabrication/recycle. The products must meet stringent requirements as nuclear fuel feedstocks or must be suitable for waste form fabrication.
- Process Monitoring and Control—Advanced computational techniques are being developed to assess and reduce uncertainties in processing operations within a plant. Such uncertainties in design, in processing, and in measurements significantly increase costs through increased needs for large design margins, material control and accounting, and product rework.
- Sampling Technologies—The tracking of materials is critical to the safeguarding and operational control of recycle processes. Improving the accuracy of real-time measurements is a major goal for material accountancy and control. Reducing the turnaround time for analysis by applying state-of-the-art sampling and analytical techniques will enable "on-line" material accountancy in real time. Advanced spectroscopic techniques are under study to reduce gaps in our ability to identify key species at key locations within a plant.

Impact on Future Nuclear Waste Management Policy

The BRC draft report details possible solutions for the ultimate disposal of used nuclear fuel in the United States. To be most effective, these efforts should proceed

in parallel with advances in used fuel processing and recycling, to ensure development of a fully integrated policy for nuclear waste management in the United States—one that is consistent with our energy security, nonproliferation, and environmental protection goals.

As previously noted, high-level waste disposal facilities are required for all fuel cycles, but the volumes and characteristics of the wastes generated by these fuel cycles are different. A cohesive waste classification system will be needed to define the facilities required to support waste disposal. Currently, the United States relies on an ad hoc system based on point of origin to address management of specific wastes. The result is a complex dual waste categorization system, one for defense wastes and another for civilian wastes. This approach has resulted in high disposition costs, nuclear waste with no disposition pathways, limited disposition sites, and a system that will be difficult to align with any alternative fuel cycle that is adopted. Without a consistent waste classification system, it is impossible to compare waste management costs and risks for different fuel cycles without making arbitrary assumptions regarding theoretical disposition pathways.

The International Atomic Energy Agency (IAEA) recommends a risk-based classification system that accounts for the intensity of the radiation and the time needed for decay to an acceptable level. The intensity of radiation is given by a range of radioactivity per unit of weight. Decay time is split into short lived (<30 years) and long lived (>30 years). The IAEA system does not consider the source of nuclear waste in either categorization or disposition options. The result is a simple, consistent, standardized system.

The question of waste categorization is yet another example of why reprocessing technologies should be fully considered in any discussions about disposal options and long-term waste management policies. Alternative technologies will have different economies of scale based on the type and number of wastes. In addition, waste packages may be retrievable or not, and waste forms should be tailored to the repository site geology. Given the need to craft the most cost-effective solution, it would be a missed opportunity to approach the question of long-term disposition without developing a congruent approach to the fuel cycle.

An Effective Fuel Cycle Strategy Going Forward

Argonne believes that advanced recycle processes and waste management technologies should be developed and demonstrated at engineering scale during the next few decades. To enable an effective research and development strategy, the development of advanced fuel treatment technologies and waste forms must be closely coordinated with R&D on:

- Advanced fuels and interim storage strategies for current light water reactors (LWRs), as these affect the requirements on reprocessing and waste technologies. Research on advanced fuels for light water reactors is one of the proposed thrusts of the DOE-NE Light Water Reactor Sustainability program.
- Advanced reactors such as liquid metal and gas-cooled "Generation IV" reactors, which employ different fuel types and thus discharge used fuel that is very different from that of LWRs. Advanced fast spectrum reactors can efficiently consume the residual actinides in used nuclear fuel, effectively converting these actinides to electricity instead of discharging them as waste.

Recommendations

As part of our long-term strategy for nuclear waste management, the United States should conduct an advanced nuclear fuel cycle research, development, and demonstration program to evaluate recycling and transmutation technologies that minimize proliferation risks and environmental, public health, and safety impacts. This would provide a necessary option to reprocessing technologies deployed today, and supports evaluation of alternative national strategies for commercial used nuclear fuel disposition, effective utilization and deployment of advanced reactor concepts, and eventual development of a permanent geologic repository(s). This should be done as part of robust public-private partnerships involving the Department of Energy, its national laboratories, universities, and industry, and conducted with a sense of urgency and purpose consistent with the U.S. retaining its intellectual capital and leadership in the international nuclear energy community.

Over the next several years, the research, development, and demonstration program should:

- Complete the development and testing of a completely integrated process flow sheet for all steps involved in an advanced nuclear fuel recycling process.

- Characterize the byproducts and waste streams resulting from all steps in the advanced nuclear fuel recycling process.
- Conduct research and development on advanced reactor concepts and transmutation technologies that consume recycled byproducts resulting in improved resource utilization and reduced radiotoxicity of waste streams.
- Develop waste treatment processes, advanced waste forms, and designs for disposal facilities for the resultant byproducts and waste streams characterized.
- Develop and design integrated safeguards and security measures for advanced nuclear fuel recycling processes that enable the quantification and minimization of proliferation risks associated with deploying such processes and facilities.
- Evaluate and define the required test and experimental facilities needed to execute the program.

Upon completion of sufficient technical progress, the program should:

- Develop a generic environmental impact statement for technologies to be further developed and demonstrated.
- Conduct design and engineering work sufficient to develop firm cost estimates with respect to development and deployment of advanced nuclear fuel recycling processes.
- Cooperate with the NRC in making DOE facilities available for carrying out independent, confirmatory research as part of the licensing process.

Argonne supports a greater emphasis on coupling the science-based approach for system development with an active design and technology demonstration effort that would guide and appropriately focus R&D, and thus enable assessment of programmatic benefits in a holistic manner. This would be accomplished by close cooperation of DOE, national laboratories, universities, and industry. The overall approach would seek to:

- Increase understanding of the diverse physical phenomena underlying reactor and fuel cycle system behavior.
- Improve ability to predict system behavior through validated modeling and simulation for design, licensing; and operation.
- Develop advanced materials, processes, and designs for reactor and fuel cycle systems through application of scientific discoveries and advanced modeling and simulation capabilities, as well as the insights and lessons learned from past nuclear energy development programs.

These efforts would allow for fuel cycle demonstration in a time frame that could influence the course of fuel cycle technology commercialization on a global basis. Moreover, each of the individual elements of the planned R&D (e.g., separations, waste forms, transmutation fuels) is potentially vast in scope and could absorb substantial resources, without commensurate benefit, if the different areas are not sufficiently integrated for the results to fit together in a viable system.

It is clear that the United States must address significant hurdles, both in policy and in technology, as we seek effective solutions to the pressing question of used nuclear fuel management. We can expect success only if we can craft a consistent national policy that includes substantial support for a robust advanced fuel cycle research and development program, to be carried out through strong public-private partnerships involving the Department of Energy (DOE), its national laboratories, universities, and industry. This program must be focused on outcomes and closely integrated with storage and disposal efforts. It also must support evaluation of alternative national strategies for commercial used nuclear fuel disposition in close conjunction with ongoing efforts to site and develop a permanent geologic repository(s). Ultimately, this program must lead to down-selection, demonstration, and deployment of effective advanced fuel cycle technologies. Only through a reasoned plan for research, development, and deployment can we expect to reach a wise, workable decision on a preferred fuel cycle technology that will enable safe and sustainable expansion of the U.S. nuclear fleet.

Chairman BROUN. Thank you, Dr. Peters. I thank the panel for you all's testimony. Reminding members that Committee rules limit questioning to five minutes, the Chair at this point will open the first round of questions. The Chair recognizes himself for five minutes.

Mr. McLeod, in your opinion, does the demand of the Secretary of Energy that BRC exclude Yucca in its deliberations detract from its ability to develop the best possible recommendations for nuclear waste management?

Mr. MCLEOD. Yes, sir, Congressman, we do. We believe that is fact. We also believe that they could—we know eventually there is going to have to be another repository as well. We can move first with Yucca Mountain and then start work on the second one, and as I stated in our testimony, the written testimony, we also believe that maybe one of the missing recommendations from this report is where is the recommendation to utilize Yucca Mountain.

Chairman BROUN. Very good. Thank you.

Dr. Swift, please summarize the scientific evaluation of Yucca Mountain that you led for Sandia and the Department of Energy. How many years was the site studied? Can you describe some of the issues considered—hydrology, seismic activity, the robustness of engineering barriers—and what was found? Ultimately, what was concluded regarding the site's suitability and its ability to meet NRC safety recommendations and requirements?

Dr. SWIFT. Thank you. Certainly. The site was studied from the early 1980s until the time the license application was submitted. Work continued after the submittal of the license application in response to questions received from the NRC. Just in terms of the—one way to look at it is the volume of the work, the page count. The application is about 8,000 pages, 8,600. You know, there are 196 documents that went with it. These were not simple documents. These were thick technical reports, maybe 50,000, 60,000 pages total. The types of topics that were addressed, from a technical point of view, we saw our responsibility to evaluate essentially everything that was potentially relevant, so we catalogued what might happen, potentially relevant things, and including things that were on the face of them probably not relevant but for completeness there they were—changes in sea level, the effects of future changes in sea level, for example, effects of erosion at the land surface well above where the waste would be buried, seismic effects, the effects of possible volcanism at the site. Each of these ends up with a detailed technical analysis, specialists focusing on it, sometimes for years.

The other processes, groundwater flow, transport of radionuclides in the groundwater away from the site, the way radionuclides might be taken up in the biosphere through potential pathways for human exposure in the future, the treatment of uncertainty that Professor Kasperson mentioned, and all of this we did attempt to estimate the range of uncertainty in our knowledge understanding of those physical processes, and that would be incorporated into what I refer to as an estimate, not a prediction of the future. It is an estimate based on our understanding of the uncertainty.

And I think you asked for the conclusions of it. Again, as I said in my testimony, we concluded with good confidence that the site would perform well, that it would meet the NRC and EPA requirements, that the two things, the primary measures that the regulations judge on would be the releases from the site into groundwater and potential doses to humans. Those are both well below regulatory limits.

Chairman BROUN. Very good, sir. Thank you.

Mr. Hollis, the State of Nevada currently opposes the repository at Yucca Mountain. You were very clear that your local community does ardently support it being there. One of the primary recommendations from the draft, the Blue Ribbon Commission report, was that any repository should have local support. Why does Nevada oppose the Yucca Mountain project yet your county favors it, and how do you define consent-based siting and local support?

Mr. HOLLIS. Mr. Chairman, I think one of the big things is people calling it a dump. If you go out and ask people, do you favor a radioactive site, that it is a dump, you are going to get no, I don't want it. If you were to ask them, do you want a repository to keep the radioactive source safe, you will probably get a yes. Most people keep their money in banks. Banks are a repository. That is what this facility is, a repository to keep something safe.

And as far as the consent basis program, the Blue Ribbon Commission didn't answer any question. What if a State doesn't or no State wants the repository? That is the reason Congress had a provision in there that the Congress would vote on it after a disapproval by the State.

Chairman BROUN. Very good. My time is expired.

Now I recognize the Ranking Member Tonko for five minutes.

Mr. TONKO. Thank you, Mr. Chair.

Dr. Kasperson, could you briefly tell us about the role of politics in the 1987 decision to designate Yucca Mountain as a permanent repository for waste?

Dr. KASPERSON. The history of radioactive waste management not only in the United States but elsewhere has indicated that it has never been a purely scientific process anywhere as far as I know, and there has always been a mixture of politics and science and interaction between the two, in particular, a 1987, a concern that I think went through the scientific community as well as people in Nevada. By the way, I also don't like the terminology of calling a repository a dump, but I don't think we fix the problem by changing the name.

Anyhow, in the case of the 1987 amendments, what happened in effect was that although a commitment had been made in the original Nuclear Waste Policy Act to have a competitive process, if you will, about characterizing the technical qualities and quality assurance and risks associated with sites, a decision was made basically to make the choice prior to the scientific work being completed, and that was a major problem in a loss of social trust and in polarizing the local people of Nevada. There have been other issues like this, for example, in the Nuclear Waste Policy Act of fairness. Actually, Congress, I think, tried very hard on—in that legislation to achieve fairness of process, and subsequently the President simply eliminated the eastern repository as basically a political move, I think, primarily because of the dangers that were represented and the election going on at that time.

Mr. TONKO. Now, even if the geology and the climate, for instance, were perfect or are perfect, which some dispute, Yucca has been a political failure with, you know, then-Presidential candidate Senator Obama promising to close it. Now, leading Republican candidates for the Presidency are making that same sort of pledge,

and we hear about the vast number of Nevadans who oppose, you know, hosting that repository. Are there any lessons that you can cite for us, Dr. Kasperson, from the failure that can be used to guide future siting processes?

Dr. KASPERSON. Well, let me indicate one example. I spent some time in Sweden earlier, in the early years of this century, and had some contact with their process there, and the Swedes really take a rather different approach than we have taken, and I think it is a lesson from both the process going on in Sweden and a lesson from Yucca Mountain that if you really rely upon coercion rather than on trying to achieve a high degree of voluntary consent, you are going to find yourself in a war with local States, and I think a number of us wrote in the 1980s that we already had learned enough about radioactive waste management to know that if you had to deal with trying to coerce an unwilling State with an active and talented Attorney General, you were going to have a major problem in winning over consent, and the polarization that has happened in Nevada is, I think, a good lesson that we ought to try to do more of what the Swedes have done of achieving a high degree of voluntary consent, taking things off the agenda that local people are concerned about and moving that whole process along, greasing the wheels rather than producing the backs up of local people.

Mr. TONKO. I yield back.

Chairman BROUN. Thank you, Mr. Tonko.

Now I recognize my fellow Subcommittee Chairman, Dr. Harris, for five minutes.

Mr. HARRIS. Thank you very much, Mr. Chairman.

I want to get back to, you know, talking about the science of Yucca Mountain. We have spent, as I said in my opening statement, billions of dollars, many of years studying it, and all the science that we are aware of right now says that the nuclear waste can be stored there safely, but much of that scientific effort and data is being blocked from public view because the NRC simply refuses to release the safety reports that scientists prepared and refuses to complete its review of the Yucca Mountain license application. In fact, Chairman Hall, Dr. Broun and myself have sent multiple letters to the NRC demanding release of this information and action on the license.

I want to ask the panel, and begin with Mr. Spencer, how important is it for the NRC to finalize and release its scientific reviews of the site, that is, the safety evaluation reports? Can any of you think of any reason why you would want to withhold any of that from the public, stonewall this, and what does the continued suppression of those reports mean with respect to the scientific integrity goals and guidelines that this Administration, you know, to their credit regularly talk about but, you know, I would like to actually see it in action? So, Mr. Spencer.

Mr. SPENCER. As I testified today and I have written extensively on in the past, I think it is absolutely critical that all that information be made available if for no other reason, notwithstanding whether we ever build the repository or not, to allow us all to make the most informed decisions possible about Yucca Mountain. In addition to that, the fact is, we have spent as a country $15 billion

characterizing that project. There simply is no good reason not to allow all the information relevant to that project be shown the light of day so that we can make our determinations on that.

Mr. HARRIS. Thank you.

Dr. Swift, any reasons you can think of not to do it?

Dr. SWIFT. I want to thank you for the question. I want to emphasize the importance of the role of the regulator in this process. I asserted earlier that I believe the site meets those regulations. The test of that is when a regulator makes that finding. I as a scientist don't actually make a decision here. I inform a decision, and we do have a process here which decision is up to the regulator, a lengthy and detailed process to be followed. Yes, I see value in following that process.

Mr. HARRIS. Mr. McLeod?

Mr. MCLEOD. I will give a short answer. Yes, they should release the report.

Mr. HARRIS. No reason you can think of where we should hide any of that from the public?

Mr. MCLEOD. No reason.

Mr. HARRIS. Okay. Dr. Peters?

Dr. PETERS. Yes, I would agree. I would like to see it released. The reason I would also like to see it released is because regardless of whether we move forward with Yucca Mountain, we have to develop a repository, so there is a tremendous amount to learn from understanding what——

Mr. HARRIS. What we have done so far.

Dr. PETERS. What we have done so far and what the regulator said about the license application.

Mr. HARRIS. Thank you.

Let me just ask two other very short questions. One is, is that, you know, Dr. Kasperson, I appreciate your point about, you know, coercion versus voluntary consent. That is important. But right next to you is Mr. Hollis. I mean, he lives in the area. His family drinks the water, breathes the air, and he is here, he doesn't look coerced to me. So I am going to ask you, Mr. Hollis, you know, according to your testimony, you have—Nye County has done some scientific investigation, according to your written testimony, and based on that, I mean, do you need to be coerced or are you, you know, looking at the data, looking at what the county itself looked at, you want to be neighbors with this facility?

Mr. HOLLIS. Absolutely. We have had a really good relationship with the Department of Energy until about two years ago, three years ago, then they started cutting down the program. The cooperation kind of went blank. And they don't talk to us much anymore.

Mr. HARRIS. But your testimony is that the county most affected and the people most affected, and it will never be everyone but they want this to go forward, at least to complete the investigation?

Mr. HOLLIS. Absolutely. I have—I don't get calls on Yucca Mountain. I get more phone calls on dogs and cats than I do——

Mr. HARRIS. I appreciate that, being a local elected official. I appreciate that.

Dr. Swift, I just want to ask you one question, because I understand the DOE has asked Sandia to begin review of deep borehole

methods versus other methods of disposal. Could you just briefly discuss the advantage and disadvantage of the deep borehole methods, and then of course whether or not—because one of the conditions that is supposed to be retrievable is whether or not that is accomplishable with a deep borehole method.

Dr. SWIFT. With respect to that last point first, if permanent disposal is not what you intend, a deep borehole probably is not the preferred option. There are ways to retrieve things out of a deep borehole. The oil industry, for example, can retrieve things from quite surprising depths out of a hole. But no, you are making it harder on yourself there.

The premise of the concept is, you drill a relatively large diameter hole, say a half a meter in diameter, to maybe a five-kilometer depth into bedrock, crystalline bedrock, and you use the lower two kilometers of the hole for disposal and that gives you a very long column to seal it. It is a very long transport pathway for radioactive material to come back out. The premise is straightforward. The technology is within reach now. It is there now to implement it. There is work to be done to demonstrate that seal technology would work, that the permeability of bedrock at that depth is as low as we think it is. There is work to be done.

Mr. HARRIS. And just out of curiosity, and I know I am a little over time, about how many of these boreholes would you need for the current nuclear waste we have? It seems like you would need a lot. Any idea?

Dr. SWIFT. Yes, we looked at that. Without reconsolidating waste and just taking the fuel assemblies as they exist today, the entire projected inventory from the current fleet of 104 commercial reactors would fit in under—probably under 1,000 boreholes.

Mr. HARRIS. Okay. Thank you very much.

I yield back.

Chairman BROUN. Thank you, Dr. Harris.

The Chair now recognizes Mr. Miller for five minutes.

Mr. MILLER. Thank you.

Dr. Kasperson, I had the experience a couple years ago of living through a proposal to locate a facility in my district that initially everyone was for, and by the time it was done, hardly anyone was for it. It was a biological research center. It was to move the Plum Island facility from Plum Island. Supposedly, the decision to site it there in the first place was always completely political. There was a provision written into the law that required that it be on an island, supposedly to contain foot-and-mouth disease but supposedly that was always just to make sure it went to Plum Island and had no scientific basis. Initially everyone saw it as research, great jobs with all four of the county commissioners of that county was for it, everybody nearby was for it. NC State was for it, Duke was for it, Carolina was for it, everybody was for it. Over the course of several public hearings, all public support for it in Granville County deteriorated, and eventually the county commissioners reversed their positions, and at that point I reversed my position from having supported local government's desire to bring it into their county to not supporting bringing the facility to a county in my district that did not want it.

How would the NBAF—it was called NBAF, that is an acronym for something—how did bringing—how did the siting decision for NBAF compare to the Yucca Mountain decision? Are you familiar with both processes?

Dr. KASPERSON. No, I am really not, but I might make one observation, that we have been looking with interest on the siting of wind energy facilities in the United States, and everybody agrees in principle. At first, everybody favors it, and they agree in principle that wind energy is a fairly benign energy source as compared with nuclear and coal and so forth. But we also know that in many of these cases what starts—what you are seeing in that particular facility is something that occurs in many places, that people start off very positive about it. As they learn more and as issues are raised about it and risks get onto the agenda and become discussed, that people's fears and concerns tend to take over in the process, and many of these situations end up with people quite negative, and I think it has become really difficult for hazardous facilities, hazardous industrial facilities and energy facilities very generally, even when they are as benign as wind energy and solar units, for example, to site any of those things, and the Cape Wind case, which you may be familiar with, is a good illustration of this where there has been a 10-year fight about establishing offshore wind turbines.

Mr. MILLER. Mr. Hollis, you testified that there is support in your county that would actually be the—the Yucca Mountain facility would actually be in your county and that folks in your county do support it, see it as bringing jobs, economic activity, and as I said in my opening statement, though, this high-level nuclear waste, although there are concerns enough about keeping it someplace safely for 10,000 years, you have got to get it there first and it will not magically appear at Yucca Mountain, and all the rail lines, all of the roads that it would likely travel through, on to get to your county, to the Yucca Mountain facility, go through Las Vegas, and what is the population of your county and what is the population of Las Vegas, and would there be any jobs associated with having high-level nuclear waste coming through Las Vegas on roads or on rail?

Mr. HOLLIS. Well, I have shipments of waste going to the test site pretty much every day, and none of that waste goes through Las Vegas. All of it goes around Las Vegas into Nye County and to the test site.

Mr. MILLER. Okay. My understanding is that 80,000 shipments a year would go through Clark County, through Las Vegas.

Mr. HOLLIS. Far as I know, none of the shipments would go through downtown Las Vegas.

Mr. MILLER. Downtown Las Vegas. How about Clark County?

Mr. HOLLIS. There might be a few shipments that would come in from down and towards California but far as I know, all of it—well, there might be some coming across a little piece of Clark County going into Lincoln County, but most of it would go around Clark County.

Mr. MILLER. Why is Clark County designated as an affected area?

Mr. HOLLIS. Well, I think it is an affected area. We used it as affected local units of government because it was designated at one time to have transportation. But there has never been any transportation that I know of nuclear waste going through Clark County. All the nuclear waste comes through Nye County, and I get it from every which way, no matter if it comes east, west, north or south. It has to go though Nye County.

Chairman BROUN. The gentleman's time is expired. I now—the Chairman now recognizes Ms. Biggert for five minutes.

Mrs. BIGGERT. Thank you, Mr. Chairman, and thank you for holding this hearing. I wish that this wasn't kind of a getaway date because I think this is a very important hearing, and we really could spend a lot more time, I think, than we have today.

Dr. Peters, I have been at Argonne, and since I have been in Congress, we have gone through electrometallurgic process, we have gone through the pyro process, we have gone through the reprocessing, and now we are talking about recycling, and so I would like to know what you recommend for the next stage for the advanced nuclear fuel cycle R&D program.

Dr. PETERS. I think DOE, Department of Energy's, nuclear energy program has a lot of the right priorities set in place, so we have an R&D program that is developing advanced fuels for transmutation and fast reactors. There is fast reactor R&D going on. There is also work on materials for reactors and also bench-top experiments on electrometallurgical or pyro processing as well as aqueous reprocessing of spent fuel, so there has been tremendous research done. Resources are being provided. That needs to continue. As I said in my testimony, my plea would be to take that to try to start to develop some down-selection and actual demonstration of some of these technologies at the pilot scale. Take it out of the lab and start to demonstrate at the pilot scale working with industries. Even by the end of this decade would be optimal.

Mrs. BIGGERT. You know, we really tried to jumpstart with GNEP and several programs and it just—it just seems to be stalled. Wouldn't it make a difference if we had the closed nuclear fuel—the closed reactor to be able to then recycle and recycle and recycle so that we don't have the waste that really—if we were to put the waste into some repository like Yucca Mountain, it would fill up with all the nuclear waste that we have right now, and it seems like before we really, you know, make such a site, that really to get the advanced fuel cycle recycling going would really be a benefit to how we are going to deal with this waste.

Dr. PETERS. Yes, I agree. I agree, Mrs. Biggert. I think closing the fuel cycle will have a variety of benefits. It will reduce the volume and the toxicity of the waste. As I said before, there is still a repository required, but you could design a repository in a much different way if you close the fuel cycle. All that would go there is fission product waste. And you can also optimize the real estate that you take up in a repository, Yucca Mountain or any other repository. You are also reusing the actinides in the uranium to make additional electricity, so it is a more sustainable approach. The research that we are doing is to try to make it more economic and also reduce the amount of waste that is produced from those processes, but I firmly believe that if you grow nuclear, closing the

fuel cycle is the right path, but we have got to—if I may, I would actually like to go back briefly to the question about boreholes because it is a systems question.

I would argue, it may not make sense to put spent fuel down a borehole, but it may make sense to put process waste down a borehole, so you have got to think about this whole thing as a system. The repository has to work with whatever fuel cycle you decide to do.

And back to your point about the GNEP program, I think we—I would like to think we learned from that, and I think we did premature down-select in that case. I think we need to do a much more rigorous job of doing the R&D and having a transparent selection process that would allow us to down-select.

Mrs. BIGGERT. And a demonstration?

Dr. PETERS. Right, into a demonstration. I agree.

Mrs. BIGGERT. Thank you.

Mr. McLeod, you seem to be——

Mr. MCLEOD. I wanted to say that we would love to see the R&D done at the H Canyon at the Savannah River Site, which is one of the few facilities that could do that research and development.

Mrs. BIGGERT. I might fight for Argonne, but we could do it more than one place.

Thank you. I yield back.

Mr. MCLEOD. We would be glad to share.

Chairman BROUN. Thank you, Ms. Biggert.

The Chair now recognizes Mr. McNerney for five minutes.

Mr. MCNERNEY. Thank you, Mr. Chairman.

This is an important and serious topic, and I am getting the feeling, or I got the feeling, that the majority party here is using at least in part this topic as an opportunity to bash the Obama Administration. So we are going down a political path that we don't need to go down, and I would rather talk about this in terms of issues that are going to help us solve the problem.

As a graduate student at the University of New Mexico, I studied—I worked on a fault tree analysis for the Waste Isolation Pilot Project. So I have some scientific understanding of the issue, and my opinion is that deep geologic sequestration is a good approach and it can work, but I agree wholeheartedly with Dr. Kasperson that public trust and public acceptance is absolutely essential. We are not going to get this solved unless we have the public trust. Lawsuits are going to hold up everything. And, you know, I do appreciate the comments of Mr. Spencer that—or at least the approach that we think about using a method that will gain public acceptance. It is just that going to the private sector and letting them take care of it is not going to really engender public acceptance, and in fact, it would require an enormous amount of federal oversight and then there is also profits involved, so I think it would end up costing more and getting less done, so that is why I would not favor that particular approach.

But I do think that you start out, Mr. Spencer, with very inflammatory language when you said the Obama anti-Yucca policy, and again, when you use that language, shutters close and people are going to react in a negative way, so my recommendation is to take

a less inflammatory approach to this if you want to get your idea across. That is just a recommendation that I give to you personally.

Now, I wanted to ask Dr. Swift, I thank you for your testimony and I wanted to ask you personally, do you think that there is other alternatives to the Yucca Mountain that would be technically feasible?

Dr. SWIFT. Yes, I do.

Mr. MCNERNEY. I mean, one of the things that struck me here is, I think that nuclear waste has potential value in the future, and drilling a hole down there five kilometers and just dumping material waste and then closing it up, it is not going to be a repository, it is going to be a dump. Nuclear waste needs to be carefully stored and safely stored and monitored with the idea, in my opinion, that a withdrawal sometime in the future will be necessary. So I can't say that I like that approach very well. That isn't what is being done at the Waste Isolation Pilot Plant, is it?

Dr. SWIFT. The—on your last point there, the Waste Isolation Pilot Plant does not have waste that has any particular recycling value to it.

Mr. MCNERNEY. Right.

Dr. SWIFT. It would not be easy to recover waste out of it but it would be feasible, and that is actually a regulatory description of the situation. You would mine back through the salt and extract the salt and the waste at the same time. It can be done.

In terms of other viable alternatives, for those that are fully retrievable at all times, actually Yucca Mountain was an excellent—that was one of the strongest features of Yucca Mountain because of its location above the water table in dry rock. Retrievability is fairly straightforward there. But other disposal options, the Swedish granite repository concept also being employed in Finland, being developed there. The French are looking and the Belgians and the Swiss are looking at disposal in clay formations. The Germans are looking at disposal in salt formations. These are concepts that are potentially viable in this country also as alternatives to Yucca Mountain.

Mr. MCNERNEY. How is the—what is the current plan for encasing the actual high-level waste? Is it encased in—not in barrels obviously but in glass formations or something before it——

Dr. SWIFT. It——

Mr. MCNERNEY [continuing]. Can be sent downstairs?

Dr. SWIFT. It depends on the environment you would want to put it into. You would want to choose a metal canister that was as corrosion-resistant, as long-lived as possible in the environment you were putting it in. So for example, in chemically reducing environments such as deep granites or clays, copper is a metal of choice. It is very stable in a reducing environment. In Yucca Mountain, where it is an oxidizing environment, the choice was a nickel-molybdenum-chromium-based alloy called alloy 22 that was as corrosion-resistant in that environment as we could come up with.

Mr. MCNERNEY. Well, I guess my final words are that we need to have public buy-in on this, and using inflammatory language isn't going to help that happen.

Chairman BROUN. Thank you, Mr. McNerney.

The Chair now recognizes Mr. Rohrabacher for five minutes.

Mr. ROHRABACHER. Thank you very much, and I am very happy to hear Mr. McNerney admonish people for using—politicizing science and using harsh language. I guess when George Bush was in, that never happened. The other side never did that when Bush was in. I just want to make that clear for the record, that that only happens now.

Let me just note that when you find yourself—this is a truism that I have learned. When you find yourself in a hole that you don't want to be in, you should quit digging. That is a truism. And in this case, it sounds like to me what we have done is we have a Blue Ribbon Commission who is supposed to come up with our alternative or a vision of what we are going to be doing with nuclear waste, and they can't get out of their mind the idea of digging a hole, and what I have seen here and what I am listening to is that it sounds like new technologies are not being addressed. What is being addressed is digging the hole. Can we dig the shafts this deep or whatever, whatever. You know, this—talk about old think. This is the ultimate old think, and here we were supposed to have a Blue Ribbon Commission that was going to give us a vision of what we would do in the future, and it has all been based on only what has been happening in the past. The Blue Ribbon Commission seems, from what I am understanding, what I can see here as well as from what I have heard, is that they have been negative or even hostile to looking into new concepts, for example, gas-cooled reactors, thorium reactors, or fast reactors, and their interest in small modular reactors seems to stop right at, let us say, the water's edge, meaning that they are only interested in looking at water-cooled reactors.

What I don't understand is, we have several very prominent scientific and very, very responsible companies that are involved with development of technologies that have told us there are other alternatives than water-cooled reactors and they have done the science. One of them is General Atomics, who has a great track record. And we have many people talking about small modular reactors. We have many people talking about these pebble-based reactors, pebble base for fuel. All of these things offer a tremendous alternative to digging a hole and letting it sit there for thousands of years. I am shocked to hear that we have spent $15 billion on digging a hole in Yucca Mountain but we haven't been able to come up with the money necessary to build a prototype of one of these reactors that would go a long way in reducing the challenge of nuclear waste. Am I wrong that these new reactors do offer a promise in the future of reducing the amount of nuclear waste that we would face? Dr. Peters?

Dr. PETERS. No, you are not wrong, but I would emphasize the word "promising." If I may, a lot of what you are referring to, the fast reactor technology has been demonstrated in the United States and worldwide so it could be—if there was a market for a fast reactor in the United States, we could develop that relatively quickly.

Mr. ROHRABACHER. The market? Where is the market for $15 billion to dig a hole in the desert?

Dr. PETERS. But——

Mr. ROHRABACHER. I mean, there is a market for the fact that we would be creating electricity and there would be less nuclear waste left over here.

Mr. Chairman, this is—what we have here is an example. If you put the people in the electronics industry who only could think about building the huge computers of the past, you know, they used to build them as big as this room, and then you got them to say well, can we—is there any solutions that we might have by building a small computer or maybe there could be a computer the size of your telephone. They wouldn't know what you were talking about.

There are some visionaries in this country that can help us solve the problem of nuclear waste, and we aren't even building the prototypes and moving forward on the prototypes to see if they are actually correct, but the people who are advocating this are very high-quality scientists and engineers and people in the private sector. I would suggest that this hearing, while—and the Blue Ribbon Commission, while they have focused on what was—what they could have focused on in the 1970s should be focusing on a vision for the better future based on technologies that can change our reality, and until we do that, I am just afraid that we are—$15 billion. We are going to waste another $15 billion?

Thank you very much, Mr. Chairman.

Dr. PETERS. Mr. Chairman, may I real quick, very quickly respond?

Chairman BROUN. Very quickly.

Dr. PETERS. I guess I just wanted to—I mean, I don't want to disagree. I want to agree with everything that you said, but a lot of the promising ones that you are referring to are on paper at this point so we need to go do the research and the prototyping to——

Mr. ROHRABACHER. Yeah, but they were put on paper by prominent scientists and people who have built nuclear power plants and people who are—we are not saying Dana Rohrabacher put it on paper.

Dr. PETERS. No, but we——

Mr. ROHRABACHER. Some really prominent people put it on paper.

Dr. PETERS. We need to make the investment to do it.

Mr. ROHRABACHER. Albert Einstein put something on paper and he ended up helping us usher us into this nuclear world.

Chairman BROUN. Thank you, Mr. Rohrabacher.

Before we close, I would like to enter in the record by unanimous consent a number of documents previously exchanged with the Minority. Without objection, so ordered.

[The information may be found in Appendix 2.]

Chairman BROUN. This hearing has allowed the Subcommittees to hear expert outside opinions about the BRC draft report. For the record and in response to comments by the minority at the outset, the Committee was in contact with the BRC prior to the hearing at which time that they indicated it would be premature to participate as their report is still in draft form and they are continuing to accept public comment. We will certainly continue to work with the BRC as they finalize their report and we will likely have an opportunity to hear from the BRC after they finalize their report.

I want to thank the witnesses for you all's valuable testimony and the members for you all's questions. The members of the Subcommittee may have additional questions for you all, and we ask for you to respond to those in writing, and please do it quickly. The record will remain open for two weeks for additional comments from members.

The witnesses are now excused and the hearing is now adjourned, and I thank you all very much.

[Whereupon, at 12:43 p.m., the Subcommittees were adjourned.]

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mr. Jack Spencer, Research Fellow, Nuclear Energy Policy, Heritage Foundation

Questions Submitted by Representative Paul C. Broun, Chairman, Subcommittee on Investigations and Oversight

Q1. Do you believe the demand of the Secretary of Energy that the Blue Ribbon Commission exclude consideration of Yucca Mountain as the site for a permanent geological repository in its deliberation detract from its ability to develop the best possible recommendation for nuclear waste management?

A1. I absolutely believe that the demand by the Secretary of Energy to exclude any consideration of Yucca Mountain from the Blue Ribbon Commission on America's Nuclear Future detracted from the Commission's ability to develop the best possible answer. As the Blue Ribbon Commission (BRC) stated in its draft report, the Nation will need a geologic repository regardless of what other technologies are brought to bear for the disposition of high-level commercial nuclear waste. Further, the BRC's establishing document demands that it consider "all" options for nuclear waste disposal.

Given both its findings and its charge, reason would dictate that the BRC be free to consider the Yucca location. After all, federal statue names the site as the Nation's nuclear waste repository and the Nation's taxpayers and electricity rate payers have invested over $15 billion in it so far. Thus, demanding that the BRC not even consider the Yucca project undermines the credibility of the entire BRC's draft findings. If it ignores the facility that most clearly meets the conditions that the BRC has determined are necessary for any nuclear waste solution, one must question the legitimacy of the remainder of its findings.

Giving the BRC the freedom to actually fulfill its charge by considering "all" options would not have necessarily been an overt endorsement of Yucca Mountain. The BRC could have acknowledged the political controversy surrounding the project and even recommended that a new site be found. At a minimum, it should have recommended that the Nuclear Regulatory Commission complete its review of the Department of Energy's application to construct the repository and that all information relevant to that review be made public, including the entire Safety Evolution Report.

However, denying the BRC the ability to even consider Yucca represents a major shortfall in the Commission's analysis.

Q2. How important it is for the Nuclear Regulatory Commission to finalize and release its comprehensive technical reviews of the site (known and the "Safety Evaluation Reports")? Are there any drawbacks from completing the technical review of Yucca Mountain?

A2. The Nuclear Regulatory Commission must release all information pertaining to the Yucca application. Regardless of whether or not the Yucca repository is ever built, the application contains critical analysis that is relevant to future repository activities. Though the information in the application is public, whether or not the NRC deemed the analysis provided by the Department of Energy sufficient to move forward with the project is not. Understanding how the NRC staff approached this analysis is critical to future repository applications.

Further, regardless of President Obama's current policy to abandon the Yucca project, the Nuclear Waste Policy Act of 1982, as amended, clearly states that Yucca Mountain shall be the site of the Nation's nuclear waste repository. The legality of the President's policy is currently being determined by the court system. Should the courts find DOE's attempt to withdraw the Yucca application to be illegal, then one would presume that the Yucca project would move forward. By releasing all data and analysis relevant to the Yucca application, the NRC would ensure that it could pick up its application review where it stopped. Just as important, the public would have access to this critical data, which would help them also to ensure that the NRC is picking up where it left off, as opposed to starting over or purposefully dragging its feet on the process.

Even if the courts were to determine that the DOE could withdraw the application, there is a possibility that the Yucca project could move forward at some future point under other circumstances. In that situation, all data regarding the NRC's review of the application would be critical.

Finally, the public deserves to know what the NRC staff thought about the Yucca project. The public has invested too much money for the government to not provide

an answer to the whether Yucca could have been built safely. This is especially true given that many in the public base their opposition to the repository on the belief that it is not safe. Should the NRC determine it is not safe, then the NRC should show clear, science-based analysis as to why it is not safe, allowing the nation to then move beyond Yucca. However, if it is deemed safe by the NRC, then the public can have an open and transparent debate on the project's merits.

Q2a. What might the continued suppression of this technical information mean with respect to the scientific integrity goals and guidelines that the President regularly touts?

A2a. Continuing to suppress this critical data seems to contradict President Obama's scientific integrity objectives. Indeed, whether one is discussing climate change policy, policies regarding access to America's vital natural resources, or nuclear waste policy, it seems that the President's policies often do not respect science-based analysis. The fact is that whether the issue is building the XL Pipeline, drilling for oil and natural gas off America's shores, or building the waste repository at Yucca Mountain, the science says one thing while the President's policies and actions seems to convey another.

Q3. You recommend that an entity other than the government have title over nuclear waste. Assuming that an entity could be created to accomplish this, what types of federal guarantees would be needed for the entity to operate in the long term? What sort of liability protections would be necessary? Do you believe the Federal Government has a role in providing liability protections to such an entity?

A3. I recommend that nuclear waste producers be responsible for managing their own waste. They are best positioned to determine whether waste should be recycled, reprocessed, placed in a repository, or some combination thereof. Government management of commercial activities does not work. The outcomes are the same each time it is attempted. Despite the best intentions of politicians and bureaucrats, they are not capable of planning the best combination of activities and investments to yield an efficient and economically sustainable commercial activity. There are simply too many variables to consider. Ultimately, nuclear waste management is a commercial activity. It is part of the process, often referred to as the nuclear fuel cycle, necessary to produce useable energy from natural uranium. And just like other parts of the nuclear fuel cycle have been successfully run by the private sector over the past decades, so too must nuclear waste management.

Instead of relying on politicians and bureaucrats to centrally manage the system, which has been a demonstrable failure, subjecting nuclear waste management to the powers of the market would yield real solutions. Ultimately, those that stand to profit from the production of waste have the greatest incentive to develop sound, safe, and economically sustainable solutions. Indeed, the private sector would even have the incentive, just as it has the ability, to develop commercial uses for spent nuclear fuel that have not been thought of before.

This does not mean, however, that the private sector should take title of the final disposed waste. Given the long-lived nature of nuclear waste, the Federal Government should take ultimate title of whatever ends up in a repository once the repository is decommissioned. In essence, the waste producers would be responsible for getting the waste from the reactor to the repository.

The repository should be privately operated as well. By allowing the repository to be privately operated and setting a specific price for emplacing waste, the nuclear industry could decide how best to manage its waste.

Imagine that the repository operator sets a price to emplace waste based on a formula that considers waste volume, heat load, and toxicity. A reactor operator would know that it costs "X" amount of dollars to place a certain amount of waste in the repository based on that formula. It could then decide how to manage its waste based on that price. Perhaps placing it in interim storage to allow the heat load and radio toxicity to dissipate, thus resulting in reduced repository emplacement costs would make sense. If so, this would create a demand for interim storage, which a company could provide. It might make sense to reprocess the fuel as well. There is any number of combinations of services that could be brought to bear. The important thing is that the market would help guide investment towards that which makes the most sense. Because the waste producers would be responsible, they would pursue those options in the market place.

Privatizing nuclear waste management, however, does not remove the role of government. The Federal Government's role would be the same as it is for the rest of the nuclear industry. It would set strict safety guidelines and enforce them through the regulatory process. I would not recommend that any federal guarantees be made. My view is that nuclear energy only makes sense if it can be done economi-

cally. I believe that it can be. But the only way to really find out is to subject the entire industry to the market. In fact, I believe that the best way to maximize its economic benefit is through market-based policies. Alternatively, the quickest way to ensure that the United States never realizes the full benefit of nuclear energy is for a major sector of the industry to be controlled by the Federal Government.

That said, there is a limited role for liability protection until the United States creates a better system that allows businesses to operate without the fear of being subject to frivolous lawsuits. I believe that nuclear waste management activities should fall under Price-Anderson as do other commercial nuclear activities. However, I also believe that the Price-Anderson should not be extended beyond 2025, the current date it is set to expire. For this to happen, however, the U.S. must engage in regulatory, nuclear waste policy, and liability reforms that would allow the commercial nuclear industry to prepare for a post-Price-Anderson environment.

Questions Submitted by Representative Randy Neugebauer, Subcommittee on Energy and Environment

Q1. In your testimony, you mentioned the importance of transferring nuclear waste disposal responsibility to the private sector. How can we ensure that the private sector will be willing to take the risks associated with nuclear waste disposal, as well as the regulatory concerns that will inevitably continue at the local, state, and national level?

A1. We do not know with certainty that the private sector will take on these risks, but I believe that they will. We do know that the nuclear industry already engages in all other parts of the fuel cycle in order to produce and sell electricity. It mines the uranium, going thousands of feet underground to retrieve the valuable ore. It takes that ore and mills it into yellowcake, which is then enriched so that the uranium can be fabricated into fuel pellets. These pellets are then placed into bundles that ultimately fuel the reactors. The private sector then takes this used fuel, stores it in cooling pools, and then moves it into dry casks where it is being safely stored indefinitely. We have seen the private nuclear industry safely and profitably engage in every step of the fuel cycle, except for waste management.

That has not always been the case. The Federal Government was at one time responsible for all parts of the nuclear fuel cycle. Most of these have been privatized over time. Most recently, in the late 1990s the nation privatized the uranium enrichment industry, and today the United States enjoys a robust, technologically modern, and private enrichment industry. That is the case across the board in nuclear energy. As government steps back, industry steps up. Consider the extremely high efficiency at which American power plants operate today. American nuclear power plants operate at over a 90 percent capacity factor. This feat was not a function of government intervention. It was the result of private nuclear plant operators responding to the market and figuring out how to maximize their profits, which ultimately benefits ratepayers.

Even nuclear waste management has benefited from private ingenuity. The Federal Government decided in 1976 that it would not reprocess used commercial nuclear fuel, and the 1982 Nuclear Waste Policy Act, as amended, places the responsibility for nuclear waste management with the Federal Government. It was determined during that time that all nuclear waste would be placed in geologic storage. Nearly three decades later, having not implemented any solution for nuclear waste management, President Obama created the Blue Ribbon Commission on America's Nuclear Future to come up with an alternative strategy for disposing of America's nuclear waste. Essentially, they determined again that nuclear waste be placed in geologic storage. In three decades, the Federal Government has made zero technological progress on nuclear waste management.

Quite a different story exists in the private sector. Each nuclear power plant was built with a spent fuel pool in which to house the spent fuel when it is removed from the reactor. The initial thinking was that the fuel would spend roughly five or so years in the pools until it got moved to some other facility—either for burial or some other process. The pools were sized to meet this requirement. Over time, however, the pools began to fill up since the Federal Government never collected any of the fuel. This created a dilemma for the private utilities. They either had to figure out a way to store additional fuel or stop operating. So they did what the private sector always does if they want to stay in business: innovate.

The nuclear industry developed two methods to allow it to store more fuel. First, it developed a technique call re-racking, which allowed them to safely place more fuel into the pools than they were originally designed to hold by placing newer fuel next to older fuel. But more impressively, they developed dry cask storage options.

Since the Federal Government was not coming to pick the fuel up, private industry figured out a way to safely store the fuel outside of the pools on dry casks. This innovation is allowing America's nuclear power plants to operate despite the Federal Government's failures.

The nuclear industry has demonstrated time and again that it can solve most any problem. The flaw of the current system is that nuclear waste is a government problem. Solving nuclear waste could be accomplished by making it an industry problem.

Q2. Most scientists agree that we need long-term storage of nuclear waste. Our experiences with Yucca Mountain highlight the political difficulties locally, statewide, and nationwide in accomplishing such an objective. How can we build local consensus anywhere in the country to accept long-term storage of nuclear wastes?

A2. Building a local consensus to accept long-term storage can be accomplished. However, the Federal Government cannot do it. The fact is that no local community will want to negotiate with the Federal Government. It has proven to be an untrustworthy partner. The better approach is to allow industry to negotiate directly with local communities and for them to rely on the force of law through negotiated contracts to be the guarantor of terms. Further, it is critical that the local communities be in control of the negotiations. It is not fair if the Federal Government comes in and states that it is going to do something either way. That is not a negotiation. That is subjugation. The private sector does a very good job at working with local communities to site major projects, and it could do the same for a nuclear materials repository.

Consider Yucca as an example. Under the current process, as dictated by the Nuclear Waste Policy Act, as amended, the Federal Government owns and operates the facility and predetermines that Yucca Mountain, Nevada, is the location. The negotiation was never really a negotiation at all. It was the Federal Government stating what was going to happen and trying to force the Nevadans to accept it.

A better approach would be to transfer all of the permits and regulatory authorities to construct and operate the Yucca facility away from the Federal Government and to some entity that represented Nevadan interests. It could be the state of Nevada, a Nevada-based non-profit or even a Nevada-based business. Once those permits were in hand, then that entity could negotiate directly with the nuclear industry the terms that would be acceptable. This approach places all parties on equal ground and would allow for an actual negotiation that could yield a positive outcome.

The government role in such a system would be to provide regulatory predictability and integrity. In essence, the private sector should be permitted to carry out whatever waste management activities that it deems appropriate if it meets local, state and federal regulatory and safety standards.

Question Submitted by Representative Sandy Adams, Subcommittee on Investigations and Oversight

Q1. Ratepayers in my state alone have contributed over $800 million to the Nuclear Waste Fund to date. While the used fuel is currently being held safely onsite by our utilities, doing so constitutes an additional economic burden. With the Administration pulling the plug on Yucca Mountain for political, not scientific, reasons, and no realistic alternative in place, why should my constituents continue to have to pay into the Waste Fund?

A1. Your constituents should not have to pay into the Nuclear Waste Fund. The Federal Government has collected over $30 billion (principal and interest) since the Nuclear Waste Policy Act, as amended became law. While competently collecting this money, the Federal Government has completely failed in its obligation to dispose of nuclear waste. Since the Federal Government has provided no nuclear waste disposal services, it is unclear why electricity rate payers should be compelled to continue paying the nuclear waste fee. At a minimum, rate payers should be relieved of this fee until the Federal Government instates a reliable nuclear waste disposal policy. Unfortunately, this seems to be beyond the Federal Government's capability. That is why the focus of any solution should not be on reforming how the nuclear waste fee is collected but rather on repealing the fee altogether. This would eliminate the Federal Government from the nuclear waste business by allowing the utilities to directly finance nuclear waste management and disposal activities.

While the blame for the Nation's lack of a feasible nuclear waste policy lies squarely on the Federal Government's shoulders, the solution should come from the private sector.

Unfortunately, that is not what the Blue Ribbon Commission on America's Nuclear Future recommends. The draft recommendations that we discussed during this hearing would do little, if anything, to change the underlying flaws of the current system. Thus, the same problems plaguing nuclear waste management today will ultimately resurface. That is because the Federal Government remains responsible for nuclear waste management under the BRC's recommendations. This is a flawed approach. Central government planning of commercial activities does not work. A better approach would be to put waste producers in charge of their own waste.

Under such a system, your constituents would no longer pay any fee to the Federal Government. Instead, the cost of waste management would be folded into the price of nuclear-generated electricity. This would allow the nuclear utilities to build business models around the entire fuel cycle. Currently, they need only consider fueling the reactors and operating them, because the government takes responsibility for dealing with the waste. The problem with this system is that waste management is critical part of the nuclear fuel cycle. By giving that responsibility to the waste producers, the utilities would then seek the most cost-effective means to manage and dispose of the waste. This market-based approach would not only ensure that solutions were developed, since the utilities would need to dispose of their waste to keep operating their reactors, but it would ensure that the solutions made the most economic sense.

This is in direct opposition to the current system, which misaligns incentives, authorities, and responsibilities. Currently, the Federal Government has no real incentive, despite the force of law, to develop any solution whatsoever, as evidenced by decades of incompetence on the issue. And further, even if it were to find a solution, there is no incentive for the Federal Government to operate economically. Placing waste producers in charge of their own waste management would fix both problems.

That does not relieve the Federal Government of any responsibility. It would set strict regulatory guidelines and enforce them, for example. In essence, it would treat nuclear waste management activities the same as it does the rest of the nuclear industry.

Responses by Dr. Peter Swift, Distinguished Member, of the Technical Staff, Sandia National Laboratory

Questions Submitted by Representative Paul C. Broun, Chairman, Subcommittee on Investigations and Oversight

Q1. Currently, two sets of federal regulatory standards for high-level radioactive waste repositories exist, one specifically developed for Yucca Mountain and another that would apply to all other sites. Which of these two standards is more stringent?

A1. Background: Each of the two existing sets of federal regulations that govern permanent disposal of high-level radioactive waste is consistent with the legal framework defined in the Nuclear Waste Policy Act, and each set includes overall safety standards set by the U.S. Environmental Protection Agency (EPA) and implementing criteria defined by the U.S. Nuclear Regulatory Commission (NRC). One set, including EPA's 40 CFR part 197 and NRC's 10 CFR part 63, was written in the past 15 years specifically for the proposed Yucca Mountain repository, and would not apply to any other disposal concept without new rulemaking activities. The other set, EPA's 40 CFR part 191 and NRC's 10 CFR part 60, date from the middle 1980s, prior to the decision to focus solely on Yucca Mountain, and, in the absence of new rulemaking, would still apply in principle to any disposal concept other than Yucca Mountain.

The older regulations, framed by the EPA in 40 CFR part 191, defined the regulatory period to be 10,000 years and set quantitative limits for scenarios that include all release pathways on the probability that the total amount of radiation released during the entire period would exceed specified values, rather than on the peak release in any single year. These regulations also tied the magnitude of the allowable release to the amount of waste emplaced in the repository: allowable releases were smaller for smaller repositories and larger for larger repositories. Consequences of inadvertent human intrusion by drilling were required to be included in the probabilistic compliance analysis. For the Waste Isolation Pilot Plant (WIPP), which is the only repository operating under 40 CFR part 191, the approach to estimating the density of future drilling was specified by the EPA in the implementing criteria (40 CFR part 194.33).

The newer regulations, framed by the EPA in 40 CFR part 197, are based on and consistent with guidance from the National Academy of Sciences (National Research Council, 1995) and were written specifically for Yucca Mountain. These regulations focus on the long-term annual dose from a repository and, following resolution of legal challenges, set limits on the peak dose allowable in any one year during the next one million years. (The period of one million years is consistent with the National Academy's guidance indicating that the period of geologic stability at Yucca Mountain is on the order of one million years.) There is no provision for scaling the allowable release to the size of the repository: the peak dose limits apply regardless of the amount of waste emplaced at the site. Human intrusion is required to be considered separately from overall performance in a stylized analysis, and releases directly to the land surface during drilling were excluded from consideration.

Response: Both sets of regulations are highly protective of future human health and the environment, and it is not useful to attempt to determine which is more stringent during the 10,000-year period required by the older set of regulations. The Yucca Mountain standards apply for 1,000,000 years, and can therefore be viewed as being more stringent during the longer time period. However, I agree with the Blue Ribbon Commission's caution relevant to requirements for quantitative standards that apply for one million years: "the Commission believes that over-reliance on million-year calculations can reduce credibility rather than enhance it. As the IAEA has warned: 'Care needs to be exercised in using the criteria beyond the time where the uncertainties become so large that the criteria may no longer serve as a reasonable basis for decision making'" (BRC 2010, p. 103; IAEA 2006).

Q1a. If Yucca Mountain has the more stringent regulatory standards, do you believe the government should abandon it to pursue an unknown repository with less robust thresholds?

A1a. While I do not believe that the government should abandon Yucca Mountain to pursue an unknown repository, I also do not believe that the existing standards that would apply to other repositories would necessarily be less protective of human health and the environment. In addition, I concur with the conclusion in the draft report of the Blue Ribbon Commission that "the generic regulations that would currently apply to all other sites will need to be revisited and revised in any case" (BRC

2011, p. 98). The NRC staff has come to the same conclusion, indicating in public presentations that they intend to update or replace 10 CFR part 60 prior to licensing disposal at locations other than Yucca Mountain (e.g., Kokajko, 2011). I believe it is unlikely that any alternative repository would be subject to significantly less protective standards than those applied to Yucca Mountain.

Q2. Knowing how long Yucca Mountain was studied, do you anticipate a similar timeline to establish confidence in the safety of a consolidated interim storage facility? What would you estimate such an evaluation to cost?

A2. I believe technical issues associated with demonstrating the safety of a consolidated interim storage facility could be addressed with substantially less time than was required for Yucca Mountain. It is relevant in this regard to note that there are currently 63 independent spent fuel storage installations (ISFSIs) licensed by the NRC under 10 CFR part 72. Most of these facilities are located at existing nuclear power plants, and none store as much spent fuel as would be present at a consolidated interim storage facility, but the existing record indicates that both the nuclear industry and the NRC have substantial experience in constructing, licensing, and operating storage facilities.

There is one recent example of a consolidated interim storage facility in the U.S. that may be directly relevant to this question. The NRC issued a license in 2006 to Private Fuels Storage, LLC (PFS), to construct and operate a consolidated interim storage facility, in Skull Valley, Utah, 13 years after the Goshute Tribe first negotiated with the Department of Energy for an interim storage facility and nine years after PFS began the licensing process (NRC 2006). The license allows dry cask storage of up to 40,000 metric tons of spent nuclear fuel from commercial nuclear power plants. The license conditioned authorization to construct the facility on obtaining funding and necessary approvals from other agencies, including the Department of Interior. The Department of the Interior subsequently denied the PFS application to use rights-of-way across federal land and to lease tribal land (BLM 2006; BIA 2006). A federal court overturned the Department of Interior's decisions in July 2010 (U.S. District Court 2010), but the future of the facility remains uncertain despite a valid license from the NRC.

Commenting on the total cost of licensing an interim storage facility is outside my area of expertise. The Government Accountability Office estimated in 2009 that the total cost of 100 years of centralized interim storage of 70,000 metric tons of spent nuclear fuel would be in the range of $12 billion to $20 billion and that the cost of 100 years of centralized storage for 153,000 metric tons would be in the range of $15 billion to $29 billion (GAO 2009, table 4).

Q3. The Department of Energy has asked Sandia National Laboratory to begin review of a deep borehole method of disposal for high-level radioactive waste. Can you describe how a mined repository differs from a deep borehole? Please describe the primary advantages and disadvantages associated with the two types of repositories.

A3. As proposed in the U.S. and internationally, mined repositories are generally 1,000 to 3,000 feet below the land surface, in a variety of geologic media including salt, clay or shale, granitic crystalline rocks (including high-grade metamorphic rocks), volcanic tuff, and limestone. Mined openings are large enough for access by both humans and heavy equipment, either by inclined ramps or hoists in vertical shafts. For waste that emits little gamma radiation, such as the transuranic waste disposed of at the Waste Isolation Pilot Plant, waste can be emplaced by human-operated equipment. For high-level waste and spent nuclear fuel, waste is packaged in robust containers, and emplacement is done by remotely-operated equipment. After waste containers and, in many disposal concepts, backfill are emplaced, access shafts and ramps are filled and sealed and the combination of engineered and natural barriers provides long-term isolation.

As proposed in recent work on deep borehole disposal concepts (e.g., Gibb, 1999; MIT 2003; Brady et al., 2009; Arnold et al., 2011), disposal would occur within crystalline bedrock at substantially greater depths, between approximately 10,000 and 16,000 feet (3–5 kilometers). Boreholes would be drilled so that they had a bottom-hole diameter of up to approximately 17 inches (0.43 m), depending on waste type and configuration. Although drilling for oil and gas routinely goes to much greater depths in sedimentary rocks that have the potential to produce hydrocarbons, this is a relatively large diameter for current drilling technology. However, as Arnold et al. (2009, p. 19) state, "there are no known technical issues that present unreasonable barriers to drilling to this diameter at depth." The stated diameter was chosen to allow emplacement of intact fuel assemblies from typical commercial reactors without disassembling or processing the spent fuel. If fuel is to be processed or con-

solidated before disposal, narrower diameter boreholes could be used. Holes would be lined with steel casing to facilitate emplacement operations. Spent nuclear fuel or high-level radioactive waste would be placed within containers of steel pipe and lowered down the hole by cable. The lower portion of the borehole (nominally the lower 2 km, or approximately the bottom 6500 feet) would be used for waste disposal, allowing emplacement of a very long (i.e., 3 km or approximately 10,000 feet) borehole seal, primarily of compacted clay and concrete.

Advantages of mined repositories are that they rely on well-understood mining technology, they have been studied in great detail for decades in disposal programs in the United States and other nations, and safety assessments for multiple repository concepts indicate they have the potential to provide excellent long-term isolation. The size of mined repositories allows for disposal of large volumes of spent nuclear fuel or high-level radioactive waste at a single location.

Relatively less research has been done on deep borehole disposal concepts, and there are far fewer examples that can be called on to evaluate the long-term performance of the approach. Studies in the United States and other nations since the 1970s have concluded that the approach is feasible and has a high potential to provide essentially complete long-term isolation, but no full-scale demonstration projects, with or without radioactive waste, have been completed at the relevant depths. Potential advantages for the approach include the relative simplicity of the isolation concept, widespread availability of suitable geology, and modularity of construction.

The deep borehole isolation concept relies primarily on the extremely low permeability of crystalline rocks at the greater depths proposed for waste disposal, where pressure from the overlying rock will tend to keep fractures closed. Clearly, the low permeability of rocks at that depth must be demonstrated, but this is something that can be measured directly in a borehole before waste is emplaced. If borehole tests show unexpectedly high permeability, or flowing water, or other unfavorable conditions at the disposal depths, the site can be abandoned before waste is emplaced. In the absence of open fractures, the primary pathway for radioactive material to get back to the near-surface environment will be back up the borehole, where thousands of feet of compacted clay and concrete seals will provide an extremely effective and permanent barrier to flow.

Fundamentally, deep boreholes have the potential to isolate radioactive waste much further away from the human environment than mined repositories, while minimizing the pathways for release. Potentially suitable rocks could be found in large portions of the continental United States, where old and stable crystalline bedrock is found within approximately one mile or less of the land surface. As a further benefit, rocks of this type and depth are unlikely to ever provide a source of natural resources that might encourage future drilling operations in the region.

The modularity of borehole disposal provides another potential benefit. Boreholes can, in principle, be drilled on an as-needed basis, with less infrastructure than mined repositories. The benefit here may be greater for other nations with smaller quantities of spent nuclear fuel and high-level radioactive waste, but even in the United States, it is perhaps worth considering the flexibility introduced by a disposal option in which all of the spent fuel generated in the 60-year lifespan of a typical light-water reactor could be disposed of in 10 (or fewer) deep boreholes, drilled and sealed as needed. Alternatively, the concept could be applied on a limited basis for a subset of high-level waste forms, including, for example, fission product wastes already existing at the Hanford site in Washington State. A perhaps significant advantage associated with the modularity of the concept is the ability to make a decision to proceed or not with a specific site with the relatively modest investment required to make a pilot borehole.

With respect to cost, Arnold et al. (2009, table 9) estimate costs for drilling a typical disposal borehole, emplacing waste, and sealing the hole to be on the order of 40 million dollars. Actual costs are uncertain, but this figure is competitive with, and potentially significantly less than, the costs associated with disposal of the same quantity of waste in a mined geologic repository.

Disadvantages to deep borehole disposal fall into three main categories: the relative scarcity of research on crystalline rock properties at these depths; operational limitations caused by the narrow diameter of the borehole; and issues associated with retrievability of the waste. The first two are addressed here, and retrievability issues are addressed in the response to the following question.

Scarcity of data on crystalline rock properties at depth is not surprising, given that most deep drilling has been done in sedimentary rocks that have the potential to produce oil and gas. Much of the data that are available for crystalline rock come from drilling done for geothermal research, where scientists and engineers have sought out deep rocks with both anomalously high temperatures and high

permeabilities, neither of which would be desirable conditions for waste disposal. There is no reason to believe a priori that suitable low permeability rocks at depth will be exceptionally difficult to find, but further research, including field tests in instrumented boreholes, is needed to demonstrate the broad applicability of the concept.

Operational limitations associated with the relatively narrow diameter of the borehole need to be acknowledged directly. Individual containers of existing borosilicate high-level radioactive waste (i.e., reprocessing waste currently stored at the Savannah River Site in South Carolina and at the West Valley site in western New York State) are too large to be emplaced in a deep borehole. The glass waste forms planned for the liquid wastes stored at the Hanford site will also be too large, as presently designed, for borehole disposal. Furthermore, essentially all spent nuclear fuel currently in dry storage would need to be repackaged in single-assembly canisters. (Repackaging of spent fuel currently in dry storage is likely to be needed for mined repository concepts also, because thermal constraints encourage disposal in smaller packages than are typical for storage; disposal packages could be larger in mined repositories than in boreholes, however.)

Q3a. The Nuclear Waste Policy Act requires stored high-level waste to be retrievable. Do you believe storage of spent nuclear fuel in a deep borehole meets that definition?

A3a. I believe deep borehole disposal concepts could be designed and operated to meet the retrievability requirements of the Nuclear Waste Policy Act. With that said, I also believe that deep geologic disposal, either in boreholes or in mined repositories, should not be undertaken if there is any foreseeable intent to retrieve the waste. Geologic disposal should be viewed as permanent, and not as a storage option that allows ready retrieval of the spent nuclear fuel.

The requirement for retrievability in the Nuclear Waste Policy Act is as follows:

- Sec. 122. Notwithstanding any other provision of this subtitle, any repository constructed on a site approved under this subtitle shall be designed and constructed to permit the retrieval of any spent nuclear fuel placed in such repository, during an appropriate period of operation of the facility, for any reason pertaining to the public health and safety, or the environment, or for the purpose of permitting the recovery of the economically valuable contents of such spent fuel. The Secretary shall specify the appropriate period of retrievability with respect to any repository at the time of design of such repository, and such aspect of such repository shall be subject to approval or disapproval by the Commission as part of the construction authorization process under subsections (b) through (d) of section 114.

As I understand the language of Section 122, the NWPA requires that it be possible to retrieve spent nuclear fuel during the operations of the repository. I believe a deep borehole repository could be designed such that it was possible to retrieve canisters of spent nuclear fuel as long as the borehole remained open and unsealed (i.e., during the period of operation) using essentially the same equipment that was used to emplace the canisters in the borehole. Looking beyond the operational-period requirements of the NWPA, however, I do not believe it is feasible to design a deep borehole repository such that canisters can reliably be retrieved intact after disposal operations have ended and the borehole is sealed. I believe techniques could be implemented using current drilling and solution mining technology that would recover some and perhaps most of the radioactive material in the spent nuclear fuel, but full retrievability of intact waste forms after a borehole has been sealed should not be viewed as a realistic option with today's technology.

The potential for recovering some portion of the wastes after the borehole has been sealed is relevant because the EPA expanded on the NWPA approach in 40 CFR part 191, by requiring that "disposal systems shall be selected so that removal of most of the wastes is not precluded for a reasonable period after disposal" (40 CFR 191.14(f)), where disposal is defined to occur when the repository is sealed. The NRC, on the other hand, stayed close to the language of the NWPA by requiring, at 10 CFR 60.111(b)(1), that "the geologic repository operations area shall be designed so that any or all of the emplaced waste could be retrieved on a reasonable schedule starting at any time up to 50 years after waste emplacement operations are initiated, unless a different time period is specified by the Commission."

In 40 CFR part 197, specific to Yucca Mountain, the EPA defers to the NRC regulation: "Because NRC's proposed licensing criteria ... contain requirements similar to the assurance requirements in 40 CFR part 191 ... we believe it is unnecessary for us to include similar requirements in this rule" (EPA 2001, 66 FR 32103). The

NRC repeats its retrievability requirements from 10 CFR part 60 essentially unchanged at 10 CFR 63.111(e)(1).

Because of the differences between the EPA's requirement in 40 CFR 191 that the majority of the waste must be removable for some period after a repository is sealed and the NRC's emphasis on maintaining retrievability during operations, existing U.S. regulations provide ambiguous guidance for evaluating disposal concepts. Deep borehole concepts that might otherwise provide excellent long-term isolation of the waste might be challenged to meet removal and retrievability expectations under the current EPA or NRC regulations, depending on the interpretation of phrases such as "most of the wastes" and "on a reasonable schedule."

Lastly, the potential difficulty of retrievability in deep borehole disposal can also be viewed as an advantage in preventing subsequent theft, diversion or sabotage of fissile material and helping to achieve nuclear nonproliferation and security objectives.

Questions Submitted by Representative Randy Neugebauer, Subcommittee on Energy and Environment

Q1. What are the alternative, legitimately viable options for nuclear waste storage in the United States aside from Yucca Mountain? How do the benefits and drawbacks of those options compare to those of Yucca Mountain?

A1. Under the Nuclear Waste Policy Act, as amended in 1987, there are no legally viable alternatives to Yucca Mountain for permanent disposal of spent nuclear fuel and high-level radioactive wastes in the United States. Were the Act to be amended to allow alternative sites, there are potentially many viable options. I agree with the Blue Ribbon Commission's statement in its draft report (BRC 2011, p. 33) that "[d]ecades of research and site investigations in the United States and elsewhere suggest that a wide variety of rock types and geologic environments could—in combination with appropriate repository design—be suitable for achieving [safe isolation of the waste]. The rock types that have been considered for a deep geologic repository have included bedded and domed rock salts, crystalline rocks (i.e., granite or gneiss), clay, shale, volcanic tuffs, basalt, and various other types of sedimentary rocks." I also agree with the BRC's observation that "[d]eep boreholes represent another form of deep geologic disposal that may offer benefits, particularly for the disposal of certain forms of waste" (BRC 2011, p. 33). Potentially suitable rock types are widely distributed across the United States, and I share the BRC's "confidence that many geologic formations and sites that would be technically suitable for hosting a permanent repository can be found" (BRC 2011, p. 33).

Any comparison of benefits and drawbacks of the various alternatives should begin with the observation that before any disposal concept can be implemented it will have been shown to meet EPA and NRC regulatory requirements. Long-term safety of a disposal facility, as defined by the EPA and the NRC, is not negotiable, and concepts that do not meet the safety standards should not be considered viable or technically suitable. Benefits and drawbacks of viable alternatives therefore are most usefully compared in terms of metrics other than safety, such as the extent to which inherent properties of the geologic media simplify (or complicate) the licensing case, and programmatic attributes such as operational efficiency, schedule, and cost.

Benefits and drawbacks are discussed in general terms for the primary alternative concepts in the following section. Relative benefits and drawbacks of deep borehole disposal are also discussed in more detail above in response to a question from Representative Broun. All of these concepts, as well as Yucca Mountain, have the potential to provide excellent long-term isolation, and the benefits and drawbacks described here should be considered in that context. None of the alternatives mentioned here, however, has a sufficient technical basis for the United States to proceed directly to site selection and licensing. For any alternative, I believe the United States will need to move through a staged process of site and concept screening, site selection, site characterization, and facility design before beginning the licensing process.

Attributes of mined repositories in granitic rocks. Granitic rocks are widely distributed in the United States, and are found in geologically stable areas where the likelihood of seismicity and volcanism is low. There is extensive experience in mining granitic rocks, and underground openings remain open and stable with relatively little support, facilitating emplacement operations and retrieval, should it be necessary. Granitic rocks tend to have very low permeability when unfractured. Granitic rocks are not associated with oil and gas resources, and locations can be found

where the likelihood of competition with other resources (e.g., metals or geothermal resources) is very low.

As is true for most potential repository locations deep below the water table, water chemistry within granites tends to be reducing (i.e., with a low oxygen content). Reducing conditions lower the solubility of most of the important radioactive species in the waste, including uranium, plutonium, and other transuranic elements. (Iodine, and its long-lived radioisotope I–129, is an exception, in that it remains highly soluble in essentially all groundwater conditions). This is in contrast to the chemical environment at Yucca Mountain, where the decision to place the repository above the water table (and therefore in a largely dry environment) means that if and when water does reach the waste, oxidizing conditions will allow greater dissolution of radioactive species. Reducing groundwater conditions can therefore be viewed as a positive attribute for potential repositories in granitic rocks (and in essentially all other deep locations far below the water table). Oxidizing conditions, however, should not be viewed as a disqualifying attribute; if little water reaches the waste, for example because of the use of long-lived waste packages, solubility is of less importance, and locations above the water table can provide other benefits that should be taken into account.

Potential drawbacks of granitic rocks begin with the observation that at the depths envisioned for mined repositories, granitic rocks may have relatively high-permeability fractures that can allow significant amounts of groundwater to enter the disposal region. These same fractures can provide a pathway for radionuclides to reach the near-surface environment if and when waste packages fail and waste is exposed to water. Granitic repository concepts, therefore, typically include clay backfill and long-lived corrosion-resistant waste packages as components of the engineered system, providing additional barriers to groundwater flow and radionuclide transport.

In common with other disposal concepts that call for a clay backfill surrounding the waste packages (e.g., mined repositories in clay or shale), repositories in granitic rocks will require waste packages that are small relative to the packages that could be emplaced in Yucca Mountain or another similar repository designed without backfill. The size limitation comes from the desire to keep temperatures in the clay backfill below approximately 100 °C, to avoid changes in the material properties of the clay. There are four primary ways to manage the heat output of spent nuclear fuel and reprocessing wastes in disposal operations: waste can be allowed to decay in surface storage before disposal, waste packages can be kept small enough to limit the thermal load, waste packages can be spaced far enough apart to limit cumulative heating effects, and the disposal region can be ventilated after the waste packages are emplaced to remove heat. Because of its location above the water table and the lack of a clay backfill, the Yucca Mountain design allowed for relatively higher temperatures on the waste package surface, mitigated by effective ventilation of the disposal region during the operational period. This in turn allowed for emplacement of relatively large waste packages spaced relatively close together. Specifically, the waste packages designed for Yucca Mountain can each accommodate 21 pressurized water reactor fuel assemblies. Waste packages in typical mined repositories in granitic rocks (or clay/shale settings) would be much smaller, accommodating perhaps 4 assemblies with fuel of similar characteristics. Thermal loading constraints do not affect the long-term safety of a repository. Rather, they have the potential to affect the efficiency of the disposal operation.

Attributes of mined repositories in clay and shale rocks. Like granitic rocks, clay and shale are widely distributed in the United States, and are found in geologically stable regions where the likelihood of seismicity and volcanism is low. Many of the potential benefits and drawbacks are similar to those of granitic rocks: for example, groundwater chemistry will be reducing in these settings, and thermal constraints on repository design and waste package size are essentially the same. Additional potential benefits of clay or shale sites include the extremely low permeability of the host rock, relatively low frequency of open fractures, and chemical properties that tend to sorb most radionuclides of concern. A potential drawback for clay and shale sites is the frequent association of these rocks with oil and gas resources, both in underlying porous rocks and trapped within the low-permeability shale layers themselves.

Attributes of mined repositories in salt. Like the other rock types discussed, salt deposits are widely distributed in the United States and are found in geologically stable regions where the likelihood of seismicity and volcanism is low. Unique properties of rock salt provide significant potential benefits for disposal of radioactive waste. Salt is relatively easy to mine. Pure salt is essentially impermeable, and it is realistically possible to find places in the center of thick salt deposits where water has not moved in hundreds of millions of years. Salt is a plastic material at the

pressures found at repository depths, and it will flow relatively rapidly (on a scale of decades) to heal fractures opened by the mining of the repository and to entomb the waste packages. Waste surrounded by salt will remain fully isolated from the surrounding environment indefinitely, for as long as the salt remains intact. Thermal constraints for salt repositories are intermediate between those of repositories above the water table (like Yucca Mountain) and repository concepts that call for clay backfill. Acceptable peak temperatures are higher in salt than clay, and the high thermal conductivity of salt means that waste packages could potentially be larger in salt repositories than in granitic rocks or clay/shale sites.

Properties of salt pose potential drawbacks, also. Salt is easily dissolved in fresh water, and although the presence of salt deposits today is proof that dissolution has not occurred in the geologic past, repository sites in salt must be chosen so that they remain isolated from flowing water in the future. The capability of salt to flow under pressure will complicate (but not preclude) retrieval of waste after it is emplaced. The bedded salts (in which the original sedimentary layering is preserved) that are the most widely distributed salt deposits in the United States tend to have layers of other evaporite minerals (primarily anhydrite) and clay interspersed with layers of pure halite. These layers have somewhat higher permeability than the pure halite, and can complicate the analysis of the potential for water to move in the rock. Finally, like clay and shale, salt is commonly found in association with oil and gas resources.

Attributes of mined repositories in other rock types. Mined repositories have also been proposed in other rock types, most noteworthy basalt at the Hanford site in eastern Washington site in the early 1980s, and recently limestone in a proposed repository for intermediate level waste in Canada. Potential benefits and drawbacks to these and other less commonly investigated rock types primarily relate to their availability, their ability to isolate the waste from moving water, and their association with natural resources. To the extent that any potential host rock displays appropriate characteristics such as low water content, low permeability, absence of open fractures, and/or favorable chemical characteristics, it could be considered as a viable medium for disposal.

Attributes of deep borehole disposal in crystalline rock. Deep borehole disposal could potentially be implemented anywhere where low-permeability crystalline bedrock occurs within approximately a mile or less of the land surface. Although relatively few data are available from deep crystalline rock in much of the United States, potentially favorable rock types are widely distributed. As discussed in more detail in response to a question from Representative Broun, deep boreholes have the potential to provide essentially complete isolation for the wastes indefinitely. Potential conflicts with natural resource extraction are virtually nonexistent. Thermal constraints that provide a point of comparison between Yucca Mountain and other mined repository concepts are not as relevant for deep boreholes, because geometric constraints posed by the diameter of the hole are likely to keep thermal loads below levels of concern. Costs are believed to be competitive with, and perhaps significantly less than, those anticipated for mined repositories. The modularity of borehole construction and operation allows a level of flexibility in waste management that is not available in mined repository operations.

Potential drawbacks of deep borehole disposal are straightforward. There are relatively few data from deep crystalline rocks in the United States, and further research, including demonstrations of rock properties in instrumented boreholes, is needed to confirm the concept. The narrow diameter of the borehole creates geometric constraints that preclude disposal of some waste forms, including existing borosilicate glass reprocessing waste at the Savannah River Site in South Carolina and the West Valley site in western New York State. Removing waste from a deep borehole after the hole has been sealed will not be simple (although recovery of much of the waste could perhaps be achieved using drilling and solution mining techniques), and deep borehole disposal should not be undertaken if full retrieval of intact waste forms is considered essential. From the alternative perspective of nonproliferation goals, however the relative difficulty of retrieving radioactive materials from a deep borehole could be viewed as a potential benefit-fissile material at the bottom of a deep borehole is unlikely to be recovered for use in a nuclear weapon.

Attributes of other disposal concepts. Various alternatives to deep geologic disposal have been proposed over the past decades for the management of spent nuclear fuel and high-level radioactive wastes. Rechard et al. (2011) provide a summary explanation of past proposals, four of which warrant a brief mention here. Constructing an engineered mountain or mausoleum over waste stored at the land surface has been proposed informally at various times, but the concept does not meet the intent of requirements for deep geologic disposal and, to the best of my knowledge, no sub-

stantive design concepts have been developed. Launching radioactive waste into space has been proposed at least since the 1970s; cost and risk analyses indicate that it is not a viable option. Disposal in polar ice sheets was proposed in the 1970s; analyses raised concerns about operational feasibility and the potential for long-term isolation, and the concept was subsequently precluded in Antarctica by international treaty. Finally, disposal in clay sediments below the deep ocean floor was proposed in the 1970s. Detailed evaluations in the 1980s indicate excellent potential for long-term isolation in sub-seabed sediments, and I believe the concept remains technically feasible. International treaty agreements in the 1990s eliminate it from further consideration.

Q2. How long can we expect current storage sites at existing nuclear facilities to remain safely operable? How long would new temporary repositories be able to handle nuclear waste?

A2. The safe operation of currently operating independent spent fuel storage installations (ISFSIs) is regulated by the Nuclear Regulatory Commission under 10 CFR part 72. The duration of a license granted under 10 CFR 72.42 is limited to 40 years, with the opportunity to apply for a 40 year license renewal. With respect to fuel stored either in spent fuel pools at reactor sites or at ISFSIs, the NRC has concluded in its most recent update to 10 CFR part 51.53 (NRC 2010) that "if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 60 years beyond the licensed life for operation . . . of that reactor in a combination of storage in its spent fuel storage basin and at either onsite or offsite spent fuel storage installations."

There are no fundamental technical reasons why temporary storage facilities could not be operated indefinitely as long as the spent nuclear fuel and its containers are monitored appropriately and structures, systems, and components are repaired or replaced as needed. The condition of the spent fuel will change through time, and degradation of the spent fuel and associated structures, systems, and components may complicate options for future handling of the waste, but I am not aware of any foreseeable processes inherent in the aging of the facility that would create unsafe conditions that could not be mitigated as needed. Non-technical factors that may limit the realistic duration of temporary storage include regulatory requirements, legal obligations concerning ownership of the spent fuel, and financial considerations regarding the cost of maintaining indefinite temporary storage. The Government Accountability Office evaluated two relevant scenarios for extended temporary storage at existing sites in a 2009 assssment of nuclear waste management options (GAO 2009): in one scenario storage was limited to 100 years, and in a second scenario storage was extended to 500 years with the assumption that spent fuel required repackaging every 100 years. Estimated costs for storing 153,000 metric tons of spent fuel at existing sites for 100 years ranged from $13 billion to $34 billion; estimated costs for storing the same amount of fuel for 500 years ranged from $34 billion to $225 billion (GAO 2009, table 5).

Acknowledgment

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10 Code of Federal Regulations Part 63, *Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada*.

10 Code of Federal Regulations Part 72, *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste*.

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Responses by Dr. Roger Kasperson,
Professor and Distinguished Scientist, Clark University

Question Submitted by Representative Paul C. Broun, Chairman, Subcommittee on Investigations and Oversight

Q1. In his testimony, Mr. Spencer testified that the BRC should address Yucca Mountain head-on, stating:

"The BRC should state what it believes should happen with Yucca Mountain based on the best science and evidence available. If its members believe Yucca should be shut down, it should state why and provide a recommendation for disengaging from Yucca. If, on the other hand, it finds that Yucca should be pursued, perhaps as one of a number of options, then the Commission should provide recommendations on how to move forward. Such a conclusion could reject the current Yucca program while proposing an alternative. Such an alternative could embody the recommendations of the BRC's consent-based approach where the people of Nevada are given control over the future of the Yucca facility."

Do you agree or disagree with this recommendation, and why?

A1. Answer:

- The science must be there and it must be strong;
- Strong science suggests that alternatives must be considered, not one site selected before the evidence is in;
- Beyond that, technical science is not the only thing that matters. Fairness in process and collaboration with those who will bear the burdens and risks are essential. They must have a role;
- And so a consent-based role is the way to proceed. In the end it will be the most successful, as Sweden and Finland have fully shown. Can we ever stop screwing it up here in the U.S.?

Responses by Mr. Gary Hollis, Chairman,
Nye County Board of County Commissioners

Questions Submitted by Representative Paul C. Broun, Chairman, Subcommittee on Investigations and Oversight

Q1. Do you believe the demand of the Secretary of Energy that the Blue Ribbon Commission exclude consideration of Yucca Mountain as the site for a permanent geological repository in its deliberations detracts from its ability to develop the best possible recommendation for nuclear waste management?

A1. Yes. Doing so sets up the Blue Ribbon Commission to be complicit in the Department of Energy's violation of the Nuclear Waste Policy Act. It is an outrage that Federal law is so blatantly being ignored. Congress passed the Nuclear Waste Policy Act. Either it should be followed or Congress should change it. The BRC is not a siting commission, but remaining silent regarding the abandonment of the Yucca Mountain Project has nothing to do with repository siting. For the BRC to claim that the Secretary's direction prohibits the BRC from considering Yucca Mountain is disingenuous. The BRC charter makes no such prohibition and the Federal Advisory Committee Act does not allow the sponsoring authority to unduly influence the BRC as an independent commission, a direct compromise of the BRC's credibility.

Q2. How important is it for the Nuclear Regulatory Commission to finalize and release its comprehensive technical reviews of the site (known as the "Safety Evaluation Reports")? Are there any drawbacks from completing the technical review of Yucca Mountain?

A2. It is extremely important that the Nuclear Regulatory Commission be allowed to complete their review of the Yucca Mountain license application, and if appropriate, make a technical finding as to the safety of the Yucca Mountain site. The Country needs a repository to dispose of its spent nuclear fuel and high-level radioactive waste. The BRC did not discover a previously unknown solution; they recommended that the country proceed expeditiously to develop one or more geologic disposal facilities. With more than $11 billion invested in studying the science of Yucca Mountain, the country has a right to know whether or not it is possible to complete a first of a kind Nuclear Regulatory Commission licensing proceeding. That knowledge is invaluable whether or not the country develops the Yucca Mountain repository or seeks another location. It will take billions of dollars and decades to develop another repository site; to come as close as the country is today without finding the answer to the safety of the Yucca Mountain repository would be a crucial mistake.

With the completion of the Safety Evaluation Reports and the Nuclear Regulatory Commission hearings, it will also be possible to once and for all separate the technical questions about the Yucca Mountain site from the political rhetoric and misinformation that has been used in the past. If a new political solution is to be crafted, it should not be based on a false premise that the Yucca Mountain science was bad.

Over the years, the opponents of the project have tried to delay every phase of the project and the NRC review is no exception. It is widely viewed that completion of the NRC licensing process would show that the NRC technical staff concurs with DOE and their national laboratory partners that a repository at Yucca Mountain could be constructed and operated safely. Opponents who continue to vocally claim that a Yucca Mountain repository would be unsafe would lose credibility.

Q3. In his testimony, Mr. Spencer testified that the BRC should address Yucca Mountain head-on, stating:

"The BRC should state what it believes should happen with Yucca Mountain based on the best science and evidence available. If its members believe Yucca should be shut down, it should state why and provide a recommendation for disengaging from Yucca. If, on the other hand, it finds that Yucca should be pursued, perhaps as one of a number of options, then the Commission should provide recommendations on how to move forward. Such a conclusion could reject the current Yucca program while proposing an alternative. Such an alternative could embody the recommendations of the BRC's consent-based approach where the people of Nevada are given control over the future of the Yucca facility."

Do you agree or disagree with this recommendation, and why?

A3. We agree. The BRC should address Yucca Mountain head on. The most difficult issue in high-level radioactive waste disposal in this country (and likely the world) is finding an acceptable geologic repository. The BRC touts a consent-based

approach to finding the appropriate repository site. If the opponents of Yucca Mountain are correct, then what harm is there to allow the NRC licensing process to proceed to its completion or allow the NRC Safety Evaluation Reports regarding Yucca Mountain to be published? Even with DOE's decision to abandon Yucca Mountain, they and their national laboratory partners have continued to maintain that Yucca Mountain is safe. The licensing process should be completed, and if Yucca Mountain is determined to be a safe option for a repository, then it is at least a baseline for comparison of other sites. This would also be a good starting point for negotiations with the State of Nevada and Nye County on mitigation of impacts and possible benefits. The only way to ever get consent for a repository is to understand the impacts to the State and local governments and then negotiate for money, land, water, etc., that help to offset these impacts.

Q4. During hearing Q&A, Ranking Member Miller asserted that "all the rail lines, all of the roads that [waste] would likely travel through, on to get to your county, to the Yucca Mountain facility, go through Las Vegas" and that "80,000 shipments a year would go through Clark County, through Las Vegas." You disputed this assertion. Please elaborate on your response. Should Yucca Mountain be licensed and accept shipments of spent nuclear fuel, what is the planned route for transportation of the spent fuel containers? Are any container required or expected to pass through Las Vegas? What about Clark County?

A4. The opening assertion that "all the rail lines, all of the roads that [waste] would likely travel through, on to get to your county, to the Yucca Mountain facility, go through Las Vegas" is inaccurate. There is no existing rail to Yucca Mountain, and there are other roads and new routes that do not go through Las Vegas. Nye County endorses rail and road options that would completely avoid the Las Vegas valley.

The second assertion that "80,000 shipments a year would go through Clark County, through Las Vegas" is also inaccurate. The Department of Energy Environmental Impact Statement that selected mostly rail as the preferred option acknowledges 95 rail shipments and 90 truck shipments per year for 25 to 30 years, a combined total of 5,550 shipments during those 30 years.

The aforementioned EIS Record of Decision rail route is a 350-mile spur through central Nevada from Caliente, NV (approximately 125 miles northeast of Las Vegas), that dead ends at Yucca Mountain. That route, although it would not be Nye County's choice, would result in approximately nine (9) percent of the total rail shipments through Las Vegas. Nye County, along with Esmeralda, Mineral, Lander, and Churchill Counties prefers a north/south through-going rail alignment (a combination of the Mina and Jean routes) that would completely avoid the Las Vegas Valley, cost less to construct, provide greater economic development opportunities within Nevada, and more directly connect with the major east/west national railroad systems.

Road routes were not finalized. Individual states are authorized to designate preferred alternative road routes within their borders There are road routes in Nevada that would avoid the Las Vegas valley. Nevada has yet to designate alternative routes.

Transportation routes that avoid the requirement or expectation of any shipments through Las Vegas are easy and have already been studied. Completely avoiding all of Clark County is possible but more difficult. The through-going rail route that is easiest to construct requires construction of the Jean Corridor in the rural southwestern part of Clark county about 30 miles from Las Vegas.

Question Submitted by Representative Randy Neugebauer, Subcommittee on Energy and Environment

Q1. Most scientists agree that we need long-term storage of nuclear waste. Our experiences with Yucca Mountain highlight the political difficulties locally, Statewide, and Nationwide in accomplishing such an objective. How can we build local consensus anywhere in the country to accept long-term storage of nuclear waste?

A1. The issue is not with local community consensus; the local support for WIPP is well documented, the local support for the PFS Interim Storage Facility is clear, and the local support for the Yucca Mountain facility has been demonstrated to the Committee. The State of New Mexico ultimately supported WIPP after negotiations that included regulatory changes, transportation improvements and other benefits, while the State of Utah found ways to block the privately owned PFS facility after it had been licensed.

The State of Nevada exercised its legal authority to submit a notice of disapproval when the President recommended that Yucca Mountain be designated and a license application submitted. That provision was explicitly included in the Nuclear Waste Policy Act; Congress recognized there could be resistance at the State level and required a supermajority vote to override the notice of disapproval. The strongest argument the State of Nevada has against the Yucca Mountain repository is a fairness complaint. When Congress amended the Nuclear Waste Policy Act and eliminated the second repository program, Nevada was able to build support for their argument about unfair treatment; a fundamental compromise in crafting the Nuclear Waste Policy Act was that no one State would have to take all of the waste. A meaningful step in building consensus could be reinstating a commitment to more than one repository.

The Blue Ribbon Commission has based their recommendation for a new, consent-based approach to siting future nuclear waste management facilities on the success of the Swedish program in siting a repository. It must be recognized that the Swedish model is not applicable in the U.S.; in Sweden, the decision authority is the local community, and there is not a state-level government. A meaningful step in building consensus could be to focus on local communities that host an acceptable geologic disposal medium, with commitments for meaningful mitigation and compensation for both the local community and the State. Incidentally, the six rural Nevada counties that have provided resolutions attesting to local support encompass an area of more than 46,500 sq. mi. That is equivalent in area to a square of more than 215 miles on a side, the distance from Washington, DC, to New York City. That area is also larger than the areas of 18 states, including Pennsylvania, Ohio, or Virginia. It is also larger than a number of countries, including, for example, Portugal, Austria, or Iceland. It is difficult to argue that local community support in Nevada is not meaningful.

There are other dimensions of consensus that should be addressed. The State of Nevada's arguments that the Yucca Mountain site is based on bad science has never had technical peer consensus; the best way to address their concerns would be to complete the license application. The State of Nevada's arguments that compensation for accepting the repository is not forthcoming is without merit; despite specific provisions of the Nuclear Waste Policy Act, the State has never entered into discussions for a consultation and cooperation agreement. If Congress were to initiate discussions with the state and local governments on compensation and impact mitigation, it could weaken support for the State's opposition. Finally, it is appropriate to note that contrary to Nevada's State's rights arguments, two facts must be acknowledged. First, the majority of the land encompassed by the rural Nevada Counties that have stated their support for Yucca Mountain is federally controlled public lands; Nye County is 98% federally controlled land. And second, the State of Nevada raised the State's rights issue in its lawsuits following the recommendation of Yucca Mountain and were not successful in that claim with the Court rejecting the State's challenge to the constitutionality of the resolution approving the Yucca Mountain site (see United States Court of Appeals for the District of Columbia Circuit, No. 01–1258, Nuclear Energy Institute, Inc., *Petitioner* v. *Environmental Protection Agency*, Respondent, Decided July 9, 2004.)

Responses by Mr. Rick McLeod, Executive Director,
Savannah River Site Community Reuse Organization

Questions Submitted by Representative Paul C. Broun, Chairman, Subcommittee on Investigations and Oversight

Q1. Please describe concerns associated with constructing and operating a consolidated interim storage facility prior to the licensing of a permanent high-level waste repository. What assurances would be necessary from the Federal Government to satisfy those concerns and begin consideration of a consolidated storage facility?

A1. First, our community leaders have studied the issues associated with nuclear waste storage for the past two years. The SRS Community Reuse Organization produced a White Paper in 2009 describing the impacts of waste storage and outlining the path for a community consensus position. A copy of the White Paper is attached.

[The White Paper may be found in Appendix 2.]

Secondly, in considering Consolidated Interim Storage, it is important to point out a couple of significant points: (1) Consolidated Interim Storage only applies to commercial spent fuel. We believe it is important that there is a clear distinction between commercial spent nuclear fuel and high-level defense waste. The two should be de-coupled and considered independently of each other. While many debate the disposal of commercial spent fuel as a "states right" issue, the disposal of high-level defense waste can only be regarded as a national issue. The high-level defense waste is our Nation's waste and it needs a national solution. We believe Yucca Mountain is that solution. (2) The storage of commercial spent fuel either separately or consolidated can be conducted safely. Safety is not the concern. We remain concerned about the definition of "interim" which, in discussing nuclear waste, can mean anything from 10 years to 500 years or more. "Interim" must be clearly and legally defined before communities such as ours can agree to host Consolidated Interim Storage. In the absence of such clear definition, we are in danger of becoming a *"de facto"* permanent repository for nuclear waste.

In addition, as stated in our testimony, our five-county region in South Carolina and Georgia will not support any interim storage scenario unless a permanent solution in pursued at the same time. This means measurable progress toward a permanent repository for commercial spent fuel and high-level defense waste and/or a program to reprocess or recycle commercial used nuclear fuel.

Community support also requires removal of a sufficient quantity of waste currently stored at DOE's Savannah River Site and the re-commitment of processing used nuclear fuel currently stored at SRS in used fuel pools.

These two conditions must be accompanied by ongoing health and safety monitoring, proper regulatory oversight at both the local and state level, and a legally binding commitment to a final disposition plan. All such considerations must be vetted in the local community in conjunction with State officials before any type of Consolidated Interim Storage can be considered.

Q2. Do you believe the demand of the Secretary of Energy that the Blue Ribbon Commission exclude consideration of Yucca Mountain as the site for a permanent geological repository in its deliberations detracts from its ability to develop the best possible recommendations for nuclear waste management?

A2. Our position on this is clear. Excluding Yucca Mountain definitely detracts from the Blue Ribbon Commission's ability to develop the best possible recommendations, In fact, we consider this to be the "missing recommendation."

The BRC draft report recommends that prompt efforts be undertaken to develop, as quickly as possible, one or more permanent, deep geologic facilities for waste disposal, yet fails to mention Yucca Mountain.

We continue to believe Yucca Mountain was—and is—the right answer for permanent nuclear waste disposal, and its completion should be vigorously pursued, especially for high-level defense waste. To blatantly and purposefully omit consideration of Yucca Mountain as an option is misguided and ignores three decades of intense research and billions in funding, which brought the Nation to the edge of a highly workable, ultimately safe solution for storing nuclear waste.

In addition, it should be noted that the vitrified glass logs of high-level defense waste from the Defense Waste Processing Facility (DWPF) at the Savannah River Site were produced based on Waste Acceptance Criteria developed for Yucca Mountain. We have to wonder if some "new" permanent geologic repository will be able to accept this waste mixture. If not, where will this national waste stream go? This underscores the point that science—not politics—should govern the process for selecting a permanent repository for nuclear waste.

Q3. How important is it for the Nuclear Regulatory Commission to finalize and release its comprehensive technical reviews of the site (known as the "Safety Evaluation Reports")? Are there any drawbacks from completing the technical review of Yucca Mountain?

A3. We see no drawbacks whatsoever in the NRC completing its technical review of Yucca Mountain, The public needs to know that Yucca Mountain is safe, and the Safety Evaluation Report will be reassuring.

This multi-discipline review involves dozens of trained professionals with expertise in numerous technical and scientific disciplines, including geochemistry, hydrology, climatology, structural geology, volcanology, seismology and health physics, as well as chemical, civil, mechanical, nuclear, mining, materials, and geological engineering.

It offers a comprehensive review of all aspects of the repository's siting, construction, and operation. This report can become an important part of an overall education and awareness program necessary for public acceptance.

Q4. In his testimony, Mr. Spencer testified that the BRC should address Yucca Mountain head-on, stating:

"The BRC should state what it believes should happen with Yucca Mountain based on the best science and evidence available. If its members believe Yucca should be shut down, it should state why and provide a recommendation for disengaging from Yucca. If, on the other hand, it finds that Yucca should be pursued, perhaps as one of a number of options, then the Commission should provide recommendations on how to move forward. Such a conclusion could reject the current Yucca program while proposing an alternative. Such an alternative could embody the recommendations of the BRC's consent-based approach where the people of Nevada are given control over the future of the Yucca facility."

Do you agree or disagree with this recommendation, and why?

A4. Mr. Spencer is right in his view that Yucca Mountain should be included in the BRC recommendations, but he overlooks an important consideration. His recommendation fails to recognize that Yucca Mountain is not just an option for waste storage. It is the law of the land. As a Nation, we should be moving forward in accordance with the law established by Congress through the Nuclear Waste Policy Act unless and until that law is changed.

It can only be changed by legislative initiative in Congress. It cannot be altered by the Blue Ribbon Commission, which can only advise and has no authorizing, regulatory, or legal mandate. We should not be waiting on the Blue Ribbon Commission in moving Yucca Mountain forward

Q5. Can you describe in greater detail the opportunities associated with the development of a research and development center to be located at Savannah River Site's H Canyon?

A5. Researchers at Savannah River National Laboratory (SRNL), along with H Canyon personnel, are currently conducting a comprehensive feasibility study to determine the benefits and challenges associated with establishing an R&D test bed for advanced detector technologies.

The need for such a test bed has been expressed the National Nuclear Security Administration's (NNSA) Next Generation Safeguards Initiative (NGSI) and would serve as a way to transfer emerging safeguards technologies from the laboratory to an operational environment.

This technology strengthens the U.S. safeguards program by opening the possibility for more efficient and cost-effective detection of nuclear materials, improving the timeliness of detection, minimizing uncertainty, and improving confidence in results.

As identified in the NGSI program plan, there is a lack of fully operational facilities that allows for full-scale testing of new technologies. H Canyon has been identified as a potential location due to its unique standing as the Nation's only operational nuclear chemical separations plant.

H Canyon offers several areas where full-scale testing could be conducted. Combined with nearby SRNL, the needed expertise for developing, deploying, testing, and evaluating advanced detector technologies is readily available.

The concept would eventually open SRNL to other DOE National Laboratories, resulting in a comprehensive initiative for testing national and international safeguards-related equipment.

Q6. What would be the impact on the Savannah River Site and surrounding communities should consideration of Yucca Mountain site be halted and the Nation em-

bark on a new search for a nuclear waste repository? How would this impact Savannah River Site concerns about the cost of managing, guarding, monitoring, and other issues relating to existing nuclear material?

A6. There are numerous potential impacts.

First and most significantly, there has been a substantial loss of trust and credibility. The Federal Government has broken faith with our community and with others across the country that trusted implicitly in the Department of Energy's commitment to complete Yucca Mountain as the Nation's preferred method of nuclear waste storage.

The Federal Government has reneged on its promise to provide a permanent repository for defense nuclear waste and for commercial spent fuel from nuclear power plants. As a region, we have counted on this promise and on the government's assurances that our site and others would be a temporary home for nuclear waste.

We relied even more heavily on this promise once the choice of Yucca Mountain became the law of the land through the Nuclear Waste Policy Act.

Today, the Savannah River Site has approximately 3,000 canisters of stabilized legacy high-level waste from the Cold War stored onsite, and another 3,000 to 4,000 canisters will be generated in the process of stabilizing the remaining liquid radioactive waste now stored in aging tank farms at SRS. This stabilized high-level waste must be disposed in a federal repository, but until a federal repository is available, it will have to be stored at SRS.

In addition, Savannah River Site is the receipt and storage site for aluminum-clad research reactor spent fuel from decommissioned research reactors worldwide. Based on approved operational plans, SRS will reprocess this fuel in H Canyon to recover the enriched uranium for use as fuel in nuclear reactors pending operational approval by DOE and budget approvals by Congress. The high-level waste resulting from processing the fuel will be stabilized along with other high-level waste at SRS and stored until a repository is available.

Savannah River Site was also selected by DOE to provide interim storage for surplus non-pit plutonium in the United States. The plutonium originally located at Rocky Flats, Hanford, Los Alamos, and several weapons research laboratories will be consolidated at SRS. Approximately 60 percent of the plutonium by weight is scheduled to be converted to commercial reactor fuel in the Mixed Oxide Fuel Fabrication Facility (MOX).

However, DOE planned to dispose of the remaining 40 percent in the federal repository by dissolving in H Canyon, incorporating plutonium into borosilicate glass in the Defense Waste Processing Facility with existing high-level liquid waste, and storing it in the Glass Waste Storage Buildings at SRS until a repository is available.

If there is no repository, the costs for monitoring materials stored at SRS will continue for a longer period of time and will increase as years go by. In addition, SRS will be forced to build additional glass log storage buildings to accommodate material that should be going to the repository. There are currently two glass log storage buildings at SRS, and a third is being designed with more to follow. These facilities only have a design life of approximately 50 years. A study on the consequences of long-term storage (100-plus years) has yet to be conducted, and therefore their suitability for long-term storage is unknown.

While we recognize that DOE, the Nuclear Regulatory Commission, and the nuclear utilities are diligent in ensuring that these materials are stored securely, and we have no concerns about the ability to store these materials safely in the near term, the impacts of long-term interim storage, including continued safety, have not been adequately evaluated. This represents an additional cost required for community support.

Question Submitted by Representative Sandy Adams, Subcommittee on Investigations and Oversight

Q1. "Ratepayers in my State alone have contributed over $800 million to the Nuclear Waste Trust Fund to date. While the used fuel is currently being held safely on site by our utilities, doing so constitutes an additional economic burden. With the administration pulling the plug on Yucca Mountain for political, not scientific reasons, and no realistic alternative in place, why should my constituents continue to have to pay into the Waste Fund?"

A1. The Nuclear Waste Fund was created to provide a permanent solution for nuclear waste disposaL We do **NOT** believe your constituents should continue to pay into the Nuclear Waste Fund, **UNLESS** those funds are used for that purpose or for specific, current storage needs. For example, they could be earmarked for safe-

guards, security and environmental protection at the existing storage sites which now dot the country.

In addition to nuclear plant sites where commercial spent fuel is currently stored, these funds could also be utilized by communities who agree to host a Consolidated Interim Storage facility for commercial spent fuel.

New legislation in the form of amendments to the Nuclear Waste Policy Act would be needed to allow funds to be used in this way.

Otherwise, if payments to the Nuclear Waste Fund are not being used to provide permanent storage. as intended, the payments should cease.

Question Submitted by Representative Judy Biggert, Subcommittee on Energy and Environment

Q1. A primary recommendation from the BRC is to establish a new "consent-based siting" process that would require relevant State and local governments to accept a facility before it proceeds. The report, however, is silent on the question of consent by local communities where nuclear waste currently resides. If the BRC's recommendation is worthy of consideration, how can the Federal Government ensure "consent" requirements are a two-way street? In other words, should all the communities around the country currently storing spent fuel be required to do so indefinitely without their consent?

A1. We do **NOT** believe communities currently storing spent fuel around the country should be required to do so indefinitely without their expressed consent. First, storage of commercial spent fuel was—and is—a legal obligation of the Department of Energy, one that has important implications in health and safety, the economics of nuclear power as an energy source, and national security. DOE has not lived up to its obligatIons in this regard and, by default, has left the job to utilities and local communities across the Nation.

Secondly, consent by local communities is an essential element of long-term success in storage of commercial spent fuel and high-level defense waste. Because of the stalemate that currently exists in progress toward a permanent solution, the matter of consent by local communities where nuclear waste currently resides has taken on added importance.

A key to the "two-way street" assurance concerning consent requirements is education and engagement with DOE, congressional delegations, and the industry **AS EARLY AS POSSIBLE** in the decision-making process.

Local governments working alongside organizations like ours are the formal voice and institutional authority speaking on a community's behalf and pursuing community interests with Federal and State Governments. They also are uniquely positioned to negotiate economic benefits on behalf of the impacted community. It is imperative that any economic benefits reside at the local community level first, not merely directed from the State level down. We must keep in mind that this is where the waste will ultimately reside. whether that is interim or long term.

Question Submitted by Representative Randy Neugebauer, Subcommittee on Energy and Environment

Q1. Most scientists agree that we need long-term storage of nuclear waste. Our experiences with Yucca Mountain highlight the political difficulties locally, Statewide, and Nationwide in accomplishing such an objective. How can we build local consensus anywhere in the country to accept long-term storage of nuclear waste?

A1. Clearly, this is a major challenge—one not subject to glib, easy answers. For starters, to develop local consensus, potential host communities must get educated on nuclear issues and then educate their citizens. Outreach and education can include hosting meetings for the community at large with site managers, contractors or utilities; creating public information centers; and building websites and producing written materials that outline the pros and cons of the proposed initiative.

Local communities and governments must help ensure there is a defined public participation process and appropriate government services and funding for key activities, including oversight infrastructure development, workforce development and emergency training and preparedness.

The public participation process needs to be locally focused. Outside stakeholders (those not living in the community), while having a right to an opinion, must not be allowed to dictate or confuse the consensus process or decision. Many times their

more vocal views are taken by DOE, congressional delegations, and the press above the voice of the local community.

Local communities and governments also can play an important role in working with States and private companies to ensure that local values, concerns, and priorities are understood and taken into account in any proposed project and that appropriate incentives and benefits result. Some of these include:

- Infrastructure improvements, including highways, railroads, waterways, airports or other public projects;
- Environmental improvements, including the cleanup of existiny air, water or waste problems;
- Public school assistance programs;
- Higher education programs;
- Health care programs;
- Proposed co-location of other federal projects or existing federal expansions;
- General economic development programs;
- Transfer of ownership of federal properties;
- Tax subsidy or property value protection programs;
- Public recreation improvement projects;
- Direct financial assistance;
- Local employment or product purchasing agreements;
- Any other type of assurance, equity, or assistance desired.

A basic and fundamentally important principle of this program is that a host jurisdiction has the opportunity—and the responsibility—to define the benefits and conditions appropriate to its particular and unique needs.

Finally. it is essential that communities have a defined oversight role, particularly with respect to safety. security, and emergency response training.

Responses by Dr. Mark Peters, Deputy Laboratory Director for Programs, Argonne National Laboratory

Questions Submitted by Representative Paul C. Broun, Chairman, Subcommittee on Investigations and Oversight

Q1. What areas of nuclear energy-related research, development and demonstration offer the most promise to make a significant change in the quantity of spent nuclear fuel produced and the manner in which it is handled?

A1. The most promising research areas relate to the development and demonstration of safe, secure, and economic technologies for "closing" the nuclear fuel cycle. The current nuclear fuel cycle in the United States is "open," which means that fuel is used only once in a reactor, for about four years. The fuel then is removed from the reactor and stored at the plant site while it cools and its radioactivity decreases.

The "open" fuel cycle yields wastes that still contain a substantial amount of untapped energy. At present, the fuel for our operating light water reactors (LWRs) is discharged after only about five percent of the uranium has been fissioned and another one or two percent has been converted to plutonium and "minor actinides," such as neptunium, americium, and curium. If the residual uranium, plutonium, and minor actinides in used LWR fuel were recycled and reused, they could generate additional electricity. Recycling also would minimize the discharge of plutonium and minor actinides as waste. Because these constituents of used fuel remain radiologically toxic for thousands of years, recycling would increase the efficient use of our uranium resources while minimizing the creation of ultralong-lived radioactive waste requiring permanent deposition.

Specific research priorities include:

- Development and demonstration of efficient processing techniques to extract/recover all long-lived constituents (plutonium and minor actinides) from used nuclear fuel. These techniques must be economical to implement and safeguard, must minimize creation of secondary wastes, and must produce high-quality feedstock for fuel re-fabrication. Wastes generated during the processing and recycle should be compact, durable, and leach-resistant.
- Design and demonstration of economical and passively safe fast-spectrum reactors (including their fuels) for consuming long-lived constituents in used nuclear fuel.
- Development and validation of advanced modeling and simulation approaches for designing efficient recycling systems and facilities, enhancing assurance of their safety, and facilitating safeguards and protection of nuclear materials.

Research also should be undertaken to improve the existing once-through fuel cycle. Specific recommendations include:

- Development of LWR fuels that will achieve increased burnup, provide greater reliability and operational flexibility, offer enhanced "accident tolerance," and assure long-term stability following discharge from the reactor.
- Verification of the stability and integrity of existing LWR fuels and their packaging (containers) after fuel discharge, during extended storage, and during transport following extended storage.

Q2. In his testimony, Mr. Spencer testified that the BRC should address Yucca Mountain head-on, stating:

"The BRC should state what it believes should happen with Yucca Mountain based on the best science and evidence available. If its members believe Yucca should be shut down, it should state why and provide a recommendation for disengaging from Yucca. If, on the other hand, it finds that Yucca should be pursued, perhaps as one of a number of options, then the Commission should provide recommendations on how to move forward. Such a conclusion could reject the current Yucca program while proposing an alternative. Such an alternative could embody the recommendations of the BRC's consent-based approach where the people of Nevada are given control over the future of the Yucca facility."

Do you agree or disagree with this recommendation, and why?

A2. The duties specified for the BRC in its Charter center on the consideration and assessment of a broad range of technological and policy alternatives for managing the back end of the nuclear fuel cycle in the United States. The Commission's intent, as well as its direction from the Administration, evidently focused on identification of workable alternatives to the Yucca Mountain Repository. In its draft report, the Commission offers only generic technical and policy options for nuclear

waste management, with no specific recommended locations for interim storage or permanent disposal. In particular, the report neither includes nor excludes Yucca Mountain in its identification of options, and instead calls for a consent-based approach to siting nuclear waste management and disposal facilities.

The BRC draft report does include some discussion of the Yucca Mountain program. Section 3.4.3 of the draft report summarizes the "Experience with the Yucca Mountain Repository Program," highlighting delays and difficulties that affected the program and discussing the erosion of public trust in the program, particularly in Nevada. Moreover, in p. 24 of the draft report, the Commission acknowledges that "with key decisions by the courts and the NRC still pending, the future of the Yucca Mountain project remains uncertain." It also should be noted that the Yucca Mountain repository is a specific example of a mined geologic repository (in volcanic tuff), which is one of the generic disposal options identified in the draft report.

As I stated during my testimony, I believe that completion and release of the Nuclear Regulatory Commission's Safety Evaluation Reports on Yucca Mountain would provide an important opportunity for lessons learned as we seek options for permanent disposition of new and legacy nuclear wastes. These reports, combined with the Yucca Mountain license application to the NRC, represent a substantial investment of both scientific endeavor and taxpayer funding, and I believe they will be valuable to the nuclear energy industry and to policymakers and regulators going forward.

Q3. Having watched the situation unfold in Japan in the wake of their historic earthquake and tsunami, I think we can all agree that it is appropriate to study what happened at Fukushima Daiichi and apply any lessons learned to our fleet of American nuclear reactors. However, it is also clear that the Japanese regulatory model is a different one than ours. What can we learn from what happened in Japan, and what do we know about the safety and security of our own plants?

A3. It is important to remember that the nuclear industry in the United States has an outstanding safety record, along with a history of improving its procedures and practices in response to safety incidents and accidents worldwide. However, the Fukushima accident highlights the need for continued vigilance and attentiveness to safety in the operation and regulatory oversight of nuclear power plants. As we learn more about the Fukushima Daiichi accident and its aftermath, the NRC and regulatory agencies in other nations should thoughtfully re-evaluate safety requirements and verification of industry compliance.

In the weeks following the Fukushima accident, nuclear plant operators in the United States and other nations re-examined and verified their preparedness to cope with emergencies, especially the type of station-blackout scenario that occurred at Fukushima after the Japanese earthquake and tsunami. Additionally, the NRC sent inspectors to every U.S. nuclear plant to review preparedness for natural and/or man-made disasters, especially those which could cause prolonged loss of offsite power. The NRC also established a Near-Term Task Force, which has issued a report on its initial recommendations to assure the safe operation and emergency preparedness of U.S. plants. The NRC currently is reviewing those initial recommendations and is planning a more intensive six-month study.

Given the U.S. nuclear industry's decades-long track record of safe and reliable operation, it seems that the safety and security risks of continued operation of America's existing nuclear power plants appear to be relatively low, especially when compared with the safety and health risks caused by other means of baseload electricity generation. However, it should be noted that important design improvements have been made since the construction of America's current operating fleet. Wherever possible, next-generation nuclear plant designs replace "active" systems, which are dependent on pumps, valves, and human operators, with "passive" systems that use natural forces, such as gravity and convection, to respond to malfunction. For example, in next-generation designs, the reactor may be engineered so that, if core temperature rises above normal levels, the efficiency of the fission reaction decreases and it slows down automatically. Control rods that stop the nuclear reaction can be suspended above the reactor and held in place with electricity, so that any interruption to the station's electrical power will automatically insert the rods into the reactor. These passive safety systems mean that if a plant loses power, as happened at the Fukushima Daiichi plant in Japan, the reactor does not require electricity to cool the core after shutdown. Incorporating these technologies in future construction of American nuclear power plants would provide additional safeguards against any possibility of a Fukushima-type disaster in the United States.

The Fukushima accident also highlights the need for safe storage and management of used nuclear fuel. As the United States seeks workable policies and practices for short- and long-term management of nuclear wastes, we must carefully con-

sider the need to find prompt, safe, and cost-effective means to limit risks associated with used fuel storage at plant sites, especially risks arising from inadequate cooling or proximity to operating reactors.

Appendix 2

Additional Material for the Record

ADDITIONAL MATERIAL FOR THE RECORD

REPORT BY THE MAJORITY STAFF OF THE HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE: *Yucca Mountain: The Administration's Impact on U.S. Nuclear Waste Management Policy*, June 2011

Committee on
SCIENCE, SPACE, AND TECHNOLOGY
RALPH M. HALL, CHAIRMAN

Yucca Mountain:

The Administration's Impact on U.S. Nuclear Waste Management Policy

Report by the Majority Staff of the House Science, Space, and Technology Committee

June 2011

Authority and Jurisdiction

Pursuant to Rule X of the U.S. House of Representatives, the Committee on Science, Space, and Technology Committee has jurisdiction over the following areas pertinent to civilian radioactive waste management, and Yucca Mountain in particular: All energy research, development, and demonstration therefor, and all federally owned or operated nonmilitary energy laboratories; environmental research and development; commercial application of energy technology; and scientific research, development, and demonstration, and project therefor. [1]

Rule X also tasks the Committee with a special oversight function to review and study on a continuing basis laws, programs, and Government activities relating to nonmilitary research and development.[2] Additionally, Rule XI allows the Committee to conduct at any time such investigations and studies as it considers necessary or appropriate in the exercise of its responsibilities under Rule X.[3] Since the passage of the Nuclear Waste Policy Act of 1982 in the 97th Congress, the Committee has actively engaged in the scientific evaluation of nuclear waste repository site selection and evaluation through oversight hearings and legislative activity.[4]

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[1] Note: The Committee has general oversight responsibilities in order to assist the House in –

(1) its analysis, appraisal, and evaluation of –

(A) the application, administration, execution, and effectiveness of Federal laws; and

(B) conditions and circumstances that may indicated the necessity or desirability of enacting new or additional legislation; and

(C) its formulation , consideration, and enactment of changes in Federal laws, and of such additional legislation as may be necessary or appropriate.

In order to determine whether laws and programs within the jurisdiction of the Committee are being implemented and carried out in accordance with the intent of Congress and whether they should be continued, curtailed, or eliminated, the Committee is tasked with reviewing and studying on a continuing basis –

(A) the application, administration, execution , and effectiveness of laws and programs addressing subjects within its jurisdiction;

(B) the organization and operation of Federal agencies and entities having responsibilities for the administration and execution of laws and programs addressing subjects within its jurisdiction.

(C) Any conditions or circumstances that may indicate the necessity or desirability of enacting new or additional legislation addressing subjects within its jurisdiction (whether or not a bill or resolution has been introduced with respect thereto)

[2] Rule X, Rules of the House of Representatives, 112th Congress, January 5, 2011. Available at: http://rules.house.gov/Media/file/PDF_112_1/legislativetext/112th%20Rules%20Pamphlet.pdf

[3] Rule XI, Rules of the House of Representatives, 112th Congress, January 5, 2011. Available at: http://rules.house.gov/Media/file/PDF_112_1/legislativetext/112th%20Rules%20Pamphlet.pdf

[4] See Appendix B.

EXECUTIVE SUMMARY

Over the course of the last two and a half years, Committee Republicans have reviewed in depth Administration actions associated with the Yucca Mountain Project and disposal of the Nation's spent nuclear fuel and high level radioactive waste. Focusing in particular on the scientific and technical information and processes associated with key policy decisions, the Committee's effort included numerous letters to Administration officials, extensive questioning at Committee hearings, and acquisition and review of thousands of pages of internal documents. This report details the results of our review of the Administration's actions related to Yucca Mountain in the context of promises and specific guidelines on scientific integrity, openness, and transparency set forth by President Obama and senior Administration officials.

The results of this review are striking. Despite numerous suggestions by political officials—including President Obama—that Yucca Mountain is unsafe for storing nuclear waste, the Committee could not identify a single document to support such a claim. To the contrary, the Committee found great agreement among the scientific and technical experts responsible for reviewing the suitability of Yucca Mountain—considered by many to be "the most studied piece of land on Earth"—that nuclear waste can be safely stored at the site for tens of thousands of years in accordance with Nuclear Regulatory Commission (NRC) requirements.

Most noteworthy in this regard is Volume III of the NRC's Safety Evaluation Report (SER)—a comprehensive technical evaluation of site safety critical to advancing licensing and construction of the Yucca facility. Obtained by the Committee only after repeated demands and over the objections of the NRC Chairman, SER Volume III demonstrates in excruciating detail the level of technical support among NRC and Department of Energy (DOE) experts in favor of the site's advancement: the Committee found that NRC agreed with over 98.5 percent of DOE's findings regarding the site's suitability to meet regulatory requirements. The remaining 1.5 percent did not impact the NRC staff's overall conclusions, which found that DOE's Yucca Mountain License Application complies with applicable NRC safety requirements, including those related to human health and groundwater protection, and the specific performance objectives called for in NRC regulations for disposal of high-level radioactive wastes at Yucca Mountain (10 CFR 63.113-115).

Why, then, has the President shut down the Yucca Mountain Project? And why does NRC Chairman Jaczko refuse to permit NRC safety review of the site to continue, and refuse to allow his fellow Commissioners to formally vote on DOE's Motion to Withdraw the Yucca Mountain License Application? The answer is clearly not explained by or based on any scientific or technical evaluation.

While the specific instances of concern uncovered by the Committee and detailed in this report are convincing in and of themselves, they collectively reveal not just a pattern, but a systematic and active effort on the part of the Administration to obfuscate, delay, and muzzle scientific and technical information and related processes in order to shut down Yucca Mountain.

These actions have not only violated the President's own highly promoted principles and directives on scientific integrity, transparency, and openness, they have also increased taxpayer liabilities under the Nuclear Waste Policy Act, left nuclear waste sitting at reactor sites across the country with no plan for disposal, and ultimately threatened the long-term potential of nuclear power to meet America's growing energy demands with safe, clean, and affordable baseload electricity.

In closing, it should be noted that, despite the path that has been worn and the damage that has been done, the Administration still has ample opportunity to make things right. Disclosing to Congress the relevant and necessary information related to the Yucca Mountain decision process, allowing formal completion of the Safety Evaluation Reports, and bringing the DOE's Motion to Withdraw its license application to a vote before the full Commission would go a long way to restoring public confidence in the nuclear waste management policy process.

> *"Other than the termination of the Department's Super Conducting, Super Collider Project in Texas in 1998, we know of no comparable single project termination in the Department's recent history as consequential as Yucca Mountain, given the importance of its intended mission, the massive investment in real and personal property and the development and compilation of huge quantities of Project-related, intellectual property."*
>
> – *DOE Inspector General, July 2010*

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FOREWORD

"I will restore the basic principle that government decisions should be based on the best-available, scientifically valid evidence and not on the ideological predispositions of agency officials or political appointees."

– Barack Obama to *Nature* Magazine, September 2008

The Science, Space, and Technology Committee has conducted active oversight of the issue of scientific integrity throughout the government, a theme consistently touted by the Obama Administration. Even before taking office, the President's transition office established a clear commitment to "Restore Scientific Integrity to the White House," and stated that the incoming administration would "[r]estore the basic principle that government decisions should be based on the best available, scientifically valid evidence and not on ideological predispositions."[5]

President Obama further emphasized this point in his inaugural address when he promised to "restore science to its rightful place."[6] These assurances were once again affirmed by the President before the National Academy of Sciences on April 27, 2009 when he stated "[u]nder my administration, the days of science taking a back seat to ideology are over."[7]

The President went on to pledge a "new effort to ensure that federal policies are based on the best and most unbiased scientific information," and stated, "I want to be sure that the facts are driving scientific decisions –and not the other way around."[8] He continued to highlight these tenets in a Presidential Memorandum that tasked the Director of the Office of Science and Technology Policy (OSTP) to develop recommended principles for ensuring scientific integrity within 120 days. In that memo, the President stated:

> "Except for information that is properly restricted from disclosure under procedures established in accordance with statute, regulation, Executive Order, or Presidential Memorandum, each agency should make available to the public the scientific or technological findings or conclusions considered or relied on in policy decisions."[9]

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[5] "The Obama-Biden Plan, Technology Agenda," The Office of the President-Elect. Available at: http://change.gov/agenda/technology_agenda

[6] President Barack Obama's Inaugural Address, January 21, 2009. Available at: http://www.whitehouse.gov/blog/inaugural-address

[7] Remarks by the President at the National Academy of Sciences, The White House, April 27, 2009. Available at: http://www.whitehouse.gov/the-press-office/remarks-president-national-academy-sciences-annual-meeting

[8] Ibid.

[9] White House Memorandum, Subject: Scientific Integrity, March 9, 2009. Available at: http://www.whitehouse.gov/the_press_office/Memorandum-for-the-Heads-of-Executive-Departments-and-Agencies-3-9-09

The Presidential Memorandum continued, "[t]he public must be able to trust the science and scientific process informing public policy decisions."[10] It also directed that "[t]o the extent permitted by law, there should be transparency in the preparation, identification, and use of scientific and technological information in policymaking," and that "[p]olitical officials should not suppress or alter scientific or technological findings and conclusions."[11]

> *"I started corresponding with John Holdren (in his position leading the National Commission on Energy Policy) back in October, 2008, about the scientific integrity problem that would emerge if a new Obama administration were to withdraw the Yucca Mountain license application and thus stop the independent NRC technical review of that application."*
>
> – *Email from Per Peterson to DOE Ass't Secretary Warren Miller*

Despite the President's call for recommendations on scientific integrity in 120 days, the Director of OSTP took nearly two years to respond to the tasking, ultimately only providing "further guidance" to agencies, and directed them to submit draft guidelines to OSTP.[12] In that memo, the OSTP Director stated, "[s]cience, and public trust in science, thrives in an environment that shields scientific data and analysis from inappropriate political influence; political officials should not suppress or alter scientific or technical findings."[13]

The Director of OSTP also directed all executive branch departments to provide a progress report on the adoption of scientific integrity policies. It was reported the progress reports were submitted on April 21, 2011, including the Department of Energy's progress report.[14] However, despite President Obama's commitment to openness, the reports are not publicly available.

The Administration's promises on transparency and openness have been just as strong as its rhetoric on scientific integrity. In issuing a January 2009 memorandum titled "Transparency and Open Government," the President stated:

> "My Administration is committed to creating an unprecedented level of openness in Government. We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration. Openness will strengthen our democracy and promote efficiency and effectiveness in Government. ... Transparency promotes accountability and provides information for citizens about what their Government is doing. Information maintained by the Federal Government is a national asset. My Administration will take appropriate action, consistent with law and policy, to disclose information rapidly in forms that the public can readily find and use."[15]

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[10] Ibid.
[11] Ibid.
[12] Office of Science and Technology Policy Memorandum, Subject: Scientific Integrity, December 17, 2011. Available at: http://www.whitehouse.gov/sites/default/files/microsites/ostp/scientific-integrity-memo-12172010.pdf
[13] Ibid.
[14] "Agencies Report Scientific Integrity Progress," OSTP Blog, April 21, 2009. Available at: www.whitehouse.gov/blog/2011/04/21/agencies-report-scientific-integrity-progress
[15] White House Memorandum, Subject: Transparency and Open Government, January 21, 2009. Available at: http://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment

In December 2009, the White House Office of Management and Budget (OMB) issued a directive to agencies to uphold and advance the President's transparency goals, stating as a high-level principle that, "[t]o create an unprecedented and sustained level of openness and accountability in every agency, senior leaders should strive to incorporate the values of transparency, participation, and collaboration into the ongoing work of their agency."[16]

In response to the Directive, the NRC issued an Open Government Plan to guide implementation of the OMB Directive.[17] The NRC Plan notes that "The NRC views nuclear regulation as the public's business and, as such, believes it should be transacted as openly and candidly as possible to maintain and enhance the public's confidence. Ensuring appropriate openness explicitly recognizes that the public must be informed about, and have a reasonable opportunity to participate meaningfully in, the NRC's regulatory processes."[18]

Nuclear Regulatory Commission Chairman Gregory Jaczko added his personal emphasis to NRC's commitment, stating, "I believe that all of this scrutiny and attention makes it even more important that we conduct the public's work in an open and transparent manner."[19] Chairman Jaczko went on to state:

> "Over the past few months, we have moved forward with implementing the President's Open Government Directive. As an independent agency, we were not required to comply with this Directive, but we have done so because it's in line with our historic organizational commitment to openness and transparency. This is an area that will always require our continuing focus. We can't simply check a few boxes on a form, and then declare ourselves open and transparent. We have to continually explain to the public what we are doing, how we are doing it, and why we are doing it."[20]

The Department of Energy touted similar objectives in its own Open Government Plan, committing to "increase transparency, participation and collaboration across its unique programs and offices" and "advance open government in support of a more effective Department for its employees and for American people, businesses and communities."[21]

The Committee regularly reviews whether administration actions comply with stated policy. In this instance, the Administration's declarations on both scientific integrity and transparency must be taken into account when evaluating its handling of the Yucca Mountain Project. This report examines Administration actions related to Yucca Mountain in the context of promises and specific guidelines on scientific integrity, openness, and transparency set forth by President Obama and senior Administration officials.

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[16] Office of Management and Budget Memorandum, Subject: Open Government Directive, December 8, 2009. Available at: www.whitehouse.gov/open/documents/open-government-directive

[17] "Open Government Plan," U.S. Nuclear Regulatory Commission, June 7, 2010. Available at: www.nrc.gov/public-involve/open/philosophy/nrc-open-gov-plan.pdf

[18] "Strategic Plan, Fiscal Years 2008-2013," U.S. Nuclear Regulatory Commission, February, 2008. Available at: www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1614/v4/sr1614v4.pdf#page=20

[19] "A Strong Foundation, A Strong Regulatory Future." Dr. Gregory B. Jaczko, Chairman, U.S. Nuclear Regulatory Commission, March 9, 2010. Available at: http://phadupws.nrc.gov/docs/ML1006/ML100680213.pdf

[20] Ibid.

[21] "Open Government Plan," U.S. Department of Energy, June 2010. Available at: www.energy.gov/open/opengovplan_html.htm

Chapter 1. Background

1.1 The History of Yucca Mountain

For over fifty years, scientists have considered how best to manage radioactive waste materials.[22] A deep geological repository has been, and continues to be, the most agreed upon method by numerous credible scientific bodies to dispose of radioactive waste.

In the late 1970's, the United States government began serious consideration of geological repositories. Initially, DOE considered numerous sites scattered throughout the country, but quickly focused on three specific sites including Yucca Mountain, Nevada; Hanford, Washington; and Deaf Smith County, Texas. DOE began studying Yucca Mountain in 1978 and an Environmental Impact Statement issued in 1980 proposed to "adopt a national strategy to develop a mined geologic repository for disposal of commercially generated high-level and transuranic radioactive waste."[23] DOE ultimately judged Yucca Mountain, a site about 100 miles from Las Vegas, on the edge of the Nevada Test Site, to have the "best overall prospects for being considered a suitable repository site."[24]

Aerial View of Yucca Mountain

[22] "The Disposal of Radioactive Waste," National Academy of Sciences, Board of Radioactive Waste Management, September 1957. Available at: www.nap.edu/openbook.php?record_id=10294

[23] "Management of Commercially Generated Radioactive Waste," Environmental Impact Statement, U.S. Department of Energy, October 1980. Available at: www.energy.gov/media/EIS0046F_33515.pdf

[24] Hearing titled "Nuclear Waste Program," Committee on Energy and Natural Resources, U.S. Senate, June 29, 1987. Available at: www.archive.org/stream/nuclearwasteprog04unit/nuclearwasteprog04unit_djvu.txt

1.2 The History of Yucca Mountain Legislation

Since the U.S. Government began nuclear waste specific studies into Yucca Mountain nearly 35 years ago, Congress has consistently voted in support of a national geological repository at the site. This legislative record began in the 97th Congress with the passage of the Nuclear Waste Policy Act of 1982 (NWPA) that centralized the long-term management of nuclear waste, most notably by mandating construction of a safe and permanent nuclear waste repository. In 1987, Congress amended the NWPA by designating Yucca Mountain as the only site to be considered as a repository by a vote of 237-181 in the House of Representatives and 61-28 in the Senate. In 2002, Congress reaffirmed this designation by a vote of 306-117 in the House of Representatives and a vote of 60-39 in the Senate. Again in 2007, the House of Representatives overwhelmingly rejected, by a vote of 80-351, an attempt to eliminate funding for the Yucca Mountain nuclear waste disposal program.

The NWPA also assigned responsibility for various aspects of the repository to four primary entities:

1. The Department of Energy to site, construct, operate, and close a repository;
2. The Environmental Protection Agency to set public radiological health and safety standards for a repository;
3. The Nuclear Regulatory Commission to promulgate regulations governing construction, operation, and closure of a repository; and
4. The civilian nuclear power industry to handle the costs of disposal of spent nuclear fuel and high-level radioactive waste.[25]

As part of the nuclear industry responsibility under NWPA, the collection from nuclear power users of one mil (or one-tenth of one cent) per kilowatt-hour of nuclear generated electricity was mandated to provide funding for development of the eventual site.

1.3 The History of Scientific, Technical, and Safety Reviews

Since the NWPA passed in 1982, Yucca Mountain has been exhaustively examined, commonly earning it the moniker of the "most studied piece of land in the world."[26] These site examinations have resulted in tens of thousands of pages of scientific, engineering, and technical studies contributing to a robust level of confidence in the safety and radiological protection characteristics of the site.

In June 1985, DOE's Office of Civilian Radioactive Waste Management (OCRWM) submitted the "Mission Plan for the Civilian Radioactive Waste Management Program," that set forth the overall goals, objectives, and strategy to dispose of spent nuclear fuel and high-level waste. It further presented detailed information required by the NWPA, for "obtaining information; potential financial, institutional, and legal issues; plans for the test and evaluation facility; the

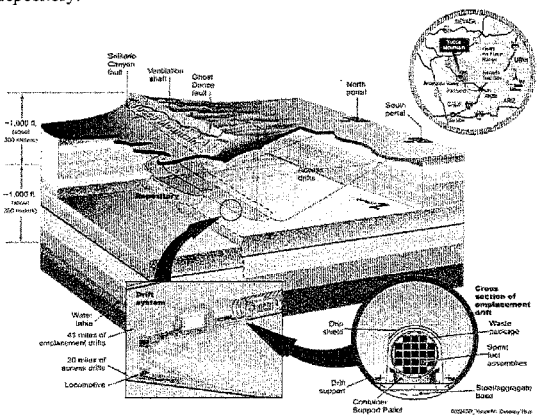
[25] "Yucca Mountain Science and Engineering Report: Technical Information Supporting Site Recommendation Consideration," Department of Energy, Office of Civilian Radioactive Waste Management, February 2002. Available at: http://www.energy.gov/media/SER.PDF

[26] "Yucca Mountain: The Most Studied Real Estate on the Planet," U.S. Senate Committee on Environment and Public Works, March 2006. Available at: http://epw.senate.gov/repwhitepapers/YuccaMountainEPWReport.pdf

principal results obtained to date from site investigations; information on the site-characterization programs; information on the waste package; schedules; costs; and socioeconomic impacts."[27] The Mission Plan provided a foundation for future site characterization and the path to open a permanent geologic repository.

As early as 1984, DOE published a draft environmental assessment of the Yucca Mountain Project that was incorporated into a May 1986 DOE report on multi-attribute utility analysis.[28] In the analysis, DOE used quantitative methods to rank possible sites on pre-closure and post-closure technical guidelines. Among the sites considered, Yucca Mountain was rated as the best option and most resilient to all impacts. DOE continued to study the public health and safety implications associated with opening Yucca Mountain.

In December 1998, DOE published five volumes titled the "*Viability Assessment of a Repository at Yucca Mountain.*" This Viability Assessment noted the design of a repository at Yucca Mountain had undergone multiple improvements to reduce uncertainties and improve its performance, highlighting that repository design is an iterative process, always incorporating a greater understanding of underlying scientific and technical issues. The report concluded that, "based on the viability assessment, DOE believes that Yucca Mountain remains a promising site for a geologic repository."[29]



Cutaway Diagram of the Yucca Mountain Repository Design

[27] "Mission Plan for the Civilian Radioactive Waste Management Program, Volume I," Department of Energy, Office of Civilian Radioactive Waste Management, June 1985. Available at: http://www.energy.gov/media/MissionPlan-HQP-19870601-0271_pp1-250.pdf

[28] "A Multiattribute Utility Analysis of Sites Nominated For Characterization For the First Radioactive Waste Repository - A Decision Aiding Methodology," May 1986. Available at: http://www.energy.gov/media/Multiattribute-Utility-Analysis_HQS-19880517-1167_pp1-250.pdf

[29] "Viability Assessment of a Repository at Yucca Mountain," Department of Energy, Office of Civilian Radioactive Waste Management, December 1998. Available at: http://www.energy.gov/media/Viability_Overview_b_1.pdf

In February 2002, OCWRM published the "*Yucca Mountain Science and Engineering Report: Technical Information Supporting Site Recommendation Consideration.*" The report "describes the results of scientific and engineering studies of the Yucca mountain site, the waste forms to be disposed, the repository and waste package designs, and the results of the most recent assessments of the long-term performance of the potential repository."[30]

Upon review of OCWRM's analysis of key technical aspects relating to Yucca Mountain, then-Secretary of Energy Spencer Abraham formally recommended to President George W. Bush that a geological repository for spent nuclear fuel and high-level radioactive waste should be located at Yucca Mountain. In his recommendation of Yucca Mountain, Abraham noted:

> I have considered whether sound science supports the determination that the Yucca Mountain site is scientifically and technically suitable for the development of a repository. I am convinced that it does. The results of this extensive investigation and the external technical reviews of this body of scientific work give me confidence for the conclusion, based on sound scientific principles, that a repository at Yucca Mountain will be able to protect the health and safety of the public when evaluated against the radiological protection standards adopted by the Environmental Protection Agency and implemented by the Nuclear Regulatory Commission.[31]

Secretary Abraham also pointed out in 2002 testimony to the Senate Energy and Natural Resources Committee that the "scientific evaluation of the Yucca Mountain site had been conducted over a 24-year period."[32] After consideration of Secretary Abraham's recommendation, President Bush made a formal recommendation to Congress in 2002 to move forward with a repository at Yucca Mountain. The NWPA afforded the state in which the repository was selected to formally disapprove of the selection. In response to Nevada's objection, Congress reconfirmed the selection of Yucca Mountain by voting to move forward with Yucca Mountain by a vote of 306-117 in the House and adopted the measure by voice vote in the Senate.[33]

Following this recommendation, DOE entered the final stages of the site characterization and recommendation process by beginning to prepare the License Application and Safety Analysis Report (SAR) for Yucca Mountain. Meanwhile, technical reviews, quality assurance evaluations, and studies continued to promulgate the necessary regulatory thresholds to protect public health and safety, and prevent adverse environmental impact.

In 2002, DOE published a 15-chapter Environmental Impact Statement (EIS) required by the NWPA in accordance with the National Environmental Policy Act.[34] In addition to the original

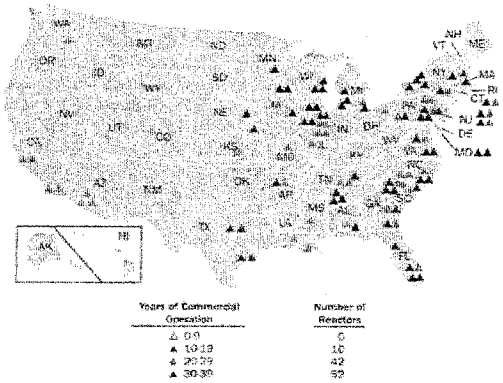
[30] "Yucca Mountain Science and Engineering Report: Technical Information Supporting Site Recommendation Consideration," February 2002. Available at: http://www.energy.gov/media/SER.PDF
[31] "Energy Timeline for the Year 2002," U.S. Department of Energy. Available at: http://www.energy.gov/about/timeline2002.htm
[32] Statement of the Spencer Abraham, Secretary of Energy, Before the House Energy and Natural Resources Committee. May 16, 2002. Available at: http://www.yuccamountain.org/abraham051602.htm
[33] "Yucca Mountain Repository Site Approval Act," Final Vote Results for Roll Call 133, H.J Res. 87, May 8, 2002. Available at: http://clerk.house.gov/evs/2002/roll133.xml
[34] "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," February 28, 2002. Available at: http://pbadupws.nrc.gov/docs/ML0326/ML032690321.html

EIS, in 2008 DOE submitted a supplemental EIS to resolve points raised following the initial EIS.[35] The EIS did not identify any environmental issues that would prevent the Yucca Mountain license from moving forward.

After years of preparation, DOE submitted the License Application (LA) for a High-Level Waste Geologic Repository at Yucca Mountain to the NRC on June 3, 2008.[36] The LA included a detailed SAR, focused on the development of the necessary safety and technical thresholds to be considered by the NRC in the SER. The SAR was divided into five chapters: "Repository Safety Before Permanent Closure," "Repository Safety After Permanent Closure," "Research and Development Program to Resolve Safety Questions," "Performance Confirmation Program," and "Management Systems."[37] Again, no obstacles were identified in the SAR and DOE demonstrated it could safely construct and manage a repository.

Upon receipt of the LA and accompanying SAR, the NRC began work on the five-volume SER. The detailed and meticulously prepared SER reports are intended to provide a final comprehensive analysis of the technical feasibility of Yucca Mountain with respect to its ability to meet regulatory thresholds.

U.S. Commercial Nuclear Power Reactors—Years of Operation



Source: U.S. Nuclear Regulatory Commission

Map of Current Nuclear Power Reactors in the United States

[35] 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," July 3, 2008. Available at: http://pbadupws.nrc.gov/docs/ML0817/ML081750191.html

[36] "DOE's License Application for a High-Level Waste Geologic Repository at Yucca Mountain," June 3, 2008. Available at: http://www.nrc.gov/waste/hlw-disposal/yucca-lic-app.html

[37] "Yucca Mountain Repository License Application: Safety Analysis Report," June 2008. Available at: http://www.nrc.gov/waste/hlw-disposal/yucca-lic-app/yucca-lic-app-safety-report.html

The summary and status of the SER volumes is as follows:

- Volume I: Released August 23, 2010, Volume I found that DOE's license application satisfied the general description of the repository, proposed schedules for activities, and described security measures and site characterization.[38]
- Volume II: Originally scheduled for release in March 2011,[39] before being advanced to December 2010, Volume II assesses pre-closure issues such as placing spent nuclear fuel in the repository and other actions necessary prior to closing the site. Volume II remains private due to NRC Chairman Jazcko's decision to stop final work on this volume.
- Volume III: Completed and waiting approval in July 2010, Volume III evaluates the safety and technical issues associated with post-closure activities. Targeted for release in November 2010, Volume III remains private due to NRC Chairman Jaczko's decision to halt all review of the LA and end the High-Level Waste Program.
- Volume IV: Still pending, originally scheduled for release in January 2011, Volume IV is to address the maintenance, quality assurance, and radiological issues.
- Volume V: Still pending, originally scheduled for release in March 2011, Volume V would include modifications to previous SER volumes and summarize previous four volumes.

While NRC staff were the primary entities responsible for the preparation of the SER, DOE was also closely involved with the document preparation. Contentions, or scientific questions needing to be resolved, were addressed in coordination between the two agencies.

[38] "Safety Evaluation Report Related to Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada; Volume 1: General Information," United States Nuclear Regulatory Commission, August 2010. Available at: http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1949/#abs

[39] See "Tentative Completion Dates for Safety Evaluation Report Volumes" figure, page 33.

Chapter 2. Chronology of Events Under the Obama Administration

2.1 President Obama's Campaign Promise

President Obama has been a consistent opponent of Yucca Mountain, despite the large number of nuclear power reactors with onsite waste storage in his home state of Illinois.[40] This skepticism and opposition continued through his Presidential campaign.

President Obama with Science Advisor John Holdren

Early during his campaign for the presidency, Barack Obama vowed to shut down Yucca Mountain. Campaign materials noted that "Barack Obama and Joe Biden do not believe that Yucca Mountain is a suitable site. They will lead federal efforts to look for safe, long-term disposal solutions based on objective, scientific analysis."[41] Candidate Obama publicly stated:

> After spending billions of dollars on the Yucca Mountain Project, there are still significant questions about whether nuclear waste can be safely stored there. I believe a better short-term solution is to store nuclear waste on-site at the reactors where it is produced...until we find a safe, long-term disposal solution that is based on sound science.[42]

2.2 The Shutdown Announcement

With the release of the President's Fiscal Year (FY) 2011 budget request in February 2010, DOE announced its intention to withdraw the License Application for Yucca Mountain. The budget request also declared the Administration's intent to dismantle OCRWM by the end of the fiscal year. DOE immediately initiated the process to shutter the office.

Despite the President's continued assertions that his nuclear waste management policy decisions would be driven by sound science, the Administration has repeatedly refused to provide a scientific or technical justification for its shutdown decision, instead simply stating that Yucca "is not a workable option." Secretary Chu has noted that "technology has advanced" since the NWPA passed in 1982; however he has not specified what those advancements mean and how new technologies change the law.

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[40] Letter from Senator Barack Obama to Senate Majority Leader Harry Reid and Senator Barbara Boxer, Dated October 30, 2007. Available at: http://my.barackobama.com/page/community/post_group/NVHQ/CSYB

[41] "Barack Obama and Joe Biden: New Energy for America," August 3, 2008. Available at: http://pensecinc.com/docs/factsheet_energy_speech_080308.pdf

[42] "Barack Obama Explains Yucca Mountain Stance." *Las Vegas Review Journal*. May 20, 2007. Available at: http://www.lvrj.com/opinion/7598337.html

2.3 The Blue Ribbon Commission

Energy Secretary Stephen Chu

In concurrence with DOE's announcement to close OCRWM and permanently remove Yucca Mountain as an option for a permanent repository, President Obama established the Blue Ribbon Commission on America's Nuclear Future (BRC). The BRC is tasked to evaluate and make recommendations relating to policies guiding fuel cycle technologies, interim waste storage, permanent SNF disposal and related management issues.[43] While the BRC is prohibited from making alternative site recommendations due to Yucca Mountain's lawful designation as the repository site, BRC Co-Chairman Lee Hamilton said Secretary Chu made it "quite clear that nuclear waste storage at Yucca Mountain is not an option."[44] Then-Climate Change Czar Carol Browner said, "It is time to move forward with a new strategy based on the best science,"[45] in spite of the lack of credible scientific evidence demonstrating Yucca Mountain is not viable.

These actions highlight the highly illogical nature of terminating the only existing waste storage option before assessing potential alternative options.

2.4 DOE's Motion to Withdraw and Related License Application Activities at the NRC

On March 3, 2010, DOE filed a motion with the NRC to withdraw the License Application for a High-Level Waste Repository at Yucca Mountain "with prejudice." By attempting to withdraw *with prejudice,* the Administration would permanently prevent consideration of Yucca Mountain, blocking future Congresses and Administrations from reversing this decision.

The primary argument of the Motion to Withdraw rested on the vague statement that Yucca Mountain isn't a "workable option." The Motion lacked detailed justification in support of this decision, stating for example that "It is the Secretary of Energy's judgment that scientific and engineering knowledge on issues relevant to disposition of high-level waste and spent nuclear fuel has advanced dramatically over the twenty years since the Yucca Mountain project was initiated."[46] These general advancements in the understanding of waste storage are of course irrelevant to the fundamental question of whether Yucca Mountain is a suitable site without an open assessment of how this advanced knowledge impacts the safety of the Yucca Mountain Project.

On June 29, 2010, the NRC Atomic Safety and Licensing Board (ASLB)[47] rejected DOE's Motion to Withdraw. The detailed denial repeatedly stressed the lack of scientific justification

[43] Blue Ribbon Commission on America's Nuclear Future, U.S. Department of Energy, "Advisory Committee Charter," March 1, 2010. Available at: http://www.energy.gov/news/documents/BRC_Charter.pdf

[44] Tetreault, Steve, "Federal panel to examine nuclear waste storage." *Las Vegas Review Journal.* January 30, 2010. Available at: http://www.lvrj.com/news/federal-panel-to-examine-nuclear-waste-storage-83143397.html

[45] Ibid.

[46] "U.S. Department of Energy's Motion to Withdraw," Atomic Safety and Licensing Board, U.S. Nuclear Regulatory Commission, March 3, 2010. Available at: http://www.energy.gov/media/DOE_Motion_to_Withdraw.pdf

[47] Note: The ASLB is an independent technical body within NRC that reviews license applications and other technical materials in order to advance Commission decision-making.

provided by DOE. For example, the ASLB notes, "conceding that the Application is not flawed nor the site unsafe, the Secretary of Energy seeks to withdraw the Application with prejudice as a 'matter of policy' because the Nevada Site 'is not a workable option.'"[48] ASLB also notes, "When Congress selected the Yucca Mountain site over Nevada's objection in 2002, it reinforced the expectation in the 1982 Act that the project would be removed from the political process and that the NRC would complete an evaluation of the technical merits"[49] and "DOE has acknowledged that its decision to seek to withdraw the Application is not based on a judgment that Yucca Mountain is unsafe or on flaws in the Application. It should be able to proceed with an evaluation of the technical merits, as directed by the NWPA, without undue discomfort."[50] ASLB summarily rejected all aspects of DOE's Motion to Withdraw, including a comprehensive rejection of the attempt to withdraw with prejudice.

Following the ASLB's ruling, the full Commission invited participants to file briefs with the Commission to determine whether the Commission should review, and reverse or uphold ASLB's decision. While it has been publicly acknowledged that the four participating Commissioners have filed their individual positions with the NRC Secretary,[51] NRC Chairman Jaczko has blocked further action on the matter by refusing to schedule a formal meeting to issue a final decision on DOE's Motion to Withdraw the License Application.

2.5 Closure of NRC's High-Level Waste Program

During the same timeframe in which the Commissioners were considering the ASLB's order rejecting DOE's Motion to Withdraw, the NRC proceeded to halt all work on the High-Level Waste Program (HLW). In accordance with the President's decision to shutter the Yucca Mountain Project, the FY 2011 NRC budget request for the High-Level Waste Repository program included funds only to carry out work related to an "orderly closure of the agency's

> *When Congress selected the Yucca Mountain site over Nevada's objection in 2002, it reinforced the expectation in the 1982 Act that the project would be removed from the political process and that the NRC would complete an evaluation of the technical merits...*
>
> *...DOE has acknowledged that its decision to seek to withdraw the Application is not based on a judgment that Yucca Mountain is unsafe or on flaws in the Application. It should be able to proceed with an evaluation of the technical merits, as directed by the NWPA, without undue discomfort.*
>
> *— NRC Atomic Safety and Licensing Board, February 2010*

[48] ASLB Board Response, page 2.
[49] Ibid.
[50] Ibid.
[51] Ling, Katherine, "NRC chairman reveals Yucca vote; still no timeline for decision," E&E Publishing, November 8, 2010. Available at: http://eenews.net/eenewspm/print/2010/11/08/10

Yucca Mountain licensing support activities" in correlation to DOE's announcement of its intention to withdraw the License Application.[52] The budget request "reflects that possibility" and "upon the withdrawal or suspension of the licensing review, the NRC would begin an orderly closure of the technical review and adjudicatory activities, and would document the work and insights gained from the review."[53] However, when the ASLB rejected DOE's Motion to Withdraw, the precondition for the NRC's budget request was not fulfilled.

Unable to pass a complete appropriations bill before the end of the fiscal year, Congress passed, and President Obama signed into law, a Continuing Resolution (CR) to continue funding government operations at existing levels. Shortly thereafter, on October 4, 2010, an NRC memorandum directed all work on HLW to halt because the CR did not "include specific restrictions on spending funds." Thus, the memo directed staff to "continue its activities on the Yucca Mountain license application in accordance with the Commission's decision on the FY 2011 budget using available Nuclear Waste Fund resources during the CR."[54]

However, NRC's FY 2011 budget request was never signed into law. The Commission therefore opted to shut down a program in the absence of explicit Congressional approval. This directive was unusual and highly controversial, especially given the drastic consequences of the action. An NRC spokesman said he was "not sure whether there was a precedent for the decision."[55]

The directive halted all NRC review of the LA and prevented the approval process for SER Volume III from moving forward. Commissioner Ostendorff requested a formal meeting to consider the memorandum. However the three Democratic Commissioners - Chairman Jaczko, Commissioner Magwood, and Commissioner Apostolakis - refused to agree to the request and thus a lack of quorum prevented the entire Commission from considering the request. Thus, NRC review of DOE's License Application including the Safety Evaluation Report came to a halt.

> *"[T]he Administration's stated rationale for changing course does not seem to rest on factual findings and thus does not bolster the credibility of our government to handle this matter competently. Those who would distort the science of Yucca Mountain for political purposes should be reminded that is was a year ago today that the President issued his memorandum on scientific integrity, in which he stated that "The public must be able to trust the science and scientific process informing public policy decisions."*
>
> – Dale Klein, Commissioner, Nuclear Regulatory Commission, March, 2010

[52] "Congressional Budget Justification for FY 2011," U.S. Nuclear Regulatory Commission, February 2010. www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1100/v26/sr1100v26.pdf
[53] Ibid.
[54] "Guidance Under a Fiscal Year 2011 Continuing Resolution," U.S. Nuclear Regulatory Commission, October 4, 2010.
[55] Ling, Katherine, "NRC starts controversial shutdown of Yucca review, E&E Publishing, October 7, 2010. Available at: www.eenews.net/greenwire/2010/10/07/04

2.6 The Administration's Justification for Closing Yucca Mountain

Despite repeated commitments to scientific integrity and adhering to science-informed decisions, the Administration has repeatedly disregarded the lack of scientific evidence regarding the safety of a geologic repository at Yucca Mountain. For example, in a March 3, 2010 hearing with the Committee on Science and Technology, Secretary Chu could not reference a single scientific analysis to justify the Administration's decision not to move forward with Yucca Mountain.[56]

As previously noted, DOE does not cite any scientific issues in their Motion to Withdraw, but rather reference "scientific advancements." Despite the widely documented lack of scientific or technical issues, it was reported the President told South Carolina Governor Nikki Haley, Yucca Mountain isn't an option because of "safety concerns" in December 2010.[57]

It is extremely concerning to have the President of the United States raise safety issues despite the results of all government conducted scientific and technical evaluations. This is particularly alarming given pending court cases relating to Yucca Mountain brought against the U.S. government. Another political opponent of Yucca Mountain, Senate Majority Leader Reid, said the project is "technically and scientifically unsound,"[58] again, with no credible scientific evidence.

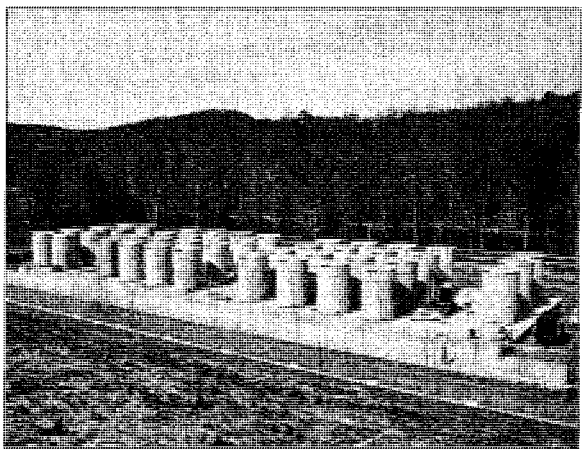
2.7 The Shutdown of OCRWM

As a part of the Administration's coordinated effort to permanently close Yucca Mountain, DOE announced in the President's FY 2011 budget request its plans to abolish OCRWM by the end of FY 2010. OCRWM was specifically established by the NWPA with a mission to "manage and dispose of high-level radioactive waste and spent nuclear fuel."[59] Enabled by the failure of the 111th Congress to complete work on the FY2011 budget, DOE proceeded to act on its plans, thus eliminating an office with important programmatic and statutory responsibilities (DOE divided statutory responsibilities amongst various DOE offices, specifically the Offices of Nuclear Energy and Environmental Management). According to the DOE's Inspector General, DOE's move to shut down OCRWM was done in such haste that it did not prepare a formal shutdown plan.[60]

[56] For full exchange and Secretary Chu's responses to the Committee's Questions for the Record, see Appendix C
[57] Chebium, Raju, "Nikki Haley and Barack Obama Talk Health Care, Yucca Mountain." December 2, 2010. Available at: http://www.wltx.com/news/local/story.aspx?storyid=110547&catid=2
[58] Rogers, Keith, "House members tour Nevada Yucca Mountain tunnel," *Las Vegas Review Journal*, December 2, 2010. Available at: http://www.lvrj.com/news/house-members-tour-nevada-yucca-mountain-site-120740349.html?ref=349
[59] U.S. Department of Energy, "About OCRWM," Available at: http://www.energy.gov/environment/about_ocrwm.htm.
[60] "Special Report: Need for Enhanced Surveillance During the Yucca Mountain Project Shut Down," Office of the Inspector General, U.S. Department of Energy, July 2010. Available at: www.ig.energy.gov/documents/OAS-SR-10-01.pdf

Chapter 3. Taxes, Liabilities, and Implications

Beyond the policy and legal repercussions of closing Yucca Mountain, the Obama Administration's actions are causing increasingly severe financial implications for U.S. taxpayers. To date, almost $15 billion has been spent studying, preparing and advancing to construction of Yucca Mountain. Should the Administration continue down this path, those tax dollars will simply be wasted.



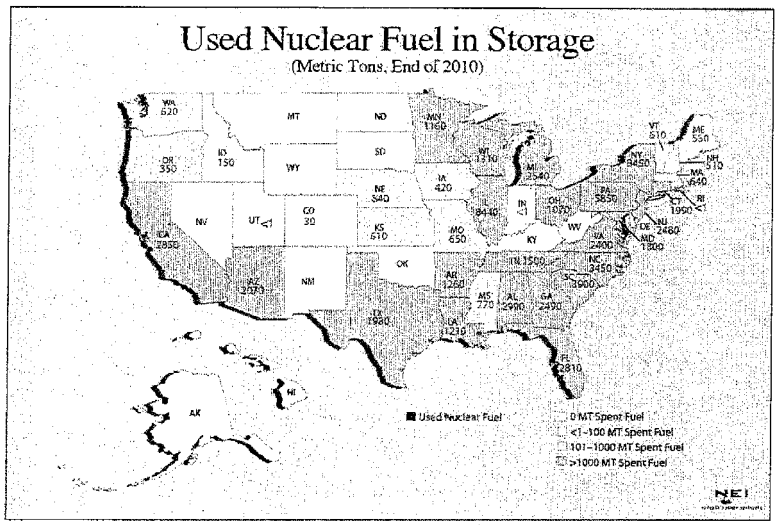
Spent Nuclear Fuel Stored in Dry Casks

Additionally, the NWPA instituted a one mil per kilowatt-hour fee upon nuclear generated electricity to be deposited in the Nuclear Waste Fund (NWF) to pay for costs associated with SNF disposal, specifically Yucca Mountain. This surcharge is passed on to ratepayers. Despite the lack of a permanent repository, ratepayers continue to contribute to the NWF. The Congressional Budget Office estimates the NWF contains over $25 billion and is accruing at a rate of $2 billion per year with fees and interest.[61]

The lack of a permanent repository places additional burdens on states and localities that currently store high-level radioactive waste. In particular, two states host to DOE facilities that store radioactive waste are directly impacted – Washington, where the nation's largest deposit of

[61] "The Federal Government's Responsibilities and Liabilities Under the Nuclear Waste Policy Act," Congressional Budget Office, July 27, 2010. Available at: www.cbo.gov/ftpdocs/117xx/doc11728/07-27-NuclearWaste_Testimony.pdf

waste is stored at DOE's Hanford Site, and South Carolina, home of Savannah River Site, that also holds a significant amount of waste produced from nuclear weapons program. Both states are actively pursuing litigation seeking damages from the Federal Government as a consequence of DOE's inability to accept waste in a permanent repository. Washington and South Carolina are also parties along with Aiken County, SC, the National Association of Regulatory Utility Commissioners, and the Prairie Island Indian Community, in a suit challenging DOE's authority to withdraw its License Application.[62] The D.C. Circuit Court heard oral arguments in the case on March 22, 2011, but has yet to issue a ruling.



Commercial Spent Nuclear Fuel Stored in the United States

Taxpayers are also liable for the government's breach of contract with nuclear generators. The NWPA stipulated the government would assume responsibility for commercially generated spent nuclear fuel by January 31, 1998. Because the government has not fulfilled this obligation, taxpayers are liable for approximately $12 billion in damages, even if the government began accepting SNF in 2020 at another location, which looks increasingly doubtful. This liability will increase by $500 million annually thereafter.[63] Further, the courts have ruled that the NWF

[62] See In re: Aiken County (& Consolidated Cases), Nos. 10-1050, 10-1069 & 10-1082 (D.C. Cir.)
[63] Ibid.

cannot be used to pay for the damages; instead it must come from the Department of Justice's Judgment Fund, exacerbating the financial exposure to taxpayers.[64]

The lack of a permanent repository also raises other issues. For example, NRC is not permitted to license a new reactor without a plan for disposal of SNF, as stipulated in the Standard Contract, restraining the nuclear industry's ability to grow over the long-term. Also of great note are the implications to homeland security and military readiness. In the absence of a permanent repository, more SNF will be stored onsite in spent fuel pools, which a 2005 study by the National Academy of Sciences deemed a credible terrorist threat.[65]

The U.S. Government is also responsible for disposal of nuclear waste generated by the Navy. A March 2011 Government Accountability Office (GAO) report notes penalties of $28 million annually will be incurred by the taxpayer should DOE not fulfill its obligation with the states of Colorado and Idaho to remove high-level radioactive waste.[66] Even more concerning is the possibility that Idaho could have the ability to suspend any further shipments from DOE or the Navy to DOE's Idaho site until DOE meets their obligation. This would have severe national security implications and impair the Navy's ability to provide for national defense.

[64] In 2002 the United States Court of Appeals for the Eleventh Circuit determined that the Nuclear Waste Fund was not available to pay these judgments or to pay settlements. See Alabama Power Company et. al. v DOE No. 00-16138 (11th Cir.).
[65] Wald, Matthew, "Study Finds Vulnerabilities in Pools of Spent Nuclear Fuel," *The New York Times*, April 7, 2005. Available at: http://www.nytimes.com/2005/04/07/politics/07nuke.html
[66] "Better Information Needed on Waste Storage at DOE Sites as a Result of Yucca Mountain Shutdown," Government Accountability Office, March 2011. Available at: www.gao.gov/new.items/d11230.pdf

Chapter 4. The Department of Energy

4.1 Previous Concerns with DOE Decision-making and Project Management

Evaluating DOE's decisions related to major energy projects is not new for the Committee. DOE's decision to restructure the FutureGen program drew the Committee's attention in the 110th Congress. Many of the issues the Committee encountered in its review of that program, as well as its ultimate findings, are relevant to this review as well. In the 2009 report titled *The Passing of FutureGen: How the World's Premier Clean Coal Technology Project Came to be Abandoned by the Department of Energy*, the then majority staff stated:

> "DOE was extremely reluctant to produce documents to the Committee so that it could determine exactly how decisions were made concerning FutureGen. Despite numerous requests from the Committee since April 2, 2008, and the threat of a subpoena, the Department has not yet provided a full response."[67]

The majority staff report also found that:

> "In abandoning the original concept, the Department of Energy left the country with no coherent strategy for carbon capture and sequestration – despite having many fingers in many pots."[68]

As detailed throughout this report, these experiences and findings with respect to FutureGen are very similar to DOE's decision to terminate the Yucca Mountain Project and nuclear waste management. Despite numerous requests for documents over a two-year span, the Committee has yet to receive a final production of documents. In abandoning Yucca Mountain, the Department of Energy left the country with no coherent strategy for nuclear waste disposal. Although the Administration formed a Blue Ribbon Commission to evaluate alternatives, it was explicitly barred from evaluating the viability of continuing to advance the Yucca Mountain site. Making matters worse, the decision was made prior to any recommendations from the Blue Ribbon Commission.

FINDING #1: A pattern exists whereby DOE makes major policy decisions prior to comprehensive analysis of costs, benefits, and risks.

[67] "The Passing of FutureGen: How the World's Premier Clean Coal Technology Project Came to be Abandoned by the Department of Energy," House Science and Technology Committee, March 10, 2009.
[68] Ibid. Note: The Majority Staff's conclusions were supported by the Government Accountability Office report GAO-09-248 (February 2009) which stated: "Contrary to best practices, DOE did not base its decision to restructure FutureGen on a comprehensive analysis of factors, such as associated costs, benefits, and risks."

4.2 Correspondence between the Committee and the Administration

May 7, 2009 – Science and Technology Committee Ranking Member Ralph Hall, Science and Technology Subcommittee on Investigations and Oversight Ranking Member Paul Broun, Energy and Commerce Committee Ranking Member Joe Barton, and Energy and Commerce Subcommittee on Oversight and Investigations Ranking Member Greg Walden to Secretary of Energy Steven Chu.

Members requested responses to numerous questions relating to the Administration's decision, including the establishment of a Blue Ribbon Commission.[69] None of the questions posed in the letter were answered in Secretary's Chu's June 1, 2009 reply.[70] Subsequent staff level correspondence on June 18, 2009 confirmed that DOE considered its June 1, 2009 reply responsive to the Members requests, and that DOE did not possess documents responsive to the Members requests. As of February 2, 2010, Secretary Chu still refused to comment on the Blue Ribbon Commission's charter,[71] although information was eventually revealed in a Press Bulletin on March 2, 2010.[72]

Energy Secretary Stephen Chu

Members also requested "all documents relating to any legal, technical, or scientific analysis that formed the basis for your decision to re-evaluate nuclear waste disposal alternatives to the proposed Yucca Mountain repository, including, but not limited to, evaluations and recommendations that led you to determine that Yucca Mountain was 'not an option.'"[73] Additionally, Members requested "any analysis of the potential impact that failing to pursue the Yucca Mountain repository may have on the construction of new nuclear power plants, which are essential to providing clean and reliable energy in the future."[74]

February 3, 2010 – Ranking Members Hall and Broun to Secretary Steven Chu.

Members once again requested explanation and documentation regarding the Administration's decision, as well as documents related to the establishment of the Blue Ribbon Commission.[75] Secretary Chu eventually replied to the letter on July 7th, six months later. The only documents provided at that time were the DOE press release dated January 29, 2010, and the BRC charter which was issued publically on March 2, 2010. No other documents were provided.[76]

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[69] Letter from Reps. Hall, Broun, Barton, Walden to Sec. Chu dated May 7, 2009.
[70] Letter from Sec. Chu to Reps. Hall, Broun, Barton, Walden dated June 1, 2009.
[71] Behr, Peter, "The Administration puts its own stamp on a possible nuclear revival," New York Times, February 2, 2010. Available at: http://www.nytimes.com/cwire/2010/02/02/02climatewire-the-administration-puts-its-own-stamp-on-a-p-76078.html
[72] Advisory Committee Charter, Blue Ribbon Commission on America's Nuclear Future, U.S. Department of Energy, March 2, 2010. Available at: http://www.energy.gov/news/documents/BRC_Charter.pdf
[73] See Supra 68.
[74] Ibid.
[75] Letter from Reps. Hall and Broun to Sec. Chu dated February 3, 2010.
[76] Letter from Sec. Chu to Reps. Hall and Broun dated July 7, 2010.

June 22, 2010 – Resolution of Inquiry.

On June 22, 2010, Representative Sensenbrenner submitted a Resolution of Inquiry[77] requesting documents related to DOE's application to foreclose use of Yucca Mountain as a high-level nuclear waste repository.[78] This resolution was considered by the Committee on Energy and Commerce, pursuant to House rules, on July 19, 2010.[79] The Energy and Commerce Committee voted to report H. Res. 1466 without recommendation with the understanding that Majority Members would join Rep. Sensenbrenner in requesting documents from the Department. A joint request was never sent.

July 6, 2010 – Ranking Member Hall, Ranking Member Broun, and Select Committee on Energy Independence and Global Warming Ranking Member Sensenbrenner (along with numerous other Senators and Members) to Secretary Chu.

Senators and Members called on the Secretary to halt all efforts to reprogram funds or terminate contracts related to Yucca Mountain. In response to this request to Secretary Chu, DOE General Counsel Scott Blake Harris responded to Members on August 3, 2010.[80] DOE refused to heed the Congressional request and continued to move forward with the closure of its Yucca Mountain-related activities.

July 20, 2010 – Ranking Member Hall, Ranking Member Sensenbrenner, Ranking Member Broun.

Members once again restated their previous requests. Members also sought additional documents related to 1) the Department's Motion to Withdraw its pending licensing application with prejudice for a permanent geologic repository at Yucca Mountain, Nevada; 2) any decision to terminate, reduce, or limit funding for the Yucca Mountain project; 3) the discontinuation or altering of standard monitoring and data collection at the site; 4) the Department's policies and procedures relating to preserving and archiving documents related to the Yucca Mountain Repository License Application.[81] On July 23, 2010, Assistant Secretary for Congressional and Intergovernmental Affairs Jeffrey Lane replied simply noted "We are in the process of collecting responsive documents and will soon begin to review them."[82]

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[77] Note: A Resolution of Inquiry (ROI) is procedural options in the House for use by Members seeking information from Federal agencies or the Administration. Authorized under House Rule XIII, Clause 7, this parliamentary tool is considered the proper form to "request" factual information from the President or "direct" information from Agency or Department Heads. Once introduced by a Member, the ROI is referred to the Committee of jurisdiction. Once received, the Committee has 14 legislative days to report the ROI (excluding day of introduction and day of discharge). The Committee may report the ROI favorably, adversely or without recommendation. If the Committee fails to report the ROI within the appropriate time, any Member of the House may offer a Motion to Discharge. If the Motion prevails, the ROI is considered on the House floor under the Hour Rule.

[78] H.Res 1466, "Of inquiry requesting the President and directing the Secretary of Energy to provide certain documents to the House of Representatives relating to the Department of Energy's application to foreclose use of Yucca Mountain as a high-level nuclear waste repository," June 22, 2010. Available at: http://www.gpo.gov/fdsys/pkg/BILLS-111hres1466rh/pdf/BILLS-111hres1466rh.pdf

[79] House Report 111-550, July 19, 2010.

[80] Letter from Scott Blake Harris, General Counsel, DOE, to Ranking Member Paul Broun, August 3, 2010.

[81] Letter from Reps. Hall, Sensenbrenner, and Broun to Sec. Chu dated July 20, 2010.

[82] Letter from Jeff Lane to Sensenbrenner, July 23, 2010.

February 14, 2011 – Space, Science, and Technology Subcommittee on Investigations and Oversight Committee Chairman Broun to Secretary Chu.

Representative Broun once again reiterated his request for all documents that were previously requested, this time in his new capacity as Chairman of the Subcommittee on Investigations and Oversight of the Committee on Science, Space, and Technology.[85] While documents were provided prior to this letter, the majority of those documents were press releases, public reports, and Congressional correspondence already in the public domain. Some documents were, in fact, responsive, but they were limited. DOE did, however, begin producing more substantive documents with a February 28, 2011 reply to Chairman Broun's letter from DOE General Counsel Harris. This response was received three days before Secretary Chu appeared before the Committee on March 3, 2011 to present DOE's FY12 Budget Request.

DOE's responsiveness to Committee requests improved drastically following Chairman Broun's February 14th letter. Unfortunately, a complete production of documents relative to Committee requests has not been received. To its credit, the Department has worked in a collegial fashion to meet the Committee's requests. The Department has notified the Committee that the only documents that have not been provided to the Committee are those with interagency interests, and that they have no schedule for the delivery of those documents because of the uncertainty of the interagency process. The Committee will continue to pursue these documents, but will not delay its review of the Yucca Mountain project.

FINDING #2: Replies to initial inquiries from Members were unresponsive.

FINDING #3: The Administration's establishment of the Blue Ribbon Commission lacked transparency, contrary to established Administration policy.

FINDING #4: No documents were provided to Members that demonstrated that potential impacts on the construction of nuclear power plants were evaluated prior to the decision to terminate the program.

FINDING #5: No documents provided to the Committee support the determination that Yucca was "not an option."

FINDING #6: A final production of documents has not been delivered despite numerous inquiries. No schedule for delivery has been provided. No index of documents withheld has been provided. No claim of privilege has been stated.

[85] Letter from Rep. Broun to Sec. Chu dated February 14, 2011.

4.3 Outside Reports and Activities

DOE Inspector General Memo: ***Need for Enhanced Surveillance During the Yucca Mountain Project Shut Down*** **(July 2010)**

In a July 21, 2010 Memorandum to the Undersecretary of Energy on the Shutdown of the Yucca Mountain Project, the DOE IG expressed the significance of the Department's decision, noting:

> "Other than the termination of the Department's Super Conducting, Super Collider Project in Texas in 1998, we know of no comparable single project termination in the Department's recent history as consequential as Yucca Mountain, given the importance of its intended mission, the massive investment in real and personal property and the development and compilation of huge quantities of Project-related, intellectual property."[84]

Because of this importance, the DOI IG announced an audit on February 23, 2010 to "determine whether OCRWM had adequately planned for the Project's orderly shutdown."[85] Surprisingly, the DOE IG quickly learned that no such plan existed, stating "On March 2, 2010, management informed us that it was in the process of preparing a master plan to manage the shut down process and that it would be completed by the end of March 2010."[86] The DOE IG then deferred its audit until DOE completed its plan. DOE never completed this planning. The DOE IG report stated that,

> "On June 12, 2010, we met with OCRWM officials to determine the status of the shutdown planning in anticipation of restarting our audit. We were told that the plan was not complete and the events were moving so quickly that no further action on the master plan was contemplated."[87]

FINDING #7: Despite an explicit commitment from the Department, DOE failed to develop a master plan prior to one of the most consequential decisions in the Department's history.

GAO Report 11-230: ***DOE Nuclear Waste: Better Information Needed on Waste Storage at DOE Sites as a Result of Yucca Mountain Shutdown*** **(March 2011)**

According to a March 2011 GAO report,

> "[f]ive states have agreements with DOE, and in one case with the Navy, regarding the storage, treatment, or disposal of nuclear waste stored at DOE sites. Only agreements with Colorado and Idaho include deadlines, or milestones, for removing waste from sites

[84] "Need for Enhanced Surveillance During the Yucca Mountain Project Shut Down," Department of Energy, Office of the Inspector General, July 21, 2010. Available at: http://www.ig.energy.gov/documents/OAS-SR-10-01.pdf
[85] Ibid.
[86] Ibid.
[87] Ibid.

> that may be threatened by a termination of the Yucca Mountain repository program. Under the agreements, DOE and the Navy are expected to remove their spent nuclear fuel from Idaho, and DOE is to remove its fuel from Colorado, by January 1, 2035. If a repository is not available to accept the waste, however, DOE and the Navy could miss these milestones. As a result, the government could face significant penalties—$60,000 for each day the waste remains in Idaho and $15,000 for each day the waste remains in Colorado—after January 1, 2035. These penalties could total about $27.4 million annually. Navy officials told GAO, however, their greater concern is that Idaho might suspend Navy shipments of spent nuclear fuel to the state until the Navy meets its agreement to remove spent nuclear fuel, a suspension that would interfere with the Navy's ability to refuel its nuclear warships."[88]

The report went on to state, "DOE and the Navy have not yet developed plans to mitigate the potential effects of longer storage resulting from a termination of the Yucca Mountain repository."[89]

FINDING #8: DOE's decision to terminate the Yucca Mountain Project leaves the federal government vulnerable to significant financial penalties and could interfere with the Navy's ability to refuel nuclear warships.

FINDING #9: The GAO determined that DOE and the Navy did not develop plans to mitigate the potential effects of longer storage prior to the termination of the Yucca Mountain Project.

GAO Report 11-229: *Commercial Nuclear Waste: Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned* (April 2011).

In April of 2011, the GAO issued a report on the effects of, and lessons learned from, the termination of the Yucca Mountain Project. One of its findings largely reiterated the DOI IG memorandum from July 2010, which found "DOE did not finalize a plan for shutdown, nor did it identify or assess risks of the shutdown. Both steps are required under federal internal control standards and DOE orders."[90] The report went also found that "DOE did not cite technical or safety issues" associated with the Yucca Mountain Project," and that "social and political opposition to the permanent repository, not technical issues, is the key obstacle." Similarly, the report also found that "there is no guarantee that a more acceptable or less costly alternative will be identified."[91]

[88] "DOE Nuclear Waste - Better Information Needed on Waste Storage at DOE Sites as a Result of Yucca Mountain Shutdown," U.S. Governement Accountability Office, March 2011. Available at: http://www.gao.gov/new.items/d11230.pdf
[89] Ibid.
[90] "Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned," U.S. Government Accountability Office, April 2011. Available at: http://www.gao.gov/new.items/d11229.pdf
[91] Ibid.

FINDING #10: GAO determined that DOE did not develop a plan for shutdown that could have indentified and assessed risks.

FINDING #11: As part of GAO's investigation, DOE did not cite any technical or safety issues associated with the Yucca Mountain Project.

FINDING #12: GAO found DOE concerns with respect to key issues associated with the Yucca Mountain Project are social and political, not technical.

4.4 Committee Review of Documents

A review of documents provided by the Department of Energy revealed issues associated with scientific integrity, inadequate shutdown planning, rushed document retention, and a lack of a scientific justification for the Department's decision.

4.4.1 Scientific Integrity

Correspondence provided to the Committee revealed several scientific integrity-related issues. Most notable among these were multiple correspondences between Dr. Per Peterson, Department of Nuclear Engineering, University of California, Berkley, and senior Administration officials including Dr. John Holdren, Director, Office of Science and Technology Policy, and Dr. Steven Chu, Secretary, Department of Energy.

Currently a member of the Blue Ribbon Commission, Peterson has written extensively on Yucca Mountain safety issues and the need for the NRC to complete its review of the DOE License Application. In a 2009 report to DOE from Dr. Peterson titled "U.S. nuclear waste policy: scientific integrity, policy, and politics" that was obtained by the Committee, Peterson made the following key points:

> The license application that the DOE submitted to the USNRC in June 2008, shows a large margin for compliance with the million-year safety standard establishment by the Environmental Protection Agency (EPA), as shown in Fig. 1.
>
> There is not a major philosophical difference between ignoring scientific evidence to serve ideological predispositions, versus actively suppressing scientific inquiry to serve ideological predispositions. But the second approach causes yet greater damage – the most recent Yucca Mountain appropriations decisions that the U.S. Congress has made did not simply reduce U.S. capacity to evaluate the Yucca Mountain site, they have also almost completely dismantled the U.S. scientific capacity to study any kind of geologic repository.

A robust U.S. policy would allow the USNRC review to continue to completion because it would be technically sound and will provide vital information to inform policy.[92]

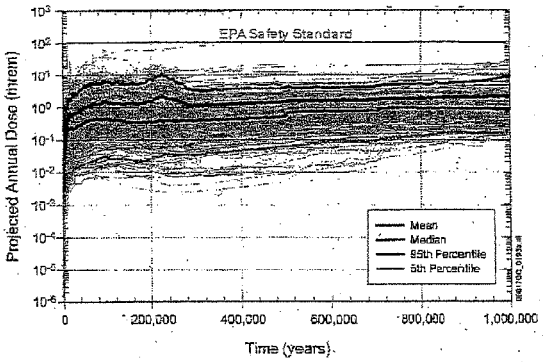

Figure 1. The DOE license application for Yucca Mountain, now under independent technical review by the USNRC, shows a large margin for compliance with the million-year EPA safety standard.

Peterson warned Administration officials, beginning as early as October 2008, of scientific integrity and data retention issues that would arise if the Obama Administration were to withdraw the Yucca Mountain license application. Additional emails sent during this process reinforce this concern.[93]

- Email from Per Peterson to Warren Miller, Assistant Secretary for Nuclear Energy, DOE Office of Nuclear Energy, July 14, 2009, Subject: RE: Call me please.

> "I started corresponding with John Holdren (in his position leading the National Commission on Energy Policy) back in October, 2008, about the scientific integrity problem that would emerge if a new Obama administration were to withdraw the Yucca Mountain license application and thus stop the independent NRC technical review of that application. I recommend that instead, the administration focus on fixing the Nuclear Waste Policy Act, which is highly flawed."

- Email from Warren Miller to Kristina Johnson, Under Secretary for Energy, DOE, Chris Kouts Principal Deputy Director, DOE Office of Civilian Radioactive Waste Management, and Peter Lyons Principal Deputy Assistant Secretary, DOE Office of Nuclear Energy, October 12, 2009, Subject: Fw: FY 11 OCRWM Budget.

[92] See Appendix E.
[93] Ibid.

> "Per is a distinguished member of the academic community. Steven Chu, John Holdren (and I) very much trust his judgment. I think we should take his advice very, very seriously."

- Email from Per Peterson to John Holdren, Director, Office of Science and Technology Policy, and Steve Chu, Secretary, Department of Energy, October 12, 2009, Subject: FY 11 OCRWM Budget.

> "Senator Reid announced at the end of the July that the administration will zero funding for the review of the Yucca Mountain license application. While stopping the license review would be one thing, the larger question relates to the fate of the scientific and technical information that supports the license application. If Quality Assurance (QA) controls are stopped on the electronic records, long-term corrosion experiments stopped, and samples in storage discarded, the scientific data base that supports the current license application and understanding of the site would be destroyed. The analogy that is emerging is that the administration might "burn the books" on the scientific work that has been done for Yucca Mountain. The loss of YM scientific and technical data would be pretty clearly analogous to the loss of knowledge that occurred with the burning of the scrolls in the Library of Alexandria (it might also invite more unsavory, if less accurate, analogies to book burning in Germany in 1933). Overall, it's a bad idea to allow this base of U.S. repository scientific and technical knowledge to be destroyed. My recommendation is that even though the FY 11 budget request may stop the current license application review, that the budget contain substantial funding to OCRWM and some to NRC and [Nuclear Waste Technical Review Board] to sustain knowledge and capability in repository science. It would also be great if the stated administration policy would be to sustain OCRWM knowledge and capability until congress amends the NWPS to provide the DOE with guidance on how to move forward with management of spent fuel and high level waste."

FINDING #13: On multiple occasions, scientific integrity issues regarding Yucca Mountain were brought to the attention of the White House Science Advisor and Secretary of Energy prior to the Administration's decision to shutter the program.

4.4.2 Shutdown Planning and the Retention of Documents and Science

Numerous documents obtained by the Committee pertain to the Department's attempts to plan for the shutdown of the Yucca Mountain Project beginning in the fall of 2009. These documents show a Department genuinely concerned with data collection and document retention but also illustrate the negative impacts and pressure generated by the rushed nature and lack of planning associated with the shutdown decision.

- Email from Peter Lyons to Asaf Nagler, November 15, 2009, Subject: Re: Yucca Mtng

> [Responding to a request for items to be discussed at a Yucca Meeting] "Need to protect nations [sic] technical investment in repository science-both knowledge and people."[94]

- Email from Dave Zabransky to All OCRWM, May 20, 2010, Subject: Further Guidance on the Retention of Documents

> "All OCRWM personnel are instructed to continue to refrain from the destruction of any documents or copies of documents that relate to Yucca Mountain and any of the science relating to storage or disposal of high-level waste or spent fuel, even if permitted under applicable retention schedules. This instruction is to be carried through to all contractors performing services for OCRWM, including other agencies performing services under interagency agreements. During the recent hiatus of shutdown activities, we were already refraining from destruction of documents or copies of documents. This confirms that this restriction remains in effect."

Despite the best intentions of those involved, emails and memos obtained by the Committee also shed light on the complexity of tasks, particularly given the tight deadlines and limited planning involved in the endeavor. During the spring of 2010, senior-level meeting notes show that sample disposition and file maintenance issues were still not resolved, a records management plan was not finalized, and funding streams for the execution of the work were still uncertain.[95]

Several emails obtained by the Committee highlight these uncertainties.

- Email from JW to AP, RS, KD, LD [All redacted], May 11, 2011, Subject: RE: Yucca Mountain Withdrawal of Work

> [Responding to a request for a shutdown plan and a termination of task activities within six days] "As we discussed, I think the turn-around time is unreasonable (i.e., a deliverable of this magnitude and importance in less than a week). I understand that Sandia may have done some preliminary work but still don't think the timing is adequate."

- Email from EB to MW, SO, CP, RW [All redacted], June 15, 2010, Subject: GAO Interview

> "As you know, one of the main concerns we have is that we're not being allowed to have sufficient time to archive the technical information supporting the postclosure technical baseline in a manner that would be conducive to retrieval and use of the information within a reasonable time."

[94] Ibid.
[95] Ibid.

- Email from AP to KD, JW, MM, and MR [All redacted], June 29, 2010, Subject: FW: ASLB Denies DOE petition to Withdraw LA

> "Do not know what impact this will have but I am more concerned with us not allowing Sandia to properly archive information based on direction from OCRWM."

Additional correspondence also points to confusion over what tasks should continue for document preservation, and how it will be funded, up until July 2010.[96]

FINDING #14: Despite the agencies' best attempts to continue data collection and preserve scientific and technical records, the Department did not finalize and fund a records management plan in a timely fashion. Because of this rushed process, uncertainty and questions associated with data retention remain an area of concern to the Committee.

4.4.3 Lack of Scientific or Technical Justification to Determine YMP is Not Safe or Viable

For over two years, the Committee sought documents related to the decision to terminate the Yucca Mountain Project. Additionally, Committee Members requested, on multiple occasions, documents related to the scientific and technical determination that the Yucca Mountain Project was "not a viable option." Over this time, staff reviewed thousands of pages of documents provided by DOE.

FINDING #15: Not a single document provided to the Committee by the Department of Energy found that the Yucca Mountain Project was not safe or viable, contrary to the President, and the Department of Energy.

[96] Ibid.

Chapter 5. The Nuclear Regulatory Commission

Given the Administration's repeated statements regarding the need to find a safe, long-term nuclear waste disposal facility, the 695-page Volume III of the Safety Evaluation Report (SER) that focuses on post-closure safety provides the most relevant and detailed information to determine whether sound science guided the decision to terminate the Yucca Mountain Project. Despite years of work by his staff, the Chairman of the Nuclear Regulatory Commission has obstructed the approval of the SER or to release it to the public to allow all Americans to judge for themselves whether sound science was used as a basis to terminate the Yucca Mountain Project. This chapter summarizes Committee correspondence with the NRC and reviews of materials provided as a result of this correspondence.

5.1 Correspondence between Committee Members and the NRC

July 15, 2010 – Fourteen Members of Congress (including Science and Technology Committee Members Sensenbrenner, Inglis, Broun, and Olson) to Chairman Jaczko

Fourteen Members of Congress wrote to the NRC expressing support for the ASLB's denial of DOE's Motion to Withdraw the License Application. Members reaffirmed Congressional intent to locate a national geologic repository at Yucca Mountain and called for the Commission to "make all relevant documents related to DOE's Motion to Withdraw public."[97] On July 30, 2010, Annette Vietti-Cook, the Secretary of the NRC, responded, "given the pendency of the adjudicatory proceeding, therefore, the Commission cannot discuss or comment on issues involved in this matter."[98] No documents were released.

October 13, 2010 – Ranking Member Hall, Ranking Member Sensenbrenner, Ranking Member Barton, and Natural Resources Committee Ranking Member Doc Hastings to Chairman Jaczko

Four House Committee Ranking Members expressed concern regarding the budget directive to bring the High-Level Waste Program, including NRC's review of the license application and preparation of the SER, to a close. The Members also requested a response to six separate questions, including the actions taken to terminate review of the License Application and specific communication on the matter between the NRC, Secretary Chu, Majority Leader Reid, and the White House.[99] Chairman Jaczko responded on October 27, 2010 but did not provide the communications, as requested.[100]

[97] Letter from Reps. Sensenbrenner, Inglis, Wilson, Barrett, McMorris Rodgers, Hastings, Shimkus, Bonner, Manzullo, LaTourette, Terry, Broun, Olson and Rehberg to NRC Chairman Jaczko, July 15, 2010.
[98] Letter from Annette L. Vietti-Cook to Rep. Sensenbrenner, July 30, 2010.
[99] Letter from Reps. Hall, Sensenbrenner, Barton, and Hastings to Chairman Jaczko, October 13, 2010.
[100] Letter from Chairman Jaczko to Reps. Hall, Sensenbrenner, Barton, and Hastings, October 27, 2010.

November 19, 2010 – Ranking Member Sensenbrenner, Ranking Member Hastings, and Oversight and Government Reform Committee Ranking Member Darrell Issa to Chairman Jaczko

Members requested the release of NRC's decision on the ASLB's denial of the Motion to Withdraw. The communication highlighted the votes filed by the four participating Commissioners and neglect by Chairman Jaczko to affirm the order.[101] The letter requested Chairman Jaczko's plans, including a specific date for issuing the final order. On December 6, 2010, NRC Secretary Vietti-Cook again responded, stating "given that the adjudicatory process is ongoing, the Commission itself cannot discuss or comment on the issues involved. No specific date has been established for completion of the matter."[102] No documents were released.

February 10, 2011 – Science, Space, and Technology Committee Chairman Ralph Hall, Science, Space, and Technology Committee Vice-Chairman James Sensenbrenner, Subcommittee Chairman Broun, and Science, Space, and Technology Subcommittee on Energy and Environment Chairman Andy Harris to Chairman Jaczko, NRC Commissioners Magwood, Svinicki, Apostolakis, and Ostendorff.

In the spirit of openness and transparency, Members requested release of SER Volume III in light of the directive to halt all activities in the High-Level Waste Program. Members also requested all documents relating to the release of the SER.[103] Commissioners Apostolakis, Ostendorff, Magwood, and Svinicki replied on February 18, 23, 24 and 25, respectively. Chairman Jaczko responded on March 4, stating a redacted version of SER Volume III was released on February 17 in response to a Freedom of Information Act request from an outside organization.[104] The letter argued against the release of the unredacted document. No documents relating to the release of the SER were provided to the Committee.

March 10, 2011 – Chairman Hall, Vice-Chairman Sensenbrenner, Chairman Broun, Chairman Harris to Chairman Jaczko

Members reiterated the call to finalize SER Volume III and release the document. The letter repeated the request for all documents and communication relating to the completion and release of SER Volume III, the February 4, 2011 memorandum titled "Update on the Yucca Mountain Program," and included six explicit questions regarding the status of SER Volume III and closure of the HLW program.[105] On March 11, a redacted version of the "Update on the Yucca Mountain Program" memorandum was publicly released. The Committee Chairmen received a response from Chairman Jaczko on April 28, which stated, "[n]otwithstanding my reservations a majority of the Commission is willing to provide unredacted copies in response to Congressional Committee requests."[106] On April 29, the Committee received an unredacted copy of SER Volume III. No other document production was included, as called for in both the February 10 and March 10 letters. The response to Committee Members from Chairman Jaczko said the

[101] Letter from Reps. Hastings, Issa, and Sensenbrenner to Chairman Jaczko, November 19, 2010.
[102] Letter from Annette L. Vietti-Cook to Reps Sensenbrenner, Hastings, and Issa, December 6, 2010.
[103] Letter from Reps. Hall, Sensenbrenner, Broun, and Harris to NRC Commissioners, February 10, 2011.
[104] Letter from Chairman Jaczko to Reps. Hall, Sensenbrenner, Broun, and Harris, March 4, 2011.
[105] Letter from Reps. Hall, Sensenbrenner, Broun, and Harris to Chairman Jaczko, March 10, 2011.
[106] Letter from Chairman Jaczko to Reps. Hall, Sensenbrenner, Broun, and Harris, April 28, 2011.

Commission "is currently identifying documents related to these matters." As of June 7, 2011, the Committee has yet to receive any production of documents. The Committee will continue to pursue these documents, but will not delay its review of NRC's activities relating to the SER and HLW Program.

The unredacted version of SER Volume II was labeled "not for public disclosure." However, a prudential determination was made that certain aspects of SER Volume III are important to advancing the Committee's aforementioned oversight authorities, responsibilities, and interest in advancing sound scientifically-based policymaking. Accordingly, key portions of SER Volume III are described below.

FINDING # 16: The NRC was non-responsive to Committee requests for the complete records upon which NRC Commissioners have and will be making critical decisions. With respect to outstanding requests, no schedule for delivery has been provided. No index of documents withheld has been provided. No claim of privilege has been stated.

5.2 Committee Review of Documents

The Committee thoroughly reviewed an unredacted version of the 695-page preliminary SER III as well as other related NRC documents. Committee staff note that the impressive thoroughness and technical detail evident throughout the SER reflect highly on the expertise and professionalism of NRC staff that worked so long to prepare it.

5.2.1 Volume III of the Safety Evaluation Report

NRC Chairman Gregory Jaczko

A key concern with the disposal of high level nuclear waste is the long term safety of the material after the storage facility is closed, leaving the radioactive waste to decay over time into non-radioactive elements. As previously noted, the long-term safety issue has been highlighted by the Obama Administration as a key issue to determine where long term storage of nuclear waste should be located. Storage risks include improper loading of the nuclear waste into storage containers, improper manufacture of these storage containers, and water or other intrusions into the facility risk compromising the ability of the material to decay. As part of the effort to determine the suitability of Yucca Mountain to store high-level radioactive waste, DOE engaged in a multi-year effort to gather comprehensive data and scientific information on the site and its associated risk factors.

This effort culminated in the Safety Analysis Report (SAR), compiled by DOE and last updated by staff in February 2009. The SAR was then submitted to the Nuclear Regulatory Commission

by DOE along with its Yucca Mountain License Application. The NRC spent over two years reviewing the Safety Analysis Report to assess the assumptions, plans, and overall technical rigor associated with the planned Yucca Mountain project. This NRC staff effort culminated in the Safety Evaluation Report comprising the following five volumes:

I. General Information
II. Repository Safety Before Permanent Closure
III. Repository Safety After Permanent Closure
IV. Administrative and Programmatic Requirements
V. License Specifications

NRC developed a review schedule for each of the respective SER volumes. The schedule inserted below (now a public document released by the NRC) was included in a March 30, 2010 NRC memorandum on the status of the High-Level Waste Program. According to this schedule, all five volumes would have been finalized and published by March 2011 if Chairman Jaczko had not halted work on the SER volumes.

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TENTATIVE COMPLETION DATES FOR SAFETY EVALUATION REPORT VOLUMES
(Milestones to be completed no later than dates shown)

SER Volume Number	Volume 1 General Information	Volume 2* Preclosure	Volume 3* Postclosure	Volume 4* Administrative/ Programmatic	Volume 5* License Specifications
HLWRS Staff completes text and Executive Summary	04/23/2010	09/21/2010	06/14/2010	08/5/2010	09/30/2010
HLWRS Management and OGC Volume Review Complete	06/7/2010	11/3/2010	07/27/2010	09/17/2010	11/15/2010
Resolve Comments and Complete Review by Technical Editor	07/6/2010	12/03/2010	08/24/2010	10/18/2010	12/14/2010
OGC Complete Legal Review	07/20/2010	12/17/2010	09/08/2010	11/01/2010	01/13/2011
NMSS Director Review and Concurrence	07/27/2010	01/04/2011	09/22/2010	11/16/2010	01/27/2011
Final OGC Review Complete with "No Legal Objection"	08/03/2010	01/18/2011	10/06/2010	12/01/2010	02/10/2011
Publication of Final SER Volume	08/31/2010	03/01/2011	11/10/2010	01/14/2011	03/24/2011

*Work on these volumes will be discontinued once FY 2010 funds are exhausted

ENCLOSURE 2

~~OFFICIAL USE ONLY – SENSITIVE INTERNAL INFORMATION~~

5.2.2 Safety Evaluation Report Volume III Content

In its executive summary, SER III described its objective as documenting "the staff's evaluation to determine whether the proposed repository design for Yucca Mountain will comply with the technical criteria and post-closure public health and environmental standards that apply after the repository is permanently closed." The report went on to note that in arriving at that determination, the NRC must consider "whether the site and design comply with the performance objectives and requirements contained in NRC's regulations at 10 CFR Part 63, Subparts E and L."

The preliminary staff draft was submitted to the Director of the Office of Nuclear Material Safety and Safeguards on July 15, 2010 for review and approval. However, it appears no action was taken on Volume III from July through October, when it was directed to bring the HLW program to an orderly close.

The specific safety issues studied in detail to support this review included:

- Short-term atmospheric changes to the desert environment
- Long-term atmospheric changes to the desert environment
- Volcanic activity
- Earthquakes
- Meteor impacts
- Improper manufacture of waste packages
- Improper loading of waste packages
- Drip-shield corrosion
- Drip-shield failure
- Human intrusion post-closure

> *"Legitimate scientific questions have been raised about the safety of storing spent nuclear fuel at this location."*
> – Letter from Senator Barack Obama to Senator Harry Reid and Barbara Boxer, October, 2007

Each of these factors were studied in depth by both DOE and NRC. The DOE SAR determined—and the NRC staff SER III confirmed—that they have no significant impact on the long-term safety of the facility.

For example, DOE staff used risk analysis to determine what would happen as a result of water that might seep through the desert floor. DOE estimated that for the first 10,000 years, the limited amount of rain that falls on the site will evaporate by the time it reaches the waste containers due to heat given off by the decaying waste. Beyond the first 10,000 years, the engineered barrier system composed of titanium drip shields will divert away any water that seeps in from above. The NRC staff review concluded that DOE acceptably demonstrated these natural and engineered barriers work together to protect groundwater resources in the vicinity of Yucca Mountain.

The preliminary SER III undertook similar in-depth reviews to determine, for example, potential radiologic exposure if people in the far distant future "unwittingly drill into the repository without realizing the repository is there." According to the SER, DOE selected 200,000 years as a conservative assumption of the earliest time the waste package could degrade enough so that an intrusion would occur without drillers recognizing it. This test also passed, with NRC staff accepting DOE's estimate that the peak dose from such human intrusion to be 0.0001 mSv per year—nearly 10,000 times below the regulatory threshold.

Overall, the Nuclear Regulatory Commission staff made over 1500 findings related to the scientific and technical research efforts of the Department of Energy. In their comments, NRC staff agreed 98.5% of the time resulting in the conclusion section listed at the beginning of this Committee report. The remaining 1.5 percent did not impact the NRC staff's overall conclusions, which found that DOE's Yucca Mountain License Application complies with applicable NRC safety requirements, including those related to human health and groundwater protection, and the specific performance objectives called for in NRC regulations for disposal of high-level radioactive wastes at Yucca Mountain (10 CFR 63.113-115).

> *"After spending billions of dollars on the Yucca Mountain Project, there are still significant questions about whether nuclear waste can be safely stored there."*
> – Senator Barack Obama, May 2007

FINDING #17: Not a single document provided to the Committee by the Nuclear Regulatory Commission found that the Yucca Mountain Project was not safe or viable.

FINDING #18: The NRC staff review of DOE's Yucca Mountain License Application detailed in SER III agreed overwhelmingly with DOE on the scientific and technical issues associated with the site, ultimately concluding that the application complies with applicable NRC safety regulations necessary for the site to proceed to licensing for construction.

5.2.3 "Update on the Yucca Mountain Program" Memorandum

On March 11, 2011, NRC placed two redacted memos—both of which were requested by the Committee—in its publicly-available "ADAMS" database.[107] The memos consisted of a March 30, 2010 memo titled, "Plans for the High-Level Waste Repository Program" and a February 4, 2011 memo titled "Update on the Yucca Mountain Program."[108] The purpose of the February 4, 2011 memo was to "describe the status of the Yucca Mountain Program," in light of the

[107] Available at: http://www.nrc.gov/reading-rm/adams.html#web-based-adams

[108] Memorandum to Chairman Jaczko, Commissioner Svinicki, Commissioner Apostolaki, Commissioner Magwood, and Commissioner Ostendorff from Catherine Haney, titled "Update on the Yucca Mountain Program," February 4, 2011. See Appendix E

transition to close the NRC staff safety review of the License Application. The memo was addressed to the five Commissioners from Catherine Haney, Director of the Office of Nuclear Material Safety and Safeguards (NMSS).
Director Haney described the activities associated with closure of the review of the LA and accompanying actions. For example, the memo notes that, since the October 1, 2010, NRC staff focused solely on converting its preparation of the safety evaluation reports into technical documents and that the reports "will contain no staff findings of regulatory compliance."[109] Absent regulatory findings, the technical review lacks context and does not provide value.

Notably, three NRC staff filed non-concurrences on the memorandum, highlighting areas of disagreement with the contents of the memo. Aby Mohseni, Deputy Director for the Licensing and Inspection Directorate in the Division of the High-level Waste Repository Safety, submitted a non-concurrence taking issue with the CR budget guidance, directed by Chairman Jaczko. Mohseni's objection states:

> Although the Commission memorandum describes the current status of the program, it also addresses a path forward that seems to me to contain policy issues that require Commission direction or guidance. For example, whereas the application of Nuclear Waste Funds in FY 2011 was only authorized for orderly shutdown activities under a CR guidance and as specifically directed by the Chairman, the ongoing ASLB hearings require that those funds also support legal activities in ongoing Yucca Mountain licensing proceedings. If there are no constraints in using FY2011 or carryover NWF monies to support licensing activities then it would be a policy issue to direct the staff to apply resources to orderly shutdown instead of completing and issuing the remaining SER volumes, especially since the Commission has not reversed the ASLB's decision that denied DOE's motion to withdraw its application.

Director Haney's response to Mr. Mohseni dismissed the issue, noting "the memo was not intended to raise policy issues" and refers to the lack of quorum to consider Commissioner Ostendorff's request for full Commission consideration of the CR budget directive. However, the inconsistent logic of the Chairman was noticed by NRC staff.

FINDING #19: Chairman Jaczko inconsistently and arbitrarily substituted his own judgment on key policy decisions more appropriately considered and decided before the full Commission. In doing so, he manipulated process to achieve his desired end: closure of the High-Level Waste Program.

The remaining two non-concurrences directly addressed the handling of the SER and shutdown of the HLW program. Dr. Janet Kotra, Senior Project Manager at Office of Nuclear Material Safety and Safeguards (NMSS), and her supervisor, Dr. King Stablein, Branch Chief for the NMSS, authored extensive opinions highlighting their disagreement with the final content of the memorandum. Dr. Kotra detailed the timeline and motivations behind NRC directives which stated, "[w]hen, on June 14, 2010, the Chairman ordered the Director to postpone issuance of

[109] Ibid.

Safety Evaluation Report Volumes 1 and 3, [High-Level Radioactive Waste] and NMSS managers became concerned the entire Commission may not be fully aware of the policy, legal and budgetary consequences of such redirection." She continued:

> "I was given to understand the memorandum was not to refer to any of the related policy issues, a decision with which I disagreed. Later, in September, it became clear that, rather than postpone issuances of individual SER volumes, the Chairman's intent was to terminate the staff's safety review altogether. Using the continuing resolution as justification, the Chairman, through [Office of Executive Director of Operations] and the [Chief Financial Officer], told staff that all work on the SER must stop, including Volume 3 on post-closure safety, which was already complete, and undergoing management review...[The Chairman] explained that the decision to shut down the staff's review of the application was his alone and that staff should move to orderly closure of NRC's Yucca Mountain program."

Dr. Stablein reiterated this point, saying, "the Chairman unilaterally brought development of the SER to a halt" and "it was pointed out to [Chairman Jaczko] that allowing the staff to finish the SER volumes would be by far the most efficient and effective use of [NWF] resources and at the same time would give the Nation the benefit of an independent regulator's evaluation of the Yucca Mountain application." Internally, Chairman Jaczko took direct credit for ending the Yucca Mountain review, while he externally stated he was simply following broad, established NRC guidance.

FINDING #20: Chairman Jaczko unilaterally decided and directed NRC staff to discontinue work on the SER.

5.3 Slow-Walking of the ASLB Decision

On June 29, 2010, the Nuclear Regulatory Commission's Atomic Safety and Licensing Board rejected DOE's Motion to Withdraw the License Application.[110] On June 30, the Secretary of the NRC issued an order to invite briefs as to whether the Commission should review the appeal, and reverse or uphold the ASLB order.[111]

On July 15, NRC Commissioner Apostolakis recused himself from consideration of the order due to his work with Sandia National Laboratories, that reviewed the adequacy of the long-term performance assessment of Yucca Mountain.[112] Commissioner Apostolakis' recusal left the remaining four Commissioners to rule on the ASLB's order.

Commissioners Svinicki, Ostendorff, and Magwood filed their votes on the matter on August 25, 26, and September 15, respectively. Chairman Jaczko voted initially on August 25, then

[110] NRC ASLB, Memorandum and Order, Docket No. 63-001 ASLBP No. 09-892-HLW-CAB04 (June 29, 2010)
[111] NRC Secretary, Order of the Secretary, Docket No. 63-001 ASLBP No. 09-892-HLW-CAB04 (June 30, 2010)
[112] NRC, Notice of Recusal, Docket No. 63-001 ASLBP No. 09-892-HLW-CAB04 (July 15, 2010)

withdrew his vote and resubmitted his vote again on October 29.[113] The votes are filed with the Secretary of the NRC; however, Chairman Jaczko has neglected to schedule a formal meeting to register the Commissioners' votes. At a May 4, 2011 Congressional hearing,[114] Commissioners Svinicki, Ostendorff, and Magwood noted their positions have not changed, which raises the question as to the intention behind Chairman Jaczko's refusal to rule on the ASLB's decision.

FINDING #21: NRC Chairman Jaczko continues to block consideration of ASLB's decision to deny DOE's Motion to Withdraw the License Application, now almost a full year removed from the decision and over nine months since Commissioners filed their votes.

5.4 Internal Disputes over NRC's Closure of the High-Level Waste Program

Chairman Jaczko's October directive to bring NRC's HLW program to closure raised concerns with his fellow Commissioners. Chairman Jaczko dismissed Commissioner Ostendorff's request for the full Commission to consider the budget memo ordering all staff work for the HLW program to be directed to an "orderly closure." This tension was reiterated by Commissioner Sviniciki.

In response to Congressional correspondence between Select Committee on Energy Independence and Global Warming Ranking Member Sensenbrenner and Chairman Jaczko, Commissioner Svinicki sent a letter expressing her explicit disapproval with Chairman Jaczko's characterization of the budget directive.[115] She took particular issue with the Chairman's claim NRC was simply "following established Commission policy to begin to close out the HLW program."[116]

Commissioner Svinicki's letter highlights the differing conditions upon which the FY 2011 budget request was submitted in January 2010 and the circumstances the NRC was facing nine months later. She wrote:

[113] Letter from Kristine Svinicki, William Ostendorff, and William Magwood, to Senator James Inhofe, November 2010. Available at: http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=e70db547-7058-4f1f-aa27-87d80de5f2e9

[114] Committee on Energy and Commerce, Subcommittee on Energy and Power, Subcommittee on Environment and Economy, "The Role of the Nuclear Regulatory Commission in America's Energy Future," May 4, 2011

[115] Letter from Commissioner Svinicki to Rep. Sensenbrenner, November 1, 2010.

[116] Ibid.

"When the Commission voted to approve budget justification language related to NRC's proposed HLW activities for FY 2011, a majority of the Commission's members supported language stipulating that orderly closure of the program activities would occur "[u]pon the withdrawal or suspension of the licensing review." The budget justification submitted to the Congress, and pending there now, was modified to include this language. These precursors have not occurred and an adjudicatory appeal related to DOE's request to withdraw its application lies unresolved before the Commission, making the orderly closure of NRC's program, in my view, grossly premature."[117]

FINDING #22: Chairman Jaczko neglected to consider legitimate concerns raised by fellow Commissioners that should be resolved through an open and transparent decision-making process.

[117] Ibid.

Chapter 6. Summary and Conclusions

The Committee undertook this study to determine the impact of the efforts by the Obama Administration to terminate the Yucca Mountain Project. Described as the most studied piece of ground on the world, Yucca Mountain was determined by a rigorous review process using sound science to be an appropriate permanent geologic repository for high-level radioactive waste. At the beginning of the Administration, President Obama committed to using sound science to develop federal policies.

Yet even after a multi-year review of the Yucca Mountain Project by the Nuclear Regulatory Commission that agreed with over 98.5 percent of the findings of the Department of Energy, the Obama Administration continued efforts to terminate the Project without stating any scientific basis to do so. This decision not only violated the President's own highly promoted principles and directives on scientific integrity, transparency, and openness, it has increased taxpayer liabilities under the Nuclear Waste Policy Act, left nuclear waste sitting at reactor sites across the country with no plan for disposal, and ultimately threatened the long-term potential of nuclear power to meet America's growing energy demands with safe, clean, and affordable baseload electricity.

After summarizing the history of the Yucca Mountain Project and the history of the Committee's oversight, this report includes copies of key emails and documents related to the termination as well as a series of Committee findings. Currently, the U.S. has no long term plan to store nuclear waste leaving it to collect at numerous sites across America.

NYE COUNTY SCIENTIFIC INVESTIGATIONS

Early Warning Drilling Program
This program consisted primarily of exploratory drilling for characterization of the geology south of Yucca Mountain. Under this program, Nye County drilled and sampled over 45,000 feet using various methods, and completed 40 wells. Cuttings samples and cores from many of these boreholes were tested in Nye County's soils laboratory to determine grain size distribution and other soil-related parameters. In addition to providing valuable geologic data, these wells were used for a variety of tests intended to characterize the hydrogeology south of Yucca Mountain.

Independent Scientific Investigations Program
Nye County conducted numerous scientific investigations to characterize the geology and hydrogeology south of Yucca Mountain. These studies included:

1. Pump tests to determine aquifer transmissivity and storativity;
2. Tracer tests to determine how radionuclides and other contaminants might move through alluvium (soils);
3. Geophysical studies to determine geological structure and unit relationships between existing wells;
4. Water level measurements to determine groundwater flow paths;
5. Water sampling and chemical analysis to determine groundwater age and flow path relationships;
6. Specialized borehole geophysical logging to determine groundwater flow velocities through both fractured rock and alluvial materials.
7. Structural geologic studies to characterize the regional groundwater flow system; and
8. Ventilation modeling efforts to assess DOE's models and closure times related to heat loading and repository safety.

Quality Assurance
All of Nye County's scientific investigations were conducted under a Nuclear Regulatory Commission approved Quality Assurance (QA) program. The quality and traceability of data generated under this QA program were sufficient to allow DOE to include them in its Yucca Mountain License Application (LA).

NYE COUNTY RESOLUTION NO. 2011-21

A RESOLUTION OF THE NYE COUNTY BOARD OF COMMISSIONERS RESOLUTION SUPPORTING COMPLETION OF THE NUCLEAR REGULATORY COMMISSION'S REVIEW OF THE YUCCA MOUNTAIN LICENSE APPLICATION

WHEREAS, the Nuclear Waste Policy Act of 1982, as amended, ("Act") selected Yucca Mountain, located in Nye County as the only site to be characterized as the nation's first high-level radioactive waste repository; and

WHEREAS, Congress in July 2002, in accordance with provisions of the Act, as amended, overrode Nevada's notice of disapproval; and

WHEREAS, Yucca Mountain was designated to be the site for development of a permanent repository for United States spent nuclear fuel and defense high level radioactive waste; and

WHEREAS, the U.S. Department of Energy ("USDOE"), in accordance with the Act, submitted a License Application (LA) to the Nuclear Regulatory Commission (NRC); and

WHEREAS, that LA, in accordance with NRC regulations, was accepted for review by the NRC and

WHEREAS, the USDOE has since requested withdrawal of its submission of the LA "with prejudice"; and

WHEREAS, the request for withdrawal has been denied by the Atomic Safety and Licensing Board (ASLB) and challenged in Federal Court; and

WHEREAS, the Commissioners of the NRC have not issued a final ruling on their review of the ASLB decision that USDOE does not have the legal authority to withdraw the Yucca Mountain license application; and

WHEREAS, the nation needs to move forward on the established NWPA strategy that provides for the permanent storage of spent nuclear fuel and high level waste; and,

WHEREAS, the Nye County Board of Commissioners (Board) recognizes that further delays in the development of a permanent geologic repository will result in significant public expenditures and potentially jeopardizes the future expansion of nuclear power production and energy independence; and

WHEREAS, the Board is convinced that until such time as the NRC completes its review of the LA, Nye County, the State of Nevada and the nation will be denied a scientific and technical determination of the potential of the Yucca Mountain repository to be built and operated safely and successfully; and

WHEREAS, Nye County adopted Resolutions 2002-7, 2002-22 and 2004-25 defining the County's involvement as the site county for the nation's geologic repository for spent nuclear fuel and defense high level waste,

NOW THEREFORE, it hereby is resolved as follows:

1. The Yucca Mountain licensing proceedings should be restarted and the NRC should complete a thorough and detailed review of the License Application; and
2. If upon completion of the license application review by the NRC staff and the licensing proceeding before the ASLB, the conclusion is that the Yucca Mountain repository can be constructed and operated safely, Nye County reaffirms our prior resolutions and supports such construction and operation consistent with these prior resolutions ; and

APPROVED this 15th day of March, 2011.

NYE COUNTY BOARD OF
COUNTY COMMISSIONERS:

Gary Hollis, Chairman

ATTEST:

Sandra "Sam" L. Merlino, Nye County Clerk
And Ex-Officio Clerk of the Board

ESMERALDA COUNTY RESOLUTION NO. 11-R-05

A RESOLUTION OF THE ESMERALDA COUNTY BOARD OF COMMSSIONERS SUPPORTING COMPLETION OF THE NUCLEAR REGULATORY COMMISSION'S REVIEW OF THE YUCCA MOUNTAIN LICENSE APPLICATION

WHEREAS, the Nuclear Waste Policy Act ("NWPA") of 1982, as amended, ("Act") selected Yucca Mountain, located in Nye County, Nevada as the only site to be characterized as the nation's first high-level radioactive waste repository; and

WHEREAS, Congress in July 2002, in accordance with provisions of the Act, overrode, the State of Nevada's notice of disapproval; and

WHEREAS, Yucca Mountain was designated to be the site for development of a permanent repository for United States spent nuclear fuel and defense high level radioactive waste; and

WHEREAS, the U. S. Department of Energy ("USDOE"), in accordance with the Act, submitted a License Application ("LA") to the Nuclear Regulatory Commission ("NRC"); and

WHEREAS, that LA, in accordance with NRC regulations was accepted for review by the NRC; and

WHEREAS, the USDOE has since requested withdrawal of its submission of the LA "with prejudice"; and

WHEREAS, the request for withdrawal has been denied by the Atomic Safety and Licensing Board ("ASLB") and challenged in Federal Court; and

WHEREAS, THE Commissioners of the NRC have not issued a ruling on their review of the ASLB decision that USDOE does not have the legal authority to withdraw the Yucca Mountain License Application; and

WHEREAS, the nation needs to move forward on the established strategy that provides for the permanent storage of spent nuclear fuel and high level waste; and

WHEREAS, the Esmeralda County Board of Commissioners ("Board") recognizes that further delays in the development of a permanent geologic repository will result in significant public expenditures, the incurring of great liability, and potentially jeopardizes the future expansion of nuclear power production and U.S. energy independence; and

WHEREAS, the Board is convinced that until such time as the NRC completes its review of the LA, Esmeralda County, the State if Nevada and the nation will be denied a scientific and technical determination of the potential of the Yucca Mountain repository to be built and operated safely and successfully; and

NOW THEREFORE, it hereby is resolved as follows:

1. **The Yucca Mountain licensing proceedings should continue and the NRC should complete a thorough and detailed review of the License Application.**

APPROVED, PASSED AND ADOPTED by the Esmeralda County Board of Commissioners this 5th day of April, 2011

ESMERALDA COUNTY BOARD OF COUNTY COMMISSIONERS:

Nancy Boland, Chair

Dominic Pappalardo, Vice Chair

William Kirby, Board Member

ATTEST:

La Cinda Elgan, Esmeralda County Clerk of the Board

APPROVED AS TO FORM:

Arthur Wehrmeister
District Attorney

///

Board of
MINERAL COUNTY COMMISSIONERS

JAMES ESSENPREIS, Chairman	Telephone: 775-945-2446	Governing Board for the Towns of Hawthorne,
NANCY BLACK, Vice Chairman	Fax: 775-945-0706	Luning, Mina and Walker Lake;
JERRIE TIPTON, Member	PO Box 1450, Hawthorne, NV 89415	Liquor Board and Gaming Board;
CHERRIE GEORGE, Clerk of the Board		County Highway Commission
	mincocommissioner@mineralcountynv.org	

Resolution No. 11-002

MINERAL COUNTY BOARD OF COMMISSIONERS

BOARD OF COUNTY COMMISSIONERS
COUNTY OF MINERAL, STATE OF NEVADA

RESOLUTION SUPPORTING COMPLETION OF THE NUCLEAR REGULATORY COMMISSION'S REVIEW OF THE YUCCA MOUNTAIN LICENSE APPICATION

WHEREAS, the Nuclear Waste Policy Act of 1982, as amended, ("Act") selected Yucca Mountain, located in Nye County as the only site to be characterized as the nation's first high-level radioactive waste repository; and

WHEREAS, Congress in July 2002, in accordance with provisions of the Act, as amended, over-rode Nevada's notice of disapproval; and

WHEREAS, Yucca Mountain was designated to be the site for development of a permanent repository for United States spent nuclear fuel and high level radioactive waste; and

WHEREAS, the U.S. Department of Energy ("USDOE"), in accordance with the Act, submitted a License Application (LA) to the Nuclear Regulatory Commission (NRC); and

WHEREAS, that LA, in accordance with NRC regulations, was accepted for review by the NRC; and

WHEREAS, the USDOE has since requested withdrawal of its submission of the LA "with prejudice"; and

WHEREAS, the request for withdrawal has been denied by the Atomic Safety and Licensing Board (ASLB) and challenged in Federal Court; and

WHEREAS, the Commissioners of the NRC have so far failed to review the ASLB decision that USDOE does not have the legal anthority to withdraw the Yucca Mountain license application; and

WHEREAS, the Chairman of the NRC unilaterally directed the NRC staff to terminate review of the LA without ruling on the ASLB decision; and

WHEREAS, with NRC's failure to act in a timely manner with respect to the ASLB decision, the Federal Court of Appeals for the D.C. Circuit has scheduled and heard challenges to USDOE's authority to terminate work on Yucca Mountain and withdraw the Yucca Mountain LA; and.

WHEREAS, the nation needs to move forward on the established strategy to provide permanent storage of spent nuclear fuel and high level waste; and,

Whereas, the Mineral County Board of Commissioners (Board) recognizes that further delays in the development of a permanent geologic repository will result in significant public expenditures and potentially jeopardizes the future expansion of nuclear power production and energy independence; and

WHEREAS, the Board is convinced that until such time as the NRC completes its review of the LA, Mineral County, the State of Nevada and the nation will be denied a scientific and technical determination of the potential of the Yucca Mountain repository to be built and operated safely and successfully; and

WHEREAS we are a nation governed with respect for laws we impose on ourselves,

NOW THEREFORE, it hereby is resolved as follows:

That absent changes to the Nuclear Waste Policy Act, as amended, NRC should complete a thorough and detailed review of the Yucca Mountain License Application;

APPROVED THIS 6TH DAY OF APRIL, 2011.

MINERAL COUNTY BOARD OF
COUNTY COMMISSIONERS:

James Essenpreis, Chairman

ATTEST:

Cherrie George, Clerk of the Board

Resolution No. 2011-5

LANDER COUNTY BOARD OF COMMISSIONERS

BOARD OF COUNTY COMMISSIONERS
COUNTY OF LANDER, STATE OF NEVADA

RESOLUTION SUPPORTING COMPLETION OF THE NUCLEAR REGULATORY COMMISSION'S REVIEW OF THE YUCCA MOUNTAIN LICENSE APPLICATION

WHEREAS, the Nuclear Waste Policy Act of 1982, as amended, ("Act") selected Yucca Mountain, located in Nye County as the only site to be characterized as the nation's first high-level radioactive waste repository; and

WHEREAS, Congress in July 2002, in accordance with provisions of the Act, as amended, over-rode Nevada's notice of disapproval; and

WHEREAS, Yucca Mountain was designated to be the site for development of a permanent repository for United States spent nuclear fuel and high level radioactive waste; and

WHEREAS, the U.S. Department of Energy ("USDOE"), in accordance with the Act, submitted a License Application (LA) to the Nuclear Regulatory Commission (NRC); and

WHEREAS, that LA, in accordance with NRC regulations, was accepted for review by the NRC; and

WHEREAS, the USDOE has since requested withdrawal of its submission of the LA "with prejudice"; and

WHEREAS, the request for withdrawal has been denied by the Atomic Safety and Licensing Board (ASLB) and challenged in Federal Court; and

WHEREAS, the Commissioners of the NRC have so far failed to review the ASLB decision that USDOE does not have the legal authority to withdraw the Yucca Mountain license application; and

WHEREAS, the Chairman of the NRC unilaterally directed the NRC staff to terminate review of the LA without ruling on the ASLB decision; and

WHEREAS, with NRC's failure to act in a timely manner with respect to the ASLB decision, the Federal Court of Appeals for the D.C. Circuit will schedule and hear challenges to USDOE's authority to terminate work on Yucca Mountain and withdraw the Yucca Mountain LA; and.

WHEREAS, the nation needs to move forward on the established strategy to provide permanent storage of spent nuclear fuel and high level waste; and,

Whereas, the Lander County Board of Commissioners (Board) recognizes that further delays in the development of a permanent geologic repository will result in significant public expenditures and potentially jeopardizes the future expansion of nuclear power production and energy independence; and

WHEREAS, the Board is convinced that until such time as the NRC completes its review of the LA, Lander County, the State of Nevada and the nation will be denied a scientific and technical determination of the potential of the Yucca Mountain repository to be built and operated safely and successfully; and

WHEREAS we are a nation governed with respect for laws we impose on ourselves,

NOW THEREFORE, it hereby is resolved as follows:

1. That absent changes to the Nuclear Waste Policy Act, as amended, NRC should complete a thorough and detailed review of the Yucca Mountain License Application.

APPROVED this 24th day of March, 2011

BOARD OF COUNTY COMMISSIONERS
COUNTY OF LANDER, STATE OF NEVADA

By: _____
Steve Stienmetz, Chairman

ATTEST:

By: _____
Sadie Sullivan, Lander County Clerk
And Ex-Officio Clerk of the Board

Senate Resolution No. 19—Senator Brown

FILE NUMBER 183

SENATE RESOLUTION—Designating certain members of the senate as members of the legislative commission in the legislative counsel bureau.

Resolved by the Senate of the State of Nevada, That pursuant to the provisions of NRS 218.660 and the joint rules of the legislature, Senators Richard H. Bryan, Melvin D. Close, Jr., Carl F. Dodge, James I. Gibson, Lee E. Walker and Thomas R. C. Wilson are designated as the regular senate members; Senator William J. Raggio is designated the alternate member for Senator Dodge; and Senators Norman Ty Hilbrecht, Richard E. Blakemore, Mary L. Gojack, Joe Neal and Gary A. Sheerin are designated as first, second, third, fourth and fifth alternate members respectively for the other members, to serve until their successors are designated.

Assembly Joint Resolution No. 15—Assemblymen Mann, Robinson, Price, Hickey, May, Getto, Jacobsen, Hayes, Moody, Chaney, Schofield, Benkovich, Dreyer, Howard, Heaney, Bennett, Christensen, Jeffrey, Vergiels, Sena and Brookman

FILE NUMBER 184

ASSEMBLY JOINT RESOLUTION—Urging the Energy Research and Development Administration to choose the Nevada Test Site for the storage and processing of nuclear material and for solar energy research under the Solar Energy Research, Development and Demonstration Act of 1974.

WHEREAS, The now supplanted Atomic Energy Commission has, over the years, demonstrated an outstanding concern for nuclear safety and has compiled, at the Nevada Test Site, an equally outstanding safety record; and

WHEREAS, The people of Southern Nevada have confidence in the safety record of the Nevada Test Site and in the ability of the staff of the site to maintain safety in the handling of nuclear materials; and

WHEREAS, The unemployment rate in Clark County, Nevada, is 20.7 percent higher than the disturbingly high national unemployment rate; and

WHEREAS, The people and the leaders in many states being considered as sites for the storage and processing of nuclear material have serious anxieties and doubts about providing storage and processing sites; and

WHEREAS, The existing facilities and the years of expertise in nuclear material handling at the Nevada Test Site are a tremendous existing resource; and

WHEREAS, Southern Nevada also offers an excellent environment in which to explore the potential of solar energy; and

WHEREAS, National energy independence and a clean environment are dependent upon tapping nonfossil fuel sources of energy for heating, cooling and electricity; and

WHEREAS, The existing facilities of the Nevada Test Site and its support infrastructure are available and well suited to scientific research in addition to nuclear projects; and

WHEREAS, The storage and processing of nuclear material, and solar energy research can both be carried out at the Nevada Test Site with minimal capital investment relative to other locations; now, therefore, be it

Resolved by the Assembly and the Senate of the State of Nevada, jointly, That the legislature of the State of Nevada strongly urges the Energy Research and Development Administration to choose the Nevada Test Site for the storage and processing of nuclear material provided that there is an acceptance by the Energy Research and Development Administration of the following conditions:

1. Air cooling is used at the storage facility;
2. Rail transportation avoiding the Las Vegas metropolitan area is established to the site;
3. Appropriate state agencies and local governments can cooperate in, and contribute to, the development of the Energy Research and Development Administration's site-specific environmental impact statement;
4. It is satisfactorily demonstrated that adequate radiation safeguards for storage and transportation can be developed and will be implemented;
5. Public hearings are held in at least four counties in the state prior to choosing a specific site for the facility; and be it further

Resolved, That under the provisions of the Solar Energy Research, Development and Demonstration Act of 1974 the Energy Research and Development Administration utilize the extensive resources and facilities of the Nevada Test Site to explore the potential uses of solar energy; and be it further

Resolved, That copies of this resolution be prepared and transmitted by the legislative counsel to the administrator of the Energy Research and Development Administration, to the assistant administrators for nuclear energy and for solar, geothermal and advanced energy systems and to all members of Nevada's congressional delegation; and be it further

Resolved, That this act shall become effective upon passage and approval.

Assembly Joint Resolution No. 38—Assemblymen Coulter, Mann, Sena, Murphy, Hayes, Dreyer, Benkovich, Polish, Glover, Mello, Wittenberg, Weise, Bennett and Christensen

FILE NUMBER 185

ASSEMBLY JOINT RESOLUTION—Memorializing Congress to authorize and fund a veterans' hospital in Southern Nevada.

WHEREAS, There are 92,000 veterans living in Nevada who have honorably served their country; and

WHEREAS, Approximately 50,000 of these veterans reside in Southern Nevada; and

WHEREAS, The closest veterans' hospitals for these 50,000 veterans are in Los Angeles and Reno, a fact which makes hospital care for any of these veterans an extreme inconvenience and even a real hardship; and

WHAT'S NEXT FOR NUCLEAR WASTE?

A New Strategy for the CSRA

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two states, one future

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September 2009

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COMMUNITY REUSE ORGANIZATION
two states, one future

November 9, 2009

Dear Community Stakeholder:

The Federal Government's decision to abandon Yucca Mountain as its preferred method for permanent disposal of defense nuclear waste and commercial spent nuclear fuel represents a critical challenge for our two-state region.

Simply put, the decision means that, unless a promised Federal solution is provided, the Savannah River Site will likely become a *de facto* permanent repository for the waste that is currently stored there – waste the government assured us would eventually be moved to its permanent home in the remote Nevada desert.

As a regional voice for issues related to the Savannah River Site, the SRS Community Reuse Organization is raising awareness of this important topic among community leaders. We want to serve as a catalyst for dialog designed to protect the region's long-term interests. Our Board of Directors recently adopted the enclosed White Paper which outlines the issue and the implications for our region.

Those responsible for public safety, job creation, image enhancement and citizen confidence must now lead in a new reality. We must come to terms with our community's lingering – perhaps permanent -- role as caretaker for the Nation's highly radioactive waste. It is the goal and intent of the SRS Community Reuse Organization to assist the communities in our region in reaching consensus concerning a path forward in addressing with the Federal government the impacts on our region resulting from the absence of a promised permanent repository for nuclear waste.

The ideas expressed in this paper are intended for information and education and a platform for public discussion as interested citizens and groups work together to arrive at a community consensus and a strategy for communicating our common position known to key decision makers.

Thank you in advance for your interest in this topic and your willingness to invest some time and effort in reviewing this information and participating in developing a workable strategy that protects the long-term interests of our two-state region.

Sincerely,

William R. (Rick) Toole
Chairman

J. David Jameson
Vice Chairman

P.O. Box 696, Aiken, South Carolina 29802 P: 803.593.9954 ext. 1409 F: 803.593.4296 www.srscro.org
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two states, one future

PREFACE

This White Paper was prepared by the Savannah River Site Community Reuse Organization (SRSCRO) to serve as a catalyst for public dialog concerning the implications of the Obama Administration's decision to halt more than two decades of work on Yucca Mountain in Nevada as the nation's permanent nuclear waste repository.

United States policies governing the permanent disposal of high level waste are defined by the Nuclear Waste Policy Act of 1982, as amended. This Act specifies that high-level waste will be disposed of underground, in a deep geologic repository, and that Yucca Mountain, Nevada, will be the single candidate site for characterization as a potential geologic repository.

The government's about face on this critical issue leaves state and local leaders with more questions than answers. Those responsible for public safety, job creation, image enhancement and citizen confidence must now lead in a new reality. They must come to terms with their community's lingering – perhaps permanent -- role as caretaker for the Nation's highly radioactive waste.

As a region, we are now left wondering what's next? How we will come together in unity to address a path forward in the wake of this broken promise – one that has implications of the longest possible term and a potential chilling effect on the region's future growth and prosperity?

It is the goal and intent of the SRS Community Reuse Organization to assist the communities in our region in reaching consensus concerning a path forward in addressing with the Federal government the impacts on our region resulting from the absence of a promised permanent repository for nuclear waste.

The ideas expressed in this paper are intended for information and education and a platform for public discussion as interested citizens and groups work together to arrive at a community consensus and a strategy for communicating our common position known to key decisionmakers.

What's Next for Nuclear Waste?
A New Strategy for the CSRA

An Unwilling Long-Term Landlord

The Obama Administration's 2009 announcement that it would abandon Yucca Mountain in the Nevada desert as the Government's preferred solution for long-term storage of nuclear waste swept across the landscape like the rippling aftershock of a feared atomic blast.

The news was sudden and abrupt – terse in its language and far-reaching in its impact. Secretary of Energy Steven Chu said Yucca Mountain is no longer an option for storing highly radioactive waste, including spent nuclear fuel from commercial and governmental programs as well as legacy materials from the Cold War effort. A blue ribbon panel would be created, the Secretary said, to determine a new strategy for the ultimate disposal of these wastes.

Senate Majority Leader Harry Reid hailed the decision as "our most significant victory to date in our battle to protect Nevada from becoming the country's toxic wasteland."

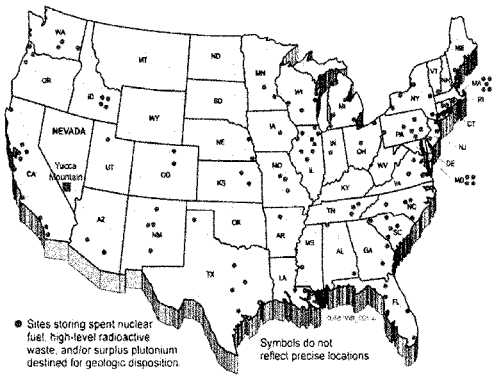
Then he added: "President Obama recognizes that the proposed dump threatens the health and safety of Nevadans and millions of Americans. His commitment to stop this terrible project could not be clearer."

Even now, the Government's rejection of its only answer to long term storage resounds in communities across the country, including our own, as local leaders reluctantly are forced to see their hometowns for what they may now have become – an unwilling permanent landlord for what many Americans consider to be the world's deadliest legacy.

We are not alone. High-level nuclear waste from the U. S. nuclear weapons complex currently resides at 16 sites in 13 states and totals 7,000 metric tons. This is approximately ten percent of the estimated capacity of the Yucca Mountain repository. There is also some 63,000 metric tons of used commercial nuclear fuel stored in 41 states that has also been designated for Yucca Mountain.

It is up to the region's leaders – elected officials, business owners, economic development professionals, educators, heads of community organizations, labor leaders and others – to join together to form a consensus concerning the new reality of nuclear waste management that has dawned in recent days and that, undoubtedly, will remain at the forefront of our agenda for months and years to come.

Figure 1: U. S. Sites Where High-Level Defense Waste and Spent Fuel are stored.



What Kind of Nuclear Waste Are We Talking About?

Two types of waste products are usually included in any discussion of a permanent repository – ***spent nuclear fuel*** and ***high-level defense waste.***

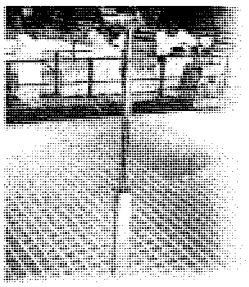
Spent nuclear fuel is used fuel from a reactor that is no longer efficient in creating electricity, because its fission process has slowed. However, it is still thermally hot, highly radioactive, and potentially harmful. Until a permanent disposal repository for spent nuclear fuel is built, nuclear power plant operators must safely store this fuel at their reactor sites.

One alternative for dealing with spent nuclear fuel is ***"reprocessing."*** Reprocessing extracts isotopes from spent fuel that can be used again as reactor fuel. Although this would extend the life of our nuclear fuel resources and help in our national goal of energy independence, commercial reprocessing is currently not practiced in the United States, although it has been allowed in the past.

Significant quantities of high-level radioactive waste are produced by the defense reprocessing programs at Department of Energy (DOE) facilities, such as Savannah River, Hanford and Washington state and by commercial reprocessing operations at West Valley, New York. These wastes, which are generally managed by DOE, are not regulated by NRC. However they must be included in any high-level radioactive waste disposal plans, along with all high-level waste from spent reactor fuel.

Because of their highly radioactive fission products, high-level waste and spent fuel must be handled and stored with care. Since the only way radioactive waste finally becomes harmless is through decay, which for high-level wastes can take hundreds of thousands of years, the wastes must be stored and finally disposed of in a way that provides adequate protection of the public for a very long time.

United States policies governing the permanent disposal of high level waste are defined by the Nuclear Waste Policy Act of 1982, as amended. This Act specifies that high-level waste will be disposed of underground, in a deep geologic repository, and that Yucca Mountain, Nevada, will be the single candidate site for characterization as a potential geologic repository.



When spent fuel is removed from a reactor, it is placed in a special pool of water contained in a steel-lined concrete basin.

The challenge of properly disposing of nuclear waste touches every man, woman and child in America. It speaks to public safety, to energy independence, to technology and innovation, to global competitiveness and economic leadership and to the political will to do what is right – what must be done for the good of our communities today and of future generations tomorrow.

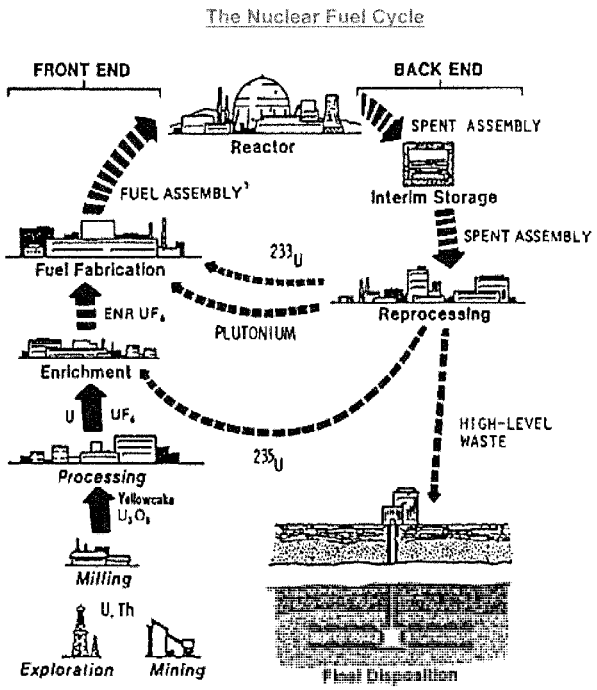
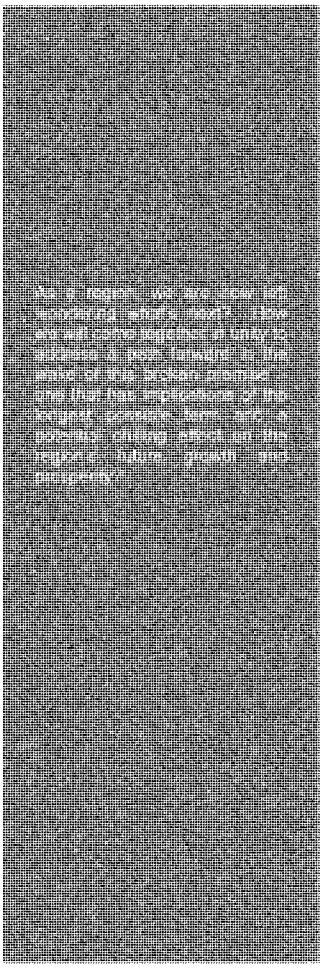


Figure 2: This drawing shows the steps of the nuclear fuel cycle from initial mining and production to use in the reactor, reprocessing and final disposition.

The challenge of properly disposing of nuclear waste touches every man, woman and child in America. It speaks to public safety, to energy independence, to technology and innovation, to global competitiveness and economic leadership and to the political will to do what is right -- what must be done for the good of our communities today and of future generations tomorrow.

The Winds of Change



The announcement to jettison Yucca Mountain as the preferred storage option came only a few days into the new Obama Administration which came to power on the winds of change. The news was not completely unexpected. The signs had been building for years amid construction delays and growing public opposition and the increasing political clout of Nevada's senior senator.

As Senate Majority Leader, Harry Reid became a force to be reckoned with and one whose opposition would ultimately seal the repository's fate. With more than $7 billion invested by nuclear power consumers and taxpayers since its inception, many saw Yucca's cancellation as the most expensive "Not in my Backyard" protest ever, despite the fact that state and local governments in Nevada had received over $400 million in "mitigation" payments since the early 1980s.

A Day of Reckoning

But when it finally came, the decision still hit hard in our region and others whose economy depended for years on federal paychecks and promises. Now, one of the biggest promises appears broken. The President says Yucca Mountain is gone. For all those communities across the country who believed and followed – for all of those who thought the waste was just passing through -- the Day of Reckoning has arrived.

What was unspoken is now clear. When it comes to disposal of high-level nuclear waste from the nation's nuclear defense program, there is no Plan B. No alternate location. No secondary geologic formation. No backup technology. No other plan. It was always Yucca Mountain. Nothing else.

The government's about face on this critical issue leaves state and local leaders with more questions than answers. Those responsible for public safety, job creation, image enhancement and citizen confidence must now lead in a new reality. They must come to terms with their community's lingering -- perhaps permanent -- role as caretaker for the Nation's highly radioactive waste.

As a region, we are now left wondering what's next? How we will come together in unity to address a path forward in the wake of this broken promise – one that has implications of the longest possible term and a potential chilling effect on the region's future growth and prosperity?

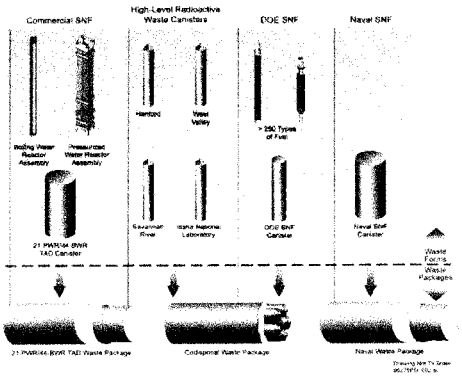


Figure 3: Waste forms and packages to be stored in Yucca Mountain (Courtesy: CNTA).

Seeking a New Strategy

For our region, whose economy was shaken by the dramatic post-Cold War downsizing of its largest employer and now seeks to diversify, hard choices lie ahead. The SRS Community Reuse Organization (SRSCRO) encourages regional dialog on this important issue in a constructive way that can help lead to consensus concerning a new strategy that is now required in light of the Administration's decision.

Local communities like ours had for years embraced their limited, defined role in nuclear waste storage -- one that was always clear in our minds and, therefore, acceptable. We were willing temporary hosts, agreeable short-term custodians.

In storing high-level nuclear waste, we saw ourselves as a hotel. Our guests were transient – staying for a while and then moving on. We never envisioned building a permanent retirement home for them. We viewed our role as a way station for nuclear waste, a place where it could stay overnight while its ultimate home was being prepared "somewhere else" – a remote desert place called Yucca Mountain.

When the waste finally reached the depths of Yucca Mountain, it would be safe and secure. It was a solution forever sealed from human intervention. The waste would permanently reside in a highly engineered hole in the ground impervious to water and worry. For most Americans, it was a place where out of sight definitely meant out of mind. For most, it seemed the perfect solution.

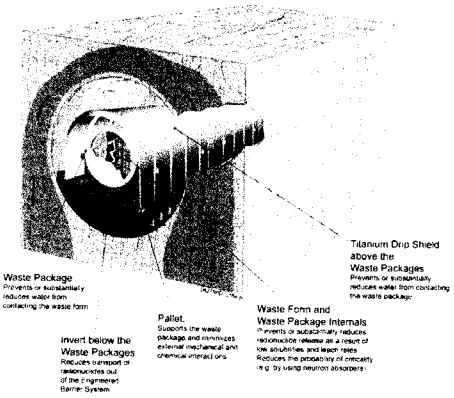


Figure 4: There is a natural tendency for any water to move around large openings or excavation in rock. The emplacement tunnels or "drifts" shown above provide a stable environment for other engineered barrier system features at Yucca Mountain. (Courtesy: CNTA).

Even now, the Government's rejection of its only answer to long term storage resounds in communities across the country, including our own, as local leaders reluctantly are forced to see their hometowns for what they may now have become – an unwilling permanent landlord for what many Americans consider to be the world's deadliest legacy.

What Now?

For community leaders in the Central Savannah River Area and in other Department of Energy communities around the country, one question remains:

What do we do now?

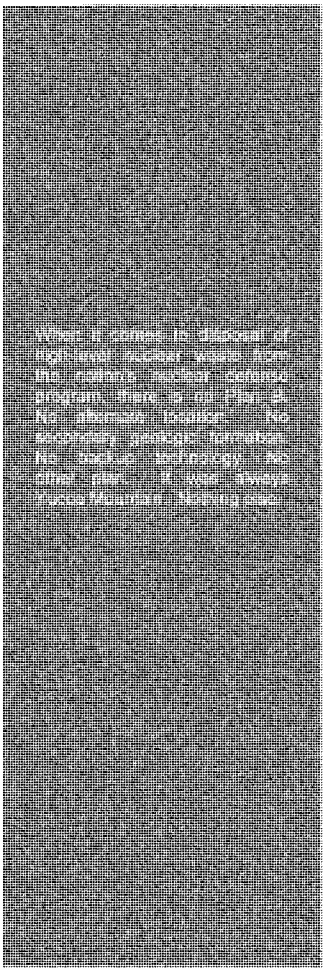
The high-level nuclear waste we so readily accepted as temporary now seems much more permanent, and community leaders in the Central Savannah River Area today find themselves at a crossroads – torn between accepting the announced fate of the government's only solution or continuing to fight for permanent storage at Yucca Mountain.

There are powerful advocates who remain committed to the fight. In a recent letter to Secretary Chu, 17 Republican Senators took the Administration to task for its quick decision to scuttle Yucca Mountain. The group was led by Senator James Inhofe (R-OK), ranking member of the Senate Environment and Public Works Committee, and included South Carolina Senator Jim DeMint. They wrote to Secretary Chu:

"The American taxpayer has invested too much money in Yucca Mountain to simply have it pushed aside without explanation. Over $7.7 billion has been spent researching Yucca Mountain as a potential repository site, and neither the National Academy of Sciences, the Nuclear Waste Technical Review Board, nor any of our National Labs involved in conducting the studies and evaluating data have concluded that there is any evidence to disqualify Yucca Mountain as a repository," the Senators wrote.

"As recently as August 2008, all ten National Lab directors, including you, signed a letter on the essential role of nuclear energy which advocated continuing the licensing of a geologic repository at Yucca Mountain.

"Given this history, President Obama's memoranda that science should govern public policy and his commitment to an unprecedented level of openness, we find it difficult to reconcile your statement that Yucca Mountain "is not an option" made after only six weeks in office."



The Senators also noted that since the first National Academy of Science (NAS) study in 1957, deep geologic disposal has been viewed as the safest approach to disposal of nuclear waste. In 1983, the Nuclear Waste Policy Act (NWPA) was signed into law providing for the siting and development of a repository for our nation's used nuclear fuel and nuclear waste culminating in the recommendation of the Yucca Mountain site.

In accordance with that law, electricity consumers have contributed $30 billion for the disposal of civilian spent fuel and taxpayers have paid $3.5 billion for the disposal of the nuclear waste legacy of the Cold War. Courts have affirmed the federal government's obligation to dispose of spent fuel. Taxpayers face up to $11 billion in liability costs even if the Department of Energy begins accepting used fuel and nuclear waste in 2020 and an additional $500 million with each passing year of delay. At present, the nuclear industry has nearly 63,000 metric tons of civilian used fuel awaiting disposal in addition to 7,000 metric tons of defense waste stored at Department of Energy facilities.

The pro-Yucca sentiments in the lawmakers' letter were underscored in a Washington Post editorial following the President's action:

"By stripping the funding for the nuclear repository at Nevada's Yucca Mountain, President Obama has succeeded in killing the contentious project that remains unfinished 22 years after Congress selected the site. He compounds the error by not offering an alternative. If the president's vision for a clean energy future is to be believed or is to come to fruition, nuclear energy must be a part of the mix, and the safe disposal of its radioactive waste must be given more serious consideration."

We Have a Huge Stake in this Issue

If and when a "blue ribbon panel" is assembled to chart a new strategy for nuclear waste storage, our region deserves – and demands – a seat at the table as part of this committee.

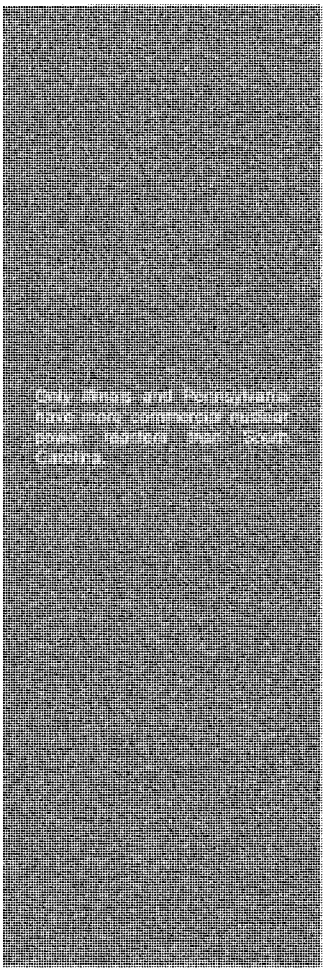
In a March 18, 2009, letter to South Carolina Governor Mark Sanford, the Governor's Nuclear Advisory Council outlined four reasons why South Carolina is a key stakeholder in this issue:

- The state has seven operating nuclear reactors at four sites. Four additional reactors at two sites are planned. Each of these reactors produces spent nuclear fuel which must be ultimately disposed of by the Department of Energy; however, until such time as a repository is available, the spent fuel will be stored at each site. Only Illinois and Pennsylvania have more commercial nuclear power reactors than South Carolina.

- The Savannah River Site has approximately 3,000 canisters of stabilized legacy high level waste from the Cold War stored on site, and another 3,000 to 4,000 canisters will be generated in the process of stabilizing the remaining liquid radioactive waste now in aging tank farms at SRS. This stabilized high level waste must be disposed in a federal repository, but until a federal repository is available, it will be stored at SRS. New York, Washington and Idaho have similar high level waste.

- Savannah River Site is the receipt and storage site for aluminum-clad research reactor spent fuel from decommissioned research reactors worldwide. Based on approved operational plans, SRS will process this fuel in H Canyon to recover the enriched uranium for use as fuel in commercial nuclear reactors. The high level waste resulting from processing the fuel will be stabilized along with other high level waste at SRS and stored until a repository is available.

- Savannah River Site was selected by DOE to provide interim storage for surplus non-pit plutonium in the United States. The plutonium originally located at Rocky Flats, Hanford, Los Alamos and several weapons



Dark shape and horizontal lines show commercial nuclear power reactors near South Carolina.

research laboratories will be consolidated at SRS by about 2012. Approximately 60 percent of the weight of the plutonium is destined to be converted to commercial nuclear fuel in the Mixed Oxide Fuel Fabrication Facility (MOX).

However, DOE planned to dispose of the remaining 40 percent in the federal repository by dissolving in H Canyon, incorporating the plutonium into borosilicate glass in the Defense Waste Processing Facility with existing high level liquid waste, and storing in the Glass Waste Storage Buildings at SRS until a repository is available.

Chairman Ben Rusche wrote that while the Council has no concerns about the ability to store and maintain these materials in the near term, the impacts of long-term interim storage, including continued safety, have not been evaluated.

He further stated that "it is the opinion of the Council that South Carolina will continue to host much of the material destined for the federal repository until one becomes available, and will bear a disproportionate share of any adverse consequences of our Nation's inability to develop a repository. For these reasons, South Carolina's participation in any federally-supported studies or discussions of alternatives to Yucca Mountain is vital to the state's well-being and the common good of the state and the Nation."

The SRSCRO Board of Directors wholeheartedly endorses the viewpoint expressed by the Governor's Nuclear Advisory Council and adds its voice to the call for our two-state region to be appropriately represented on any panel formed to review this critical issue.

The Demise of Yucca Mountain: Problem or Opportunity?

The Chinese use two brush strokes to write the word "Crisis". One brush stroke stands for "danger", the other for "opportunity". Which is it for our region? True, the Government's apparent rejection of Yucca Mountain as a

permanent repository for nuclear waste creates something of a crisis. But for us, does it mean "opportunity" or "danger"?

There are those who see both. Some see tremendous opportunity in our half century history of nuclear accomplishment and in the reservoir of stellar talent that has already created and deployed technology designed to ensure safe storage of nuclear waste, creating jobs and international focus on our capabilities.

Supporters point to the Savannah River Site's half century of experience in nuclear fuel cycle programs. They highlight an extensive commercial nuclear energy supply centered on Plant Vogtle in Georgia and on seven nuclear reactors on four sites in South Carolina. They remind us of the presence in our region of the world's premier nuclear power engineering and construction companies, of our central location with respect to the resurgence of nuclear power in the Southeast and a government, business and community base that understands and appreciates the benefits of nuclear energy.

Others see dangerously dark days ahead for a region whose potential is marred by the prolonged presence of nuclear waste and crippled by the unappealing specter of a worldwide reputation as a "nuclear waste dump". To them, it deters industry, crimps job growth, numbs entrepreneurship and innovation, tarnishes civic pride and ultimately fuels the widespread perception of an unsafe place to live and work.

Forming a New Strategy

Both viewpoints have advocates, and both have merit. It is up to the region's leaders – elected officials, business owners, economic development professionals, educators, heads of community organizations, labor leaders and others – to join together to form a consensus concerning the new reality of nuclear waste management that has dawned in recent days and that, undoubtedly, will remain at the forefront of our agenda for months and years to come.

The seeds of dialog and consensus have already been planted as local community groups have prepared documents addressing this critical issue

The seeds of dialog and consensus have already been planted. Local community groups, including area Chambers of Commerce and Citizens for Nuclear Technology Awareness, have prepared documents addressing this critical issue. The chamber document suggests that Yucca Mountain be preserved as a disposal pathway for Spent Nuclear Fuel "unless and until a better option is approved". It calls for establishing reprocessing as the national policy option for management of Spent Nuclear Fuel.

The document underscores the fact that capabilities already existing in the region provide a "unique opportunity for public/private partnerships in developing non-polluting nuclear power as an increasingly important part of our nation's energy mix."

In a separate document, Citizens for Nuclear Technology Awareness (CNTA), a regional grassroots educational organization, echoed its support for continued development of Yucca Mountain as the ultimate repository.

"The Yucca Mountain repository is a safe, scientifically sound solution to the storage of used nuclear fuel and high level defense waste," the paper concludes. "There has been no suggestion by more than 50 scientific reviews of the Yucca Mountain project that this option is not suitable for its intended purpose. We urge compliance with the Nuclear Waste Policy Act and that the necessary funding be restored to pursue the Yucca Mountain Repository project."

As part of our regional dialog, local leaders should work together to examine key questions related both to the status of Yucca Mountain and to the future of reprocessing spent nuclear fuel. For ease of reference, these questions are divided into categories – ***CONTINUED SUPPORT FOR YUCCA MOUNTAIN*** and ***ADOPTION OF REPROCESSING AS NATIONAL POLICY***.

Should Congress reaffirm the 2002 legislation which specifies that Yucca Mountain is to be developed as the national repository?

Specifically, these questions include:

I. CONTINUED SUPPORT FOR YUCCA MOUNTAIN

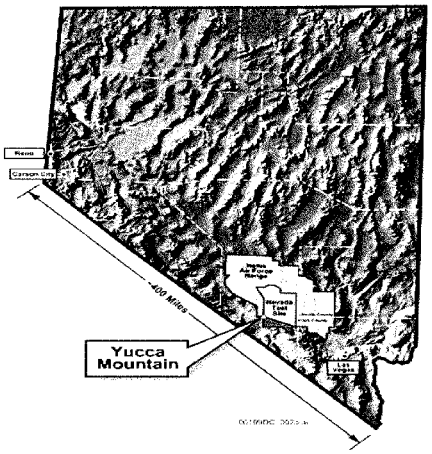
A. Should Congress reaffirm the 2002 legislation which specifies that Yucca Mountain is to be developed as the national repository?

DOE has submitted a license application to NRC to construct the Yucca Mountain repository. NRC has up to four years to review the application. We anticipate that funding in the President's 2010 budget proposal will not be adequate to support the application review process, and the Yucca Mountain project will fail. A funding level of about $350 Million (a continuation of past funding trends) will allow the license review process to remain on schedule.

Electric utility ratepayers in 35 states have paid $30 Billion into the Nuclear Waste Fund to develop Yucca Mountain. South Carolina and Georgia ratepayers have paid $1.2 Billion and $675 Million respectively. In addition 39 states have commercial reactor SNF or DOE high level radioactive wastes scheduled for disposal in Yucca Mountain.

Consideration should be given to designating the CSRA as an "affected unit of government" as defined in the Nuclear Waste Policy Act.

B. Should the Governors of the 39 states with either commercial SNF and/or DOE high level radioactive nuclear waste contact their federal delegations to express their concern and request that the Yucca Mountain disposition pathway for SNF and DOE high level radioactive wastes be reestablished?



C. Should stakeholders from South Carolina and Georgia be included as members of the Blue Ribbon Commission being assembled by DOE to consider alternatives to Yucca Mountain?

Many believe processing is a better spent nuclear fuel management option than direct disposal. Processing of spent nuclear fuel will have two significant benefits: (1) it will reduce (but not eliminate) the need for deep geologic disposal of wastes from nuclear power production and (2) the unburned fuel materials in spent nuclear fuel can be separated and returned to a nuclear reactor as fresh fuel.

II. Adoption of Reprocessing as National Policy

A. Should Congress approve legislation which establishes processing as the national policy for management of spent fuel?

If processing of spent nuclear fuel is authorized today, commercial-scale plants will probably use the 'PUREX' process, a proven process which results in liquid wastes and separates plutonium in its pure form. Improved spent nuclear fuel processing methods can reduce the amount of wastes generated and provide improved security for plutonium contained in SNF. These are worthwhile objectives, and are the type of program ideally suited for research and engineering development at SRS.

B. Should DOE and the Congress approve a vigorous program to (1) select a new spent nuclear fuel process and (2) develop and demonstrate the new process at the engineering scale on SRS as soon as possible?

A portion of the energy-bearing materials separated from spent nuclear fuel are not suitable for use in conventional nuclear power reactors. A new type of reactor which can 'burn' this otherwise unburnable fuel is needed to (1) reduce security concerns, (2) reduce waste requiring geologic disposal and (3) recover the maximum energy content from spent nuclear fuel. Commercial reactor vendors and DOE have been performing low-budget research on alternate reactor types. Some of these concepts are ready for scale-up and a public/ private partnership at SRS is an ideal location to demonstrate a new reactor type. Construction and operation of a new reactor type is not required immediately.

C. Should DOE and the Congress approve a program to develop alternate reactor types which can burn the portion of recovered fuel which is not suitable for use in conventional nuclear power reactors?

Without Yucca Mountain or an acceptable alternate, commercial spent nuclear fuel and glass logs from the SRS Defense Waste Processing Facility will remain at their existing locations – this is an unacceptable long-term situation. In addition, DOE is contractually committed to

take spent nuclear fuel from commercial utilities and the unavailability of Yucca Mountain or commercial spent nuclear fuel processing might result in DOE forcing consolidation of commercial spent nuclear fuel at its field locations, including SRS. Therefore, we believe it is in the community's best interest to (1) aggressively pursue opening of Yucca Mountain and (2) establish processing as an acceptable spent nuclear fuel management option.

The completion of Yucca Mountain and reprocessing are both important, and both should be part of any Spent Nuclear Fuel management policy. While the processing option can recover unburned fuel, it also generates high level radioactive wastes which require geologic disposal (with less volume and less radiotoxicity than direct disposal). In addition Yucca Mountain can receive and dispose of 6,000 canisters of vitrified high level radioactive waste currently being produced and stored on SRS. Without Yucca Mountain there is no approved disposition pathway for this SRS waste.

Other Considerations

In addition to the questions raised above, there are other considerations for the community as well.

1. As affected units of government, should we advocate that the Nuclear Waste Policy Act of 1982 as amended be reopened to address our region's prolonged role as host to high-level nuclear waste? Specifically, should the law be changed to require the Federal Government to compensate local units of government for their willingness to continue to serve as host while the Government develops other, more permanent storage options?

2. Should the region retain the services of Washington, DC-based firm to represent its interests with Federal agencies and elected officials on Capitol Hill? As we face a lengthy delay in progress toward an ultimate solution for nuclear waste storage, is it time to ensure that

our voice is amplified and our case is presented in the strongest possible terms with Government decision makers?

3. What groups should be brought together to develop regional consensus and how is this done (e.g. CNTA, CAB, Economic Development Groups, County Councils?)

4. Since resolution of this critical challenge impacts many regions besides ours, should we coordinate with affected units of government in other states to amplify our voice, maximize our ability to communicate with policy makers and ensure that the final resolution addresses national needs and concerns in a comprehensive way?

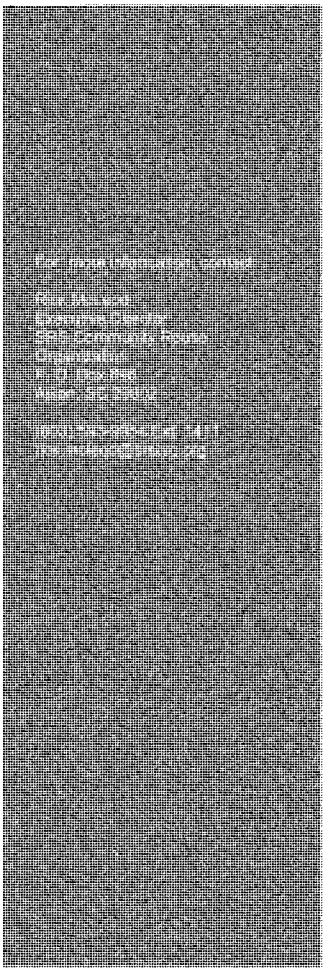
Life After Yucca

In the coming months, the SRS Community Reuse Organization will seek to assist our region in developing consensus concerning a national strategy for safe, permanent nuclear waste disposal.

We will reach out to elected officials, business leaders, economic development groups, state and local governments, the Department of Energy and its contractors, community groups with a perspective on nuclear issues and the long-term betterment of the community, and citizens at-large. Our purpose is to inform and create dialog leading to consensus and a plan of action.

As we wrestle with the implications of "life after Yucca", we must consider the full impact of the Administration's decision on our community, our economy, our way of life, our ability to attract new jobs and the way we view ourselves -- as well as how others see us.

It is a complex tapestry of interrelated issues unprecedented in their scope and impact -- the convergence of strongly-held ideology, social conscience and political compromise, a questioning reliance on technology, the quest for energy independence, and the tension between raw emotion and the long-term well-being



of our nation as we seek to manage and maximize the legacy of our historic commitment to harness the power of the atom.

The public discourse in the months ahead must respect the viewpoints of all parties and must be focused on blending disparate positions into a common, unified approach the community can embrace and support. That work is already underway. The SRSCRO -- representing five counties and two states closely tied to the future of the Savannah River Site -- stands ready to lead and partner with others in a cooperative regional effort to forge a nuclear waste strategy that will serve our best interests and those of the nation for generations to come.

###

U.S. State by State Commercial Nuclear Used Fuel and Payments to the Nuclear Waste Fund

NEI
NUCLEAR ENERGY INSTITUTE

State	Metric Tons of Uranium	Nuclear Waste Fund Contributions ($ M)
Alabama	2,790	719.7
Arizona	1,710	508.7
Arkansas	1,180	285.6
California	2,590	795.7
Colorado	30	0.2
Connecticut	1,890	353.0
Florida	2,720	743.4
Georgia	2,330	662.3
Idaho	90	NA
Illinois	7,420	1,706.9
Iowa	430	108.7
Kansas	570	180.9
Louisiana	1,080	309.5
Maine	550	65.5
Maryland	1,220	343.5
Massachusetts	610	156.8
Michigan	2,310	503.0
Minnesota	1,090	375.9
Mississippi	730	194.0
Missouri	610	187.3
Nebraska	790	252.5
New Hampshire	480	146.3
New Jersey	2,280	574.8
New York	3,280	762.9
North Carolina	3,220	801.7
Ohio	980	287.5
Oregon	350	75.5
Pennsylvania	5,410	1,502.4
South Carolina	3,610	1,197.9
Tennessee	1,350	439.5
Texas	1,810	580.3
Vermont	580	89.8
Virginia	2,240	672.1
Washington	570	152.8
Wisconsin	1,250	344.2
Other	NA	7.6
Total	60,150	16,088.3

Idaho is holding used fuel from Three Mile Island 2

Used Fuel Data is rounded up to the nearest ten and is as of January 2009, Nuclear Waste Fund Contributions as of June 30, 2008

Source: ACI Nuclear Energy Solutions and Department of Energy

Updated: 4/09

Glossary of Nuclear Waste Terms

Atom

The basic component of all matter; it is the smallest part of an element having all the chemical properties of that element. Atoms are made up of protons and neutrons (in the nucleus) and electronics.

Background Radiation

Radiation arising from natural radioactive material and always present in the environment, including solar and cosmic radiation and radioactive elements in the upper atmosphere, the ground, building materials and the human body.

Canister

The outermost container into which vitrified high-level waste or spent fuel rods are to be placed. Made of stainless steel or inert alloy.

Cask

Container that provides shielding during transportation of canisters of radioactive material. Usually measures 12 feet in diameter by 22 feet long and weighs 200 tons.

Chain Reaction

A self-sustaining series of nuclear fissions taking place in a reactor core. Neutrons produced in one fission cause the next fission.

Civilian Waste

Low-level and high-level (including spent fuel) radioactive waste generated by commercial nuclear power plants, manufacturing industries and institutions (hospitals, universities and research institutions.)

Cladding

Protective alloy shielding in which fissionable fuel is inserted. Cladding is relatively resistant to radiation and to the physical and chemical conditions in a reactor core. Cladding may be made of stainless steel or an alloy such as zircaloy.

Closed Fuel Cycle

A closed fuel cycle includes chemical reprocessing to recover the fissionable material remaining in the spent fuel. An open fuel cycle does not. (See Fuel Cycle).

Curie

A measure of the rate of radioactive decay; it is equivalent to the radioactivity of one gram of radium or 37 billion disintegrations per second. A nanocurie is one billionth of a curie; a picocurie is one trillionth of a curie.

Daughter Product

Nuclides resulting from the radioactive decay of other nuclides. A daughter product may be either stable or radioactive.

Decay

Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles, photons or both.

Decommissioning

Preparations taken for retirement of a nuclear facility from active service, accompanied by a program to reduce or stabilize radioactive contamination.

Decontamination

The removal of radioactive material from the surface of or from within another material.

Defense Waste

Radioactive waste resulting from weapons research and development, the operation of naval reactors, the production of weapons material, the reprocessing of defense spent fuel and the decommissioning of nuclear-powered ships and submarines.

Defense Waste Processing Facility (DWPF)

The largest radioactive waste glassification plant in the world, the Defense Waste Processing Facility (DWPF) converts the liquid nuclear waste currently stored at the Savannah River Site (SRS) into a solid glass form suitable for long-term storage and disposal.

Disposal

Permanent removal from the human environment with no provision for continuous human control and maintenance.

Dose

A quantity of radiation or energy absorbed; measured in rads.

Dry Cask Storage

Heavily shielded, air-cooled storage casks for storing spent fuel.

Exposure

A measure of ionization produced in air by X-rays or by gamma radiation. Acute exposure generally refers to a high level of exposure of short duration; chronic exposure is lower-level exposure of long duration.

Fissile

Able to be split by a low-energy neutron, for example, U-235.

Fission

The splitting or breaking apart of a heavy atom such as uranium. When a uranium atom is split, large amounts of energy and one or more neutrons are released.

Fission Products

A general term for the complex mixture of nuclides produced as a result of nuclear fission. Most, but not all, nuclides in the mixture are radioactive, and they decay, forming additional (daughter) products. The complex mixture of fission products contains about 200 different isotopes of over 35 elements.

Fuel Cycle

The complete series of steps involved in supplying fuel for nuclear reactors. It includes mining, refining, the fabrication of fuel elements, their use in a reactor and management of spent fuel and radioactive waste.

Half-Life

Time required for a radioactive substance to lose 50 percent of its activity by decay. The half-life of the radioisotope plutonium-239, for example, is about 24,000 years. Starting with a pound of plutonium-239, in 24,000 years there will be one-half pound of plutonium-239, in another 24,000 years there will be ¼ pound, and so on. (A pound of actual material remains but it gradually becomes a stable element.)

High Level Waste

Highly radioactive material containing fission products, traces of uranium and plutonium and other transuranic elements; it results from chemical reprocessing of spent fuel. Originally produced in liquid form, high level waste must be solidified before disposal.

Interim Storage

The temporary holding of waste on or away from the generator's site when disposal space is not available. Monitoring and human control are provided and subsequent action involving treatment, transportation or final disposition is expected.

Low Level Waste

Radioactive waste not classified as high level waste, transuranic waste, spent fuel or by-product material. Most are generally short-lived and have low radioactivity. An example is protective gloves used by workers in a nuclear facility.

Mixed Waste

Waste that contains both radioactive and hazardous chemical components.

Radiation

Particles or waves from atomic or nuclear processes (or from certain machines). Prolonged exposure to these particles or rays may be harmful.

Radioactive Waste

Liquid, solid, or gaseous waste resulting from mining of radioactive ore, production of reactor fuel materials, reactor operation, processing of irradiated reactor fuels, and related operations, and from use of radioactive materials in research, industry, and medicine.

Radioactivity

The spontaneous emission of radiation from the nucleus of an atom. Radioisotopes of elements lose particles and energy through the process of radioactive decay.

Repository

A permanent disposal facility for high-level of transuranic waste and spent fuel.

Reprocessing

The process by which spent fuel is separated into waste material for disposal and into material such as uranium and plutonium to be reused as fuel.

Spent Fuel

Fuel that has been "burned" (irradiated) in a nuclear power plant's reactor to the point where it no longer contributes efficiently to the nuclear chain reaction. Spent fuel is thermally hot and highly radioactive.

Storage

Operations that are designed to provide isolation and easy recovery of radioactive material and which rely on continuous human monitoring, maintenance and protection from human intrusion for a specified period of time.

Tank Farms

Underground storage tanks at some Department of Energy facilities used to store liquid radioactive waste prior to vitrification. The liquid nuclear waste in tank storage exists in two forms, a sludge form and a salt form. The sludge form, while comprising only about 10% of the

volume in the tanks, contains about half of the radioactivity. The salt form readily dissolves in water, comprises about 90% of the volume and contains the balance of the radioactivity

Transuranic Waste (TRU)

Waste material contaminated with U-233 (and its daughter products), certain isotopes of plutonium and nuclides with an atomic number greater than 92 (uranium). It is produced primarily from reprocessing spent fuel and from use of plutonium in fabrication of nuclear weapons.

Vitrification

The conversion of high-level waste into a glassy or non-crystalline solid for subsequent disposal.

Volume Reduction

Various methods of waste treatment, such as evaporation for liquids or compaction for solids, aimed at reducing the volume of waste.

Waste Isolation Pilot Plant (WIPP)

The Waste Isolation Pilot Plant – known as WIPP – in New Mexico is the world's first underground repository licensed to safely and permanently dispose of transuranic radioactive waste left from the research and production of nuclear weapons.

Yucca Mountain

Yucca Mountain is located in a remote desert on federally protected land within the secure boundaries of the Nevada Test Site in Nye County, Nevada. It is approximately 90 miles northwest of Las Vegas. The U. S. Department of Energy began studying Yucca Mountain in 1978 to determine whether it would be suitable for the nation's first long-term geologic repository for spent nuclear fuel and high-level radioactive waste. Currently stored at 121 sites around the nation, these materials are a result of nuclear power generation and national defense programs.

LETTER FROM DEPARTMENT OF ENERGY PERTAINING TO YUCCA MOUNTAIN REPOSITORY LICENSE APPLICATION

Department of Energy
Washington, DC 20585

QA: N/A
Project No. WM-00011

June 3, 2008

HAND DELIVERY

ATTN: Document Control Desk
Michael F. Weber, Director
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
EBB-2B2
11545 Rockville Pike
Rockville, MD 20852-2738

YUCCA MOUNTAIN REPOSITORY LICENSE APPLICATION (LA) FOR CONSTRUCTION AUTHORIZATION

Dear Mr. Weber:

Pursuant to Section 114(d) of the Nuclear Waste Policy Act, as amended, and 10 C.F.R. Part 63, and in accordance with 10 C.F.R. § 2.101, the U.S. Department of Energy (DOE) hereby submits the unclassified part of its Yucca Mountain Repository LA (Enclosure 1) to the U.S. Nuclear Regulatory Commission (NRC). The DOE initially seeks construction authorization pursuant to 10 C.F.R. § 63.31 for a high-level radioactive waste repository at a geologic repository operations area at Yucca Mountain in Nye County in the state of Nevada. To the extent that portions of the LA are based upon the NRC's proposed revisions to 10 C.F.R. Part 63 (70 Fed. Reg. 53,313), the DOE will provide a revision to the LA as the NRC or DOE determine to be necessary. DOE anticipates providing the NRC with an update to the LA prior to requesting a "Receive and Possess" license pursuant to 10 C.F.R. § 63.24.

DOE prepared the LA in accordance with the requirements set forth in 10 C.F.R. § 63.21, "Content of Application," and the guidance contained in the "Yucca Mountain Review Plan," NUREG-1804, Revision 2, Final Report (July 2003) (YMRP). DOE is submitting the LA to the NRC, in both paper and electronic format (i.e., DVD), three (3) copies of the unclassified LA for the Director of the Office of Nuclear Material Safety and Safeguards, as required by 10 C.F.R. § 63.22(a), and an additional thirty-one (31) copies of the LA, as required by 10 C.F.R. § 63.22(b).

NMSS 25

Printed with soy ink on recycled paper

The complete LA includes the following documents:

- General Information.
- Safety Analysis Report (SAR) – the SAR, while not containing any classified information, contains certain information that the DOE has determined to be Official Use Only (OUO) information. Such information is exempt from public disclosure under the Freedom of Information Act and 10 C.F.R. § 2.390 and is appropriately marked. DOE has segregated those pages of the SAR containing OUO information into Appendix A of the SAR, which has been printed as a separate volume, and requests that such information be withheld from public disclosure.
- Naval Nuclear Propulsion Program (NNPP) Technical Support Document (TSD), which DOE is transmitting under separate cover *(classified: 214 pages)*.

Because the NNPP TSD contains classified information related to naval fuel, the DOE has separated this part of the LA from the unclassified SAR in accordance with 10 C.F.R. § 63.21(a). The DOE is submitting the NNPP TSD concurrently with the unclassified LA, but under separate cover along with a request to withhold from public disclosure pursuant to 10 C.F.R. § 2.390.

Pursuant to Section 114(f) of the Nuclear Waste Policy Act, as amended, and 10 C.F.R. Part 63.22, accompanying the LA in this submittal is the DOE's *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* (FEIS) (February 2002) (Enclosure 2). DOE will submit under separate cover the *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* (Repository SEIS), which currently is in the process of being finalized and is expected to be available on or before June 30, 2008. Because the Repository SEIS incorporates by reference portions of the *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 – Nevada Rail Transportation Corridor* (Rail Corridor SEIS) and the *Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada* (Rail Alignment EIS), DOE will also provide copies of those documents to the NRC for information at the same time it provides the Repository SEIS.

On October 19, 2007, DOE certified to the Pre-License Application Presiding Officer (PAPO) Board compliance with the Licensing Support Network (LSN) requirements pursuant to 10 C.F.R. § 2.1009(b). Today, DOE is updating its certification with the PAPO Board pursuant to 10 C.F.R. § 2.1009(b). DOE is providing a hard copy of its updated certification to the NRC under separate cover, in compliance with 10 C.F.R. § 2.1012(a).

As required by 10 C.F.R. § 63.22(d), the DOE is also making paper and electronic copies of the public version of the LA available at appropriate locations near the proposed geologic repository operations area. Those locations are identified in Enclosure 3. DOE will make paper and

electronic copies of the Repository SEIS, the Rail Corridor SEIS, and the Rail Alignment EIS available for public inspection at these same locations. The public version of the LA has also been included in DOE's LSN collection.

Finally, for informational purposes, the DOE is also submitting as an enclosure to this letter, but not part of the LA, the following: copies of primary reference documents in electronic format (Enclosure 4); and a matrix cross-referencing sections of the SAR to 10 C.F.R. Part 63 and NUREG-1804 (Enclosure 5). A listing of the electronic files in this submittal is provided as Enclosure 6.

If you have any questions regarding your review and acceptance of this application, please contact William J. Boyle, Director, Regulatory Authority Office, Office of Civilian Radioactive Waste Management, [redacted] or e-mail [redacted].

Sincerely,

[redacted]

Edward F. Sproat, III, Director
Office of Civilian Radioactive
Waste Management

6 Enclosures:

1. Yucca Mountain Repository License Application
   (3 originals and 31 copies in paper; 34 DVDs marked "Official Use Only" (OUO) containing all three components below (to be withheld from public release); 1 DVD marked "For Public Release" containing the General Information and non-OUO portions of the Safety Analysis Report, but omitting the OUO Appendix A of the Safety Analysis Report)
   a. General Information
   b. Safety Analysis Report (non-OUO volumes)
   c. Safety Analysis Report Appendix A (OUO volume)
2. FEIS (33 copies – paper and electronic)
3. Locations of LA for Public Availability
4. Primary Reference Documents (34 sets of 2 DVDs marked "Official Use Only" containing some references to be withheld from public release and 1 set of 2 DVDs marked "For Public Release" containing those references except those considered OUO, which are omitted)
5. Yucca Mountain Review Plan Cross Reference Matrix (34 CDs)
6. Listing of electronic files provided on enclosed DVDs and CDs

cc:
A. C. Eitreim, NRC, Rockville, MD
L. E. Kokajko, NRC, Rockville, MD
J. D. Parrott, NRC, Las Vegas, NV
D. B. Spitzberg, NRC, Arlington, TX
Rosemary Ryan, CNWRA, Rockville, MD
Mike Simpson, CNWRA, San Antonio, TX

cc: With enclosures (except Enclosure 1(c)):
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R. R. Loux, State of Nevada, Carson City, NV
Nevada State Legislature, State of Nevada, Carson City, NV
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RAO Records Coordinator, NV
RAO Library
Records Processing Center = "16"
(ENCLS = READILY AVAILABLE)

MFR: RAO:AVG-0782

"FEDERAL REPORT: NUCLEAR WASTE: CAN NEVADA KEEP AMERICA'S SIZZLING NUCLEAR WASTE OUT OF ITS BACKYARD?"
Governing Magazine, April 1990

Governing Magazine/April 1990

FEDERAL REPORT: NUCLEAR WASTE

CAN NEVADA KEEP AMERICA'S SIZZLING NUCLEAR WASTE OUT OF ITS BACKYARD?

Washington may have underestimated what a determined state can do.

By Foster Church

Foster Church is a reporter for The Oregonian of Portland.

Each year, 2,000 tons of high-level waste, sizzling with radioactivity, emerge from the nation's nuclear plants. Thirty-three states produce it; none want to keep it. The waste, most of it radioactive pellets sealed in metal rods, can remain dangerously radioactive for up to 10,000 years. For now, it is accumulating in holding ponds at the facilities that generate it, mostly commercial power plants. The nuclear power industry wants to be rid of it and is willing to pay for a place to put it.

Congress supports that aim. In 1982, it passed legislation setting out a careful procedure for scientific selection of two sites for disposal of high-level radioactive waste, one in the East and one in the West.

Just four years later, science hit political reality. Faced with pressure from four Eastern states where U.S. Senate seats held by Republicans were threatened--they were Georgia, New Hampshire, North Carolina and Wisconsin--the Reagan administration postponed indefinitely the search for an Eastern site. One year later, in 1987, Congress scrapped the scientific processes of the 1982 law for the other site as well. It picked a Western site based on pure politics. Nevada--a vast arid state with a population of slightly more than 1 million and a very junior four-person congressional delegation--was named the only candidate for hosting the repository.

Since then, resentment at the action has grown steadily in Nevada and spawned distrust of Congress, of the federal government and of all the other states that helped make the decision possible.

The mood in Nevada today is confrontational. As the state employs a variety of techniques to resist a federal decision it considers unfair, constitutional lawyers are watching to see how far Nevada can go toward making a case that Congress had no right to do what it did. Watching, too, are officials in other states, who fear that some day they could be placed in a similar predicament.

The congressional decision did not come as a complete surprise to Nevadans close to the political process.

For U.S. Representative James Bilbray of Nevada, the cold truth came in a whispered acknowledgment outside a congressional committee room in December 1987.

A freshman Democrat from Las Vegas, he was a former state legislator and the son of a county assessor. Savvy about the ways of local politics, he was still cautiously feeling his way through the halls of the Capitol.

A Senate-House conference committee was about to convene to take up a massive budget bill. Included among its many provisions were amendments to the 1982 Nuclear Waste Policy Act. Three states, Nevada, Texas and Washington, were under consideration for the nuclear waste dump. All three had lobbied furiously against being chosen.

The version approved by the Senate came close to excluding any state but Nevada from consideration, but it did not designate Nevada by name. That gave Bilbray some encouragement to continue the fight. So did the conversations he had had earlier with powerful House Democrats, including Majority Leader Thomas S. Foley of Washington, Whip Tony Coelho of California and Energy Committee Chairman John D. Dingell of Michigan.

``They were reassuring me all along that no matter how it looked, everything would come out in the wash," he recalls. But he knew something was up when a conference committee member pulled him aside before the committee session began.

``Listen," the man murmured. ``I hope you understand what is going on here. There are three sites under review--Texas, Nevada and Washington. And the speaker [of the House, Jim Wright] is a Texan and the majority leader [Tom Foley] is a Washingtonian." He noted the weak status of the small Nevada delegation. Three of the four were in their first terms. Furthermore, none served on the conference committee.

``I hope you understand," he concluded. ``It is not going to Washington. And it is not going to Texas." It was a lesson in power politics that Bilbray would not soon forget.

With a speed that surprised even Senate conferees, the House conferees proposed accepting most of the Senate language and taking it a step further. The Nevada site would be chosen by name, and the other two potential sites that had been recommended by the U.S. Department of Energy, Deaf Smith County, Texas, and the Hanford Site in Washington, would be dropped.

Bilbray stalked from the room. ``Nevada was treated very shabbily, and our delegation was treated very shabbily," he recalls bitterly. ``I resent it to this day."

Even Representative Al Swift, a Washington Democrat who served on the conference committee and whose state was protected by the choice of Nevada, recoiled from the naked power play.

``What you are watching is an exercise in pure politics," he told a

reporter when the committee adjourned. ``I am participating in a nonscientific process--sticking it to Nevada. This is as bad a case as I have seen in 10 years" in Congress.

The bill that passed directed the Department of Energy to make a scientific study of Yucca Mountain, a block of federally owned land 100 miles northwest of Las Vegas, to determine its safety as the dump site.

Today, in Nevada, politicians, newspaper editorial writers and ordinary citizens all call what came out of that conference committee ``The Screw Nevada Bill." The anger embedded in the words speaks to a sense of wrong that does not focus on the site's scientific suitability. Few argue that Yucca Mountain should not be considered, although it is an area of potential volcanic and earthquake activity and some believe that explosions from the underground nuclear test site nearby could shake the deep rock caverns where waste would be stored. But it is also far from population centers, high above the water table and settled on volcanic rock. The nearest surface water is 30 miles away. Other sites in rock and salt formations would appear equally suitable in the absence of detailed investigation.

Nor do Nevadans deny that conducting the scientific study at only one site rather than three, as envisioned in the 1982 legislation, would save money. It will cost an estimated $2 billion to make the necessary tests of rock stability, hydrology and other factors collectively known as ``characterization" of the site. The purpose of investigating multiple sites, they argue, should be to find the best site--not the best site in the politically weakest state at the cheapest price.

The determination of Nevadans to fight back built slowly against an initial sense of inevitability. A 1987 poll by the University of Nevada showed that while only 24 percent of Nevadans believed their state was the safest place to store the waste, 89 percent thought it likely or very likely that the federal government would have its way.

Some key politicians had committed themselves to the fight even before Congress officially designated Nevada as the only site. Governor Richard Bryan, a Democrat, was one. Another was former Governor Grant Sawyer, likewise a Democrat, who went before the Senate Energy and Natural Resources Committee early in 1987 to argue against Nevada's selection and was stung by the disdain that he felt from the committee. He had expected courtesy, at the least, especially from two other former governors on the committee, Republicans Mark O. Hatfield of Oregon and Daniel J. Evans of Washington.

``I came away with the feeling that the fix was absolutely in," he recalls. Louisiana Senator Bennett Johnston's brusque remark that Nevada ``is not a pristine national park" was especially galling. Johnston, a Democrat, was the committee chairman. Evans and Hatfield,

maneuvering to prevent the dump from being drilled into the basalt rock of the Hanford Site near the Columbia River, were no better. ``That is when I adopted the policy that...we had to be militant in our opposition at every turn," Sawyer says. ``Our only solution is to become such a pain that it will not be feasible to use Yucca Mountain." Sawyer returned to Nevada determined to rally opposition and work with Bryan, who since 1983 had laid his political reputation on the line as the dump's harshest opponent.

But the legislature, as well as the public, had to be turned around on the issue. Two earlier efforts, in 1985 and 1987, to get resolutions passed opposing the dump had died in committee.

Then, a prank further undercut the anti-dump forces. As the legislature rushed to adjournment in mid-1987, it approved a bill carving out the desolate Yucca Mountain site from Nye County and declaring the creation of Bullfrog County. The new entity was to include neither courthouse nor jail--nor citizens. The county seat was placed 250 miles away in Carson City, the state capital.

The basic purpose behind the legislation was simply to find a way to impose a higher tax rate on the dump site than on the rest of Nye County, thus reaping some economic benefits for the state. But the bill sent a peculiar, jokey message to Congress at a critical time in the 1987 deliberations: Even if Nevada opposed the dump, it was still prepared to accept it and cut the best deal it could. Bryan signed the bill and later regretted it. Although the measure was subsequently found to violate the state constitution, the damage had been done.

It took a political campaign to galvanize opposition across the state. In 1988, Bryan challenged first-term Republican Senator Chic Hecht for the Senate, contrasting his own fight against the dump as governor with Hecht's weak performance on the Senate Energy Committee where the 1987 amendments were drafted.

The approach ``hit a raw nerve," says Attorney General Brian McKay, a Republican. ``When in 30-second sound bites you say that your children will grow up glowing in the dark, you have a very powerful political issue." When the Nevada legislature met the following year, no one could doubt that the political atmosphere had changed. A bill creating a commission to negotiate with the federal government--which suggested that Nevadans were willing to take the dump if the price was right--went down overwhelmingly. After that, legislation prohibiting the storage of high-level radioactive waste in the state passed easily, along with two resolutions declaring state opposition to the dump.

The opponents now had the legal tools they needed, in Sawyer's words, to show Congress that ``we are just too much of a problem for them, and they had better find another sucker someplace."

In order to ``characterize" the site, the U.S. Department of Energy must dig into the mountain, studying it from every conceivable angle.

Two 1,200-foot vertical shafts 12 feet in diameter need to be drilled, along with about 300 other holes.

To proceed, the Energy Department requires permits from the state: a surface disturbance permit to move dirt around, a permit from the state Division of Environmental Protection to use chemical tracers in the groundwater and water rights from the Nevada state water engineer to conduct site characterization.

At Bryan's direction, the state delayed issuing the permits when the Energy Department requested them in 1988. And with the passage of the two resolutions, Governor Bob Miller--the Democrat who replaced Bryan when he was elected to the Senate later that year--believed that he had his legal basis for blocking the characterization.

The hardline view against granting even minor permits was bolstered by an official opinion from Attorney General McKay. He said the legislative resolutions constituted a veto of the site. Under the terms of the 1987 amendments, a state chosen to become the dump site may veto the decision and Congress has only 90 days to overturn the veto. Since Congress did not act, McKay declared that the veto had taken effect and that the Energy Department could not legally proceed with the dump. Miller promptly instructed his agencies to box up the permit requests and send them back to the Department of Energy.

Then, last November, events took an unexpected turn. Energy Secretary James D. Watkins announced that he had lost confidence in the work that had been done at Yucca Mountain by his own department's people. Nothing except some surface work would be done until the whole program was restructured. This would delay the projected opening of the site, which was originally set for 1998 and subsequently postponed to 2003, to 2010.

No one argues that Nevada's resistance was the only factor that prompted Watkins to start over. Independent scientists and staff at the Nuclear Regulatory Commission--which must ultimately license the repository--had already criticized the Energy Department's work on the site. What is more, Watkins had repeatedly, publicly and in blunt terms expressed contempt for the past management of his department. The sloppy, secretive management ``culture," which he said permeated the department's nuclear bomb plants, may also have colored his view of its management at Yucca Mountain.

But Admiral Watkins, a former commander of nuclear ships, is also a strong advocate of commercial uses of nuclear energy and, furthermore, he knew he had a directive from Congress to do the work that would result in designation of a dump site. He had to get the testing done, whatever Nevada's objections.

On January 25, he took action to force Nevada to give his people the necessary permits. The department filed suit in U.S. District Court in Nevada, arguing that the state's veto was premature and invalid, since Yucca Mountain has not been recommended by the president to become the

site but is only being studied.

Nevada, meanwhile, had launched a vigorous counterattack with its own lawsuits challenging many different aspects of what Washington had done. The most important of these, following the opinion of Attorney General McKay, argues that the legislative resolutions do constitute a veto of the site and that the deadline for Congress to override the state's ban has irrevocably passed.

Lawyers and constitutional experts generally agree that the standoff between Nevada and the federal government raises crucial issues of state-federal relations.

Should a state's political weakness in Congress be a factor in a siting decision? Does creation of a dump to store commercial waste lie within the powers of the federal government enumerated in the Constitution? And is the supremacy clause of the Constitution, which affirms the primacy of federal laws, applicable to a decision that could affect the health and welfare of a state's citizens, particularly if the state has been placed at a disadvantage compared with others?

``We are not discussing a normal usage of land," says Governor Miller. ``We are discussing a usage that could have severe health and welfare effects on the people nearby."

But many constitutional experts believe Nevada's case will be tough to argue.

``I would have to say it is uphill for Nevada," says University of Virginia law professor A.E. Dick Howard. The Supreme Court, he notes, has been deferential to Congress in deciding what is included in its enumerated powers. But Howard suggests that an argument might be found in the 10th Amendment, which reserves to the states or the people powers not granted the federal government. The argument would be that states have certain intrinsic powers; if Nevada could show that Congress followed a flawed process in choosing the site, it could argue that these essential powers were violated.

Others disagree. ``I don't know of any constitutional grounds on which Congress would be blocked from enacting this legislation," says Frederick R. Anderson, who teaches environmental and constitutional law at American University. ``There might be some infirmity in the statute. But in principle, Congress should be able to direct that federal land be used for a site." Still others suggest that the federal government, by attempting to push a site on an unwilling state through a naked power play, may already have lost the upper hand.

Roger E. Kasperson, as director of the Center for Technology, Environment and Development at Clark University, has watched the repository issue for almost 20 years. The question, he believes, is not whether the federal government has the legal right to build the repository where it wishes, but whether it realistically can do so.

``A competent attorney general in a state, backed by an unhappy

legislature, probably has the capacity to give endless grief to an attempt at federal supremacy," he says. ``I think the arrogance and the disregard that went into the whole process was terrible....The statement was that we are going to do this to you, and can you resist it? Now they are getting the answer."

Prevailing in court may be only one of the possible ways Nevada could win; the state is well aware of the advantages of delay.

Increasingly, scientists are asking whether building a repository, at an estimated cost of $25 billion, is wise or even feasible. Geologic conditions can change drastically over 10,000 years, possibly making the effort futile. Many argue that it would be best to drop the repository idea and instead entomb the waste above ground on site or in a central location until the next century. By that time, techniques to reprocess waste or render it harmless may have been developed.

Nevada's protests--its recalcitrance and its legal and legislative maneuvers--could force that option, or at least force delay until it becomes widely accepted.

Says Governor Miller, ``If we continue to delay and costs mount, the nuclear power industry will reconsider its solution. We are looking to resolve for 10,000 years a problem that technicians have considered for only 50 years. Every day they delay, Nevada looks worse."

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TESTIMONY OF MARTIN G. MALSCH,
SPECIAL DEPUTY ATTORNEY GENERAL FOR THE STATE OF NEVADA

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SPECIAL DEPUTY ATTORNEY GENERAL FOR THE STATE OF NEVADA
U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON ENVIRONMENT AND THE ECONOMY
JUNE 1, 2011

Mr. Chairman, member of the Subcommittee, my name is Martin G. Malsch. I appreciate the opportunity to provide testimony on behalf of the State of Nevada at this hearing today. I have practiced law in the nuclear energy and nuclear waste fields for over forty years, in both the public and private sectors, and I am a Special Deputy Attorney General for the State of Nevada.

Background

The failure of the Nation's geologic repository program is a direct result of various decisions that were taken beginning almost twenty-five years ago. A decent respect for history would have suggested that those decisions created a very high risk of program failure, but the lessons of history were disregarded. Ironically, the original Nuclear Waste Policy Act of 1982, signed into law by President Reagan with substantial bipartisan support, foresaw many of the problems that now afflict the Yucca Mountain program, and Congress sought to avoid them through a series of carefully constructed provisions designed to achieve both safety and credibility. The systematic dismantling of the Act by Congress in 1987, followed by related agency decisions that undermined both safety and credibility, lead to the situation we find ourselves addressing today. To see why we failed, and how failure was virtually inevitable, a brief history of the geologic repository program in the Unites States is in order.

History

Four events in the history of DOE's and its predecessor agencies' attempts to address the high-level waste problem stand out in this regard: Lyons, Kansas; the site nomination and selection process

under the 1982 NWPA; the 1987 NWPA amendments; and current NRC legal proceedings associated with the filing of DOE's license application.

In the 1960s a clamor arose over the potential that high-level radioactive wastes would leak from Atomic Energy Commission (AEC) storage facilities located at the National Reactor Testing Station in Idaho, the Savannah River Site in South Carolina, and the Hanford Site in Washington. As a result, the AEC promised Idaho Senator Church that the Idaho wastes would be transferred out of Idaho to a permanent geologic repository by the end of the 1970s. The AEC pinned its hopes on an abandoned salt mine in Lyons, Kansas. However, rather than taking the time to complete necessary scientific investigations, the AEC offered disputable safety conclusions and pressed ahead. Ultimately, the Lyons, Kansas site proved to be unsuitable. The AEC also bungled the political aspects of the debate. It knew that State and local support was essential, but it lost that support when it failed to give any credence to the legitimate concerns of Kansas experts and it effectively committed to the project before the scientific studies were completed.[1]

Two lessons may be learned from Lyons, Kansas. The first is that the Federal Government should not commit or even appear to commit to a repository site unless the necessary scientific investigations are completed and the legitimate safety concerns of State and local experts are addressed satisfactorily. The second is that State and local support is critical to success.[2]

After Lyons, Kansas, failed, the AEC's successor agencies continued to investigate other possible repository sites and the Congress enacted the NWPA in 1982. In accordance with the NWPA, DOE selected five sites for more detailed study (characterization): salt deposits in Mississippi, Texas, and

[1] J. Samuel Walker, "The Road to Yucca Mountain," University of California Press, 2009 (Walker), at 50-51, 74-75. Mr. Walker was the NRC Historian, and this book is the fifth in a series of volumes on the history of nuclear regulation sponsored by the NRC. The book does not represent the official position of the NRC.
[2] Walker at pp. 74-75

Utah; basalt formations in Hanford, Washington; and volcanic tuff rock in Nevada.[3] In perhaps a hint of what was to come, potential sites in Louisiana were excluded based on a political side agreement between Louisiana Senator Johnston and the Secretary of DOE, known to Congress when the NWPA was enacted.[4] The NWPA then called upon DOE to narrow the choices to three, all three of which were to be fully characterized (studied) so that any one failure would not prematurely destroy the whole repository program.[5]

In 1986, the DOE Secretary announced that the final three choices were the ones in Deaf Smith County, Texas; Yucca Mountain, Nevada; and Hanford, Washington. The designation prompted angry protests from all three areas, whose representatives believed that the scientific investigations were not completed, and the protests became part of a nationwide movement when DOE cancelled the search for an eastern site, notwithstanding a clear informal agreement among NWPA supporters that the second site called for by the NWPA would be located in an eastern State.[6]

The program was now in shambles, program costs were increasing, and the nuclear power industry argued (incorrectly, as it turned out) that the Nation faced a spent fuel storage crisis that might require shutdown of nuclear power plants. Congress reacted by enacting the Nuclear Waste Policy Act Amendments Act of 1987. That Act directed DOE to limit its future site characterization and selection efforts to Yucca Mountain, Nevada, notwithstanding the advice from NRC (and others) that the scientific information was insufficient to make an informed safety conclusion about the suitability of the site.[7] In

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[3] Walker at 181-182.
[4] The agreement was discussed during Senate debates on the enactment of the NWPA. 128 Cong. Rec. D485 S41430, April 28, 1982.
[5] 42 U.S.C. § 10132 (b) and 10133.
[6] Walker at 182.
[7] 42 U.S.C. 10172; prepared testimony of Robert Bernero, June 29, 1987, appearing in S. Rep. No. 100-152, 100th Cong., 1st Sess. at 194 ("At the Yucca Mountain site, the major issues include geological concerns such as the presence of potentially active faults and related ground motion, the potential for volcanism, and the origin and significance of mineral veins in the area. Hydrology is also a concern in the saturated and unsaturated zones; groundwater flow patterns and regimes and travel times have yet to be fully determined. As at Hanford, the ability

fact, the selection of the Yucca Mountain site was based on DOE's so-called "Multiattribute Utility Analysis of Sites," which depended in important part on the assumption that little groundwater would move downward from the Mountain top and seep into the tunnels where the waste would be disposed of, and this assumption later proved to be false.[8]

The NWPA Amendments Act of 1987 attempted to place the entire high-level waste disposal burden on one western state with no nuclear power plants or other high-level waste generating facilities. The supporters of the NWPA Amendments Act of 1987 flagrantly ignored both of the lessons learned from Lyons, Kansas. First, they effectively committed the Nation to a single disposal site not only before the necessary scientific investigations were completed, but also before any final licensing standards were in place.[9] Second, supporters ignored the objections of the host State, which believed (with good reason) that Nevada had been singled out simply because it was "the small kid on the block."[10]

By 2001, DOE had spent about $4.5 billion characterizing the Yucca Mountain site, and its efforts established that the site was more complex than originally thought and that (as indicated above) the underground environment was not as dry as Yucca proponents had expected. [11] But DOE pressed

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of the medium (tuff) to retard movement of radionuclides is not yet well understood." Mr. Bernero was the Deputy Director of the NRC Office in charge of evaluating the safety of high-level waste disposal facilities. NRC did not object to studying (characterizing) Yucca Mountain further.

[8] Compare the June 29, 1987 testimony of Donald L. Vieth, DOE Project Manager, Waste Management Project Office, Nevada Operations Office, appearing in S. Rep. No. 100-152, 100th Cong., 1st Sess. at 133, 138 "[L]ittle groundwater is expected to be available to dissolve and move the waste even if a waste canister is damaged," with DOE's June 2008 license application at 2.1-21 ("On average over all waste packages, the amount of seeping water is 1.2, 4.6, and 14.4 kg/yr per waste package for the present-day, monsoon, and glacial-transition climate states, respectively," There are 11,000 waste packages (2008 application at 1-10), so this means the total seepage ranges from 13,200 to 158,400 kg of water per year. Accordingly, DOE plans to install thousands of titanium alloy drip shields in the tunnels "to divert seepage away from the waste packages." June 2008 license application at 2-7. However, eventually the drip shield and waste packages are all degraded by corrosion. *Id.*

[9] Final and complete NRC licensing regulations were not in place until 2009. See 74 Fed. Reg. 10811 (March 13, 2009).

[10] Walker at 182.

[11] Walker at 183.

forward with Yucca Mountain much like its predecessor AEC pressed forward with Lyons, Kansas. In February 2002, DOE Secretary Abraham formally recommended the Yucca Mountain site to President Bush, notwithstanding the Nuclear Waste Technical Review Board's conclusion that DOE "has yet to make a convincing case that nuclear waste can safely be buried at Yucca Mountain."[12] President Bush promptly agreed with Secretary Abraham and recommended the site to the Congress. Citing numerous scientific flaws, Nevada Governor Guinn formally disapproved of the site, using the state veto procedure set forth in the NWPA.[13] Congress then formally overrode Nevada's veto by enacting H.J. Res. 87. The designation of Yucca Mountain as a repository site then became effective on July 23, 2002, when the President signed S.J. Res. 34 into law.[14]

The NWPA required DOE to file its license application within 90 days after the President's site recommendation became effective, or by October 21, 2002.[15] October 21, 2002 came, went, and receded into history without any application being filed. This was not a surprising development, given the scientific and engineering challenges DOE still faced when Nevada's veto was overridden. DOE also failed to plan adequately to meet NRC's pre-application discovery requirements.[16] DOE's plan to file its application in 2004 (one of many such plans with progressively later filing dates) was aborted and the application was not filed and docketed by the NRC until September 8, 2008, more than five years after the statutory deadline.

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[12] Hearings before the Senate Committee on Energy and Natural Resources on S.J. Res. 34, May 23, 2001, at 157. The Board elaborated that DOE's safety case was only "weak to moderate." *Id.* The Board was established by Congress to advise DOE on repository safety. Its members were (and are) appointed by the President based on recommendations from the National Academy of Sciences. 42 U.S.C. §§ 10261-64.
[13] Walker at 183.
[14] 42 U.S.C. § 10135 *note*.

[15] 42 U.S.C. § 10134(b).
[16] *U.S. Department of Energy (High-Level Waste Repository, Pre-Application Matters)*, LBP-04-20, 60 NRC 300 (2004).

The NRC then admitted over 300 contentions (formal objections to the application) as matters in controversy in the NRC Yucca Mountain licensing proceeding, more than in any other case in the history of NRC licensing.[17] All of the technical contentions were supported by the equivalent of an expert report under F. R. Civ. P. 26 (a)(2)(B) and, accordingly, the NRC found that each of them presented a "genuine dispute" supported by "facts or expert opinions."[18] DOE faced other serious obstacles. For example, at the time DOE's motion to withdraw its license application was filed on March 3, 2010, no significant progress had been made on funding or constructing the enormously expensive rail line that would be necessary to transport high-level nuclear waste through Nevada to the site in the safest manner. Construction and operation of a repository would require the appropriation of water resources owned by the public and administrated by the State of Nevada, and the State vigorously opposed the granting of the necessary State water use permits. A disinterested observer would reasonably conclude that a repository at Yucca Mountain would probably never be built and operated, even if the necessary NRC licenses were granted.

In the meantime, the near crisis atmosphere that permeated the Congressional debates over the original NWPA has completely dissipated. In 1982, NRC licensees and the Congress were gravely concerned that nuclear power plants would shut down because of a lack of adequate storage space for spent reactor fuel that was piling up in storage pools pending disposal.[19] When DOE moved to withdraw its application twenty eight years later, more than 50 independent spent fuel storage installations across the United States stored more than 45,000 spent fuel assemblies and greater-than-Class C waste in

[17] *See U.S. Department of Energy (High Level Waste Repository)*, CLI-09-14, __ NRC __ (2009).
[18] 10 C.F.R. § 2.309 (f)(1)(v) and (vi).
[19] *See* NWPA section 111(a)(2), 42 U.S.C. § 10131(a)(2). Senator Alan Simpson, a key supporter of the NWPA, declared in 1982 that "[w]e're about to bring the nuclear industry to its knees unless we act now." Walker at 176.

more than 1,200 dry storage casks.[20] The NRC opined that such dry storage would be safe for at least 100 years and is evaluating whether it may be safe for 300 years.[21]

Loss of Program Credibility

The original Act sought to assure the extent possible that potential repository sites would be identified and evaluated based on objective technical and scientific criteria. It also sought fairness and redundancy by requiring multiple sites from which to choose ultimate locations for repositories, and it strove for regional equity by setting up site selection programs for two facilities – one in the west and one in the east. In 1987, Congress scrapped both the multi-site process and the concept of regional equity that were the cornerstones of the 1982 law. It directed that all repository development efforts focus on just one site in Nevada, notwithstanding the incompleteness of the scientific information and the fact that spent reactor fuel and high-level waste from every region of the Country would be sent to a single western State with no nuclear power plants or high-level radioactive waste generating facilities.

The 1987 amendments lead to a devastating loss of trust in the overall program and ever increasing opposition on the part of the State of Nevada and its citizens. Further actions by DOE, EPA, and NRC then further undermined the credibility of the program. Prior to 1987, DOE's focus – while certainly not without problems – was essentially on identifying safe and suitable sites for a repository. The question that guided investigations at each of the candidate sites was, "Is this site suitable for development as a repository?"

After 1987, that changed drastically. Now there was only one possible site, and the focus changed to efforts to vindicate Congress' choice. Inevitably, as more and more dollars were spent, it became progressively more important to avoid admitting that the selection of Yucca Mountain had been

[20] NRC "Plan for Integrating Spent Nuclear Fuel Regulatory Activities," Revision 00, June 21, 2010, at C-1.
[21] Supra note 20 and COMSECY-10-1007, Enclosure 1 at 10.

a mistake. Technical problems, even site conditions previously considered to be disqualifying, became obstacles to be overcome by ever-more-exotic engineering fixes, some designed to protect the waste from adverse conditions in the mountain, contrary to the original concept that site geology would protect man and the environment from the waste. When it appeared likely that the Yucca Mountain site could not satisfy certain NRC licensing requirements designed to achieve safety defense-in-depth, NRC eliminated the requirements. And, when DOE safety analyses showing that releases of radioactive materials in groundwater would result in doses in excess of EPA safety standards after 10,000 years, EPA and NRC unlawfully declared that releases after 10,000 years would not count in determining compliance. All of these actions, by Congress and then by DOE, EPA, and NRC, utterly destroyed the credibility of the program.

Opposition to the Yucca Mountain project in Nevada was not always a given. Early on while the NWPA of 1982 was being put together and immediately subsequent to its passage, Nevada, while skeptical of DOE's ability to implement a scientifically credible site screening process, essentially took a wait-and-see approach. In 1986, the first chairman of the Nevada Commission on Nuclear Projects, former Governor Grant Sawyer, laid down the criteria by which the state would judge DOE:

> *"... [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 ... isolate radioactive materials from the biosphere for more than 10,000 years - and that ... such a repository 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."*

When DOE and Congress abandoned the site selection process of the original Act in 1987, things changed drastically. Public opinion, which until then had been mixed with regard to Yucca Mountain, solidified into strong, across-the-board opposition. In biannual surveys done between 1989 and 2010, opposition to the project has remained constant at between 63% and over 70%.

While there has been and continues to be some local government support for the project in small rural counties surrounding the site (although according to survey data, that support is by no means overwhelming or shared by all residents), such support should not be extrapolated to the wider Nevada population. Nevada's population is roughly 2.6 million, with over 1.8 million in Clark County and the greater Las Vegas area. By contrast Nye County, where Yucca Mountain is located, has less than 45,000 people. Taken together, the six counties sometimes cited as evincing some level of support for DOE's program comprise only a tiny fraction of the overall State citizenry.

In 2002, the State of Nevada carefully evaluated the effects a prospective Yucca repository would have on the State and its communities and economy[22]. That report documents the potential, among other things, for major economic consequences arising out of the Yucca project, including significant risks to Nevada's unique tourism-based economy, property value losses due to the transportation of spent fuel and high-level waste through the state, as well as disastrous consequences in the event of accidents or incidents of terrorism related to waste being shipped to the facility. The report concluded:

> *"Given the unique reliance of the Nevada economy on the Stote's ability to attract tens of millions of tourists and visitors annually, any impacts that reduce the number of visitors, especially to southern Nevada, would have major consequences for the State's economy. Consequently, the most serious and passibly catastrophic economic risk for Nevada stemming directly from the Yucca Mountain project is the potential for stigma impacts on the tourist and visitor industry. Such impacts would produce significant losses to an economy dominated by visitor-based revenues."*

[22] A Mountain of Trouble, A Nation at Risk: Report on Impacts of the Proposed Yucca Mountain High-Level Nuclear Waste Program (February 2002) Ref. http://www.state.nv.us/nucwaste/yucca/impactreport.pdf

This broad perspective on how the project would affect the State provides a critical basis for the State of Nevada's determined opposition to locating a geologic repository at Yucca Mountain.

The GAO Report, "Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned," and the Situation Today

In its recent report, GAO report states that DOE's decision to seek withdrawal of the Yucca Mountain license application was made for non-safety reasons. However, GAO made no systematic effort to evaluate the many safety problems that remain unresolved. These problems go to the heart of Yucca Mountain's suitability as a repository and Nevada's opposition to it. They include:

- the rapid movement of water within the subsurface and fast radioactive waste pathways to the accessible environment;
- the likelihood of major waste package corrosion;
- the unstable and highly fractured nature of the host rock and the problems that causes for safety analyses, waste isolation, retrieval, the installation of engineered barriers; and
- the risk of volcanic eruptions below and then through the repository that would disperse radioactive materials to the environment.

Accordingly, from Nevada's perspective, DOE's decision to seek a withdrawal of the license application avoided both significant safety problems and further wasting of taxpayer and ratepayer dollars on a flawed and hopeless project.

Some Lessons Learned

In its 2010 report to the Nevada Governor and Legislature[23], the Nevada Commission on Nuclear Projects identified some of the key findings and lessons to be learned from the Yucca Mountain experience. The findings include:

- While Yucca Mountain failed for many reasons, a critical element was unquestionably the forced nature of the site selection process.
- 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, and billions of dollars and years of effort would have been saved.
- Yucca Mountain was an extremely poor site from the beginning.
- DOE 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 lessons learned include:

- A successful repository facility siting program must be premised on the fully informed consent of the host state, tribe (if applicable) and local community.
- Any future siting effort must be based on and motivated by irrefutably sound science.
- A scientifically credible repository siting process must have as its foundation objective and rigorous criteria against which the geotechnical suitability of a site would be evaluated.
- The criteria must be established in advance of the siting effort and not structured so as to apply only to specific sites. The application of the criteria to candidate sites must be objective and above reproach, and criteria cannot be changed based on conditions found when studying or characterizing various sites.

Conclusion

[23] Report of the Nevada Commission on Nuclear Projects to the Governor and Legislature of the State of Nevada (December 2010) Ref. http://www.state.nv.us/nucwaste/news2011/pdf/comm2010summary.pdf

It is sometimes difficult to terminate a Federal project when large amounts of money have been spent. But there is no sense in adding good money after bad. What's done is done and we should look to the future for better solutions, guided by the lessons of Lyons Kansas and Yucca Mountain, and the recommendations of the Blue Ribbon Commission on America's Nuclear Future. DOE's finding that Yucca is unworkable, the decision to seek withdrawal of the license application, and the establishment of the Blue Ribbon Commission to look for alternatives for the management and storage of spent nuclear fuel, were the right things to do. They have the potential to put the Country on a path to a safer, more cost-effective and expeditious solution to managing spent fuel and high-level waste.

A key lesson to be learned from Nevada's experience with DOE and the Yucca program is that the Federal Government cannot seek to force a geologic repository on an unwilling state based on incomplete information, press forward with the repository in the face of growing scientific difficulties, and still expect the effort to be successful. At the least, there must be a steadfast and unwavering commitment to scientific credibility, openness and transparency, and a willingness to allow the science to take its course and let the chips fall where they may.

Thank you for the opportunity to address the Subcommittee today. I would be happy to answer any questions.

"NUCLEAR WASTE PROGRAM FACES POLITICAL BURIAL"
Science, 22 August 1986

Nuclear Waste Program Faces Political Burial

Angered by DOE's decision to drop plans to explore sites in the eastern United States, some senators are seeking to halt funding for site work in the West

A posse of senators and congressmen, upset by the Department of Energy's (DOE) recent actions, wants to hang the civilian nuclear waste program.

The politicians say they are not driven by the intense regional campaigns that broke out this spring over DOE's choice of waste disposal sites. They just want to impose a year-long pause in site exploration to allow for a more careful review of the environmental risks. However, once on-site research is stopped, it will be difficult to get it going again.

A little over 4 years ago, Congress put together a national compromise, the Nuclear Waste Policy Act. All the states agreed to give up some autonomy to support a single comprehensive system for disposing of nuclear reactor fuel. About 15,000 metric tons of old fuel sit in utility company storage areas. Space is getting tight, and the utilities are eager to get rid of the aging and increasingly vulnerable fuel containers. They would also like to lower storage costs.

DOE was assigned to search the country for the best geological formation in which to bury the waste. In a series of reviews, DOE was to narrow its choices for a western site from nine to five, then to three finalists. It was to follow the same course east of the Mississippi, starting with 12 and narrowing to three sites. When detailed local studies on these finalists were complete, the President was to choose one site in the West to hold 70,000 metric tons of waste. Several years later, he would chose a second site in the East. The two-site requirement was essential. Without it, westerners were not inclined to take any waste from the East, where most nuclear waste is generated.

This compromise arrangement has now been thrown off the tracks by political maneuvering in the Administration and a backlash in Congress.

The main threat at present comes from western states, whose leaders have offered to save the act by gutting it. To end a controversy that has raged since May, they would strip away all funds that enable DOE to explore potential waste sites in the West. Representative James Weaver (D–OR) proposed to do this in a budget-cutting amendment to the House energy and water bill on 23 July. The amendment failed, 351 to 68.

The same idea is now circulating in the Senate Appropriations Committee, backed by powerful Republicans, including Senators Mark Hatfield (R–OR), Paul Laxalt (R–NV), James McClure (R–ID), and Pete Domenici (R–NM). By stalling, the senators say, they will let regional disputes cool

John Herrington. *The Energy Secretary set the stage for trouble when he said DOE had suspended plans to look for a waste site in the East.*

and allow time for better planning. They may also help Republican candidates this fall avoid getting linked with DOE's odious decision.

However, the delay would set DOE's schedule back at least a year and throw the whole subject open for renegotiation. The vote on restarting the program would come as the presidential campaign gets under way, not the best time for a reasoned debate. Congress found it hard to agree before specific sites had been named. It will be harder now. Representative Morris Udall (D–AZ), sponsor of the original law, says that it will take a mighty effort to "put this program back together."

The program burst wide open on 28 May when Energy Secretary John Herrington announced in a press conference that three specific sites had been chosen for exploration in the West. They were Hanford, Washington; Yucca Mountain, Nevada; and Deaf Smith, Texas. Then Herrington delivered the big surprise. He said that DOE had dropped—for the indefinite future—all plans to explore sites in the East.

Westerners were outraged because Herrington described the "postponement" in a way that seemed to let the East completely off the hook. They took it as a violation of the spirit if not the letter of the Nuclear Waste Policy Act. A month ago, Udall, Representative Sid Morrison (R–WA) and 11 senators demanded that DOE submit a legal justification for its action. They are still waiting for it.

Northwesterners were especially upset to find Hanford on the final list of candidate sites. Hanford, a huge defense nuclear center 5 miles from the Columbia River in southeastern Washington, had been ranked among the top five western sites by DOE a year earlier. Critics said DOE chose Hanford for its local politics, not geology. Residents have dealt with nuclear materials for 40 years and would welcome the new jobs. An investigation in 1985 by Representative Edward Markey (D–MA), chairman of the House subcommittee on energy conservation and power, found fault with the selection process. DOE inflamed the controversy when it said it could not give the subcommittee its working files on the decision because they had been thrown away.

With advice from the National Academy of Sciences, DOE set up a new and more methodical selection procedure. From the list of possible western sites, five finalists were selected once again. This time, taking environmental and transportation costs into account, Hanford ranked last in desirability—not third, as before. Thus, when Hanford suddenly jumped from fifth back into third place on 28 May, ahead of two higher ranked sites (Richton Dome, Mississippi, and Davis Canyon, Utah), northwesterners felt the decision had been rigged. DOE seemed intent on using Hanford, regardless of what the studies might indicate.

Markey demanded again that DOE turn over its decision memoranda, and DOE again said the documents had been thrown away. About 8 weeks later, DOE found some memos and released them. They revealed that the nuclear waste office had indeed considered the public repercussions of dropping the eastern sites, but they shed

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no light on the ranking of western sites.

Meanwhile, according to the General Accounting Office, 19 lawsuits have been filed against the nuclear waste program, many brought by state governments. One of the more significant, *Tennessee v. Herrington*, seeks to prevent DOE from sending a proposal to Congress on a waste-handling site known as the monitored retrievable storage (MRS) center. DOE has proposed three sites for MRS, all in Tennessee. MRS would serve as a waste processing, packaging, and transfer point. It is also attractive to DOE planners because it could store up to 15,000 metric tons of waste pending completion of the repository. And, because it is in the East, it lends a measure of regional balance. But Tennesseeans are sharply divided on its merits. The state's legal action thus far has prevented DOE from sending an MRS proposal to Congress.

As western politicians threaten to halt the program to restore regional balance, environmental and antinuclear groups have moved in as well, calling for a moratorium. This fueled the recent proposals to cut all site-specific research at DOE.

However, the origins of this trouble lie in decisions taken earlier, back in the winter when DOE first released a list of possible waste sites in the East. The seven states DOE named on 16 January as having crystalline rock (granite) suitable for a second repository were Georgia, Maine (two sites), Minnesota (three sites), New Hampshire, North Carolina (two sites), Virginia (two sites), and Wisconsin. Although the process of choosing an eastern site had received little attention until then, as one activist said, "When they finally put the pins in the map, the intensity of the response took everyone by surprise." DOE collected 60,000 comments, most of them negative.

The Governor of Maine, Joseph Brennan (D), who had said little on the subject, suddenly found himself at the head of a furious local protest. He came out strongly against DOE's selections. The Governor of the granite state of New Hampshire, engineer John Sununu (R), described by press secretary Frank Haley as "not one who acts on emotion," traveled to Washington in January to argue his case "strictly on the facts." Sununu argued that a second repository was not needed and that, in any case, the granite in New Hampshire is too porous. A Republican candidate in a close race for a Senate seat in North Carolina, Representative James Broyhill, also sent distress signals to DOE.

Logs obtained by Markey show that DOE's nuclear waste officials had 32 meetings or phone conversations with distraught eastern senators, congressmen, governors, and their staffs between 15 January and 28 May 1986.

A small campaign orchestrated by Cooper Brown, an attorney at the firm of Baron & Budd in Washington, D.C., illustrates how some of these protests made an impact.

A group in Sebago Lakes, Maine, known as Citizens Against Nuclear Trash (CANT) hired Brown in February. After consulting with Brown, CANT chairperson Bonnie Titcomb and other members of the group arranged to meet Vice President George Bush on 22 April when he was in Maine for a fund raiser. Bush met with them, listened, and invited them to see his staff in Washington. In mid-May, Titcomb and Brown met with vice-presidential aide Lehmann Li at the Old Executive Office Building on Pennsylvania Avenue.

"Before January, most people in Maine had no knowledge of what DOE was proposing," said Titcomb. They were shocked to learn that Sebago Lakes was on the list of proposed disposal sites. Titcomb argues that DOE's process was flawed on technical grounds, citing the fact that an aquifer through Sebago provides drinking water for 200,000 people. "We have people in Maine who are willing to die to keep DOE out of here," she said, making it clear that she spoke literally.

Morris Udall. *It will take a mighty effort to put this program back together.*

According to Brown, if DOE had persisted with its plans for Maine and New Hampshire, "it would have been very difficult for any Republican candidate associated with this Administration [to win] in the upcoming presidential primaries. The Bush people saw the handwriting on the wall, and saw that something had to be done."

Brown continued: "I pointed out to Li that we were looking for help from the White House to go to DOE and point out that they were off center." He asked Li to persuade the DOE to "suspend the process and go back and start all over." Brown said it would be politically difficult to rescue Maine and New Hampshire alone, so he suggested to Li that it "would make more political sense if DOE would drop the whole second round [of eastern site selection]."

A list of calls and visits obtained by Representative Markey's committee shows that on 26 March, Li called DOE's Office of Civilian Radioactive Waste Management to convey some comments from the Maine group. Li declined to discuss this or the later meeting in May. Two weeks after the Maine citizens visited Li in Washington, Herrington announced that he would "indefinitely postpone" work on an eastern site.

Vice-presidential spokesman Stephen Hart says Bush's staff sent DOE many comments it received, including those from Maine, but that none could be characterized as recommendations. "The Vice President's role is not to persuade," Hart said, but to "listen" and "pass along the feelings of people he meets."

Herrington insists that he did not change the waste program to suit the Vice President's plans for 1988 or the needs of Republican candidates running in the East this fall. Politics played no part in it, he told the House Interior Committee on 31 July. "It was a managerial decision made in the Department," Herrington said, aimed at saving money.

In the spring, DOE reviewed new, low figures on waste production and learned that the first repository would provide adequate storage space for 10 to 15 years longer than previously realized. The statutory limit of 70,000 metric tons for the first site will not be reached until 2020. DOE will not have to decide on building a second repository until 1995. "It is not prudent to spend hundreds of millions of dollars on site investigation and identification now," Herrington said. Slowing the pace will allow DOE to restructure the program technically and investigate new disposal technologies.

Whatever valid technical reasons there may be for changing the schedule, DOE's announcement on 28 May had an obvious political dimension. Herrington's tone aroused suspicions that eastern states would be let off the hook indefinitely and was read by westerners as a betrayal. DOE now confronts potential delays in both the East and the West. The Administration will have to repair this badly scarred program or propose a new one, just at a time when Congress is least interested in taking up the subject. ■

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