GLOBAL NUCLEAR ENERGY PARTNERSHIP: YUCCA MOUNTAIN'S SAVIOR OR SAVANNAH RIVER'S FOE?

W. CHRIS SWETT

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Abstract

The United States Department of Energy (DOE) touts the Global Nuclear Energy Partnership (GNEP) as an environmentally friendly approach to provide virtually limitless energy to emerging economies around the world while reducing the risk of nuclear proliferation. DOE plans to reduce the amount of high-level radioactive waste for disposal in a national repository and reduce nuclear proliferation risks by recycling and converting fissionable materials into safer isotopes. To accomplish these goals, DOE intends to build a spent nuclear fuel processing plant composed of various GNEP facilities. Many proponents of GNEP support siting the GNEP facilities at the Savannah River Site in South Carolina so that the high-level radioactive waste that results from processing spent fuel at these facilities can be permanently disposed of through shallow land burial in an effort to reduce the burden on the proposed national repository. However, without Yucca Mountain operational, GNEP will do little to resolve the nation's radioactive waste crisis. In addition, the Savannah River Site is not a viable location to host GNEP facilities. GNEP facilities will not only exacerbate the Savannah River Site's overabundance of radioactive waste, but the disposal of the additional waste that results from processing spent fuel at these facilities will produce serious long-term health and environmental consequences for the citizens South Carolina and Georgia.

I. INTRODUCTION

A: Global Nuclear Energy Partnership

In February 2006, United States Energy Secretary Samuel W. Bodman announced that the United States intends to follow-through with President George W. Bush's Advanced Energy Initiative, which he first introduced during the 2006 State of the Union Address,[1] by creating the Global Nuclear Energy Partnership (GNEP).[2] GNEP has four main goals: (1) Reduce United States dependence on foreign fossil fuels, (2) Recycle spent fuel to recover more energy while reducing waste, (3) Encourage economic growth and clean development globally, and (4) "[U]tilize the latest technologies to reduce the risk of nuclear proliferation worldwide."[3] As such, GNEP attempts to revive the processing of spent nuclear fuel in the United States and create a "fuel services program" that would allow developing nations to acquire and use nuclear energy economically while minimizing the risk of nuclear proliferation.[4] To achieve these goals, the United States Department of Energy (DOE) proposes to "design, build, and operate three facilities: an advanced fuel cycle research facility, a nuclear fuel recycling center; and an advanced recycling reactor which would destroy long-lived radioactive elements in the new fuel while generating electricity."[5]

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[1] President George W. Bush, Address before a Joint Session of the Congress on the State of the Union, 42 Weekly Comp. Pres. Doc. 145, 150 (Jan. 31, 2006).
[2] *See* Press Release, Global Nuclear Energy Partnership, Department of Energy Announces New Nuclear Initiative (Feb. 6, 2006), *available at* http://www.gnep.energy.gov/gnepPRs/gnepPR020606.html.
[3] *Id.*
[4] *Id.*
[5] Press Release, Department of Energy, Savannah River Operations Office, DOE Seeks Public Input on Scope of Environmental Review for the Global Nuclear Energy Partnership (Feb. 13, 2007), *available at* http://www.srs.gov/sro/nr_2007/sr0701.htm.

The advanced fuel cycle research facility "would perform research and development into spent nuclear fuel recycling processes and other advanced nuclear fuel cycles."[6] Furthermore, the nuclear fuel recycling center "would separate spent nuclear fuel into reusable and waste components and then manufacture new nuclear fast reactor fuel using reusable components."[7] This recycling center would be designed to "incorporate the advanced separations and fuel fabrication modules, with construction scale paced by success in the R&D validating these modules and the prospect for use of separated product as fuel in fast reactors."[8] DOE asserts that once this recycling center is approved to accept spent fuel, commercial utilities could begin shipping spent fuel to this facility, and the site hosting the facility would be charged with managing the high-level radioactive waste that results from processing the spent nuclear fuel.[9] Finally, the advanced recycling reactor would economically produce electricity using the recycling center's fast reactor fuel, while destroying long-lived radioactive elements in the new fuel.[10]

DOE touts GNEP as a program capable of bringing about "the expansion of world-wide nuclear energy."[11] In addition, DOE plans to reduce the amount of high-level radioactive waste for disposal in a national repository and reduce nuclear proliferation risks by converting fissionable materials into safer isotopes.[12] To accomplish these goals, DOE intends to build a

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[6] Press Release, Department of Energy, Office of Nuclear Energy, Department of Energy Releases the Notice of Intent for the GNEP Environmental Impact Statement (Jan. 4, 2007), *available at* http://www.ne.doe.gov/newsroom/2007PRs/nePR010407.html.
[7] *Id.*
[8] U.S. DEP'T OF ENERGY, OFFICE OF NUCLEAR ENERGY, OFFICE OF FUEL CYCLE MANAGEMENT, GNEP-167312, GLOBAL NUCLEAR ENERGY PARTNERSHIP STRATEGIC PLAN 9-10 (2007), *available at* http://www.fas.org/programs/ssp/_docs/GNEPStratPlanJan07.pdf.
[9] *See id.*
[10] *Id.*
[11] INSTITUTE FOR POLICY STUDIES, RADIOACTIVE WASTES AND THE GLOBAL NUCLEAR ENERGY PARTNERSHIP 3 (2007), *available at* http://www.ips-dc.org/reports/070423-radioactivewastes.pdf.
[12] *Id* at 2.

spent nuclear fuel processing plant composed of various GNEP facilities.[13] However, GNEP will do little to reduce the proposed national repository's radioactive waste burden. In fact, depending on the location at which DOE decides to place the GNEP facilities, GNEP could potentially exacerbate a site's overabundance of radioactive waste and create far worse long-term health and environmental problems.

This paper will briefly discuss the site selection process for potential locations to host GNEP facilities and explain why many GNEP proponents consider the Savannah River Site in South Carolina a prime candidate for one or more of these facilities. Moreover, this paper will present an overview of the Savannah River Site's accumulation of high-level radioactive waste and the laws that govern DOE's management and disposal of this waste. In addition, this paper will address the special treatment afforded to DOE's disposal of high-level radioactive waste at the Savannah River Site, which is one of the primary factors driving the movement to locate GNEP facilities there. Finally, this paper will discuss why the Savannah River Site is not a viable location to host GNEP facilities.

B: Site Selection

In August 2006, DOE announced that it would accept applications from eligible entities interested in hosting GNEP's nuclear fuel recycling center, advanced recycling reactor, or both facilities.[14] DOE solicited applications from public and commercial groups seeking financial assistance awards to conduct detailed site characterization studies at potential host sites.[15] In the grant application, candidate sites had to demonstrate that minimal criteria such as size,

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[13] *See supra* note 5.
[14] THE CENTRAL SAVANNAH RIVER AREA COMMUNITY TEAM, DE-FG07-07ID14794, GLOBAL NUCLEAR ENERGY PARTNERSHIP SITING STUDY FINAL REPORT, ENERGY PARK ON THE SAVANNAH RIVER SITE 4 (2007), *available at* http://www.gnep.energy.gov/pdfs/SRS_GNEP_Compiled_Report_FINAL-ESC%20rev1.pdf
[15] *See* DOE - Office of Nuclear Energy, GNEP Participation: GNEP Siting Studies, http://www.gnep.energy.gov/gnepSitingStudies.html (last visited Apr. 21, 2008).

hydrology, population density, water availability, and seismic stability could be met.[16] Any site that met the minimal requirements was then eligible for financial assistance to conduct final siting study reports.[17]

In January 2007, DOE awarded over $10 million to eleven groups to conduct site characterization studies at eleven different locations.[18] Of the eleven locations, six are currently owned and operated by DOE: Savannah River Site in South Carolina, Hanford Site in Washington, Idaho National Laboratory in Idaho, Oak Ridge National Laboratory in Tennessee, Paducah Gaseous Diffusion Plant in Kentucky, and Portsmouth Gaseous Diffusion Plant in Ohio.[19] The GNEP siting studies for DOE sites require little evaluation because previous studies are available, however non-DOE sites must evaluate issues such as "nearby land uses; demographics; ecological and habitat assessment; threatened or endangered species; historical, archaeological and cultural resources; geology and seismology; weather and climate; and regulatory and permitting requirements."[20] DOE will also use the information obtained from these siting studies to prepare a draft programmatic environmental impact statement, which will evaluate the potential environmental impacts of each proposed GNEP facility.[21]

C: Savannah River Site Receives Funding

The Savannah River Site was one of the eleven sites for which DOE granted financial assistance to conduct a site characterization study.[22] Because of its "proximity to most of the nation's reactors, access to ports, and its nuclear material processing infrastructure, the

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[16] *See id*; *see also* THE CENTRAL SAVANNAH RIVER AREA COMMUNITY TEAM, *supra* note 14, at 2.
[17] *See* DOE - Office of Nuclear Energy, *supra* note 15.
[18] Press Release, Department of Energy, Department of Energy Awards Over $10 Million for GNEP Siting Grants (Jan. 30, 2007), *available at* http://www.doe.gov/news/4674.htm.
[19] *Id.*
[20] *Id.*
[21] *Id.*
[22] *See id.*

Savannah River Site (SRS) in South Carolina is considered a prime candidate" for GNEP facilities.[23] Consequently, in its GNEP Siting Study Final Report,[24] the Central Savannah River Area Community Team (CSRA Team) proposed locating both the nuclear fuel recycling center and an advanced recycling reactor on the Savannah River Site.[25] The CSRA Team asserts that the Savannah River Site would be ideal for the nuclear fuel recycling center and an advanced recycling reactor because both GNEP facilities could use existing Savannah River Site infrastructure and thereby reduce capital, reduce operating costs, and accelerate program schedules.[26] In addition, the CSRA Team asserts that the GNEP facilities should be federally owned to capitalize on the Savannah River Site's ability to manage high-level radioactive waste differently than other proposed sites.[27]

However, if DOE selects the Savannah River Site to host either GNEP facility, the Savannah River Site will receive shipments of spent fuel from all over the United States and will be charged with managing the high-level radioactive by-products of processing this fuel.[28] Significantly, the Savannah River Site already accommodates more high-level radioactive waste than DOE can safely manage,[29] while the high-level radioactive waste that would result from processing additional spent fuel at GNEP facilities would be stored and eventually disposed of through on-site burial near major water supplies to reduce the burden on the proposed national repository.[30]

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[23] INSTITUTE FOR POLICY STUDIES, *supra* note 11, at 3.
[24] THE CENTRAL SAVANNAH RIVER AREA COMMUNITY TEAM, *supra* note 14.
[25] *See id.* at 4.
[26] *Id.*
[27] *See id.* at 23. *See infra* notes 76-84 and accompanying text.
[28] *See* U.S. DEP'T OF ENERGY, OFFICE OF NUCLEAR ENERGY, OFFICE OF FUEL CYCLE MANAGEMENT, *supra* note 8, at 9-10.
[29] *See infra* notes 45-46 and accompanying text.
[30] INSTITUTE FOR POLICY STUDIES, *supra* note 11 at 2.

D: Savannah River Site and High-Level Waste

The Savannah River Site is a key DOE industrial complex that covers 198,344 acres and encompasses parts of Aiken, Allendale, and Barnwell counties in South Carolina.[31] The site is responsible for processing and storing nuclear materials "in support of the national defense and U.S. nuclear non-proliferation efforts."[32] The Savannah River Site also develops technologies to improve the environment and treat hazardous waste left over from the Cold War.[33]

The Savannah River Site was established in 1950 to "produce special radioactive isotopes for national security purposes and to support research in nuclear medicine, space exploration and commercial applications."[34] During the peak production years, DOE operated five nuclear reactors, two chemical separation areas, a nuclear fuel and target fabrication facility, a heavy water extraction plant, and a tritium extraction facility.[35] In support of the nation's Cold War efforts, the Savannah River Site produced materials used in nuclear weapons: tritium, uranium, and plutonium-239.[36] In fact, the Savannah River Site produced more than one-third of the United States plutonium-239 stock and essentially all the tritium used in nuclear weapons

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[31] Facts about the Savannah River Site, http://www.srs.gov/general/news/factsheets/srs.pdf (last visited Sept. 10, 2007).
[32] *Id.*
[33] *Id.*
[34] About.com, Nuclear Weapons: Pay Up to Cleanup, http://usgovinfo.about.com/library/weekly/aa050700b.htm (last visited Nov. 13, 2007).
[35] *A Review of Dep't of Energy's Radioactive High-Level Waste Cleanup Programs: Hearing before the Subcomm. on Oversight and Investigations of the H. Comm. on Energy and Commerce*, 108th Cong. 42, 52 (2003) [hereinafter *Hearing*] (prepared statement of David E. Wilson, Jr., Assistant Bureau Chief, Land and Waste Management, South Carolina Department of Health and Environmental Control), *available at* http://www.access.gpo.gov/congress/house/house05ch108.html.
[36] *See* Savannah River Site, History Highlights, http://www.srs.gov/general/about/history1.htm (last visited Nov. 15, 2007).

production during the Cold War.[37] The waste generated from this production is stored in fifty-one tanks ranging from 750,000 gallons to 1.3 million gallons in capacity.[38]

Since the end of the Cold War, DOE "program emphasis has shifted to environmental cleanup projects including nuclear material stabilization, facility stabilization and deactivation, environmental restoration and waste management."[39] However, DOE has processed less than 3 percent of the total radioactivity stored at the Savannah River Site.[40] Initially, over 99 percent of the radioactivity stored in canisters at the Savannah River Site was to be removed from the waste and then mixed with molten glass in a process known as vitrification[41] in preparation for disposal at the proposed Yucca Mountain repository.[42] However, in 2002, DOE announced that Yucca Mountain was running out of capacity despite the fact that the site was not yet operational; as a result, 60 percent of the high-level radioactive waste at the Savannah River Site would have to remain on-site indefinitely.[43]

In an effort to reduce the amount of high-level radioactive waste scheduled for geologic disposal in the national repository, DOE intends to dispose of greater amounts of radioactivity on-site.[44] Unfortunately, approximately thirty-seven million gallons of high-level radioactive

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[37] Arjun Makhijani & Michele Boyd, *Nuclear Dumps by the Riverside: Threats to the Savannah River from Radioactive Contamination at the Savannah River Site (SRS)* 14 (2004), *available at* http://www.ieer.org/reports/srs/fullrpt.pdf.

[38] *Hearing*, *supra* note 35, at 43 (prepared statement of David E. Wilson, Jr., Assistant Bureau Chief, Land and Waste Management, South Carolina Department of Health and Environmental Control).

[39] About.com, *supra* note 34.

[40] INSTITUTE FOR POLICY STUDIES, *supra* note 11, at 11.

[41] *See generally* Fran Poda, SRS Environmental Report, http://www.srs.gov/general/pubs/ERsum/er05/hl_waste.pdf (last visited Nov. 15, 2007) (The Defense Waste Processing Facility "processes the sludge from the original waste by combining it with glass frit. The mixture is heated until it melts, then is poured into stainless steel canisters to cool. The glass-like solid that forms contains the highly radioactive material and seals it off from the environment.").

[42] INSTITUTE FOR POLICY STUDIES, *supra* note 11, at 11.

[43] *See id.* at 8 ("DOE concluded in 2004 that 63,000 metric tons of nuclear spent fuel could be stored in the Yucca Mountain site, but continued operation of reactors would generate about 105,000 metric tons by 2030. In effect, by the time the Yucca Mountain Site would be full, nuclear power plants will have accumulated nearly the same amount of spent fuel stored at reactor sites today—requiring the establishment of a second repository.")

[44] *Id.* at 11.

waste containing over 400 million curies of radioactivity are still stored in tanks at the Savannah River Site.[45] In fact, the Savannah River Site houses the nation's largest inventory of radioactivity in high-level waste.[46] These revelations raise two pivotal questions: (1) What laws govern the management and disposal of radioactive waste, and (2) How could DOE possibly manage safely an increase in the amount of high-level radioactive waste at the Savannah River Site.

II. HIGH-LEVEL WASTE REGULATION

There are many laws that govern the management and disposal of radioactive waste. Agency responsibility for radioactive waste has changed over time. Similarly, the management requirements governing radioactive waste have changed drastically over the last 50 years as a result of political intervention and financial concerns. This section provides a brief overview of the laws governing the management and disposal of high-level radioactive waste and a discussion of how these laws have changed over time.

A. Atomic Energy Act

The Atomic Energy Act of 1954, as amended (AEA),[47] authorized the Atomic Energy Commission (AEC) to produce plutonium and enriched uranium in its own facilities,[48] to produce atomic weapons,[49] and to conduct research and development on the military use of atomic energy.[50] The AEA also gave the AEC the power to regulate the use of atomic energy

[45] *Hearing*, *supra* note 35, at 43 (prepared statement of David E. Wilson, Jr., Assistant Bureau Chief, Land and Waste Management, South Carolina Department of Health and Environmental Control).
[46] *See* Makhijani & Boyd, *supra* note 37, at 8 (stating that the Savannah River Site houses approximately two-thirds of the total radioactivity in the entire U.S. nuclear weapons complex).
[47] 42 U.S.C.A. §§ 2011-2297(h)-13 (West 2003 & Supp. 2007). (Atomic Energy Act of 1954, Pub. L. No. 83-703, 68 Stat. 919 (codified as amended at 42 U.S.C. §§ 2011-2284 (2000))).
[48] *Id.* § 2061(b) ("The Commission is authorized and directed to produce or to provide for the production of special nuclear material in its own production facilities.").
[49] *Id.* § 2121(a)(2).
[50] *Id.* § 2121(a)(1).

for civilian medical, industrial, and commercial purposes.[51] Although the AEA required the AEC to promulgate rules that set forth minimum health and safety criteria for licensing certain civilian uses of atomic energy and nuclear materials,[52] the AEA specifically exempted the AEC's nuclear weapons activities from the licensing requirements.[53] Consequently, the AEA failed to provide for the management of the AEC's radioactive waste. Instead, the AEA granted the AEC general authority to establish necessary regulations and orders to govern its activities, protect public health, and minimize danger to property.[54]

B. Energy Reorganization Act

The Energy Reorganization Act of 1974[55] abolished the AEC and delegated its duties to two new agencies.[56] The Energy Research and Development Administration (ERDA) took over the AEC's non-regulatory functions, including the nuclear weapons program.[57] The Nuclear Regulatory Commission (NRC) assumed the AEC's licensing and regulatory authority over the use, management, and disposal of atomic energy.[58] While the Act gave the NRC authority to oversee high-level radioactive waste disposal, it did not grant the NRC regulatory or licensing authority over the ERDA's nuclear weapons program.[59]

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[51] *See, e.g.*, 42 U.S.C.A. § 2134 (West 2003).
[52] *See id.* § 2073(b) (explaining AEC's duty to establish minimum criteria for the issuance of licenses for the distribution of special nuclear material); *see also* § 2093(b) (explaining AEC's duty to establish minimum criteria for the issuance of licenses for the distribution of source material).
[53] *See* 42 U.S.C.A. § 2140(a) (West 2003) ("Nothing in this subchapter shall be deemed (a) to require a license for (1) the processing, fabricating, or refining of special nuclear material, or the separation of special nuclear material, or the separation of special nuclear material from other substances, under contract with and for the account of the Commission; or (2) the construction or operation of facilities under contract with and for the account of the Commission.").
[54] *Id.* § 2201(b).
[55] Energy Reorganization Act of 1974, Pub. L. No. 93-438, 88 Stat. 1233 (codified as amended at 42 U.S.C. §§ 5801-5891 (2000)).
[56] *See e.g., id.* §§ 5814 -5842.
[57] *See id.* § 5814(d).
[58] *See id.* § 5841(f).
[59] *See id.* § 5842.

C. Department of Energy Organization Act

Subsequently, the Department of Energy Organization Act of 1977 transferred all ERDA's nuclear weapons and national security functions to DOE.[60] Without granting DOE any of the NRC's licensing authority, the Act gave DOE the authority to oversee the government's radioactive waste[61] and the power to create programs and facilities "for the treatment, management, storage, and disposal of nuclear waste."[62] However, the Act did not require any specific action by DOE in managing this radioactive waste; rather, the Department retained discretionary authority to act in this area.[63]

D. Nuclear Waste Policy Act

In 1982 Congress decided that disposing of high-level radioactive waste in a deep geologic repository was the best long-term strategy for managing the nation's abundant stock of hazardous nuclear waste.[64] Under the Nuclear Waste Policy Act of 1982,[65] Congress delegated the responsibilities of developing, building, and operating the national geologic repository to DOE.[66] The Act also gave the President of the United States the authority to determine whether the national repository for commercial nuclear waste could effectively store DOE's high-level radioactive waste as well.[67] Consequently, in 1985 President Ronald Reagan

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[60] Department of Energy Organization Act, Pub. L. No. 95-91, § 301(a), 91 Stat. 565, 577 (1977) (codified at 42 U.S.C. § 7151(a) (2000).
[61] *Id.* § 7133(a)(8)(A)-(B).
[62] *Id.* § 7133(a)(8)(D)-(E).
[63] *See generally id.* § 7133(a)(8) (This section gave DOE control over existing government facilities for the treatment and storage of nuclear waste and the control over all existing nuclear waste in the possession or control of the government. However, this section did not mandate that DOE act in any specific way to manage its stockpile of nuclear waste.).
[64] *See* Joanne Hughes Burkett, Note, *Changing the Rules?* NRDC v. Abraham *& the Reclassification of High Level Nuclear Waste*, 12 SOUTHEASTERN ENVTL. L.J. 159, 164 (2004).
[65] Nuclear Waste Policy Act of 1982, 42 U.S.C. §§ 10101-10270 (2000).
[66] *Id.* § 10191(2)(A).
[67] *Id.* § 10107(b)(2).

determined that a separate repository for DOE's high-level radioactive waste was superfluous.[68]

Initially, Congress instructed DOE to nominate five potential sites to serve as the geologic repository for permanent storage of the nation's nuclear waste.[69] DOE selected nine locations in six states: Cypress dome, Mississippi; Richton dome, Mississippi; Vacherie dome, Louisiana; Yucca Mountain, Nevada; Deaf Smith County, Texas; Swisher County, Texas; Hanford Site, Washington; Davis Canyon, Utah; and Lavender County, Utah.[70] Subsequently, DOE performed an environmental assessment on each site.[71] Because of cost and time restraints, in 1987 Congress directed DOE to cease investigation of the other potential sites for the repository and proceed with site characterization at Yucca Mountain only.[72] In 2002, President George W. Bush authorized Yucca Mountain as the site for the national geologic repository by approving a congressional resolution.[73]

In the Nuclear Waste Policy Act, Congress defines high-level radioactive waste as:

> (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and
> (B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.[74]

In contrast, Congress defines low-level radioactive waste as radioactive material that "is not high-level radioactive waste, spent nuclear fuel, transuranic waste, or by-product material."[75]

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[68] *See* Burkett, *supra* note 64.
[69] Nuclear Waste Policy Act of 1982 § 10132(b)(1)(A).
[70] Aletheia Gooden, *The 10,000 Year Guarantee: High-Level Radioactive Waste Disposal at Yucca Mountain, Nevada*, 26 ENVIRONS ENVTL. L. & POL'Y J. 95, 102 (2002).
[71] *Id.*
[72] Andrew J. Butcher, Note, *In Search of a Remedy to the Nuclear Storage Conundrum:* Western Shoshone National Council v. United States, 28 ENERGY L.J. 207, 209 (2007).
[73] *Id.*
[74] Nuclear Waste Policy Act of 1982, 42 U.S.C. § 10101(12) (2000).
[75] *Id.* § 10101(16)(A).

E: National Defense Authorization Act for Fiscal Year 2005

In October 2004, Congress enacted the National Defense Authorization Act for Fiscal Year 2005.[76] Section 3116 of the Act, written by DOE and proposed to committee by Senator Lindsey Graham (R-SC), specifically authorized DOE to dispose of high-level radioactive waste on-site at the Savannah River Site in South Carolina.[77] Furthermore, § 3116 granted DOE sole discretion to define high-level radioactive waste.[78] According to § 3116:

> [T]he term "high-level radioactive waste" does not include radioactive waste resulting from the reprocessing of spent nuclear fuel that the Secretary of Energy. . . in consultation with the Nuclear Regulatory Commission. . . determines—
> (1) does not require permanent isolation in a deep geologic repository for spent fuel or high-level radioactive waste; [or]
> (2) has had highly radioactive radionuclides removed to the maximum extent practical; and
> (3)(A) does not exceed concentration limits for Class C low-level waste as set out in section 61.55 of title 10, Code of Federal Regulations. . .[79]

Section 3116 also directs the Nuclear Regulatory Commission to monitor DOE's disposal of radioactive waste to ensure that DOE complies with the requirements enumerated under the Section.[80] However, if the Nuclear Regulatory Commission determines that DOE's disposal of radioactive waste is not in compliance with § 3116, the Commission is directed to inform DOE; the appropriate State; and the defense, energy, and appropriations committees only.[81] As such, § 3116 grants the Secretary of Energy broad discretionary power to define high-level radioactive waste, but provides little repercussion for abuse of this authority.

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[76] Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005, Pub. L. No. 108-375, 118 Stat. 1811 (2004).
[77] *Id.* § 3116(d) ("For purposes of this section, the following States are covered States: (1) The State of South Carolina. (2) The State of Idaho.").
[78] *See* Press Release, Natural Res. Def. Council, Energy Department Cannot Leave Highly Radioactive Waste in Tanks Without EPA or NRC Approval, National Academy of Sciences Panel Says (Mar. 1, 2005), http://www.nrdc.org/media/pressreleases/050301.asp (last visited Nov. 16, 2007).
[79] Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 § 3116(a).
[80] *Id.* § 3116(b).
[81] *Id.*

Under § 3116, DOE plans to separate out ninety percent of the high-level radioactive waste in the storage tanks at the Savannah River Site, process it to remove hazardous radionuclides, redefine it as low-level radioactive waste, and dispose of it on-site at the Saltstone Disposal Facility.[82] Moreover, DOE plans to use a § 3116 determination to reclassify the high-level radioactive sludge remaining at the bottom of the tanks as "incidental waste," fill the tanks with grout, and bury them a few feet below ground.[83] As such, § 3116 grants DOE the authority to reclassify high-level radioactive waste as "incidental waste" exempt from the Nuclear Waste Policy Act's national repository burial requirement.[84]

Section 3116 is the main reason proponents of siting GNEP facilities at the Savannah River Site are promoting their cause so feverishly. DOE claims that "GNEP has important implications for the proposed repository at Yucca Mountain, Nevada."[85] Furthermore, DOE claims that locating GNEP facilities at the Savannah River Site would "significantly reduce the amount of high-level radioactive waste for geological disposal" at Yucca Mountain.[86] In actuality, however, locating any GNEP facilities at the Savannah River Site would be a disaster and cause a myriad of problems far greater than any problems that would accompany the disposal of radioactive waste at Yucca Mountain. If DOE selects the Savannah River Site to house these GNEP facilities, DOE could use a § 3116 determination to dispose of the high-level radioactive waste that would result from processing spent fuel at these facilities. As such, DOE could then dispose of the additional high-level radioactive waste through on-site burial

[82] *See Hearing*, *supra* note 35, at 3 (prepared statement of Hon. Peter Deutsch, a Representative in Congress from the State of Florida).
[83] *See* Burkett, *supra* note 64, at 166-167.
[84] *See id.* (DOE coined the phrase, "Waste Incidental to Reprocessing").
[85] United States Department of Energy, Minimize Nuclear Waste, http://www.gnep.energy.gov/pdfs/gnepMNW.pdf (last visited Apr. 22, 2008).
[86] INSTITUTE FOR POLICY STUDIES, *supra* note 11, at 2.

(near major water supplies) to reduce the burden on the proposed national geologic repository at Yucca Mountain.[87]

III. GNEP: YUCCA MOUNTAIN'S SAVIOR OR SAVANNAH RIVER'S FOE?

A: National Repository Status

Twenty-six years after the Nuclear Waste Policy Act was enacted, the government's nuclear waste disposal program is being impacted by legal challenges and technical problems. As a result, the schedule for the proposed Yucca Mountain disposal site in Nevada is over a decade behind the original opening date of January 1998.[88] On July 23, 2002, President George W. Bush took the final step in approving Yucca Mountain as the location for the national geologic repository when he authorized a joint resolution over the objection of many people, including the Governor of Nevada.[89] Thus, authorization occurred over four years after the Nuclear Waste Policy Act's original goal for loading waste into the repository.[90] With the President's approval, DOE must now seek approval from the NRC, which will then make the final decision whether to issue a license for the Yucca Mountain repository.[91]

Even with the signing of the joint resolution, delays and roadblocks have continued to plague Yucca Mountain's progress. Two of the most prevalent events that have contributed to the opening date of the repository being delayed until 2012 are the EPA's reversal of its

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[87] *See supra* note 30.
[88] *See* Nuclear Waste Policy Act of 1982, 42 U.S.C. § 10222(a)(5) (Contracts entered into under this section shall provide that-(A) following commencement of operation of a repository, the Secretary shall take title to the high-level radioactive waste or spent nuclear fuel involved as expeditiously as practicable upon the request of the generator or owner of such waste or spent fuel; and (B) in return for payment of fees established by this section, the Secretary, beginning not later than January 31, 1998, will dispose of the high-level radioactive waste or spent nuclear fuel involved as provided in this subtitle).
[89] *See* H.R.J. Res. 87, 107th Cong., 116 Stat. 735 (2002).
[90] *See supra* note 88 and accompanying text.
[91] Western Shoshone Nat'l Council v. United States, 408 F. Supp. 2d 1040, 1045 (D. Nev. 2005); Public Health and Environmental Radiation Protection Standards for Yucca Mountain, 40 C.F.R. pt. 197 (2001).

regulations pertaining to the 10,000-year compliance period[92] and flawed humidity measurements resulting in work shut-downs.[93] Additionally, concerns over theft of stored spent fuel rods by terrorists have intensified the controversy.[94]

Nevada is also fighting DOE's selecting of Yucca Mountain as the site for the national repository in court. For example, the "Nevada Protection Fund was established to raise funds to legally challenge the Yucca Mountain repository."[95] The State of Nevada contributed $4 million to the Fund, while the City of Las Vegas also donated $100,000.to stop the development of the Yucca Mountain repository.[96] The following is a list of some of the many issues Nevada has challenged or is currently challenging concerning Yucca Mountain: DOE's citing guidelines, NWPA amendments designating Yucca Mountain as the sole location for site review, DOE's Environmental Impact Statement, NRC's decision to issue DOE a construction authorization for a repository, DOE's groundwater permit to construct and operate the site, and EPA's radiation protection standard.[97]

B: Reducing Yucca Mountain's Burden comes with a Cost

DOE claims that GNEP facilities will relieve the burden on Yucca Mountain and enable the geologic repository to "accommodate all the used U.S. commercial nuclear fuel that has been or will be generated by U.S. nuclear power plants over their lifetimes."[98] Thus, it is important to

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[92] *See* Nuclear Energy Inst. v. EPA, 373 F.3d 1251, 1258 (D.C. Cir. 2004).
[93] *See generally* Keith Rogers, *Yucca Feeling Heat on Humidity*, LAS VEGAS REVIEW-JOURNAL (Feb. 23, 2006), *available at* http://www.reviewjournal.com/lvrj_home/2006/Feb-23-Thu-2006/news/6030840.html ("The stop-work order took effect Jan. 30, about three weeks after inspectors from the Nuclear Regulatory Commission's safeguards office wrote to the project's licensing director to say that the work was based on humidity gauges that weren't calibrated.").
[94] *See generally* Nick Caistor, *Alert Highlights 'Dirty Bomb' Fears*, BBC NEWS ONLINE: AMERICAS, Dec. 5, 2001, *available at* http://news.bbc.co.uk/1/low/world/americas/1693425.stm ("A 'dirty bomb' involves wrapping radioactive material such as spent nuclear fuel rods around ordinary high explosives, and detonating the device.").
[95] Gooden, *supra* note 70, at 110.
[96] *Id.*
[97] *Id.*
[98] United States Department of Energy, Minimize Nuclear Waste, *supra* note 85.

note how the advanced nuclear fuel recycling center will work with an advanced recycling reactor to accomplish this feat. According to DOE, an advanced nuclear fuel recycling center and an advanced recycling reactor located at the Savannah River Site would operate as follows:

> An advanced nuclear fuel recycling center contains facilities where usable uranium and transuranics are separated from spent light water reactor fuel and then produced into new fuel (or "transmutation fuel") which then could be reused in an advanced recycling reactor. This advanced recycling reactor is a fast reactor that would demonstrate the ability to reuse and consume materials recovered from spent nuclear fuel, including long-lived elements that would otherwise be disposed of in a geologic repository.[99]

As such, GNEP proponents claim that these two facilities will result in a much smaller amount of high-level nuclear waste to be disposed in the national repository, while troublesome stocks of nuclear weapon materials will be greatly reduced.[100]

However, if the Savannah River Site is chosen to host the GNEP facilities in an attempt to free up space at Yucca Mountain, "the major preponderance of the radioactivity in spent power reactor fuel would be stored and disposed in shallow burial near water supplies."[101] If the Savannah River Site is selected to host these GNEP facilities, the Savannah River Site will receive shipments of spent fuel from all over the United States and will be charged with managing the high-level radioactive by-products of processing this fuel.[102] Using a § 3116 determination, DOE will grout[103] all of the spent fuel sent to the Savannah River Site by mixing it with a cement-like mixture in steel tanks, and then bury the tanks along the banks of

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[99] Press Release, Department of Energy, Department of Energy Awards Over $10 Million for GNEP Siting Grants, *supra* note 18.
[100] INSTITUTE FOR POLICY STUDIES, *supra* note 11, at 8.
[101] *Id.* at 2.
[102] *See supra* note 9.
[103] *See generally* Facts about the Savannah River Site: Waste Management, http://www.srs.gov/general/news/factsheets/wm.pdf (last visited Nov. 14, 2007) (stating that the grouting process consists of mixing radioactive waste with cement, ash, and furnace slag to dilute the radioactivity and immobilize the waste).

the Savannah River.[104] Unfortunately, the long-term risks to groundwater and surface water from shallow land burial of grouted radioactive waste are unknown.[105] DOE acknowledged this fact nearly two decades ago when it abandoned the use of grout to immobilize low-level radioactive waste because of technical risks and strong public resistance.[106] In the early 1990s, the Hanford Waste Task Force concluded that "[g]rout 'doesn't adequately protect public, workers and environment' and that 'reduction of waste volume was an issue for grout' since grout increases final waste form volume significantly."[107] As a result, DOE opted for vitrification as a more effective and cost efficient means of processing its waste at the Hanford Site.[108]

Despite the absence of subsequent testing or investigation, DOE is reverting back to the use of grout to dispose of its high-level radioactive waste at the Savannah River Site.[109] If the grout fails to immobilize the highly radioactive components in the sludge, South Carolina and Georgia could suffer irreparable harm; the States could lose their most valuable water resource.[110] Grouting the storage tanks would put the high-level radioactive sludge in a form that would be very difficult, if not impossible, to retrieve if the tanks began leaking radioactive components. Moreover, the tanks would be nearly impossible to remediate. Under the GNEP plan, the grouted tanks would contain enough strontium, cesium, and plutonium to render the

[104] *See* Burkett, *supra* note 64.
[105] *See* Makhijani & Boyd, *supra* note 37, at 48.
[106] *Hearing*, *supra* note 35, at 47 (Washington State Department of Ecology, White Paper, History of Grout as Waste Form for Hanford Tank Waste).
[107] *Id.* at 48.
[108] *See id.*
[109] *See supra* note 83 and accompanying text.
[110] *See* Makhijani & Boyd, *supra* note 37, at 50 ("grouting residual high-level waste in tanks that contains significant quantities of long-lived radionuclides (including cesium-137 and plutonium-238, and plutonium - 239/240) is a policy that poses considerable risks to the long-term health of the water resources in the region.")

Savannah River useless for drinking water purposes.[111] For example, under the GNEP plan, "separation of cesium and strontium from spent nuclear fuel could result in the storage and near surface disposal after 300 years of the single largest concentration of lethal, high-heat radioactive wastes in the United States and possibly the world."[112] According to DOE spent nuclear fuel estimates, "these wastes would still be highly radioactive after 300 years."[113] In addition, "the amounts of cesium-135 that could be disposed under GNEP could be several thousand times greater than [cesium-135] generated after decades of U.S. nuclear weapons material production."[114] Finally, "separated transuranics would contain as much as 638 metric tons of plutonium-239—more than two and a half times the amount produced worldwide for nuclear weapons."[115] As a result, if these radionuclides were grouted in tanks, buried shallowly at the Savannah River Site, and then began to leak, the harm would greatly outweigh any benefit derived from expediting the cleanup process at the Savannah River Site or reducing Yucca Mountain's waste disposal burden.

C: Safer Disposal

A national repository at Yucca Mountain is much safer than a nuclear dump stored in shallow burial along the banks of the Savannah River. Two of the most important criteria to evaluate when selecting a site for permanent disposal of high-level radioactive waste are

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[111] *See id.* ("The grouting of two tanks still containing residual wastes has already created a *de facto* highlevel nuclear waste dump on the site. The main radionuclides remaining in the tanks are strontium-90, cesium-137, technetium-99, and cobalt-60, but the residual waste also includes selenium-79, carbon-14, iodine-129, plutonium-238, -239, -240, -241 and -242, neptunium-237, americium-241, and curium-244 and -245. The residual radioactivity level in Tank 20 is estimated to be about a quarter of a curie per gallon and that in Tank 17 almost half a curie per gallon. The total plutonium concentration of the residual wastes in both tanks (for isotopes 238, 239 and 240) is well above the limit for Class C low- level waste, putting the waste in the category that must generally be disposed of in a deep geologic repository.")
[112] INSTITUTE FOR POLICY STUDIES, *supra* note 11, at 2.
[113] *Id.*
[114] *Id.*
[115] *Id.* at 3.

dryness and isolation.[116] This is because water "can rust waste containers, dissolve radioactive compounds, and carry toxic solutions underground" toward water tables and wells containing drinking water.[117] As a result, Yucca Mountain is a great location for permanent disposal. Yucca Mountain is a dry, isolated hill in Nevada.[118] The Nevada desert receives little rainfall, and its water table is one of the deepest in the world.[119] In fact, "Yucca Mountain's deep water table would allow the repository to be placed 1,000 feet underground and still be 800 feet above the water table."[120] Furthermore, DOE's environmental analysis of Yucca Mountain, which was conducted during initial site selection, indicates that radioactive waste could be contained at Yucca Mountain for 10,000 years if the stainless steel storage containers remained dry.[121]

As such, disposing of spent fuel at Yucca Mountain is certainly better than disposing of it on-site at the Savannah River Site. In fact, if the Department of Defense had taken into account environmental issues when selecting sites for nuclear weapons storage facilities in the 1950s, the Savannah River Site would likely have been eliminated from consideration immediately. The average annual precipitation at the Savannah River Site is forty-eight inches per year.[122] Furthermore, the Savannah River Site is "located within the greatest water recharge area on the

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[116] *See generally* Gooden, *supra* note 70, at 103 ("Site characterization at Yucca Mountain involved studying the geology and hydrology of the site. Scientists observed the depth, thickness, and extent of the host rock at Yucca Mountain and whether it responded to heat or water. They studied the ground water at the site and the amount of water present, where the water comes from, how far the water table is from the surface, and in what direction the water flows. The amount of surface water at Yucca Mountain was also observed. Researchers studied the terrain at the site and the potential for volcanic activity and earthquakes. . . . Yucca Mountain was initially picked as a repository because of its arid condition, lack of water, isolated water basin, and low population density near the site.").

[117] David Forest, *Burial Ground: Fear and Loathing at Yucca Mountain*, ONEARTH, Summer 2002, *available at* http://www.nrdc.org/onearth/02sum/burial1.asp.

[118] *See id.*

[119] *Id.*

[120] Gooden, *supra* note 70, at 103.

[121] David Forest, *supra* note 117.

[122] Alliance for Nuclear Accountability, *Savannah River Site* 196, http://www.ananuclear.org/Portals/0/documents/Water%20Report/waterreportsavannahriver.pdf (last visited Nov. 13, 2007).

southeastern seaboard."[123] With a watershed larger than 27,400 square kilometers,[124] the Savannah River basin is one of the major river systems in the southeastern United States. Moreover, approximately twenty-one percent of the Savannah River Site is wetland.[125] Along the southeast border of the Savannah River Site, the Savannah River Swamp consists of approximately "30 square kilometer[s of] 'forested wetland on the floodplain of the Savannah River.'"[126] The Savannah River Site's many wetlands and swamps reveal that the Savannah River region has a very high water table. In fact, the Savannah River region's water table is only 45 feet below the surface.[127]

The Savannah River Site's sodden landscape and high water table form a hazardous combination that can accelerate tank deterioration and facilitate contamination. In fact, plutonium has been detected in the groundwater at the Savannah River Site since 1981,[128] which means that the storage tanks began to leak approximately thirty years after the site's establishment.[129] When this fact is compared to the DOE environmental analysis, which indicates that Yucca Mountain can safely store high-level radioactive waste for nearly 10,000 years,[130] it becomes clear that the dangers of locating GNEP facilities at the Savannah River Site are too great to justify, despite the fact that these facilities may partially lighten Yucca Mountain's radioactive waste disposal burden.

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[123] *Id.* at 195
[124] U.S. DEP'T OF ENERGY, ENVIRONMENT, SAFETY AND HEALTH OFFICE OF ENVIRONMENTAL AUDIT, DOE/EH/OEV--10-P, ENVIRONMENTAL SURVEY PRELIMINARY REPORT, SAVANNAH RIVER PLANT 3-87 (1987), *available at* http://www.osti.gov/bridge/servlets/purl/6534863-XXALFn/6534863.PDF.
[125] C. MCALLISTER ET AL., SURVEY OF ECOLOGICAL RESOURCES AT SELECTED U.S. DEPARTMENT OF ENERGY SITES 9.8 (1996), *available at* http://homer.ornl.gov/oepa/guidance/risk/ecores.pdf.
[126] Makhijani & Boyd, *supra* note 37, at 17.
[127] *See* Alliance for Nuclear Accountability, *supra* note 122, at 195 ("[T]he water table fluctuates, between 0 and 100 feet, with 45 feet below the surface being the average.").
[128] *Id.* at 198.
[129] *See generally* Savannah River Site, *supra* note 36 (stating that an area for the site was selected in 1950, and operations began in 1952).
[130] *See supra* note 121.

While Yucca Mountain's close proximity to Death Valley, one of America's most active fault systems, raises concern that an earthquake could fracture the turf and allow rainwater to reach the storage containers,[131] earthquakes pose a significant threat to radioactive waste storage at the Savannah River Site as well. The Savannah River Site "is located in the most susceptible area for earthquakes on the eastern seaboard."[132] In fact, two major earthquakes have occurred within 100 miles of the Savannah River Site.[133] The Charleston earthquake of 1886, which registered on the Richter scale with a magnitude of 6.8,[134] was the largest earthquake to ever devastate the eastern United States.[135] The earthquake was so great that distant cities such as Boston, Massachusetts and Chicago, Illinois reported the earthquake.[136] Another major earthquake in Charleston, S.C. could easily rupture the Savannah River Site's storage tanks, releasing millions of lethal radioactive components.[137] As such, the Savannah River Site should not be considered a viable location for placement of a nuclear fuel recycling center and an advanced recycling reactor to facilitate GNEP.

D: Recommendations

While the quest to establish a national repository has been wrought with technical and legal delays,[138] Yucca Mountain must come to fruition. Because of its deep water table, arid climate, and isolated location, Yucca Mountain is a prime setting for the national repository.[139]

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[131] David Forest, *supra* note 117.
[132] Alliance for Nuclear Accountability, *supra* note 122, at 200.
[133] THE CENTRAL SAVANNAH RIVER AREA COMMUNITY TEAM, *supra* note 14, at 34.
[134] *Id.*
[135] U.S. Geological Survey, Historic Earthquakes, http://earthquake.usgs.gov/regional/states/events/1886_09_01.php (last visited Nov. 10, 2007).
[136] *Id.*
[137] *See Hearing*, *supra* note 35, at 14 (prepared statement of Robin M. Nazzaro, Director, Natural Resources and Environment, General Accounting Office) (stating that the Savannah River Site's tanks were built between 1940 and 1960).
[138] *See supra* notes 92-97 and accompanying text.
[139] *See supra* notes 118-121.

While there may be some concern over capacity issues,[140] all opponents of the repository must agree to stop contesting the proposed site at Yucca Mountain. The United States is facing a very serious conundrum: What do we do with all of our high-level radioactive waste? This very serious problem is only aggravated by the fact that more and more radioactive waste is accumulating every day as a result of the decades-old policy decision that nuclear energy would play a substantial role in our energy matrix; radioactive waste is an unavoidable, direct consequence of producing nuclear energy.

GNEP appears to be a great first step towards alleviating Yucca Mountain's burden. However, that contentious topic is not at issue in this paper. The true purpose of this paper is to reveal one unequivocal fact in the midst of our nation's radioactive waste dilemma coupled with the emergence of the nation's plan for GNEP: Any attempt to relieve Yucca Mountain's burden, either in response to capacity concerns or in an attempt to assuage criticism of the proposed repository site, does not justify dumping any more radioactive waste at the Savannah River Site. As outlandish as it may sound to some people, even an act by Congress to arbitrarily increase the Yucca Mountain repository's capacity would be better, and safer, than disposing of any more high-level radioactive waste at the Savannah River Site.

The banks of the Savannah River have become a virtual nuclear waste dump due to the shallow burial of two tanks containing millions of curies of radioactivity.[141] Unfortunately, DOE plans to bury more high-level radioactive waste in the same fashion.[142] Despite the

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[140] *See supra* note 43 and accompanying text.
[141] *See* Burkett, *supra* note 64, at 166 (stating that in 1996 DOE permanently closed two tanks at the Savannah River Site by removing the salt waste and covering the remaining high-level radioactive sludge with a cement-like grout); *see also* Savannah River Site High-Level Waste Tank Closure Record of Decision, 67 Fed. Reg. 53,784 (Dep't of Energy Aug. 9, 2002) (DOE removed the bulk of the high-level radioactive waste and then filled the tanks with grout. "DOE has confidence in the method due to the demonstrated performance of the reducing grout and the successful waste removal and closure process employed for Tanks 17 and 20.").
[142] *See* Burkett, *supra* note 64, at 166-167.

ramifications on human life and safety of such disposal under normal circumstances, the Savannah River Site's location, sodden landscape, and extremely low water table exponentially increase the danger that such waste disposal poses to the citizens of Georgia and South Carolina. DOE must find a way to safely manage and dispose of the millions of gallons of high-level radioactive waste that contain millions of curies of radioactivity at the Savannah River Site before it decides to dump any more nuclear waste in South Carolina's backyard. In fact, DOE should issue South Carolina a "pass" from receiving any more radioactive waste, either directly or indirectly, for the next few decades because the Savannah River Site has dutifully shouldered the burden of storing the most radioactive stockpile of nuclear waste in the nation for the last five decades.[143] Thus, hosting a nuclear fuel recycling center and an advanced nuclear reactor, which would result in the storage and disposal of more high-level radioactive waste at the Savannah River Site,[144] should be left to one of the other ten sites that were awarded money to conduct site characterization studies.[145]

[143] *See supra* notes 45-46 and accompanying text.
[144] *See supra* note 9.
[145] *See supra* notes 18-19.