

WASTED OPPORTUNITIES: RESOLVING THE IMPASSE IN UNITED STATES NUCLEAR WASTE POLICY

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Synopsis: This article examines the problem of nuclear waste disposal and its implications for the future of the nuclear industry in the United States. Following a brief introduction, Part II investigates the process that generates spent nuclear fuel and discusses the current legal framework established by the Nuclear Waste Policy Act (NWPA). It also provides a brief overview of Yucca Mountain, succinctly tracing the project from its origins to the present. Part III summarizes developments in U.S. nuclear waste policy from 2002 to today, notably the creation of a Blue Ribbon Commission (BRC) on America’s Nuclear Future. Part IV discusses three of the central recommendations from the BRC’s final report. Part V analyzes available alternatives to Yucca Mountain and discusses the costs and benefits of each. Part VI provides conclusions pertaining to the sufficiency of the BRC’s recommendations and suggestions for policymakers. In following this structure, the article provides one of the first comprehensive critiques of the BRC’s suggestions and examines their effectiveness. Furthermore, it provides a necessary critical evaluation of the current statutory structure developed to address the nuclear waste disposal issue, and highlights major areas that policymakers must address if nuclear power is to have a future in the United States.

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I. INTRODUCTION

Nuclear power stands at a crossroads both in the United States and around the world. As of 2012, thirty-two countries operated 435 nuclear reactors constituting 374 gigawatts (GW) of installed capacity.¹ Together, these reactors produced about 13.5% of the world's electricity, or 2,518 billion kilowatt-hours (kWh). In the United States, which hosts 23.9% of the world's reactors, nuclear power plants accounted for almost 20% of national electricity generation from the country's 104 commercially operating reactors.²

However, since 1996, the Nuclear Regulatory Commission (NRC) has issued only four licenses for new reactors.³ High construction costs compared to other energy sources continue to impede industry growth and the catastrophic disaster at the Fukushima Daiichi facility in Japan resulted in a world-wide reassessment of the world's aging nuclear reactor fleet.⁴ Falling natural gas prices have further eroded whatever financial advantages new nuclear units had in the late 1990s and early 2000s.⁵

Despite these major problems, some industry insiders are predicting a "nuclear renaissance."⁶ The nuclear industry is developing so-called "Generation IV" reactors that are safer, cheaper, generate less waste, and use fuel more efficiently than reactors currently operating.⁷ Nuclear power provides a source of constant base-load power required to maintain electric grids and back up more intermittent sources such as wind and solar.⁸ Nuclear power continues

1. WORLD NUCLEAR ASS'N, WORLD NUCLEAR POWER REACTORS AND URANIUM REQUIREMENTS (Jan. 1, 2012), <http://www.world-nuclear.org/info/reactors.html>.

2. *Id.*

3. MARK HOLT, CONG. RESEARCH SERV., RL3358, NUCLEAR ENERGY POLICY 1 (June 20, 2012) [hereinafter HOLT, NUCLEAR ENERGY POLICY].

4. *See generally* BENJAMIN K. SOVACOO, *CONTESTING THE FUTURE OF NUCLEAR POWER* (2011).

5. *See, e.g.*, Matthew Weinschenk, *Natural Gas Claims Another Victim*, OIL&ENERGY DAILY (Feb. 13, 2013), available at <http://www.oilandenergydaily.com/2013/02/13/natural-gas-victim/>.

6. Jeff McMahon, *The Nuclear Renaissance is Back, Industry Panel Says*, FORBES (Sept. 27, 2012), <http://www.forbes.com/sites/jeffmcmahon/2012/09/27/the-nuclear-renaissance-is-back-industry-panel/>; David Worthington, *The U.S. Nuclear Renaissance Has Begun*, SMART PLANET (Feb. 9, 2012), <http://www.smartplanet.com/blog/intelligent-energy/the-us-nuclear-renaissance-has-begun/13058>.

7. AL GORE, *OUR CHOICE* 163 (2009).

8. *World Energy Needs and Nuclear Power*, WORLD NUCLEAR ASSOC., <http://www.world-nuclear.org/info/inf16.html> (last updated Nov. 2012).

to be heavily subsidized, with the Energy Policy Act of 2005 providing various federal incentives for nuclear power⁹ and more than *half* (54%) of all federal energy research subsidies from 2002 to 2007 going to nuclear fission.¹⁰

Moreover, with the threat of climate change and regulation of carbon emissions, utilities and governments alike view nuclear power as a clean alternative to traditional fossil fuel burning plants.¹¹ Most recently, President Obama's 2011 State of the Union Address "called for nuclear power to be included in a national goal of generating 80% of U.S. electricity 'from clean energy sources' by 2035."¹² In particular, the Obama Administration's *Blueprint for a Secure Energy Future* contains several provisions that indicate nuclear power is going to play an expanded role in the United States' future energy portfolio alongside renewables and natural gas.¹³ The *Blueprint* asks for more research and development concerning nuclear generation and promotes continued federal financial support for the nuclear industry through a loan guarantee program.¹⁴ The Obama Administration's support is already showing results. In 2012, the NRC "approved the first licenses to build new U.S. commercial reactors in more than three decades."¹⁵

However, despite a seemingly promising future, energy planners and even electric utility operators have inadequately addressed the nuclear power industry's so called "Achilles Heel": nuclear waste disposal.¹⁶ The United States, home to the largest stockpile of spent nuclear fuel awaiting disposal in the world, has grappled with the nuclear waste problem since the industry began in the 1950s.¹⁷ In 1982, Congress sought to address the waste issue once and for all with the Nuclear Waste Policy Act (NWPA), which established a multi-stage statutory framework governing the identification, construction, and operation of a permanent geologic nuclear waste repository.¹⁸ In 1987, Congress amended the NWPA and designated Yucca Mountain—a remote, volcanic tuff formation located ninety miles northwest of Las Vegas, Nevada¹⁹—as the sole candidate for a repository.²⁰ Congress' decision to designate Yucca Mountain generated strong public opposition from Nevada and local officials, and thirty years after

9. HOLT, NUCLEAR ENERGY POLICY, *supra* note 3, at 2, 20.

10. Benjamin Sovacool, *Toward a Sustainable Energy Policy*, S.F. CHRON., Aug. 12, 2008, at A18, available at <http://www.sfgate.com/opinion/article/Toward-a-sustainable-energy-policy-3273506.php> (quoting U.S. Department of Energy and U.S. Government Accountability Office data).

11. *Id.* at 26-27.

12. *Id.* at 2.

13. EXEC. OFFICE OF THE PRESIDENT, BLUEPRINT FOR A SECURE ENERGY FUTURE 3 (2011), available at http://www.whitehouse.gov/sites/default/files/blueprint_secure_energy_future.pdf.

14. *Id.* at 33-34.

15. MARK HOLT, NUCLEAR ENERGY POLICY, *supra* note 3, at 2, 20.

16. Allison Fisher, *Will Nuclear Power Continue to Hobble Along Despite Its Radioactive Achilles Heel?*, ENERGY VOX (Aug. 14, 2012), <http://www.energyvox.org/2012/08/14/will-nuclear-power-continue-to-hobble-along-despite-its-radioactive-achilles-heel/>.

17. Charles de Saillan, *Disposal of Spent Nuclear Fuel in the United States and Europe: A Persistent Environmental Problem*, 34 HARV. ENVTL. L. REV. 461, 485 (2011).

18. *Id.* at 486.

19. FAQ'S, EUREKA COUNTY, NEVADA—NUCLEAR WASTE OFFICE, <http://www.yuccamountain.org/faq.htm> (last visited Jan. 20, 2013).

20. de Saillan, *supra* note 17, at 488.

the enactment of the NWPA, the Obama Administration has taken several administrative steps that essentially terminate the Yucca Mountain project.²¹

Meanwhile, nuclear waste continues to pile up at *de facto* on-site storage units across the country. “[T]he national inventory of commercial spent nuclear fuel amounts to nearly 70,000 metric tons”²² (exceeding this amount when high-level defense-waste is also considered),²³ of waste currently “stored at [seventy-five] sites in [thirty-three] states.”²⁴ This stockpile increases about 2,000 metric tons each year.²⁵ If “no new reactors are brought online” and the nation’s current reactors continue to operate at existing levels, “[t]he amount of spent fuel is expected to more than double to about 140,000 metric tons by 2055.”²⁶ Yet on-site facilities were not designed for long-term storage of spent nuclear fuel, and many storage pools across the country are reaching their full capacity.²⁷

To find a way out of this impasse, the Obama Administration asked the Department of Energy (DOE) to establish a Blue Ribbon Commission (BRC) to develop a new approach to nuclear waste disposal in January 2010.²⁸ The BRC issued its final report on January 26, 2012,²⁹ and this article provides one of the first critical in-depth examinations of the BRC’s central recommendations.³⁰ This article investigates the process that generates spent nuclear waste, discusses the current legal framework established in the NWPA, and provides a brief overview of Yucca Mountain. It then analyzes available alternatives to Yucca Mountain and the BRC’s suggestions, discussing the relative merits of each, before offering six conclusions concerning nuclear waste and the nuclear industry in the United States as a whole.

II. SPENT FUEL, THE NWPA, AND YUCCA MOUNTAIN

A. *The Generation of Spent Nuclear Fuel*

“Proponents of nuclear power are fond of pointing out that one kilogram of uranium can produce 50,000 kWh of electricity, while one kilogram of coal can

21. *Id.* at 489-90.

22. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-12-797, ACCUMULATION OF SPENT NUCLEAR FUEL 5 (2012) [hereinafter GAO-12-797].

23. *Id.* at 1 n.2.

24. *Id.*

25. *Id.* at 19.

26. *Id.*

27. *Id.* at 13-14.

28. BLUE RIBBON COMM’N ON AMERICA’S NUCLEAR FUTURE, REPORT TO THE SECRETARY OF ENERGY (Jan. 2012) [hereinafter BRC FINAL REPORT], available at http://brc.gov/sites/default/files/documents/brc_finalreport_jan2012.pdf.

29. *Id.*

30. For other initial observations on the BRC’s findings see, e.g., John P. Banks & Charles K. Ebinger, *Around the Halls: President Obama and America’s Nuclear Future*, BROOKINGS (Jan. 27, 2012), <http://www.brookings.edu/blogs/up-front/posts/2012/01/27-halls-nuclear>; Chuck Gray, *Action on Waste Needed Now*, NATIONALJOURNAL.COM (June 12, 2012), <http://energy.nationaljournal.com/2012/06/confronting-americas-nuclearwa.php#2218429>; Press Release, Steve Kerekes, Nuclear Energy Inst., Nuclear Energy Stakeholders Welcome Blue Ribbon Commission Report to DOE (Jan. 26, 2012), <http://resources.nei.org/documents/keydocsnws/02-06-2012/12-04%20Joint%20Statement%20on%20BRC%20final%20report.pdf>.

only produce three kWh of electricity.”³¹ “What they don’t tell you is that because nothing is burned or oxidized during the fission process, nuclear plants convert almost all their fuel to waste with little reduction in mass.”³²

In the open nuclear fuel cycle, used predominately by the U.S., Sweden, and Finland, fuel is burned in reactors and not reused, meaning that about 95% of it is wasted. In the closed fuel cycle, utilized by Belgium, France, Germany, the Netherlands, Spain, and the United Kingdom, plutonium is extracted from spent fuel, recycled, and reprocessed, but 94% of the fuel is still wasted.³³

The nonpartisan U.S. Government Accountability Office considers the results of this relatively inefficient process—spent nuclear fuel (SNF) and high-level nuclear waste (HLW)—“one of the most hazardous substances created by humans.”³⁴ Spent fuel is “the most radioactive form of civilian waste” and consists of both “extremely hot but relatively short-lived fission products . . . as well as long-lived radionuclides, . . . which [remain] . . . radioactive for tens of thousands of years”;³⁵ some, such as plutonium, have a half-life of 24,100 years.³⁶ High-level radioactive waste consists of the residue resulting from reprocessing, primarily generated for defense purposes in the United States.³⁷ High-level waste is typically stored “at a number of government-owned facilities managed by the [Department of Energy].”³⁸ Both emit high levels of radiation and require shielding to prevent human and environmental exposure.³⁹

B. Early SNF Policy (Pre-NWPA)

The issue of spent nuclear waste disposal began in the 1950s. At the time, there was no policy in the United States addressing the disposal of spent fuel rods.⁴⁰ Instead, the government considered spent nuclear fuel as a valuable source of uranium and plutonium that could be “reprocessed” for fuel.⁴¹ Industry officials believed that reprocessing nuclear waste would be the only way to support the fledgling nuclear power industry, given a perceived lack of natural uranium deposits.⁴² Thus, spent fuel was only to be stored at commercial

31. Benjamin K. Sovacool & Christopher Cooper, *Nuclear Nonsense: Why Nuclear Power Is No Answer to Climate Change and the World’s Post-Kyoto Energy Challenges*, 33 WM. & MARY ENVTL. L. & POL’Y REV. 51 (2008) (citation omitted).

32. *Id.*

33. *Id.* (internal citations omitted).

34. GAO-12-797, *supra* note 22, at 1.

35. MARK HOLT, CONG. RESEARCH SERV., RL33461, CIVILIAN NUCLEAR WASTE DISPOSAL 11 (2011) [hereinafter HOLT, CIVILIAN NUCLEAR WASTE DISPOSAL].

36. NUCLEAR WASTE TECHNICAL REVIEW BD., EVALUATION OF THE TECHNICAL BASIS FOR EXTENDED DRY STORAGE AND TRANSPORTATION OF USED NUCLEAR FUEL 74 and fig.28 (2010) (the figure is specifically titled: “Relative Radioactivity of Used Nuclear Fuel with a Burnup of 38 FWd/MTU”), available at http://www.nwtrb.gov/reports/eds_rpt.pdf.

37. HOLT, CIVILIAN NUCLEAR WASTE DISPOSAL, *supra* note 35, at 11.

38. BRC FINAL REPORT, *supra* note 28, at 16.

39. *Id.* at 12.

40. Scott Helton, Comment, *The Legal Problems of Spent Nuclear Fuel Disposal*, 23 ENERGY L.J. 179, 181-82 (2002).

41. MARK HOLT, CONG. RESEARCH SERV., 96-212 ENR, CIVILIAN NUCLEAR SPENT TEMPORARY STORAGE OPTIONS 3 (1998) [hereinafter HOLT, TEMPORARY STORAGE OPTIONS].

42. *Id.*

reactor sites “for a few years [before] being shipped to ‘reprocessing’ plants, where the useful uranium and plutonium would be chemically separated” and be reused as fuel.⁴³ This would reduce the amount of radioactive “fission products” and make the entire process more efficient.⁴⁴ However, concerns over nuclear proliferation, environmental protection, and cost would ultimately cause government and industry officials to reconsider reprocessing.⁴⁵

In the interim, underground tanks were often used for isolating highly radioactive nuclear waste at reactor sites.⁴⁶ Recognizing the limits in this approach, the Atomic Energy Commission (AEC), the predecessor to the Nuclear Regulatory Commission, announced that interim storage would not be a long-term solution, and that “better means of isolating, concentrating, immobilizing, and controlling wastes will ultimately be required.”⁴⁷ In 1955, the AEC asked the National Academy of Sciences (NAS) to research the disposal issue.⁴⁸ In 1957, the NAS issued a report identifying “deep geologic disposal in salt formations [as] the most promising” solution to the waste dilemma.⁴⁹

Based on these recommendations, the AEC investigated potential geological disposal options through the late 1950s, 1960s, and 1970s.⁵⁰ Some of the sites investigated were “an abandoned salt mine in Lyons, Kansas”; deep salt beds in New Mexico; a basalt formation at Hanford, Washington; “and a welded volcanic tuff at Yucca Mountain in Nevada.”⁵¹ In 1970, the AEC began to investigate an abandoned salt mine near Lyons, Kansas, but local opposition was strong and the project was abandoned in 1972.⁵² Around the same time, the community of Carlsbad, New Mexico invited the AEC to explore a nearby salt bed for a potential repository.⁵³ In 1979, Congress authorized this site, or the Waste Isolation Pilot Plant (WIPP), but limited deliveries to defense-generated waste from nuclear weapons.⁵⁴ This decision also generated considerable opposition from the State of New Mexico that prevented the WIPP from receiving waste until 1999.⁵⁵ The WIPP remains “the world’s only operating deep geological repository.”⁵⁶

Meanwhile, a national shift in nuclear policy significantly impacted the nuclear disposal issue. Prior to 1974, the United States’ nuclear policy endorsed

43. *Id.*

44. *Id.*

45. *Id.* at 4.

46. BRC FINAL REPORT, *supra* note 28, at 19.

47. *Id.* (internal quotations omitted).

48. FRANK D. HANSEN & CHRISTI D. LEIGH, SANDIA NAT’L LABS., SALT DISPOSAL OF HEAT-GENERATING NUCLEAR WASTE 2 (2011), available at <http://prod.sandia.gov/techlib/access-control.cgi/2011/110161.pdf>.

49. *Id.* at 3.

50. BRC FINAL REPORT, *supra* note 28, at 19-20.

51. *Id.* at 20.

52. *Id.*

53. *Id.*

54. *Id.*

55. BRC FINAL REPORT, *supra* note 28, at 21.

56. *Id.*

reprocessing nuclear fuel.⁵⁷ However, “when India exploded a nuclear weapon” using plutonium isolated with U.S. and Canadian reprocessing equipment,⁵⁸ President Gerald Ford announced “that the United States should no longer regard reprocessing of used nuclear fuel to produce plutonium as a necessary . . . step in the nuclear fuel cycle.”⁵⁹ In 1977, President Carter would make this deferral indefinite.⁶⁰ President Reagan lifted this ban in 1981, but the nuclear industry has yet to invest in commercial reprocessing in the United States.⁶¹

Thus, with reprocessing essentially abandoned, “the ‘once through’ nuclear fuel cycle became official policy,” which meant a satisfactory permanent storage option would need to be found quickly.⁶² In response, the Department of Energy formed an Interagency Review Group (IRG) in 1979.⁶³ The IRG recommended that “potential repository sites for spent fuel . . . be identified in different geologic environments and in different parts of the country.”⁶⁴ In particular, the IRG recommended “several repositories sited on a regional basis insofar as technical considerations permit.”⁶⁵ These recommendations signaled that the federal government would continue to rely on the permanent geologic storage option for the long-term disposal of spent nuclear fuel, and would eventually lead to the enactment of the Nuclear Waste Policy Act (NWPA).

C. Nuclear Waste Policy Act

Congress enacted the NWPA in 1982 to address the increasing concerns regarding the management of the nation’s growing stockpile of nuclear waste.⁶⁶ The NWPA identifies three potential storage options to handle waste; creates a multi-stage statutory framework for establishing a disposal facility; designates roles for various federal agencies, the President, and Congress; and also addresses how the disposal facility is to be financed.⁶⁷ Moreover, the NWPA establishes two congressionally approved methods for the disposal of nuclear waste: centralized interim storage and permanent geologic disposal.⁶⁸ Recognizing that a permanent site would take time to develop, the NWPA states that civilian nuclear plant operators have the primary responsibility for providing interim storage of spent nuclear fuel at the reactor site.⁶⁹ Congress did not

57. ANTHONY ANDREWS, CONG. RESEARCH SERV., RS22542, NUCLEAR FUEL REPROCESSING: U.S. POLICY DEVELOPMENT 1-3 (2008).

58. de Saillan, *supra* note 17, at 480.

59. ANDREWS, *supra* note 57, at 3-4 (quoting Gerald D. Ford’s Statement on Nuclear Policy, PUB. PAPERS 987 (Oct. 28, 1976)).

60. *Id.* at 4.

61. de Saillan, *supra* note 17, at 480 (citing Statement Announcing a Series of Policy Initiatives on Nuclear Energy, PUB. PAPERS 903, 904 (Oct. 8, 1981)).

62. HOLT, TEMPORARY STORAGE OPTIONS, *supra* note 41, at 4.

63. BRC FINAL REPORT, *supra* note 28, at 20.

64. *Id.*

65. *Id.* (citation omitted).

66. Nuclear Waste Policy Act of 1982, Pub. L. No. 97-425, 96 Stat. 2201 (1982) (codified at 42 U.S.C. §§ 10101-10270 (2012)).

67. 42 U.S.C. §§ 10101-10270; *see also* Helton, *supra* note 40, at 182.

68. *Id.* §§ 10151-10153; 10202.

69. *Id.* § 10151.

authorize funding for interim storage, and utilities were forced to begin storing waste at their own initial expense, to be eventually reimbursed by the DOE.⁷⁰ Thirty years later, however, all commercial nuclear waste in the United States is still stored on-site, adjacent to reactor facilities.⁷¹

The original NWPA also authorized the DOE to develop a “monitored retrievable storage” facility to store spent fuel at a centralized interim location until a permanent repository is found.⁷² The NWPA required the Secretary of Energy to submit a proposal to Congress outlining site-design, construction, and site selection for one or more MRS facilities.⁷³ In 1987, the “DOE submitted [a] proposal to build and operate an MRS facility” near Oak Ridge, Tennessee, as well as “two alternative sites . . . also in Tennessee.”⁷⁴ However, robust opposition from Tennessee officials halted the proposal.⁷⁵ This opposition would result in Congress expressly annulling the DOE’s proposal in the 1987 NWPA Amendments.⁷⁶ The 1987 Amendments to the NWPA prohibit the DOE from continuing to develop the MRS facility until a final repository site has been selected and licensed.⁷⁷ Therefore, under the current statutory scheme, the DOE is not authorized to develop an MRS facility, or any other interim facility, until the NRC grants a license for the Yucca Mountain facility.

The original NWPA also established a Nuclear Waste Fund (NWF) to pay for the disposal of commercial nuclear waste.⁷⁸ The NWPA authorized the DOE to enter into Standard Contracts with U.S. generators of spent nuclear fuel.⁷⁹ Under a Standard Contract, the DOE agreed to take title of the spent fuel and in return, the utilities make an annual contribution to the NWF based on generation output.⁸⁰ The NWPA prohibited nuclear reactors from being licensed to operate without first signing a Standard Contract with the DOE.⁸¹ In order to ensure that waste would not permanently be stored on site, the Standard Contracts specified that the DOE would begin disposing of waste no later than January 31, 1998.⁸² Given the delays in developing the repository, the DOE has yet to collect any

70. Helton, *supra* note 40, at 182.

71. *Background: Radioactive Waste*, U.S. NUCLEAR REGULATORY COMM’N 2-3, available at <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html> (last updated Feb. 4, 2011); see also Helton, *supra* note 40, at 184 (noting that “DOE has yet to remove any waste”).

72. 42 U.S.C. § 10161 (amended 1987).

73. *Id.* § 10161(b) (amended 1987).

74. U.S. GENERAL ACCOUNTING OFFICE, GAO/RCED-91-194, OPERATION OF MONITORED RETRIEVABLE STORAGE FACILITY IS UNLIKELY BY 1998, at 9 (1991), available at <http://www.gao.gov/assets/160/151171.pdf>.

75. *Id.*

76. Nuclear Waste Policy Amendments Act of 1987, Pub. L. No. 100-203, tit. V, § 142(a) 101 Stat. 5021 (1987) (codified at 42 U.S.C. § 10162(a)).

77. 42 U.S.C. §§ 10165(b), 10168(d)(1).

78. Nuclear Waste Policy Act of 1982, 42 U.S.C. § 10222.

79. *Id.*

80. *Id.* § 10222(a)(5).

81. *Id.* § 10222(b).

82. *Id.* § 10222(a)(5)(B).

commercial waste for disposal.⁸³ The DOE's inability to dispose of the waste has generated several lawsuits and settlements associated with the government's failure to meet the 1998 deadline.⁸⁴

D. Yucca Mountain

In 1987, Congress designated Yucca Mountain, Nevada⁸⁵ as the nation's sole candidate for a permanent nuclear waste repository.⁸⁶ Yucca Mountain is located about ninety miles northwest of Las Vegas, Nevada, on uninhabited federal land adjacent to the Nevada Test Site,⁸⁷ where the U.S. government has been testing nuclear weapons since 1951⁸⁸ (the most recent test occurring underground on December 7, 2012).⁸⁹ In addition to the site's distance from major population centers, the DOE determined that Yucca Mountain "provides a stable geologic environment," unlikely to be disturbed by seismic or volcanic forces.⁹⁰ The federal government also favored Yucca Mountain because the mountain is located in a very dry climate.⁹¹ Aridity "is important because water movement is the primary means by which radioactive waste could be transported."⁹² Finally, the repository would be "1,000 feet above the water table," making groundwater contamination difficult.⁹³ The Yucca Mountain facility was intended to store "nuclear waste in a safe and secure environment long enough for the waste to degrade into a form that is less harmful to humans and the environment."⁹⁴

Despite being selected as the nation's only permanent repository for nuclear waste in 1987, the Yucca Mountain characterization process did not start until the early 1990s due to local opposition⁹⁵ and budgetary problems.⁹⁶ Beginning

83. TODD GARVEY, CONG. RESEARCH SERV., R40996, THE YUCCA MOUNTAIN LITIGATION: LIABILITY UNDER THE NUCLEAR WASTE POLICY ACT (NWPA) OF 1982, at 1 (2010) [hereinafter GARVEY: YUCCA MOUNTAIN LITIGATION].

84. *Id.* (stating that at least "seventy-one breach of contract claims have been filed against the DOE since 1998, resulting in approximately \$1.2 billion in damages and settlements").

85. U.S. DEP'T OF ENERGY, DOE/RW-0508, VIABILITY ASSESSMENT OF A REPOSITORY AT YUCCA MOUNTAIN: OVERVIEW 11 (fig.) (1998) [hereinafter DOE VIABILITY ASSESSMENT].

86. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-10-48, NUCLEAR WASTE MGMT: KEY ATTRIBUTES, CHALLENGES AND COSTS FOR THE YUCCA MOUNTAIN REPOSITORY AND TWO POTENTIAL ALTERNATIVES 2 (2009) [hereinafter GAO-10-48].

87. *FAQ's*, EUREKA COUNTY, NEVADA—NUCLEAR WASTE OFFICE, <http://www.yuccamountain.org/faq.htm> (last visited Jan. 20, 2013).

88. NEVADA OPERATIONS OFFICE, U.S. DEP'T OF ENERGY, UNITED STATES NUCLEAR TESTS: JULY 1945 THROUGH SEPTEMBER 1992, at 2 (2000), available at http://www.nv.doe.gov/library/publications/historical/DOENV_209_REV15.pdf.

89. Krista Hostetler, *Underground Experiment Tested at Nevada Proving Ground*, KNTV.COM (Dec. 7, 2012), <http://www.ktnv.com/news/local/182551561.html>.

90. DOE VIABILITY ASSESSMENT, *supra* note 85, at 10.

91. *Id.* at 2, 10.

92. *Id.* at 10.

93. *Id.* at 11.

94. GAO-10-48, *supra* note 86, at 13.

95. *Repository Development*, NUCLEAR ENERGY INST., <http://www.nei.org/Key-Issues/nuclearwastedisposal/yuccamountain> (last visited Jan. 17, 2013).

96. Helton, *supra* note 40, at 185.

in 1994, the DOE conducted many studies investigating the site,⁹⁷ drilling more than 180 boreholes into the mountain.⁹⁸ In 1997, the DOE excavated “a [five] mile tunnel through the mountain to function as an Exploratory Study Facility.”⁹⁹ At this time, Congress ordered the DOE to conduct a Viability Assessment of the Yucca Mountain site to identify any critical issues that would make the site unsuitable for storage and update Congress and the President with the site’s progress to date.¹⁰⁰ After conducting the assessment, the DOE found that “Yucca Mountain remains a promising site for a geologic repository.”¹⁰¹ Furthermore, the viability assessment revealed that “no show stoppers” were identified at the site, and that scientific and technical work should proceed.¹⁰² In 2002, the Final Environmental Impact Statement (EIS) for the project supported these findings.¹⁰³

Despite these seemingly favorable reviews, the next sections show how legal disputes and political hostility would continue to hamper the Yucca Mountain project throughout the 1990s and the early 2000s.

III. RECENT DEVELOPMENTS

A. *Yucca Mountain Characterization Process Ends*

Throughout the 1990s, Congress attempted to pass legislation authorizing the construction of an interim storage facility at the Nevada Test Site located near Yucca Mountain,¹⁰⁴ setting deadlines for Yucca Mountain licensing,¹⁰⁵ and stipulating the need for surface storage to begin at Yucca Mountain within eighteen months of NRC approving the construction permit.¹⁰⁶ The Clinton Administration, however, vetoed the bills in every instance, though it never effectively terminated the project.¹⁰⁷

97. *Repository Development*, *supra* note 95.

98. U.S. SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, YUCCA MOUNTAIN: THE MOST STUDIED REAL ESTATE ON THE PLANET 6 (2006) [hereinafter YUCCA SENATE REPORT], available at <http://epw.senate.gov/repwhitepapers/YuccaMountainEPWReport.pdf>.

99. *Id.*

100. DOE VIABILITY ASSESSMENT, *supra* note 83, at 1.

101. *Id.* at 2.

102. Press Release, Nuclear Energy Inst., Yucca Mountain Viability Assessment Increases Confidence that Government Can Develop Repository for Used Fuel (Dec. 18, 1998), <http://www.nei.org/newsandevents/yuccamtviability/>.

103. U.S. DEPT. OF ENERGY, DOE/EIS-0250, FINAL ENVIRONMENTAL IMPACT STATEMENT FOR A GEOLOGICAL REPOSITORY FOR THE DISPOSAL OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE AT YUCCA MOUNTAIN, NYE COUNTY, NEVADA S-82 (2002), available at http://energy.gov/sites/prod/files/EIS-0250-FEIS_Summary-2002.pdf.

104. *Timeline – The Nuclear Waste Policy Dilemma*, YUCCAMOUNTAIN.ORG, <http://www.yuccamountain.org/time.htm> (last visited Jan. 17, 2013).

105. *Update on Nuclear Waste Program Developments*, NUCLEAR WASTE PROJECT OFF. (Apr. 1997), <http://www.state.nv.us/nucwaste/news/upd4-97.htm> (the bill would have required the NRC to grant or deny the license in no more than thirty-two months upon receiving the application).

106. *Id.* (the bill would have required the DOE to begin accepting waste at the facility eighteen months after NRC granted the license for the repository).

107. *Timeline – The Nuclear Waste Policy Dilemma*, *supra* note 104.

After more than fifteen years of extensive site analysis, the Yucca Mountain characterization process ended in 2002, when then Secretary of Energy, Spencer Abraham, presented the Yucca Mountain site recommendation to President Bush.¹⁰⁸ The recommendation included various scientific and technical reports and the final EIS.¹⁰⁹ On the very next day, President Bush approved the Yucca Mountain site, “and pursuant to the terms of the NWPA, recommended the site to Congress.”¹¹⁰ In approving the project, Bush stressed that the Yucca Mountain repository “is necessary to protect public safety, health and this nation’s security.”¹¹¹

As predicted,¹¹² Nevada officials submitted a formal “Notice of Disapproval” to Congress.¹¹³ Under the NWPA, if the host state submits a notice of disapproval, the site is effectively vetoed “unless both [chambers] of Congress [override] the state’s objection by passing a joint “resolution of siting approval.”¹¹⁴ In issuing the notice of disapproval, the Nevada governor stated that Yucca Mountain was “scientifically flawed” and referred to notions of environmental justice and equity, considering the state’s long relationship with nuclear weapons development and testing.¹¹⁵ Nevada also cited concerns over the project’s ability to prevent groundwater contamination, the presence of seismic activity, and its overall long-term safety.¹¹⁶ Despite these objections, “Congress passed, and the President signed, the necessary approval resolution to override Nevada’s objection.”¹¹⁷ Thus, twenty years after the enactment of the NWPA, the approval stage of the NWPA process ended and licensing began.¹¹⁸

Nonetheless, a series of lawsuits initiated by the State of Nevada quickly interrupted the DOE’s licensing procedures.¹¹⁹ First, the State of Nevada and several environmental groups challenged the radiation protection standard issued by the EPA in 2001 for being “insufficiently protective of public health and safety.”¹²⁰ Second, the State of Nevada attacked the “NRC’s licensing criteria

108. YUCCA SENATE REPORT, *supra* note 98, at 8-9.

109. *Id.* at 9.

110. TODD GARVEY, CONG. RESEARCH SERV., R41675, CLOSING YUCCA MOUNTAIN: LITIGATION ASSOCIATED WITH ATTEMPTS TO ABANDON THE PLANNED NUCLEAR WASTE REPOSITORY 2 (2012) [hereinafter GARVEY, CLOSING YUCCA MOUNTAIN].

111. *Bush Approves Nevada Nuclear Waste Dump Site*, USA TODAY (Feb. 15, 2002), <http://usatoday30.usatoday.com/news/nation/2002/02/15/yucca-mountain.htm>.

112. *Id.* (noting that President Bush expected a protest from Nevada).

113. BRC FINAL REPORT, *supra* note 28, at 23.

114. GARVEY, CLOSING YUCCA MOUNTAIN, *supra* note 110, at 2 (citing NWPA §§ 115(b) and (c); 42 U.S.C. §§ 10135(b) and (c)).

115. Kenny C. Guinn, Statement of Reasons Supporting the Governor of Nevada’s Notice of Disapproval of the Proposed Yucca Mountain Project 1-2 (Apr. 8, 2002), *available at* <http://www.yuccamountain.org/pdf.govveto0402.pdf>.

116. *Id.*

117. GARVEY, CLOSING YUCCA MOUNTAIN, *supra* note 110, at 2 (citing P.L. 107-200, 107th Cong. (2002)).

118. *Id.*

119. *The Major Yucca Mountain Lawsuits*, YUCCAMOUNTAIN.ORG, <http://www.yuccamountain.org/court/case.htm> (last updated Sept. 2004).

120. *Nuclear Energy Inst., Inc. v. EPA*, 373 F.3d 1251, 1261-62 (D.C. Cir. 2004).

rule as arbitrary, capricious, and contrary to law.”¹²¹ Third, the State of Nevada challenged “the constitutionality of the congressional resolution selecting the Yucca Mountain site, arguing that Congress had impermissibly singled out the state to bear a unique burden of housing the nation’s nuclear waste.”¹²² And fourth, the State of Nevada challenged the DOE’s “site suitability criteria, the Energy Secretary’s and [the] President’s decisions to recommend Yucca Mountain for development as the nation’s waste repository, and the [DOE’s] Final Environmental Impact Statement.”¹²³

Instead of deciding the merits of each lawsuit separately, the D.C. Circuit Court of Appeals consolidated the lawsuits into one hearing.¹²⁴ In reaching a decision, the court denied or dismissed all of the lawsuits except the challenge against the EPA’s 10,000-year safety standard.¹²⁵ The court found that the “EPA’s chosen compliance period” represented an “unreasonable construction of section 801(a) of the Energy Policy Act of 1992” because it “sharply differ[ed] from [the] NAS’s findings and recommendations.”¹²⁶ The court then vacated the EPA’s rule “to the extent that it require[d] DOE to show compliance for only 10,000 years following disposal.”¹²⁷ Since both the DOE and the NRC would need to comply with any revised EPA standard before granting the Yucca Mountain license, the DOE delayed pursuing its plans to submit a license application to the NRC in late 2004.¹²⁸ The EPA would announce its final public health and safety standards for Yucca Mountain four years later, in 2008.¹²⁹

Despite the lawsuits and political antagonism, the final stage of the NWPA process commenced in 2008 when the DOE submitted its license application to the NRC for approval.¹³⁰ Once submitted, the NRC is responsible for conducting an “independent, thorough and rigorous review of the repository design to determine whether it can safely contain the nation’s high-level nuclear waste.”¹³¹ The NRC’s decision to accept the application triggered a three-year review process set by Congress¹³² to reach a decision on whether to approve construction, based on the DOE’s 8,600 page license application.¹³³ The DOE’s submission of the license application was a substantial milestone for the Yucca

121. *Id.* at 1262.

122. *Id.*

123. *Id.*

124. *Id.* at 1257.

125. *Id.*

126. *Id.* at 1273.

127. *Id.*

128. *Backgrounder: Radioactive Waste*, U.S. NUCLEAR REGULATORY COMM’N 2-3, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html> (last updated Feb. 4, 2011).

129. *Radiation Protection, About Yucca Mountain Standards*, EPA, <http://www.epa.gov/radiation/yucca/about.html#specific> (last updated Aug. 30, 2012).

130. GARVEY, *CLOSING YUCCA MOUNTAIN*, *supra* note 110, at 2.

131. *Fact Sheet: Licensing Yucca Mountain*, U.S. NUCLEAR REGULATORY COMM’N 1, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-yucca-license-review.pdf> (last updated Jan. 2012).

132. 42 U.S.C. § 10134(d).

133. *DOE Marks Milestone in Submitting Yucca Mountain License Application*, DEPT. OF ENERGY (June 3, 2008), <http://energy.gov/articles/doe-marks-milestone-submitting-yucca-mountain-license-application>.

Mountain project that concluded a twenty-six year effort to select, study, and approve Yucca Mountain as the nation's final repository for spent nuclear fuel.¹³⁴ This milestone would prove to be short lived, nevertheless, when the new Obama Administration swept into the policy arena, perhaps initiating a permanent policy shift away from Yucca Mountain.

B. DOE's Attempt to Withdraw the Yucca Mountain License Application

President Obama and Secretary of Energy Chu have both stated that Yucca Mountain "is not a workable option for a nuclear waste repository."¹³⁵ In 2007, then-Senator Barack Obama wrote a letter to Senators Harry Reid and Barbara Boxer stating that "the selection of Yucca Mountain has failed, the time for debate on this site is over, and it is time to start exploring new alternatives for safe, long-term solutions based on sound science."¹³⁶ Obama continued to support the closing of Yucca Mountain during his 2008 campaign for the presidency, stating he did not believe Yucca Mountain was a "suitable site."¹³⁷

Yet the most direct attack on Yucca Mountain has been the DOE's attempted withdraw of the facility's license application in order to terminate the licensing procedure before the NRC. In 2010, the DOE filed a motion with the NRC to withdraw the pending license application for Yucca Mountain.¹³⁸ The motion stated that in order "to avoid further expenditure of funds on a licensing proceeding for a project that is being terminated, DOE has decided to discontinue the pending application . . . with prejudice."¹³⁹ The "with prejudice" term is significant in this case, because "an application that is withdrawn 'with prejudice' is generally barred from being re-filed in the future."¹⁴⁰ Therefore, because construction at Yucca Mountain cannot continue without NRC authorization, a successful withdraw would mean the Yucca Mountain experiment will essentially cease.¹⁴¹ In September 2011, the NRC Board issued an order suspending the Yucca Mountain licensing process based on the uncertainty over the availability of funds to complete the adjudication.¹⁴² Thus, the NRC proceedings were forced to come to a halt as a direct result of the Obama Administration's decision not to request funding for Yucca Mountain

134. *Id.*

135. *Yucca Mountain Project Close to Dead*, NUCLEAR WASTE UPDATE (Eureka Cnty. Yucca Mountain Info. Office, NV), Winter 2010, at 1, available at http://www.yuccamountain.org/docs/winter_2010_newsletter.pdf.

136. *Obama Has Consistently Opposed Yucca Mountain as a Storage Site for Nuclear Waste*, WIFR.COM (Oct. 31, 2007), <http://www.wifr.com/home/headlines/10916081.html>.

137. Obama for America, Barack Obama and Joe Biden: New Energy for America (2008), available at http://energy.gov/sites/prod/files/edg/media/Obama_New_Energy_0804.pdf.

138. Motion to Withdraw at 1, *In re* U.S. Dep't of Energy (High Level Waste Repository), No. 63-001, ASLBP No. 09-892-HLW-CAB04 (N.R.C. Mar. 3, 2010), available at http://energy.gov/sites/prod/files/edg/media/DOE_Motion_to_Withdraw.pdf.

139. *Id.* at 2.

140. GARVEY, CLOSING YUCCA MOUNTAIN, *supra* note 110, at 8.

141. *Id.*

142. Memorandum and Order at 3, *In re* U.S. Dep't of Energy, No. 63-001-HLW, ASLBP No. 09-892-HLW-CAB04 (N.R.C. Sept. 30, 2011), available at <http://pbadupws.nrc.gov/docs/ML1127/ML11273A041.pdf>.

High-Level Waste activities in the FY 2012 Budget.¹⁴³ Despite the suspension, the Board's decision to deny the DOE's motion to withdraw remains in effect.¹⁴⁴

C. The 2010 Blue Ribbon Commission on America's Nuclear Future

Perhaps foreseeing such a stalemate, in 2010 President Obama sent a presidential memorandum to Secretary of Energy Steven Chu requesting the DOE to establish a Blue Ribbon Commission on America's Nuclear Future (BRC).¹⁴⁵ The BRC "was chartered to recommend a new [approach] for managing the back end of the nuclear fuel cycle."¹⁴⁶ The BRC would also evaluate advanced fuel cycle technologies and alternatives addressing the storage, processing, and minimization of nuclear waste consistent with U.S. nonproliferation policy.¹⁴⁷ The BRC, appointed by the Secretary of Energy, consisted of scientists, academics, industry representatives, and former elected officials.¹⁴⁸ Despite the broad scope of the BRC's charter, the BRC affirmed that it was "not a siting body" and that it would not be making any finding regarding the Yucca Mountain site or discussing alternative locations for a new repository.¹⁴⁹ Furthermore, the BRC would not make any recommendations regarding the suitability of nuclear energy as a source of power in the United States.¹⁵⁰

The BRC "was charged with producing an interim report within [eighteen] months . . . and a final report within [twenty-four] months" of its establishment.¹⁵¹ Throughout this process, Secretary Chu and the Obama Administration conveyed to the BRC that they were to focus primarily on "alternatives" rather than on the suitability of Yucca Mountain.¹⁵² To further this point, Secretary Chu provided that the Commission would be free to evaluate scientific and technical options regarding waste disposal and reprocessing, but that Yucca Mountain would be "off the table."¹⁵³ Commission Co-Chair and former Congressman Lee Hamilton reiterated this focus stating, "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."¹⁵⁴

143. *Id.* at 3.

144. *Id.* at 2.

145. Press Release, The White House, Office of the Press Sec'y, Presidential Memorandum – Blue Ribbon Commission on America's Nuclear Future (Jan. 29, 2010), <http://www.whitehouse.gov/the-press-office/presidential-memorandum-blue-ribbon-commission-americas-nuclear-future>.

146. BRC FINAL REPORT, *supra* note 28, at vi.

147. *Id.* at 122, app. A (Advisory Committee Charter).

148. *Id.* at 121, app. A (list of BRC Commissioners, Staff, and Senior Consultants).

149. *Id.* at 3.

150. *Id.*

151. GARVEY, CLOSING YUCCA MOUNTAIN, *supra* note 110, at 6.

152. *Id.*

153. Steven Tetreault, *Federal Panel To Examine Nuclear Waste Storage*, REVIEWJOURNAL.COM (Jan. 30, 2010), http://www.yuccamountain.org/pdf-news/panel_01302010.pdf.

154. *Id.*

The BRC issued its Final Report on January 26, 2012.¹⁵⁵ Overall the report received support from Yucca Mountain's opponents. Senator Harry Reid, a very vocal critic of the Yucca Mountain project, stated that the report is "a critical step towards safely and securely managing nuclear waste," and that it clearly underscores that "no state, tribe, or community should be forced to store spent nuclear fuel or high-level waste without its express consent."¹⁵⁶ Nevada's Governor Sandoval also voiced support for the BRC's report, but strongly reaffirmed that the state would never consent to an interim repository being considered in the state.¹⁵⁷ Former Republican Presidential candidate Mitt Romney commended the BRC's recommendation for consent-based storage, stating "[t]he people of Nevada ought to have the final say" on the Yucca Mountain project.¹⁵⁸ However, as discussed below, while the BRC provided a much needed new approach to addressing the nuclear waste issue, some major issues remain unresolved.

D. Current Proposals and the DOE's 2013 Response

Most recently, The Rand Corporation announced in December 2012 that a new public-private nuclear waste "Management and Disposition Organization," or MDO, should be created along the lines of those proposals.¹⁵⁹ Secretary Chu and the DOE declared a "new waste disposal strategy" on January 10, 2013.¹⁶⁰ This three-tiered approach to the waste issue would see a "pilot interim store" beginning operations in 2021 to house spent nuclear fuel from shut down nuclear power plants; a bigger "full-scale interim store" built shortly after that; and an "underground disposal facility" completed by 2048.¹⁶¹

However, even the overly optimistic policy document from the DOE admitted that such a plan faces two serious obstacles: public opposition and new legislation. As the World Nuclear News noted, building any type of storage

155. Christopher Helman, *Obama's Nuclear Commission Issues Final Report, Urges Immediate Action on Atomic Waste*, FORBES (Jan. 26, 2012), <http://www.forbes.com/sites/christopherhelman/2012/01/26/obamas-nuclear-commission-issues-final-report-urges-immediate-action-on-atomic-waste/>.

156. Press Release, U.S. State Senator for Nevada, Harry Reid, Reid Statement on Blue Ribbon Commission's Final Report (Jan. 26, 2012), http://www.reid.senate.gov/newsroom/pr_012612_reidstatementonblueribboncommissionsfinalreport.cfm.

157. Cy Ryan, *Gov. Sandoval: Nye County May Want a Nuke Dump But it Doesn't Speak for Nevada* (Mar. 12, 2012), <http://www.lasvegassun.com/news/2012/mar/12/sandoval-nye-county-may-want-nuke-dump-it-doesnt-s/>.

158. *Obama, Romney Support Nuclear Energy, Offer Views on Financing, Regulation*, NUCLEAR ENERGY INSIGHT (Nuclear Energy Inst.), Summer 2012, available at <http://www.nei.org/resourcesandstats/publicationsandmedia/insight/insightsummer2012/obama-romney-support-nuclear-energy-offer-views-on-financing-regulation/>.

159. LYNN E. DAVIS, ET AL., RAND CORP., MG-1230-DOE, CHOOSING A NEW ORGANIZATION FOR MANAGEMENT AND DISPOSITION OF COMMERCIAL AND DEFENSE HIGH-LEVEL RADIOACTIVE MATERIALS (2012), available at http://www.rand.org/content/dam/rand/pubs/monographs/2012/RAND_MG1230.pdf.

160. *New Start for US Nuclear Disposal*, WORLD NUCLEAR NEWS (Jan. 14, 2013), http://www.world-nuclear-news.org/WR_New_start_for_US_nuclear_disposal_1401131.html.

161. *Id.*; U.S. DOE, STRATEGY FOR THE MANAGEMENT AND DISPOSAL OF USED NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE 2 (Jan. 2013) [hereinafter DOE NUCLEAR WASTE STRATEGY], available at <http://energy.gov/sites/prod/files/Strategy%20for%20the%20Management%20and%20Disposal%20of%20Use%20Nuclear%20Fuel%20and%20High%20Level%20Radioactive%20Waste.pdf>.

facility will depend “on the expressed will of American people.”¹⁶² Moreover, it needs new Congressional approval and legislation to “enable progress on implementing this strategy.”¹⁶³ Lastly, the DOE response ignored the BRC’s short-term proposal on funding (explained in detail in the next section) and effectively bumped the recommendation for the long term to the political process.

IV. CRITICALLY ASSESSING THE BLUE RIBBON COMMISSION RECOMMENDATIONS

The Commission’s Final Report identified “eight key elements” of a new approach to nuclear waste disposal.¹⁶⁴ The following section discusses the three most prominent of the BRC’s recommendations: a consent-based approach to siting; establishing a new independent organization to manage nuclear waste disposal; and changing disposal funding structures.

A. *A New, Consent-Based Approach to Siting*

The BRC begins by identifying perhaps the principal barrier to a permanent repository: public opposition. The 1982 NWPA expressly provides that “public participation in the planning and development of repositories is essential in order to promote public confidence” in disposal.¹⁶⁵ However, the NWPA establishes a development schedule that does not allow for adequate public participation, while allowing the host state’s objection to be overridden by congressional resolution.¹⁶⁶ This top-down approach has been plagued with legal deadlock, political controversy, fierce hostility from host states, steadily escalating project costs, and lengthy delays.¹⁶⁷ The State of Nevada’s opposition is one, if not the major, reason that Yucca Mountain has been effectively abandoned.¹⁶⁸

The BRC addresses this top-down problem by recommending a new “adaptive, consent-based” siting approach.¹⁶⁹ According to the BRC, a successful consent-based approach consists of six components. First, this approach would allow “affected communities [to] have an opportunity to decide whether to accept [a] facility . . . and retain significant local control.”¹⁷⁰ Second, the process would become more transparent with more opportunities for interested parties to become engaged in the process.¹⁷¹ Third, this approach would be phased, in that “key decisions would be revisited and modified as necessary.”¹⁷² Fourth, the process would be adaptive and flexible in response to

162. *New Start for US Nuclear Disposal*, *supra* note 160.

163. DOE NUCLEAR WASTE STRATEGY, *supra* note 161, at 3.

164. BRC FINAL REPORT, *supra* note 28, at vii.

165. *Id.* at 67.

166. *Id.* at 48, 56.

167. *Id.* at 48.

168. *Id.*

169. *Id.* at 47.

170. *Id.*

171. *Id.*

172. *Id.*

“new technical, social, or political developments.”¹⁷³ Fifth, the process would be driven by objective standards and science.¹⁷⁴ Finally, the process would generate legally-enforceable partnerships between the federal government, states, and local communities.¹⁷⁵

In developing this approach, the BRC looked to experiences in other countries, particularly Finland, and at the Waste Isolation Pilot Plant (WIPP) in New Mexico.¹⁷⁶ In Finland, the Nuclear Energy Act requires the government to provide notice to potential host communities and allows other interested parties to present opinions in writing.¹⁷⁷ Furthermore, the host community must approve the siting.¹⁷⁸ If the host community approves, the decision is ratified by Parliament.¹⁷⁹ This process encouraged volunteer communities to come forward, and Finland became “the first, and so far . . . only, country to [successfully] select a site for [the] disposal of [nuclear waste].”¹⁸⁰ The BRC also commended the process involved in siting the WIPP project in New Mexico. The BRC noted that despite several delays and contentious negotiations, the WIPP project benefited from a supportive local community and state throughout the process.¹⁸¹ After reviewing these two approaches to siting, the BRC identified several critical elements to a successful consent-based approach for the United States: “a clear and understandable legal framework[;] an opt-out option for local affected communities, up to a certain point in the process”; financing and compensation to the local communities; public education; and openness and transparency.¹⁸²

The BRC correctly identifies public opposition as the heart of the disposal problem.¹⁸³ The current top-down approach—which allows for a federally mandated solution over the objection of states—is inefficient, time consuming, costly, and impedes progress toward developing a permanent repository.¹⁸⁴ In contrast, the BRC’s adaptive, consent-based approach provides flexibility, encourages host communities to become involved voluntarily, and ultimately leaves “consent” up to the host community.¹⁸⁵

However, this new, consent-based approach could prove to be unrealistic given the time required. The BRC estimates that it would take fifteen to twenty additional years for site identification, characterization, and licensing for a deep geologic depository.¹⁸⁶ Given that the debate over Yucca Mountain has lasted more than three decades and cost billions of dollars, it may be impractical to rely

173. *Id.*

174. *Id.*

175. *Id.* at 47-48.

176. *Id.* at 48-49.

177. de Saillan, *supra* note 17, at 505.

178. *Id.*

179. *Id.*

180. *Id.* at 506.

181. BRC FINAL REPORT, *supra* note 28, at 48.

182. *Id.* at 52.

183. *Id.* at 48.

184. *Id.* at 49.

185. *Id.* at 52.

186. *Id.* at 55.

on communities volunteering to develop a repository. Furthermore, with the current cap on storage, a second repository would be required.¹⁸⁷ Therefore, the scale of this process will ostensibly need to be doubled. Finally, the BRC sets lofty goals for a new approach, but offers little specifics on implementation. For example, the BRC fails to discuss what happens if no volunteer communities step forward. The BRC seems to assume that a supportive, local community can be identified. However, as Yucca Mountain demonstrated, even if the community is supportive, regional or state opposition could hinder the process.¹⁸⁸ Thus, under the BRC's consent-based approach, both a willing host community and a willing state need to be found. Given the extreme "Not In My Backyard"-nature of nuclear waste disposal, finding a consenting local community could be very difficult, much less finding a combination of a consenting community and state. The BRC does not offer any detailed solutions to address such an impasse.

B. An Independent Organization to Implement the Waste Management Program

Under the current NWPA, the DOE, the EPA, and the NRC all have statutorily defined roles in developing a permanent repository for nuclear waste, with the DOE responsible for investigating and developing a suitable site for a permanent repository.¹⁸⁹ However, as a cabinet-level agency, the DOE is dependent upon congressional appropriations and its top officials change with every administration.¹⁹⁰ One of the BRC's central recommendations is therefore to develop a new, independent, and more stable agency to take over the waste management program.¹⁹¹ According to the BRC, a federally chartered corporation would address these issues because its sole focus would be on developing storage options, it would offer long-term stability and program-level continuity, it would have more control over its finances (as a federal corporation), and it would promote a new culture of transparency and trust with host communities.¹⁹² The BRC saw great benefit in the continuity in management and strategy that a corporation could provide but that would be harder to achieve with an entity with a chief management that will change on a four- to eight-year political cycle.

Attempts to create an independent U.S. agency to manage nuclear waste disposal are not new. Both the 110th and 111th sessions of Congress introduced legislation that "would have amended the Atomic Energy Act to create a new federal corporation (called the 'United States Nuclear Fuel Management Corporation') that would 'assume responsibility for the activities, obligations, and use of resources of the federal government with respect to SNF management.'"¹⁹³ The BRC supports this approach, suggesting that the a federal

187. JOHN WERNER, CONG. RESEARCH SERV., R42513, U.S. SPENT NUCLEAR FUEL STORAGE 5 (2012).

188. Ryan, *supra* note 157.

189. BRC FINAL REPORT, *supra* note 28, at x.

190. *Id.* at 61.

191. *Id.* at x, 61.

192. *Id.* at 61.

193. *Id.* at 61 n.160 (quoting United States Nuclear Fuel Management Corporation Establishment Act of 2010, H.R. 5979 and S. 3322, 111th Cong. § 2(a) (2010)).

corporation chartered by Congress would be the most promising model for the agency, given that the corporation would have a well-defined mission, access to funding, an ability to enter into contracts, and be subject to external oversight.¹⁹⁴

According to the BRC, a federal corporation is preferable over a new single-purpose agency because it would be more immune from the political process, would have more flexibility to respond to external changes, and would have a greater influence over its finances.¹⁹⁵ For example, an independent organization, particularly a publicly-held corporation, would have enhanced autonomy and offer a degree of insulation from day-to-day politics. Establishing a new organization would give Congress an opportunity to develop an entirely new approach that would build confidence and trust. As a single-purpose agency, the new organization could concentrate on nuclear waste disposal in a way that a large, multipurpose agency, such as the DOE, cannot.¹⁹⁶

However, such a new organization also faces pernicious challenges. For one, Congress would also have to enact new legislation or amend the NWPA to create the institutional form and mission of the new organization, and create adequate funding sources.¹⁹⁷ Moreover, the agency would not be completely immune to political pressure, because the board of directors would be appointed by the President and confirmed by the Senate.¹⁹⁸ Neither of these twin challenges of congressional action and pressure seem likely in the near term given the currently partisan and divided nature of politics in the United States.

C. *Funding the Waste Management Program*

The BRC's third central recommendation, and perhaps the least controversial, is that the newly established organization should have access to "the revenues generated by the nuclear waste fee and the balance in the [Nuclear Waste Fund (NWF)] . . . when needed and in the amounts needed to implement the program."¹⁹⁹

The NWPA created a Nuclear Waste Fund to ensure that the full costs of disposing of commercial nuclear waste would be paid by utilities, with no impact on taxpayers and the federal budget.²⁰⁰ Under the current NWPA system, nuclear utilities pay one mil (0.1 cents) per every kilowatt-hour produced since January 7, 1983.²⁰¹ In exchange, the DOE was to begin disposing of waste by January 31, 1998.²⁰² Recently, the fee has generated approximately \$750 million annually and "utility nuclear waste fees and interest totaled \$31.69 billion" as of January 31, 2010.²⁰³ Of this total, "\$7.41 billion ha[s] been [spent on] the waste

194. *Id.* at 61.

195. *Id.* at 61-62.

196. *Id.* at 62-63.

197. *Id.* at 65.

198. *Id.* at 63.

199. *Id.* at 70.

200. JOSEPH S. HEZIR, BUDGET AND FINANCIAL MANAGEMENT IMPROVEMENTS TO THE NUCLEAR WASTE FUND 9-10 (2011).

201. *Id.*

202. HOLT, CIVIL NUCLEAR WASTE DISPOSAL, *supra* note 35, at 5.

203. *Id.* at 18; BRC FINAL REPORT, *supra* note 28, at 75.

disposal program, leaving a current balance of \$24.276 billion.”²⁰⁴ The purpose of the NWF was to “provide an assured source of funds to carry out the programs and . . . eliminate . . . annual budgetary perturbations.”²⁰⁵ Consequently, the NWF was designed to allow the DOE to access a fund independent of the constraints inherent in the annual federal budget process.²⁰⁶

The BRC recommended that the administration modify the nuclear waste fee collection process so that utilities pay “only an amount equal to actual appropriations from the NWF . . . each year, with the remainder retained by the utilities in [an] approved trust fund[] to be available” for future expenditures.²⁰⁷ This would address the criticism that nuclear waste fees are “being used to reduce the federal budget deficit,” instead of being utilized for waste disposal, and “stop the flow of waste fees into an inaccessible account in the U.S. Treasury.”²⁰⁸ Additionally, the BRC recommends that the fee receipts be reclassified as “discretionary” so they can be used by appropriators to fund the waste program without reducing funds for other discretionary programs.²⁰⁹ This would also allow waste fee receipts to directly offset appropriations for the waste program.²¹⁰ Furthermore, the BRC recommends that legislation should be adopted that would grant the new independent organization access “to the unspent balance in the [NWF].”²¹¹ This would provide much needed flexibility and further insulate the NWF expenditures from the budget process.

V. WHAT NOW? EXPLORING FIVE ALTERNATIVES

What happens, however, if the BRC’s recommendations are not acted upon? The Obama Administration’s decision “to withdraw the Yucca Mountain license” and curtail funding for the project strongly jeopardizes its future.²¹² The NWSA provides that the DOE may only select Yucca Mountain as a repository site and that a federal interim storage facility cannot be opened before the repository is licensed.²¹³ Thus, without congressional action, the only alternatives to Yucca Mountain are (1) indefinite on-site storage, (2) federal or private interim storage, (3) reprocessing, (4) non-repository options, and (5) building a new repository. This section briefly discusses the pros and cons of each option.

A. *The Default Option: Extended On-Site Storage*

If no legislative changes are made, and Yucca Mountain remains closed, the default option is extended on-site storage for spent nuclear fuel. To be fair, there

204. HOLT, CIVIL NUCLEAR WASTE DISPOSAL, *supra* note 35, at 18.

205. BRC FINAL REPORT, *supra* note 28, at 71 (quoting 128 CONG. REC. 32557 (1982) (statement of Sen. James McClure)).

206. *Id.*

207. *Id.* at 75.

208. *Id.* at 76.

209. *Id.* at 77.

210. *Id.*

211. *Id.* at 78.

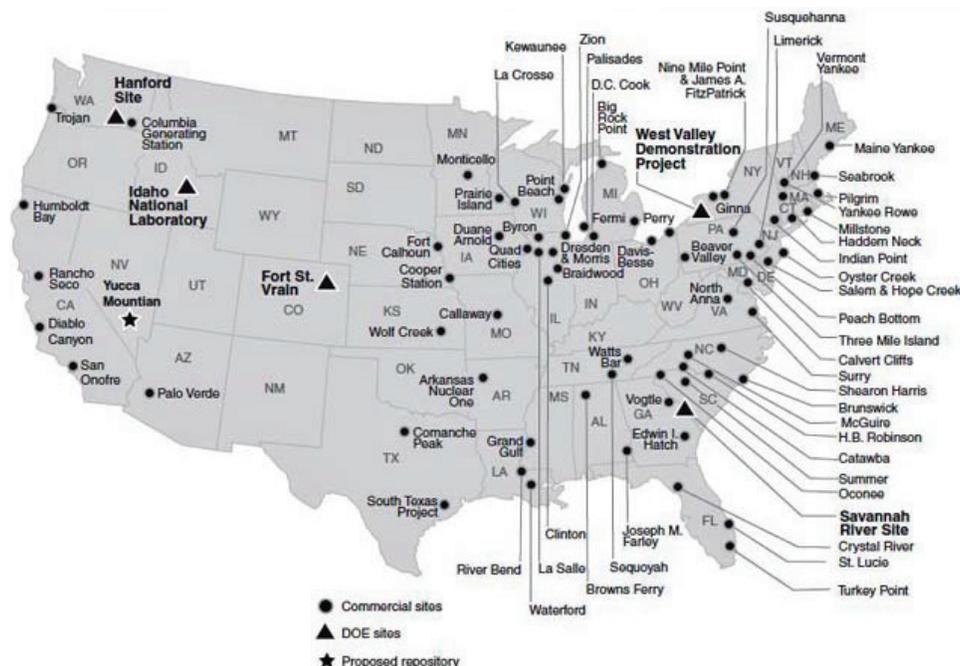
212. *Id.* at 24.

213. *Id.* at 22.

are a few benefits to this option. First, maintaining on-site storage requires minimal effort, because no legislative changes are required.²¹⁴ Second, transportation risks are reduced, because the spent fuel would only have to be transported once, to a final geological repository, instead of twice if moved to a centralized interim facility, and because the fuel will be cooler having been located in a storage pool for some time.²¹⁵ Third, current storage technologies are considered by some to be safe as long as they are adequately guarded and maintained.²¹⁶ Finally, extended on-site storage provides needed flexibility while the federal government continues to assess options for a comprehensive waste management system.²¹⁷ Thus, extended on-site storage is apparently beneficial given its simplicity, proven track record, and flexibility in allowing the federal government to develop better alternatives.

However, the costs of extended on-site storage far outweigh any benefits given issues of storage capacity, liability, and safety. As discussed in Part II, the amount of spent fuel stored on-site is rising rapidly and presents several capacity and safety issues. “Spent nuclear fuel is currently stored at [seventy-seven] different sites in the United States.”²¹⁸ This total includes sixty-three licensed operating commercial nuclear power reactors, four DOE-operated sites, nine decommissioned reactors, and a proposed reprocessing plant in Illinois.²¹⁹ Most of the country’s spent nuclear fuel (nearly 84%) is located in the Midwest and along the East Coast (see Figure 1).²²⁰ A large commercial reactor generates “an average of 20-30 metric tons of spent fuel a year—an average of about 2,150 metric tons annually for the entire U.S. nuclear fleet.”²²¹ The total amount of commercial spent fuel was 67,450 metric tons in May 2012.²²² If you include the 2,458 metric tons of DOE spent fuel and high-level waste that is also destined for Yucca Mountain, the total amount of waste requiring storage already exceeds the NWP’s 70,000 metric-ton limit for the repository.²²³ According to the BRC, this amount could increase to between 150,000 to over 200,000 metric tons by mid-century.²²⁴

Figure 1: Nuclear Waste Storage Facilities in the United States²²⁵



The lack of a geologic repository requires nuclear plant operators to expand storage pools and to pack spent nuclear fuel more densely within them, raising concerns about safety in the event of a Fukushima-like accident, fire, or explosion.²²⁶ One GAO study found that twenty-eight “reactor sites could have to add dry cask storage facilities over the next [decade] to maintain a desired capacity in their storage pools.”²²⁷ In addition, extended on-site storage exposes the federal government to significant and growing liability to pay claims resulting from the DOE’s failure to begin accepting waste from commercial utilities under the NWPA and Standard Contract.²²⁸ The U.S. government has paid close to \$1 billion to settle a series of claims by utilities that the DOE had breached its contracts to accept SNF.²²⁹ The federal government has been paying these claims for SNF storage since 2000.²³⁰ “Through January 2011, the Department of Justice . . . negotiated [twelve] settlements [from] the [seventy-four] lawsuits filed against DOE for missing the waste disposal deadline.”²³¹ The payments are made from the U.S. Treasury’s Judgment Fund, a permanent account used to cover damage claims against the U.S. government.²³² As of July 2012, the Congressional Budget Office found that the federal government’s current liability for settlements, final judgments, and entered judgments under appeal stand at \$1.8 billion.²³³ The DOE’s own estimates project that its potential liabilities for waste program delays would total \$20.8 billion if disposal began by 2020, which appears unlikely.²³⁴

In addition to cost, there are also serious safety and environmental concerns regarding extended on-site storage. Various external threats could result in containment being breached, resulting in potential exposures and risks. For example, the National Academy of Sciences (NAS) determined that a terrorist attack or aircraft crash could drain a storage pool and cause the spent fuel inside to overheat and catch fire.²³⁵ Furthermore, disasters similar to “Fukushima . . . demonstrate[] that spent fuel pools could be vulnerable to accidental damage resulting from the loss of cooling systems.”²³⁶ Over packed storage pools could

226. *Id.* at 30.

227. *Id.*

228. *Id.*

229. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-11-731T, NUCLEAR WASTE DISPOSAL: CHALLENGES AND LESSONS LEARNED FROM YUCCA MOUNTAIN 10 (2011) [hereinafter GAO-11-731T].

230. *Maine Yankee Atomic Power Co. v. United States*, 225 F.3d 1336, 1343 (Fed. Cir. 2000); *Pac. Gas & Elec. Co. v. United States*, 536 F.3d 1282, 1284, 1287 (Fed. Cir. 2008).

231. HOLT, CIVILIAN NUCLEAR WASTE DISPOSAL, *supra* note 35, at 5.

232. GAO-10-48, *supra* note 86, at 21.

233. *The Fed. Gov’t’s Responsibilities and Liabilities Under the Nuclear Waste Policy Act: Hearing Before the H. Comm. On the Budget*, 111th Cong. 5 (2010) (statement of Kim Cawley, Chief, Natural and Physical Resources Costs Estimates Unit, Congressional Budget Office), available at http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/117xx/doc11728/07-27-nuclearwaste_testimony.pdf.

234. HOLT, NUCLEAR ENERGY POLICY, *supra* note 3, at 34.

235. NATIONAL ACADEMY OF SCIENCES, BOARD ON RADIOACTIVE WASTE MANAGEMENT, SAFETY AND SECURITY OF COMMERCIAL SPENT NUCLEAR FUEL STORAGE: PUBLIC REPORT 6 (2005).

236. HOLT, CIVILIAN NUCLEAR WASTE DISPOSAL, *supra* note 35, at 13.

also catch fire.²³⁷ Finally, the “NRC has identified releases of tritium-contaminated water to groundwater at [thirty-eight] sites, and determined that, in some cases, SNF storage pools had contributed to groundwater contamination.”²³⁸

Lastly, a recent D.C. Circuit Court of Appeals decision places more pressure on the federal government to locate a permanent repository. In *New York v. NRC*, the D.C. Circuit Court of Appeals vacated a 2010 update to the NRC’s Waste Confidence Decision (WCD).²³⁹ The original WCD, published in 1984, declared a geological repository as a safe storage option that would ostensibly be available by 2007 or 2009.²⁴⁰ The original WCD further determined that SNF can be stored safely at nuclear plants for at least thirty years beyond the licensed life of each reactor.²⁴¹ The NRC made several revisions to the WCD in 2010, however. First, the updated WCD stated that a suitable repository would be available “when necessary,” rather than providing a specific timeframe.²⁴² Second, the updated WCD noted that SNF may be stored safely on-site for “at least [sixty] years beyond the licensed life . . . of the reactor.”²⁴³ Based on the updated WCD, the NRC released a new Temporary Storage Rule (TSR) enacting the WCD’s conclusions and updating various regulations.²⁴⁴

Petitioners challenged the TSR, arguing in part that the TSR was a “major federal action,”²⁴⁵ and that the NRC violated the National Environmental Policy Act (NEPA) by failing to prepare either a finding of no significant impact (FONSI) or an environmental impact statement (EIS) for the TSR.²⁴⁶ The petitioners further argued that the NRC’s WCD violated NEPA in two ways.²⁴⁷ For one, they claimed that the NRC failed to “account for the significant societal and political barriers that may delay or prevent the opening of a repository.”²⁴⁸ Secondly, they posited that the NRC’s conclusion stating a “repository will be available when necessary” was undefined and “does not address the effects of a failure to establish a repository in time.”²⁴⁹ In response, the NRC argued that (1) their conclusion stating “institutional obstacles will not prevent a repository from

237. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-12-797, ACCUMULATION OF SPENT NUCLEAR FUEL 28-29 (2012) [hereinafter GAO-12-797].

238. WERNER, *supra* note 187, at 34 (citations omitted).

239. *New York v. Nuclear Regulatory Comm’n*, 681 F.3d 471, 483 (D.C. Cir. 2012).

240. Final Waste Confidence Decision, 49 Fed. Reg. 34,658, 34,659-60 (Aug. 31, 1984) (codified at 10 C.F.R. pts. 50 and 51).

241. *Id.* at 34,660.

242. Waste Confidence Decision Update, 75 Fed. Reg. 81,037, 81,067 (Dec. 23, 2010) (codified at 10 C.F.R. pt. 51).

243. *Id.* at 81,074 (emphasis added).

244. Final Rulemaking, Consideration of Environmental Impacts of Temporary Storage of Spent Fuel after Cessation of Reactor Operation, 75 Fed. Reg. 81,032, 81,032-33 (Dec. 23, 2010) (codified at 10 C.F.R. § 51.23(a)).

245. 40 C.F.R. § 1508.18 (2012).

246. *New York v. Nuclear Regulatory Comm’n*, 681 F.3d 471, 476 (D.C. Cir. 2012); 42 U.S.C. § 4332(2)(C) (2012).

247. *New York*, 681 F.3d at 477.

248. *Id.*

249. *Id.*

being built” creates substantial room for deference, (2) selecting a “precise date for [locating a repository] is not required by NEPA or any other laws,” and (3) the WCD serves as an environmental assessment (EA) and thus already properly considers all necessary environmental impacts.²⁵⁰

Siding with the petitioners, the court found that the WCD rulemaking was a major federal action requiring either a FONSI or EIS.²⁵¹ Therefore, the court found the WCD to be “defective.”²⁵² The court also concluded that even if the WCD were to be considered an EA, it would be insufficient because merely concluding that a “reasonable assurance exists” that a repository will be available does not properly examine the environmental consequences of failing to establish a repository.²⁵³ The court provided that “[t]he Commission apparently has no long-term plan other than hoping for a geologic repository. If the government continues to fail in its quest to establish one, then [spent nuclear fuel] will seemingly be stored on site at nuclear plants on a permanent basis.”²⁵⁴ The court held that the NRC must consider the impacts of this reality before making licensing decisions.²⁵⁵ As a result, the court vacated the WCD and TSR, requiring the agency to perform a NEPA analysis concerning spent fuel storage and disposal prior to relicensing or licensing a nuclear power generation station.²⁵⁶

The D.C. Circuit’s opinion is already making waves. In response to the decision, the NRC decided to postpone issuing “at least nineteen final reactor licenses” and stated that no new licenses would be issued “until [the agency] addressed the issues raised by the D.C. Circuit.”²⁵⁷ New filings with the NRC in January 2013 also argued that “the NRC has ‘no choice but to continue to suspend all licensing and re-licensing actions.’”²⁵⁸ Thus, the full impact of the D.C. Circuit’s decision remains unclear. However, the decision sends a clear signal that the federal government cannot continue to issue licenses for reactors without addressing the long-term problem of nuclear waste disposal.

250. *Id.* at 478.

251. *Id.* at 476-77 (the court found “that NEPA requires that ‘environmental issues be considered at every important stage in the decision making process concerning a particular action,’” and that the WCD constituted such an “important stage,” because future licensing decisions would be based on its findings (quoting Calvert Cliffs’ Coordinating Comm., Inc. v. U.S. Atomic Energy Comm’n, 449 F.2d 1109, 1118 (D.C. Cir. 1971)).

252. *Id.* at 478.

253. *Id.* at 478-79.

254. *Id.* at 479.

255. *Id.* The court also found that in determining SNF can be safely stored on site for sixty years after the reactor’s license expires, the NRC failed to properly examine the future risk and consequences of storage pool leaks and fires. *Id.*

256. *Id.* at 483.

257. Maryam K. Ansari, *NRC Stops Issuing Nuclear Reactor Licenses . . . For Now*, FINDLAW (Aug. 10, 2012, 9:03 AM), http://blogs.findlaw.com/dc_circuit/2012/08/nrc-stops-issuing-nuclear-reactor-licenses-for-now.html?DCMP=NWL-cons_greenpage.

258. Ailis Aaron Wolf, *24 Groups: NRC Rushing Nuclear “Waste Confidence” Process, Not Satisfying Court-Ordered Requirements*, RIVERKEEPER.ORG (Jan. 3, 2013), <http://www.riverkeeper.org/news-events/news/stop-polluters/power-plant-cases/indian-point/24-groups-nrc-rushing-nuclear-%E2%80%9Cwaste-confidence%E2%80%9D-process-not-satisfying-court-ordered-requirements/> (quoting filings with the NRC by twenty-four various environmental interest groups).

B. Federal or Private Central Interim Facilities

Supporters of interim storage facilities, designed to last forty to sixty years utilizing dry cask technology,²⁵⁹ state that they are “safer and less expensive” than on-site storage, and would allow the DOE to meet its long-overdue obligations to begin accepting fuel under the standard contracts it signed with nuclear facilities.²⁶⁰ If a centralized storage facility were built, the DOE estimates that it could reduce its liabilities to nuclear utilities by “\$500 million per year after 2020.”²⁶¹ Interim storage was also one of the BRC’s recommendations.²⁶² Furthermore, spent nuclear fuel would be consolidated, decreasing the complexity of securing and overseeing waste and increasing the efficiency of waste storage operations.²⁶³ Centralized interim storage could also allow the DOE to remove waste from DOE managed facilities and the nine decommissioned reactor sites, allowing them to close.²⁶⁴ Continued storage at these sites costs power companies between \$4 million and \$8 million annually.²⁶⁵ Moreover, centralized storage could provide a secure location away from population centers and water supplies.²⁶⁶

In contrast, opponents state that the option is not feasible or worth pursuing because any interim facility “will likely face intense state or local opposition, [especially] if there is no final [repository located] or other benefits” provided.²⁶⁷ Affected states and communities would also raise concerns about safety and security, meaning that development would take a considerable amount of time and be very expensive. According to the GAO, “a federal centralized storage option with two locations . . . would take about [nineteen] years to implement and would cost from \$23 billion to \$81 billion.”²⁶⁸ Centralized storage does not ultimately solve the nuclear waste issue because it only provides an interim alternative and does not eliminate the need for a final repository.²⁶⁹ Furthermore, centralized storage requires nuclear waste “to be transported twice—once to the centralized site and once to [the] repository—if a centralized site were not colocated with a repository.”²⁷⁰

Another challenge confronting centralized storage is that the DOE currently lacks the authority under the NWPA to provide it.²⁷¹ The NWPA provisions

259. *Spent Fuel Storage in Pools and Dry Casks: Key Points and Questions and Answers*, U.S. NRC, <http://www.nrc.gov/waste/spent-fuel-storage/faqs.html> (last visited January 26, 2013).

260. MARK HOLT, CONG. RESEARCH SERV., 96-212 ENR, CIVILIAN NUCLEAR SPENT FUEL TEMPORARY STORAGE OPTIONS 2 (1998).

261. GAO-10-48, *supra* note 86, at 30.

262. BRC FINAL REPORT, *supra* note 28, at viii.

263. GAO-11-731T, *supra* note 229, at 11.

264. GAO-10-48, *supra* note 86, at 29.

265. *Id.* at 30.

266. *Id.*

267. GAO-11-731T, *supra* note 229, at 12.

268. *Id.*

269. *Id.*

270. GAO-10-48, *supra* note 86, at 32-33.

271. U.S. DEP’T OF ENERGY, DOE/RW-0596, REPORT TO CONGRESS ON THE DEMONSTRATION OF THE INTERIM STORAGE OF SPENT NUCLEAR FUEL FROM DECOMMISSIONED NUCLEAR POWER REACTOR SITES iii

addressing central storage have either expired or are unavailable because they are contingent on the final repository being licensed.²⁷² The DOE has determined that it lacks the authority to develop an interim facility under current law other than the “monitored retrievable storage” (MRS) facility authorized by the NWPA.²⁷³ Section 141 of the NWPA also prohibits the DOE from developing an MRS facility until the NRC issues a license for Yucca Mountain.²⁷⁴ Therefore, in order for the DOE to begin working on a federal interim facility, Congress would need to pass legislation eliminating the limitations in the NWPA and establishing an expedited siting process and development process for the facility.²⁷⁵

Given the delays in determining whether an interim facility should be built, a number of private organizations have sought licenses for interim storage facilities under the Atomic Energy Act.²⁷⁶ However, these types of actions pose even more uncertainty. In 2006, “after a nine-year . . . process, the NRC issued a license for a private central storage facility” to a partnership between a utility consortium and the Skull Valley Band of the Goshute Indians.²⁷⁷ The partnership received a twenty-year license, “renewable for an additional [twenty] years,” for storing up to 44,000 tons of spent fuel “pending shipment by DOE to a permanent repository.”²⁷⁸ However, the Department of Interior issued two decisions against the storage project.²⁷⁹ “The Bureau of Indian Affairs disapproved a proposed lease of tribal trust lands” for the project, finding that “there was too much risk that the waste [would] remain at the site indefinitely.”²⁸⁰ The Bureau of Land Management also rejected a crucial rights-of-way authority to transport waste to the facility, finding the railroad line would be incompatible with preserving the local wilderness area and that existing roads were inadequate.²⁸¹ The utility consortium and the Skull Valley Band of Goshutes filed a lawsuit to overturn the Interior decisions on grounds that they were politically motivated.²⁸² In 2010, a federal district court judge ordered the Department of the Interior to reconsider its decisions to disapprove the permits.²⁸³ That said, the site is “strongly opposed by the state of Utah and a

(2008) [hereinafter DOE 2008 REPORT TO CONGRESS], *available at* <http://pbdupws.nrc.gov/docs/ML0834/ML083450160.pdf>.

272. *Id.* at 7-8 (citing Office of Civilian Radioactive Waste Management; Nuclear Waste Acceptance Issues, 60 Fed. Reg. 21,793 (May 3, 1995)).

273. *Id.* at 7.

274. *Id.*

275. *Id.* at 8.

276. MARK HOLT, CONG. RESEARCH SERV., R40202, NUCLEAR WASTE DISPOSAL: ALTERNATIVES TO YUCCA MOUNTAIN 15 (2009) [hereinafter HOLT, ALTERNATIVES TO YUCCA MOUNTAIN] (citing the Atomic Energy Act, 42 U.S.C. §§ 2011-2297h-13 (2012) (codified at 10 C.F.R. pt. 72)).

277. *Id.*

278. *Id.*

279. *Id.*

280. *Id.*

281. *Id.*

282. *Id.*; *see also* Judy Fahys, *Goshute Nuclear Storage Allies Sue Interior Department*, THE SALT LAKE TRIBUNE (July 18, 2007), http://www.sltrib.com/news/ci_6400527.

283. *Skull Valley Band of Goshute Indians v. Davis*, 728 F. Supp. 2d 1287 (D. Utah 2010).

majority of Utah citizens.”²⁸⁴ Thus, the future of this facility remains indeterminate.

C. Spent Fuel Reprocessing

Proponents of reprocessing argue that a “closed fuel cycle could reduce the volume and long-term radioactivity of nuclear waste and potentially postpone the need for permanent disposal.”²⁸⁵ Proponents also argue that reprocessing is simply more efficient, as reprocessing “sav[es] up to [30%] of the natural uranium otherwise required” and gains approximately 25% energy from the fuel source.²⁸⁶ Thus, reprocessing potentially increases energy security, helps conserve the world’s uranium supplies, and reduces the need for permanent storage.²⁸⁷

Some of these claims have merit and are proven with international experience. In France and the United Kingdom, where reprocessing continues,

spent uranium is [successfully] stored for hopeful use at a later date in fast breeder reactors, plutonium is recycled into mixed-oxide (MOX), and the remaining fissile waste is vitrified—chemically transformed into a glass to make the waste inert. This method of reprocessing, plutonium uranium extraction (PUREX), involves chemically separating uranium and plutonium. A significant fraction of these plutonium stockpiles is intended to be used for MOX fuel fabrication at two industrial scale facilities: Areva’s Melox plant in Marcoule, France and British Nuclear Group’s Sellafield MOX plant in the UK. These facilities blend uranium and plutonium powders at high temperatures to create MOX pellets that are then loaded into fuel assemblies.²⁸⁸

“Researchers have recently proposed a newer method of reprocessing called uranium extraction plus (UREX+), which keeps uranium and plutonium together in the fuel cycle to avoid separating out pure plutonium,” a technique that makes it, in theory, more proliferation resistant.²⁸⁹

However, reprocessing also comes with a litany of issues concerning safety and cost. First, reprocessing does not eliminate the disposal issue.²⁹⁰ Reprocessing still generates a significant volume of highly radioactive waste.²⁹¹ Furthermore, “spent fuel that has been reprocessed and used again has a higher heat content than spent fuel only used once.”²⁹² Since “the main factor that determines the overall storage capacity of a long-term repository is the heat content of the waste, not its volume,” reprocessing does not significantly reduce

284. BRC FINAL REPORT, *supra* note 28, at 24.

285. HOLT, ALTERNATIVES TO YUCCA MOUNTAIN, *supra* note 276, at 16.

286. *Processing of Used Nuclear Fuel*, WORLD NUCLEAR ASSOC., <http://www.world-nuclear.org/info/inf69.html> (last updated May 2012).

287. *Id.*

288. Sovacool & Cooper, *supra* note 31, at 33 (internal citations omitted).

289. *Id.* at 34.

290. GAO-10-48, *supra* note 86, at 11.

291. *Id.*

292. *Costs of Reprocessing Versus Directly Disposal of Spent Nuclear Fuel*, 110th Cong. 4 (2007) (statement of Peter R. Orszag, Director, Congressional Budget Office) [hereinafter Orszag Statement].

the size of a future repository.²⁹³ Also, reprocessed fuel is only used one more time before becoming “spent.”²⁹⁴ Thus, reprocessing still “generate[s] waste streams that require a permanent disposal solution.”²⁹⁵

Second, reprocessing is costly. According to a study conducted by the Boston Consulting Group, reprocessing is estimated to “cost \$585 per kilogram – or about 6[%] more than direct disposal.”²⁹⁶ Another study by Harvard University’s Kennedy School of Government estimates that, at a “price of \$1,000 per kilogram of heavy metal (kgHM) . . . , reprocessing and recycling plutonium in existing light-water reactors [would] be more expensive than direct disposal of spent fuel until the uranium price [exceeds] \$360 per kilogram”—a price unlikely to be reached in the foreseeable future.²⁹⁷ Furthermore, the Harvard Study concluded reprocessing and recycling would also increase the cost of nuclear electricity.²⁹⁸ Adding to the trouble, the Congressional Budget Office concluded that reprocessing would cost at least \$5 billion more than direct disposal over the life of a reprocessing plant, some 25% greater in cost than direct disposal.²⁹⁹ Even abroad, reprocessing is comparatively expensive. Researchers at the Commissariat à l’Energie Atomique in France looked at five Generation IV reactors and theoretical models of their associated fuel cycles from 2000 to 2150.³⁰⁰ They found that Generation IV reactors entailed much higher reprocessing and disposal costs compared to conventional recycling and fuel disposal and estimated that the Generation IV pathway would cost 30% to 45% more than business as usual.³⁰¹

Finally, reprocessing yields pure “plutonium in a form that poses risks for theft and proliferation.”³⁰² Spent fuel is highly radioactive, emitting lethal gamma radiation from fission byproducts³⁰³ and must be handled remotely, by machine, to avoid exposure.³⁰⁴ Plutonium only emits alpha particles that are only harmful if inhaled or ingested, and can be handled rather easily.³⁰⁵ Thus, reprocessing makes plutonium more readily useable for fabricating nuclear weapons.³⁰⁶

293. *Id.*

294. *Id.* at 1.

295. BRC FINAL REPORT, *supra* note 28, at xii.

296. Orszag Statement, *supra* note 292, at 1.

297. Matthew Bunn et al., Harvard University: Project on Managing the Atom, *The Economics of Reprocessing vs. Direct Disposal of Spent Nuclear Fuel* 87 (2003).

298. *Id.*

299. Orszag Statement, *supra* note 292, at 1.

300. Aude Le Dars & Christine Loaec, *Economic Comparison of LongTerm Nuclear Fuel Cycle Management Scenarios: The Influence of the Discount Rate*, 35 ENERGY POL’Y 2995 (2006).

301. *Id.* at 2999-3000.

302. Orszag Statement, *supra* note 292, at 4.

303. John Pike, *Plutonium Production*, FED’N OF AM. SCIENTISTS (June 20, 2000), <http://www.fas.org/nuke/intro/nuke/plutonium.htm>.

304. *Background on Radioactive Waste*, U.S. NUCLEAR REGULATORY COMM’N, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html> (last updated Feb. 4, 2011).

305. Pike, *supra* note 303.

306. *Nuclear Reprocessing: Dangerous, Dirty, and Expensive*, UNION OF CONCERNED SCIENTISTS (Apr. 5, 2011), http://www.ucsusa.org/nuclear_power/nuclear_power_risk/nuclear_proliferation_and_

D. Non-Repository Options

Given the difficulty in siting and establishing a permanent geologic repository for spent nuclear fuel, a variety of non-repository proposals have been studied.³⁰⁷ Section 222 of the NWPA gave the DOE the authority to research and investigate these alternative means for disposal, but most have failed to develop due to large technical obstacles, uncertain costs, environmental concerns, and public opposition.³⁰⁸

For instance, during the 1970s and 1980s, the DOE investigated sub-seabed disposal in stable clay sediments, and the 1987 amendments to the NWPA even established an Office of Subseabed Disposal Research within the agency.³⁰⁹ The office developed a research plan for identifying potential sites and developed some conceptual storage designs, but it was abolished in 1996.³¹⁰ International efforts to study sub-seabed disposal were also conducted through the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD).³¹¹ The NEA program studied the feasibility of placing “nuclear waste canisters in ocean sediments with gravity driven-penetrators or in drilled holes.”³¹² The NEA concluded that sub-seabed disposal would probably keep the maximum dose to humans “many orders of magnitude below present standards” and pose “insignificant risk to the deep sea environment.”³¹³ Despite the NEA’s optimistic review, sub-seabed disposal is currently prohibited under the 1972 London Dumping Convention, though the Convention has not been ratified by the United States Senate.³¹⁴

Another prominent non-repository alternative is the disposal of waste in outer space. Space disposal involves placing nuclear waste canisters into a space shuttle and launching that craft into space or at the sun.³¹⁵ This is a very costly approach given the small size of the shuttle, the amount of waste requiring disposal,³¹⁶ concerns about launch safety, the immense cost of a launch, and concern over reentry.³¹⁷ The Atomic Energy Commission, which studied the issue during the 1970s, concluded that space disposal “does not seem an attractive alternative to the geological development program.”³¹⁸

terrorism/nuclear-reprocessing.html.

307. HOLT, ALTERNATIVES TO YUCCA MOUNTAIN, *supra* note 276, at 18.

308. *Id.*; 42 U.S.C. § 10202 (2012).

309. HOLT, ALTERNATIVES TO YUCCA MOUNTAIN, *supra* note 276, at 18; 42 U.S.C. § 10204.

310. HOLT, ALTERNATIVES TO YUCCA MOUNTAIN, *supra* note 276, at 18.

311. *Id.*

312. *Id.*

313. *Id.* (quoting ORG. FOR ECON. COOPERATION AND DEV., NUCLEAR ENERGY AGENCY, FEASIBILITY OF DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE INTO THE SEABED, OVERVIEW OF RESEARCH AND CONCLUSIONS vol. 1, at 60 (1988)).

314. *Id.*

315. Subhan Ali, Nuclear Waste Disposal Methods (Mar. 9, 2011) (unpublished coursework, Stanford University), available at <http://large.stanford.edu/courses/2011/ph241/ali2/>.

316. *Id.*

317. HOLT, ALTERNATIVES TO YUCCA MOUNTAIN, *supra* note 276, at 18-19.

318. *Id.* (quoting ATOMIC ENERGY COMMISSION, WASH-1539, DRAFT ENVIRONMENTAL STATEMENT ON MANAGEMENT OF COMMERCIAL HIGH LEVEL AND TRANSURANIUM-CONTAMINATED RADIOACTIVE WASTE 5.3-6 (Sept. 1974)).

E. Erecting a New Repository

Despite the multiple problems with Yucca Mountain, the BRC concludes that deep geologic disposal will remain the cornerstone of any future nuclear waste management program.³¹⁹ In the report, the BRC found that “deep geological disposal is the most promising and accepted method currently available for safely isolating spent fuel and high-level radioactive wastes from the environment for very long periods of time.”³²⁰ Moreover, the NWPA currently requires the DOE to pursue geologic disposal.³²¹ Thus, pursuing a new repository would require fewer legislative changes to the current statutory structure.

Yet a new repository would face considerable hurdles before completion. For instance, the current amount of nuclear waste requiring disposal already exceeds Yucca Mountain’s current legislated capacity of 70,000 metric tons.³²² Therefore, more than one repository site will need to be identified, studied, approved, constructed, and operated to handle current waste projections, unless Congress amends the NWPA. Moreover, the project would be costly. According to the DOE, the estimated life-cycle cost of Yucca Mountain was “\$96.2 billion . . . to license, construct, operate, and close,” and that was only for the first few centuries of storage.³²³ So, a new site selection effort, without changes to the NWPA site selection process, would be slow-moving, costly, and extremely controversial.

VI. RECOMMENDATIONS AND CONCLUSION

First, abandoning the Yucca Mountain project would have negative and positive impacts in resolving the nuclear waste impasse in the United States. Proponents of Yucca Mountain are correct in arguing that terminating the project would further delay the federal government’s removal of nuclear waste “by at least twenty years and cost billions of dollars.”³²⁴ The DOE, before they took steps to dismiss the project, estimated that Yucca Mountain could have been open by 2020.³²⁵ Thus, continuing with the Yucca Mountain project would be potentially less costly than developing an entirely new repository and would allow the DOE to begin taking nuclear waste at a much earlier date.

However, this argument fails to consider some very real implications. The NWPA caps nuclear waste that can be disposed of at the Yucca Mountain repository at 70,000 metric tons until a second repository is available.³²⁶ The current stockpile of commercial and defense nuclear waste destined for Yucca Mountain already exceeds this cap, and the amount of waste continues to

319. BRC FINAL REPORT, *supra* note 28, at 27.

320. *Id.* at 29 (citing MASS. INST. OF TECH., THE FUTURE OF THE NUCLEAR FUEL CYCLE: AN INTERDISCIPLINARY MIT STUDY 59 (2011)).

321. *Id.* at 20-22.

322. WERNER, *supra* note 187, at 5.

323. BRC FINAL REPORT, *supra* note 28, at 31.

324. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-11-229, COMMERCIAL NUCLEAR WASTE: EFFECTS OF A TERMINATION OF THE YUCCA MOUNTAIN REPOSITORY AND LESSONS LEARNED 29 (2011).

325. *Id.* at 51.

326. WERNER, *supra* note 187, at 5.

increase.³²⁷ Congress must either expand the cap or begin to develop a second repository.³²⁸ This means that even if Yucca Mountain goes forward, the process would need to be repeated. Yucca Mountain has faced considerable opposition from the State of Nevada, so committing to that facility despite these objections will essentially send a signal to future host states that the federal government does not value the local communities' participation in the decision-making process. As a result, even if the Yucca Mountain project proceeds, the institutional distrust and opposition generated by such a decision would likely make siting a second repository even more difficult. The current Yucca Mountain project should therefore be set aside as an expensive learning tool, and a new approach should be developed to avoid future litigation and opposition.

Second, in addition to abandoning the Yucca Mountain project, simultaneously developing both centralized interim storage and permanent geologic disposal facilities should remain the primary focus of any new approach. Continued on-site storage is not an attractive option for several reasons. Spent nuclear pools and other storage facilities are becoming crowded, and they were not constructed with long term disposal in mind.³²⁹ Furthermore, the utilities and communities where these storage facilities are located never agreed for them to become *de facto* permanent storage sites. On-site storage results in rising federal and taxpayer liability and possibly hinders the development of new generation facilities.³³⁰ The decentralized nature of on-site storage makes security and safety more difficult to achieve. Nor is reprocessing a viable alternative, as it would reduce the overall volume of waste, but the heat content and hazardous nature of the waste would still require a large, permanent repository to be developed.³³¹ Furthermore, reprocessing facilities are costly and counter to current nonproliferation policy.

A new permanent repository would be expensive (the DOE estimated that Yucca Mountain would have cost almost \$100 billion),³³² but it offers several advantages over non-repository options. A geologic disposal facility would be designed to isolate nuclear waste long enough for the waste to degrade into a less harmful form to humans and the environment. These facilities, under current EPA standards, would be designed to handle waste up to one million years.³³³ Permanent storage would provide a consolidated approach to waste disposal, reducing monitoring and security costs. Permanent storage would also allow utilities to clear out spent nuclear fuel assemblies in densely packed spent fuel pools, potentially reducing the risk of fires, accidents, and attacks, and allowing nuclear utilities to continue generating electricity without constructing additional, costly storage facilities. A permanent repository would help the

327. See *supra* notes 22-27 and accompanying text.

328. WERNER, *supra* note 187, at 5.

329. GAO-12-797, *supra* note 237, at 13-14.

330. *Id.* at 46.

331. See *supra* notes 290-95 and accompanying text.

332. BRC FINAL REPORT, *supra* note 28, at 31.

333. Fact Sheet: Public Health and Environmental Standards for Yucca Mountain, Nevada (40 CFR Part 197), Final Rule, EPA (Aug. 30, 2012), <http://www.epa.gov/radiation/yucca/2008factsheet.html>.

federal government finally fulfill its obligation under the NWPA to utilities and ratepayers to take custody of commercial spent fuel.³³⁴

A long-term facility could potentially take up to forty years to complete,³³⁵ so Congress should consider concurrently adopting new procedures for centralized interim storage that can be located at or near the final repository site to reduce costs and transport. Centralized storage would allow the DOE or a new organization to begin taking waste from on-site storage facilities within the next thirty years.³³⁶ Furthermore, centralized storage would give the federal government or private organizations time to negotiate the details over a final repository.

Third, the BRC report highlights that the current approach to waste disposal has generated considerable public opposition that is “at the heart” of the waste disposal impasse.³³⁷ In response, the BRC recommends that a new adaptive, consent based approach be adopted.³³⁸ This recommendation is commendable, and policymakers should pursue it. Strong public opposition triggered Yucca Mountain’s eventual demise. Host states and communities should be involved at every step of the repository process and project approval should require their consent, because they will be storing this waste for millions of years. This is not a decision to be made lightly, and any new approach should entice communities to voluntarily step forward. This will require a delicate balance of transparency and should grant the host state and community some regulatory authority over the facility.

Furthermore, the federal government should offer the host state considerable incentives for hosting the repository. Section 171 of the NWPA currently provides annual payments to the host state for a permanent repository.³³⁹ The BRC considered these payments to be “inadequate” and proposed offering a substantially higher amount and providing for infrastructure investments and local hiring preferences to stimulate economic growth.³⁴⁰ The BRC also noted that set payments may not work and that more adaptive compensation frameworks could be developed between the host communities and federal waste management organization.³⁴¹ Overall, a combination of higher direct payments, tax incentives, and economic investments would hopefully locate a volunteer host community.

However, the BRC’s recommendation fails to address a contingency plan for a situation where either no willing state or host community comes forward or when the local community supports the project, but the state is opposed. This latter scenario has already been played out with the Skull Valley private storage project in Utah.³⁴² The leaders of the Skull Valley Goshute Indian Tribe

334. 42 U.S.C. § 10131 (2012).

335. GAO-12-797, *supra* note 237, at 23.

336. GAO-10-48, *supra* note 86, at 29.

337. BRC Final Report, *supra* note 28, at 48.

338. *Id.* at 52-59.

339. 42 U.S.C. § 10173a(a)(1).

340. BRC FINAL REPORT, *supra* note 28, at 59.

341. *Id.*

342. *See, e.g.*, HOLT, ALTERNATIVES TO YUCCA MOUNTAIN, *supra* note 276, at 15.

supported the development of a private storage facility on their land despite tension within the tribe itself.³⁴³ However, the Skull Valley Project faced considerable opposition from the state of Utah and lacked public support.³⁴⁴ While the BRC's recommendations recognize that "a new waste management organization must find ways to address state concerns while at the same time capitalizing on local support" for a nuclear waste storage facility,³⁴⁵ the BRC fails to provide any detailed solutions to address this problem.³⁴⁵ The BRC's recommendations assume that a mixture of cooperation and incentives will bring a volunteer party forward. Perhaps by providing more financial incentives, a seat at the table, decision-making authority, an ability to enter into legal agreements, and ultimately approval to local groups,³⁴⁶ more volunteer host communities may begin to emerge. States facing considerable budget issues may even see a repository as a source of income and jobs.³⁴⁷ However, an amended NWPA or new legislation must make this decision palpable and must not force a repository on any host state or community.

Fourth, it is obvious that Congress must either make major revisions to the NWPA or enact new legislation incorporating elements of the BRC's recommendations. As enacted, the NWPA is too rigid and anachronistic to continue serving as the current statutory structure for waste disposal. The first major problem with the NWPA is its top-down approach to siting. As discussed above, the top-down approach has generated considerable opposition and needs to be altered to provide a more adaptive, consent based approach that allows for more flexibility and an ability to respond to problems that arise during the development process.³⁴⁸ The second major problem with the NWPA is that many of its provisions are dated, impose capacity limits, and are contingent on milestones that are unlikely to occur.³⁴⁹ The NWPA still requires the DOE to pursue a geologic repository at Yucca Mountain, thus limiting the agency's ability to locate new facilities.³⁵⁰ The NWPA prohibits the DOE from providing centralized interim storage.³⁵¹ The provisions allowing the DOE to provide for temporary storage expired in 1990 and prevent the DOE from constructing such a facility until the NRC grants a license for a permanent nuclear waste repository.³⁵² This designation limits the DOE and other agencies from locating and developing new facilities while the Yucca Mountain license languishes at the NRC. Legislation would also be required to allow for the creation of a new, independent organization and address issues with the NWF.

Fifth, Congress should consider explicitly prohibiting the relicensing or licensing of reactors without definite plans for waste disposal in place, or at least

343. BRC FINAL REPORT, *supra* note 28, at 24.

344. *Id.*

345. *Id.* at 56.

346. *Id.* at 56-59.

347. *Id.* at 59.

348. *Id.* at 23.

349. *Id.*

350. HOLT, ALTERNATIVES TO YUCCA MOUNTAIN, *supra* note 276, at 1.

351. BRC FINAL REPORT, *supra* note 28, at 22.

352. DOE 2008 REPORT TO CONGRESS, *supra* note 271, at 7.

until the federal government has made meaningful progress on the waste impasse. Such a moratorium would prevent waste from continuing to build up in the United States and possibly force utilities to rethink their approach to the waste disposal issue, perhaps encouraging more private sector participation. A moratorium has the benefit of encouraging states relying on nuclear power to seek a cooperative solution to the disposal problem, though it also comes with risks such as greater amounts of air pollution and possibly higher electricity tariffs if those states choose to forego nuclear units entirely in favor of building new coal- and gas-fired ones. Despite this risk, it does strike us as unwise to continue expanding the United States nuclear fleet without adequately addressing the environmental impact of nuclear waste disposal. The D.C Circuit decision in *New York v. NRC* forces the NRC to begin considering this failure when granting new licenses or relicensing,³⁵³ and several states have passed laws that put a moratorium on new nuclear plant construction until certain waste management conditions have been met.³⁵⁴ These efforts should be supplemented with Congressional action at the federal level.

As a sign that Congress recognizes some of our first five conclusions, Senator Jeff Bingaman introduced legislation that would implement a few of the BRC's recommendations in August 2012.³⁵⁵ The purpose of S. 3469, or the Nuclear Waste Administration Act of 2012, would be "to establish a new nuclear waste management organization," institutionalize a new "consensual process for the siting of nuclear waste facilities," and provide for new interim centralized storage facilities and a permanent waste repository.³⁵⁶ The bill also removes some impediments caused by the NWPA, allowing the simultaneous development of centralized interim storage and a permanent repository,³⁵⁷ giving preference to sites suitable for "co-location" of an interim storage facility and repository,³⁵⁸ and repealing the 70,000 metric ton volume restriction.³⁵⁹

However, the bill does not address the problem that would arise if local and state government officials disagree on whether to site a facility within their borders. Also, the Bingaman legislation would allow a small pilot storage facility to go forward, but then bars any further storage sites until the Senate has ratified an agreement for a disposal site.³⁶⁰ More fundamentally, in promoting a federal agency as the structure for the new waste organization, and putting the Congress in the middle of the process through ratification of disposal sites, the Bingaman legislation misses a fundamental thrust of the BRC to try to get Congressional politics out of the process. Furthermore, the bill faces difficult challenges before passage. Some House Republicans continue to support the

353. *New York v. Nuclear Regulatory Comm'n*, 681 F.3d 471 (D.C. Cir. 2012).

354. *E.g.*, CAL. PUB. RES. CODE § 25524.2 (West 2012); WIS. STAT. ANN. § 196.493(2)(a) (West 2012); MASS. GEN. LAWS ANN. ch. 164 App. § 3-3 (West 2012).

355. *Coming to Grips with Nuclear Waste*, U.S. SENATE COMM. ON ENERGY AND NATURAL RES. (Aug. 1, 2012), <http://www.energy.senate.gov/public/index.cfm/democratic-news?ID=489fb7dd-03ef-4044-b1cb-0c93c09899e6>.

356. S. 3469, 112th Cong. § 102 (2012).

357. *Id.* § 201(4).

358. *Id.* § 304(d)(2).

359. *Id.* § 509.

360. *Id.* § 306.

Yucca Mountain project by providing \$25 million to the NRC to complete the licensing process,³⁶¹ and have introduced resolutions expressing support for Yucca Mountain to remain the “nation’s primary permanent nuclear waste storage site.”³⁶² Thus, it appears that the House does not favor abandoning the Yucca Mountain project (though, ostensibly, such moves could be more about attacking Obama and Reid than making meaningful progress on Yucca Mountain).

In conclusion, the situation with Yucca Mountain implies that the Obama Administration has developed a contradictory nuclear energy policy. On the one hand, the Obama Administration has stood firm behind expanding the nuclear power industry in the United States. Obama’s energy plan includes providing financial incentives for nuclear power,³⁶³ incorporating nuclear power into a Clean Energy Standard,³⁶⁴ and continuing with research and development.³⁶⁵ Federal support has arguably prompted several utilities to reconsider pursuing nuclear units and power plants.³⁶⁶ Early this year, the NRC issued a license to build and operate two new reactors in Georgia.³⁶⁷ While the *New York v. NRC* D.C. Circuit decision may impede new licenses from being issued, nuclear power is once again becoming a popular generation option.

However, the Obama Administration has also taken considerable steps against, and may have ultimately terminated, the only current and viable option for nuclear waste disposal: Yucca Mountain.³⁶⁸ This decision by the Obama Administration may have set the entire waste disposal project back up to thirty to forty years and will cost billions of additional dollars. The Obama Administration did establish the BRC to identify a new approach for our congressional leaders, but the BRC’s recommendations set out a very long, slow siting process that will require major amendments to the NWPA.

In short, addressing the nuclear waste impasse in the United States is full of complexity, uncertainty, and tension. Yet one thing is certain: if nuclear power is to really continue to play a consequential role in the United States’ energy portfolio, a more serious approach is needed to match the severity of the country’s nuclear waste problem.

361. H.R. 5325, 112th Cong. (2012).

362. H. Res. 1123, 111th Cong. (2010).

363. EXEC. OFFICE OF THE PRESIDENT, *supra* note 13, at 34.

364. *Id.* at 32.

365. *Id.* at 36.

366. HOLT, NUCLEAR ENERGY POLICY, *supra* note 3, at 2.

367. Matthew L. Wald, *Federal Regulators Approve Two Nuclear Reactors in Georgia*, N.Y. TIMES (Feb. 9, 2012), http://www.nytimes.com/2012/02/10/business/energy-environment/2-new-reactors-approved-in-georgia.html?_r=0.

368. *See supra* text accompanying notes 135-37.