Chapter 7: Nuclear Waste Management

The nuclear waste generated at Vermont Yankee is of two basic types – spent nuclear fuel (SNF) and low-level radioactive waste (LLRW). Because of important differences in their radiological characteristics, comparative risks to public health and the environment, and relative volumes generated, the legal obligations and management strategies associated with these two types of waste also differ significantly. Accordingly, this Report will discuss separately the management of these two types of waste at Vermont Yankee.

A. Spent Nuclear Fuel

1. Background

(a) Characteristics

Nuclear fuel used in power reactors is packaged in long, thin, metal-clad rods, which are then bundled in assemblies. While there is considerable variation in individual assemblies, a typical fuel assembly is about fourteen to fifteen feet long, about nine inches square in a pressurized-water reactor, and about five inches square in a boiling-water reactor.[1] In a boiling-water reactor, there are typically 63 fuel rods per fuel assembly, with each assembly weighing 320 kg (705 lbs), having a nominal volume of 0.0864 m^3 (3.05 ft^3) containing 0.183 metric tons of uranium (MTU).[2] In a pressurized-water reactor, there are typically 264 fuel rods per assembly, with each assembly weighing 658 kg (1451 lbs), having a nominal volume of 0.1860 m^3 (6.57 ft^3) and containing 0.461 MTU.[3]

Spent nuclear fuel results from the nuclear fission process which takes place in power reactors. There are more than thirty elements which are produced by the fission process and found in spent nuclear fuel.[4] Spent nuclear fuel is highly radioactive and thermally very hot. At

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1 *See* DEPARTMENT OF ENERGY, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, OCWRM TRANSPORTATION REPORT 1 (1995).

2 *See* DEPARTMENT OF ENERGY, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM: TOTAL SYSTEM DESCRIPTION 6 (1997).

3 *See id.*

4 *See* Richard Ausness, *High-Level Radioactive Waste Management: The Nuclear Dilemma*, 1979 WIS. L. REV. 707, 727-30.

discharge, each metric ton initially produces nearly 180 million curies of radioactivity and generates 1.6 megawatts of heat.[5] Because many of the radioactive isotopes in spent fuel decay quickly, its level of radioactivity falls to 693,000 curies and its thermal output to 12,500 watts per ton a year after removal from the reactor.[6] However, even after 10,000 years, each ton of spent fuel still emits hazardous levels (470 curies) of radioactivity and measurable amounts (fourteen watts) of heat.[7]

Spent nuclear fuel is perhaps the most dangerous radioactive waste of all in terms of its threat to human health and the environment, absent appropriate measures for its safe storage and disposal.[8] Even though it accounts for less than one percent of the volume of all radioactive waste in the United States, it contains 95 percent of the radioactivity from all civilian and military sources combined.[9] Each radioactive isotope in spent fuel has its own characteristic duration and level of radioactivity, emitting varying levels of alpha and beta particles and gamma rays for varying lengths of time.[10] It is these particles and rays which cause harm to living tissue and threat to the environment.

Typically, the level of radiation at a point in time is measured in curies and duration of radioactivity over time is measured in "half-lives," where a half-life is the amount of time it takes for 50 percent of the isotope's current level of radioactivity to decay.[11] Generally, the radioactive isotopes in spent fuel are considered dangerous to human health and the environment for at least ten and, in some cases, as many as twenty half-lives.[12] Thus, shorter-lived fission

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5 *See* NICHOLAS LENSSEN, WORLDWATCH INSTITUTE, NUCLEAR WASTE: THE PROBLEM THAT WON'T GO AWAY 9 (1991).

6 *See id.* at 9-10.

7 *See id.*

8 *See id.*

9 *See id.*

10 *See id.*

11 *See* LENSSEN, *supra* note 5, at 9.

12 *See* Ausness, *supra* note 4, at 746; LENSSEN, *supra* note 5, at 9.

products, such as strontium-90 and cesium-137 with 30-year half-lives, require isolation from the environment for 600 years before being considered safe.[13] By contrast, long-lived transuranics, such as plutonium-239, remain hazardous for at least 240,000 and perhaps as many as 500,000 years.[14]

(b) Temporary Storage

Based on the last comprehensive survey publicly reported by the Department of Energy, there were approximately 47,000 MTU of spent fuel from commercial nuclear plants in temporary storage at the end of 2002.[15] Additional spent fuel is currently being generated at the rate of approximately 2,150 MTU per year.[16] Thus, the Congressional Research Service has projected that, by 2010, there will be approximately 62,000 MTU of commercially-generated spent fuel in temporary storage. Including 7,000 metric tons of DOE spent fuel and high-level waste that is also planned for disposal at Yucca Mountain, this projection means that the total high level waste inventory would nearly reach the NWPA's 70,000-metric-ton limit by 2010.[17] Longer term, DOE recently updated its estimate of the total amount of commercial spent fuel that may eventually require disposal from 105,000 metric tons[18] to 130,000 metric tons.[19]

Currently, spent fuel discharged from U.S. commercial nuclear reactors is stored at 72

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13 *See* Ausness, *supra* note 4, at 746.

14 *See id.*

15 *See* ANTHONY ANDREWS, SPENT NUCLEAR FUEL STORAGE LOCATIONS & INVENTORY, CONGRESSIONAL RESEARCH SERVICE REPORT RS22001, 3 (December 21, 2004).

16 *See id.*

17 MARK HOLT, CIVILIAN NUCLEAR WASTE, CONGRESSIONAL RESEARCH SERVICE REPORT RL33461, 8 (November 26, 2007).

18 *See* DEPARTMENT OF ENERGY OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, OCRWM ANNUAL REPORT TO CONGRESS, FISCAL YEAR 2002, DOE/RW-0560, October 2003, Appendix C.

19 *See* DEPARTMENT OF ENERGY, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR A GEOLOGIC REPOSITORY FOR THE DISPOSAL OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE AT YUCCA MOUNTAIN, NYE COUNTY, NEVADA, SUMMARY, DOE/EIS-0250F-S1D, October 2007, p. S-47.

power plant sites around the nation, plus two small central storage facilities.[20] Most commercial spent fuel is being stored in steel-lined, water-filled pools below ground-level at the site of the generating reactor. However, a small but increasing amount of spent fuel is being stored in heavy, thick-walled metal or concrete casks above-ground on pads at reactor sites. At the end of 2002, for example, approximately 41,600 MTU were stored in spent fuel pools and an additional 5,400 MTU were stored in casks.[21]

(c) Permanent Disposal

The Nuclear Waste Policy Act of 1982 established a program for developing a geologic repository for the permanent disposal of up to 70,000 metric tons of spent nuclear fuel and high-level waste. DOE's Office of Civilian Radioactive Waste Management (OCRWM) was created to carry out the program. The Nuclear Waste Fund, which holds receipts from a fee on commercial nuclear power to dispose of its waste and federal contributions for emplacement of high-level defense waste, was established to pay for the program. DOE was required to select three candidate sites for the first national high-level waste repository. After much controversy over DOE's implementation of NWPA, the Act was substantially modified by the Nuclear Waste Policy Amendments Act of 1987. Under the amendments, the only candidate site DOE may consider for a permanent highlevel waste repository is at Yucca Mountain, Nevada. If that site cannot be licensed, DOE must return to Congress for further instructions.[22]

(d) Current Status of Yucca Mountain Repository

Under the NWPA, a geologic repository was scheduled to be completed so that DOE could begin accepting spent nuclear fuel from commercial reactors beginning in 1998. However, numerous political, technical, financial and legal problems have significantly delayed the characterization, licensing and construction of the Yucca Mountain repository. As a result, DOE announced on July 19, 2006, that it would submit a license application to the NRC for the planned Yucca Mountain repository by June 30, 2008. At the same time, DOE announced that its

20 *See* HOLT, *supra* note 17, at 8.

21 *See* ANDREWS, *supra* note 15, at 5.

22 *See* HOLT, *supra* note 17, at 9.

new goal for starting nuclear waste shipments to Yucca Mountain would be early 2017 -- nineteen years later than required by the NWPA.[23] This is DOE's "best achievable" schedule and assumes satisfaction of several preconditions,[24] of which two (Congressional approval of the Bush Administration's 2007 and 2008 budget requests and Yucca Mountain legislation) have already not been met and two more (no litigation or licensing delays) are most unlikely to occur as required. As a result, this schedule is now "in serious jeopardy," according to OCRWM's director.[25] In particular, the opening of a Yucca Mountain repository could be delayed until 2020.[26]

(e) Spent Nuclear Fuel Litigation Between Nuclear Utilities and DOE

When Yucca Mountain delays had made clear that DOE would not be able to accept spent fuel by January 31, 1998, the agency issued its Final Interpretation of Nuclear Waste Acceptance Issues in May, 1995, stating that it did not have an unconditional obligation to accept spent fuel in the absence of a repository or an interim storage facility constructed under the NWPA.[27] The agency also determined that it had no authority under the NWPA to provide interim storage in the absence of a facility authorized, constructed, and licensed in accordance with the Act.[28] Finally, DOE ruled that, even if it did have an unconditional obligation to accept waste beginning January 31, 1998, the Delays Clause of its Standard Contract for the Disposal of Spent Nuclear Fuel would provide an administrative remedy for the agency's failure to meet the obligation.[29]

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23 *See id.*, at 10.

24 *See* DEPARTMENT OF ENERGY, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, ANNUAL REPORT TO CONGRESS, FISCAL YEAR 2006, 2 (March 8, 2007).

25 Erica Werner, *Official: More Yucca Mountain Layoffs Ahead, Schedule in Doubt*, SAN DIEGO UNION-TRIBUNE, January 14, 2008, *http://www.signonsandiego.com/news/nation/ 20080114-1739-nv-yuccamountain.html*.

26 Erica Werner, *Yucca Head Defends '09 Budget Request*, KOLO-TV Channel 8, Reno, NV, February 5, 2008, *http://www.kolotv.com/home/headlines/15314246.html.*

27 *See* 60 Fed. Reg. 21,793, 21,793-94 (1995).

28 *See id*., at 21,797.

29 *See id.*

A number of nuclear utilities, states, and state public utility commissions sought judicial review of DOE's Final Interpretation of Nuclear Waste Acceptance Issues. In *Indiana Michigan Power Co. v. Department of Energy*,[30] the D. C. Circuit rejected DOE's interpretation of the NWPA and held that the agency did have an unconditional obligation to begin to accept spent fuel no later than January 31, 1998, even in the absence of a repository or interim storage facility authorized, constructed, and licensed under the NWPA.[31] However, the court also ruled that it was premature to determine the appropriate remedy, as DOE had not yet defaulted on its obligation.[32]

The prospect of DOE default on its waste acceptance obligation and indefinite at-reactor storage of spent nuclear fuel became a reality for nuclear utilities in December, 1996 when DOE sent letters to all holders of its Standard Contract formally notifying them that the Department would be unable to begin accepting spent nuclear fuel by January 31, 1998.[33] The agency also invited the utilities to share their views as to how the indefinite delay in waste acceptance could best be accommodated. In response, much the same group of utilities, states, and state commissions which had sued in *Indiana Michigan Power Co.* petitioned the D. C. Circuit for a writ of mandamus, seeking to compel DOE to begin to accept spent fuel by the January 31, 1998 deadline. DOE opposed the writ on the grounds that the petitioners had an adequate remedy under the Delays Clause of the Standard Contract. In *Northern States Power Co. v. Department of Energy*,[34] the court denied the writ sought by petitioners, but did issue one to compel DOE to comply with the court's prior mandate in *Indiana Michigan Power Co.*[35] Specifically, the court ordered DOE to proceed with contractual remedies in a manner consistent with its unconditional

30 88 F.3d 1272 (D.C. Cir. 1996).

31 *See id.* at 1277.

32 *See id.*

33 *See* DEPARTMENT OF ENERGY, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, FISCAL YEAR 1996 ANNUAL REPORT TO CONGRESS Summary at 4 (1997).

34 128 F.3d 754 (D.C. Cir. 1997).

35 *See id.* at 759.

NWPA obligation to begin acceptance of spent nuclear fuel by January 31, 1998, and precluded DOE from concluding that any delay in acceptance was unavoidable "on the ground that it has not yet prepared a permanent repository or that it has no authority to provide storage in the interim."[36]

Both the petitioners and DOE sought Supreme Court review of the *Northern States Power* decision, but the Court denied certiorari.[37] The petitioners also sought a "move fuel" order from the D.C. Circuit to implement its mandate in *Northern States Power*, but the court denied that relief on the grounds that the NWPA "requires the DOE to include an unconditional obligation in the Standard Contract, [but] it does not itself require performance," so "[b]reach by DOE does not violate a statutory duty [or] provide a basis for a move-fuel order."[38] Subsequently, on August 31, 2000, the Federal Circuit Court of Appeals decided two cases regarding the nuclear utilities' remedies for DOE's breach of its Standard Contract: *Maine Yankee Atomic Power Co. v. United States*[39] and *Northern States Power Co. v. United States*.[40] In these two cases, the court held that four nuclear power companies could sue the DOE for breach of contract for its failure to dispose of the companies' nuclear waste by the January 31, 1998 contractual deadline.

As a result of the *Maine Yankee* and *Northern States* decisions, over sixty utilities have filed suits in the Court of Federal Claims seeking, in the aggregate, billions of dollars in damages.[41] *The Washington Post* has quoted industry predictions that owners of all of the nation's nuclear plants will eventually sue for damages totaling between $31 billion and $53

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36 *Id*. at 760.

37 *See* Department of Energy v. Northern States Power Co., 119 S.Ct. 540, 142 L.Ed.2d 449 (1998).

38 Northern States Power Co. v. Department of Energy, 1998 WL 276581, at *2 (D.C. Cir. 1998).

39 225 F.3d 1336 (Fed. Cir. 2000) (involving three New England power companies: Maine Yankee Atomic Power Company, Connecticut Yankee Atomic Power Company, and Yankee Atomic Electric Company).

40 224 F.3d 1361 (Fed. Cir. 2000).

41 *See* Comment, *Recent Decisions Concerning the DOE's Commercial Radioactive Waste Disposal Program*, 19 ENERGY L. J. 387, 394 (1998).

billion.[42] By comparison, DOE estimates that the federal government will be liable for $7 billion in damages if Yucca Mountain begins operating by 2017 as currently planned, with the liability growing by $500 million for each year of additional delay.[43]

Through 2007, the U.S. Court of Federal Claims had ordered more than $400 million in payments to utilities in nuclear waste delay cases. For example, during 2006, TVA was awarded $34.9 million in January, three New England power companies were awarded $142 million in September, Pacific Gas & Electric Company was awarded $42.7 million in October, and the Sacramento Municipal Utility District was awarded $39 million in December. In 2007, Xcel Energy was awarded $116 million in September and Entergy was awarded $58.7 million in October.[44]

In addition, DOE has reached settlements with at least two utilities. Exelon announced a settlement with the Department of Justice in August, 2004, which that utility calculated would result in payments of $300 million if DOE began taking waste by its previous goal of 2010, and up to $600 million if the schedule slipped to 2015. As previously noted, DOE now does not expect to begin taking waste until 2017 at the earliest, so the Exelon payments will certainly be even larger. Duke Energy also announced a settlement with DOE on March 6, 2007, under which the company will receive an initial payment of $56 million and annual reimbursements for its future storage costs as they are incurred.[45]

(f) Reprocessing and Other Alternatives to Geologic Disposal

In the past, DOE and its predecessor agencies have studied several alternatives to the geologic disposal of spent fuel, as well as technologies that might make waste disposal easier. However, most of these technologies involve large technical obstacles, uncertain costs, and

42 *See* Michael Grunwald, *Lawsuit Surge May Cost U.S. Billions*, WASH. POST, Aug. 10, 1998, at A1.

43 *See* Elaine Hiruo, *Duke Receives $56 Million in Spent Fuel Settlement Agreement*, NUCLEAR FUEL, March 12, 2007, at 11.

44 *See* HOLT, *supra* note 17, at 4.

45 *See id.; see also* Elaine Hiruo, *Court Awards PG&E Less Than Sought for Spent Fuel Storage Costs*, NUCLEONICS WEEK, October 19, 2006, at 9, *and Court Awards $39 Million to SMUD*, NUCLEAR FUEL, December 18, 2006, at 13.

potential public opposition. Among the primary long-term disposal alternatives to geologic repositories are disposal in deep ocean trenches and transport into space, neither of which is currently being studied by DOE. Other technologies have been studied that, while probably not replacing geologic disposal entirely, might reduce the volumes of high-level waste requiring geologic disposal and make geologic disposal safer and more predictable. Chief among these technologies is the "reprocessing" or "recycling" of spent fuel.[46]

With reprocessing, plutonium, uranium, and other long-lived radionuclides are either separated from other fission products for reuse as nuclear fuel or converted to faster-decaying fission products in special nuclear reactors or particle accelerators. The other fission products remaining following reprocessing are not subject to reuse and are therefore wastes. They are primarily liquid, highly radioactive, and very unstable, being quite prone to fire and explosion. To improve their stability and safety, these high-level wastes are sometimes changed into solid forms intended for geologic disposal.[47]

In a few countries other than the United States, notably France, Great Britain and Russia, reprocessing has been used extensively. However, no commercially generated spent fuel has been reprocessed in the United States since 1976 and American national policy since the Carter Administration has disfavored reprocessing, primarily because of the nuclear proliferation risks it poses.[48] The spent fuel recycling provisions in recent Energy and Water Development Appropriations bills and the Bush Administration's Global Nuclear Energy Partnership (GNEP) initiative seem to indicate renewed interest in this area.[49] But, this interest has been focused on research and development of a "new generation" of reactor and reprocessing technologies which

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46 *See* HOLT, *supra* note 17, at 16.

47 *See* Michael B. Gerrard, *Fear and Loathing in the Siting of Hazardous and Radioactive Waste Facilities: A Comprehensive Approach to a Misperceived Crisis*, 68 TUL. L. REV. 1047, 1075 (1994).

48 In addition to the nuclear proliferation risks it poses, commercial reprocessing proved both economically unattractive and environmentally problematic in the United States. Of the three reprocessing plants constructed in the United States, one (West Valley, N.Y.) operated for six years but left a legacy of contamination, fires and accidents; the second (Morris, Ill.) was completed but never opened because it did not work; and the third (Barnwell, S.C.) was never finished because of massive cost overruns. *See id.*, at 1075-76 & n.190.

49 *See* HOLT, *supra* note 17, at 16.

do not currently exist and would likely require several decades to develop to the point where they would have commercial application.[50]

2. Vermont Yankee's Current Situation

(a) Spent Fuel Storage

Through 2002, there were approximately 500 metric tons of spent fuel stored at Vermont Yankee.[51] Similar to the situation at many other nuclear plants, the protracted and continuing delays in DOE's acceptance of spent fuel for transportation to and emplacement at the Yucca Mountain repository has meant that the amounts of spent fuel projected to accumulate at Vermont Yankee during its current license period would exceed the capacity of the plant's spent fuel pool. As a result, ENVY sought and obtained approval from the NRC and PSB to construct and operate a dry cask storage facility at the plant.

In particular, in its April 26, 2006 Final Order in Docket 7082 conditionally approving the new facility, the PSB found as follows[52]:

> 2. Currently, Vermont Yankee has sufficient spent fuel storage capacity (in the spent fuel pool in the Reactor Building) to operate with full-core discharge capability until the 2007 outage. Without additional storage capacity, such as the ISFSI proposed by Entergy VY, Vermont Yankee would likely shut down no later than 2008.
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> 3. If Entergy VY shuts down Vermont Yankee, it is likely that Entergy VY will commence decommissioning, which will require construction of an ISFSI to store the fuel now in the spent fuel pool.
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> 4. Entergy VY now proposes to install a dry cask storage facility at Vermont Yankee to temporarily store a portion of the spent nuclear fuel generated by Vermont Yankee. The Project consists of a number of modifications to Vermont Yankee that will permit Entergy VY to store spent nuclear fuel in dry casks.
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> 5. Dry cask storage has been in use at nuclear plants since 1986. There are

50 *See* INSTITUTE FOR POLICY STUDIES, RADIOACTIVE WASTES AND THE GLOBAL NUCLEAR ENERGY PARTNERSHIP, EXECUTIVE SUMMARY, at 1 (2007).

51 *See* ANDREWS, *supra* note 15, at 5.

52 *See* PSB Final Order, Docket 7082, April 26, 2006, at 16-17, 22.

more than 30 such installations in the United States. As of July 7, 2005, there were 118 loaded HI-STORM dry casks (the type Entergy VY plans to use) at eight nuclear plant sites.

6. If construction commences in late April as planned by Entergy VY, construction of the dry fuel storage facilities should be completed in 2007. Entergy VY would then conduct a "dry run" for loading of spent nuclear fuel in the summer and fall of that year and undertake the first loading campaign in early 2008.

7. During the first loading campaign, Entergy VY expects to move enough spent nuclear fuel to load six dry cask units.

8. If Vermont Yankee's operating license is not renewed in 2012 and Entergy VY removed all of the spent nuclear fuel from the spent fuel pool and placed it in casks, 60 casks would be required. However, the proposed ISFSI could only store 36 casks.

9. Under the proposed schedule, Entergy VY will not have sufficient capacity in the existing spent fuel pool to maintain full-core discharge until the ISFSI is complete. Entergy anticipates operation of Vermont Yankee without full-core discharge capability will last for approximately twelve months. . . .

42. An ISFSI with the proposed capacity, up to 36 overpacks, does not commit Entergy VY or the state to plant operation beyond the current licensed life (until March 2012).

43. An ISFSI large enough to accept all of the fuel from plant operations and to accommodate full offload of the spent-fuel pool would require space for approximately 60 overpacks (for a 2012 plant shutdown) and 80 overpacks (for a 2032 plant shutdown); an ISFSI of sufficient size to meet these needs would not fit within the plant's existing, highly protected security area.

The process of transferring spent fuel from the VY spent fuel pool to dry cask storage began in the spring of 2008. During the transfer of the initial cask to the ISFSI, ENVY experienced a reactor building crane problem on May 12, 2008. Specifically, while lowering a spent fuel transfer cask, the crane operator attempted to stop movement of the crane when the transfer cask was approximately four inches above the refueling floor. However, the crane

motion did not stop as expected, and the fuel cask continued to be lowered at the normal rate of speed to the refueling floor. The spent fuel transfer cask was set down on the refueling floor in an acceptable location and supplemental cooling was established per procedure. However, ENVY suspended the transfer process through May 22, 2008. No further equipment problems were noted subsequent to the resumption of the spent fuel transfer activities on May 23, 2008. ENVY completed the transfer of the initial cask of spent fuel to the ISFSI on May 29, 2008.[53] Subsequently, ENVY completed the transfer of four more casks on July 29, 2008.[54] On August 5, 2008, the NRC concluded that the crane problem had been the result of neglected maintenance but the resulting incident had not had any impact on public health and safety.[55]

(b) Spent Fuel Litigation with DOE

Like the other nuclear utilities, VYNPC filed suit against DOE in the Federal Court of Claims for breach of its spent fuel disposal contract. Following its purchase of VYNPS, ENVY did also. The two suits were then consolidated by the Court of Claims.[56] In October, 2006, in response to cross-motions for summary judgment from the parties, the Court of Claims ruled that DOE was liable to VYNPS and ENVY for their damages caused by the Department's breach of the spent fuel disposal contract, with the respective amounts of those damages to be determined at trial.[57] Pending completion of discovery and the filing of any further dispositive motions, the trial of the damages issues has yet to be scheduled.

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53 *See* VERMONT YANKEE NUCLEAR POWER STATION, (UPDATE) TRANSFER OF SPENT FUEL FROM SPENT FUEL STORAGE POOL TO ONSITE INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI), PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE PNO-I-08-006A, *available at* www.nrc.gov, ADAMS Accession No. ML081510695.

54 *See* Susan Smallheer, *NRC: Entergy Neglect Led to Crane Crash*, RUTLAND HERALD, September 5, 2008.

55 *See id.*

56 *See* Federal Court of Claims Cause Nos. 02-898C and 03-2663C.

57 *See* Vermont Yankee Nuclear Power Corp. v. U.S., 73 Fed. Cl. 236 (2006).

(c) ENVY's Spent Fuel Management Obligations under Federal Law

Pursuant to 10 CFR § 72.210, ENVY notified the NRC of its plans to construct and operate a dry cask spent fuel storage facility at VYNPS and, on June 15, 2006, the agency published notice in the Federal Register that it had issued a general license to ENVY for the facility. This notice was accompanied by two orders modifying the VYNPS operating license to impose certain specified but confidential security measures on the facility required by NRC regulations.[58] Pursuant to 10 CFR § 72.212, ENVY's general license to construct and operate its dry cask storage facility is limited to storage only of the spent fuel authorized by the VYNPS operating license and only in casks certificated by the NRC for an initial period of twenty years. The general license is also subject to the additional conditions imposed by 10 CFR Part 72 Subpart K, including compliance with the requirement imposed by 10 CFR § 50.54(bb) to submit a plan for the management and removal of spent fuel from the reactor site.

Because of the scheduled expiration of the VYNPS operating license on March 21, 2012, ENVY submitted to the NRC on March 21, 2007 the initial plan required by 10 CFR § 50.54(bb). Generally, the plan contemplates the following schedule of activities for VYNPS:

1. Completion in 2008 of a first, smaller dry cask storage facility within the existing VYNPS protected area;

2. Expiration of the VYNPS operating license as scheduled on March 21, 2012;

3. Completion in early 2015 of a second, larger dry cask storage facility within an enlarged VYNPS protected area.;

4. Transfer of casks from first facility to second facility during 2015;

5. Completion of the Yucca Mountain repository and acceptance by DOE of spent fuel beginning in March, 2017;

6. Completion of transfer of spent fuel from reactor pool to second storage facility during 2017;

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58 *See* Issuance of Order for Implementation of Interim Safeguards and Security Compensatory Measures, Docket 72-59, EA-06-116, June 15, 2006, *available in* the NRC's ADAMS database as ML061640284 and Issuance of Order for Implementation of Additional Security Measures Associated with Access Authorization, Docket 72-59, EA-06-117, June 15, 2006, *available in* the NRC's ADAMS database as ML06164313.

7. First VYNPS spent fuel assembly removed from site in fourth quarter of 2017;

8. Last VYNPS spent fuel assembly removed from site in December, 2042;

9. Second storage facility (along with rest of site) decommissioned and decontaminated between April 2045 and March 2048; and

10. Second storage facility (along with rest of site structures) demolished between December 2048 and June 2050.[59]

On March 12, 2008, the NRC sent ENVY a Request for Additional Information regarding its spent fuel management plan. Specifically, the NRC requested ENVY to explain how it would fund the plan "recognizing the decommissioning trust fund is required by NRC regulation, 10 CFR § 50.75, for radiological decommissioning and not for spent fuel management costs or other non-radiological costs."[60] Entergy's response to the NRC staff's RAIs stated, "Entergy VY plans to use funds from the decommissioning trust fund to cover spent fuel management costs." 10 CFR § 50.75 requires that licensees provide decommissioning funding assurance for decommissioning costs. However, such costs do *not* include spent fuel management costs under 10 CFR § 50.54 (bb). Funds placed in the decommissioning trust fund may only be used for decommissioning, unless the funds are in addition to decommissioning funds and have been earmarked for spent fuel management. Entergy has not earmarked such funds and does not have a separate subaccount to address spent fuel management costs. Furthermore, 10 CFR § 50.75 generally allows a licensee who has submitted a site-specific cost estimate to take credit for projected earnings on the decommissioning trust fund only up to a two percent annual real rate of return through the decommissioning period. A licensee may use a credit of greater than two percent up to the time of license expiration, but only if the licensee's rate-setting authority has specifically authorized a higher rate. This is not the case for ENVY. ENVY's plan uses a real

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59 *See* ENTERGY NUCLEAR OPERATIONS, INC., VERMONT YANKEE NUCLEAR POWER STATION PROGRAM FOR MAINTENANCE OF IRRADIATED FUEL, dated Mar. 21, 2007, *available at* www.nrc.gov, ADAMS Accession No. ML070860696.

60 *See* NUCLEAR REGULATORY COMMISSION, OFFICE OF NUCLEAR REACTOR REGULATION, REQUEST FOR ADDITIONAL INFORMATION TO SUPPORT THE REVIEW OF THE VERMONT YANKEE NUCLEAR POWER STATION SPENT FUEL MANAGEMENT PLAN, dated Mar. 12, 2008, *available at* www.nrc.gov., ADAMS Accession No. ML 080710307.

rate of return of greater than two percent through the specified SAFSTOR period, based on Entergy's position that it is reasonable to consider historical performance of the fund, and Entergy's pending request for license renewal. ENVY's use of greater than two percent has not been authorized by a rate-setting authority and no licensee may use a greater than a two percent real rate of return after its license expiration. For these reasons, it is unacceptable for VY to use greater than a two percent real rate of return. Thus, the NRC Staff disapproved ENVY's initial spent fuel management program and requested the Company to submit a revised plan within 90 days.[61]

ENVY submitted its revised plan to the NRC Staff on October 14, 2008.[62] In its revised plan, ENVY attempts to address the concerns of the NRC Staff with several significant changes, including:

1. While still using Decommissioning Scenario 5 as the basis for its proposed SNF Management Plan, altering that Scenario to extend completion of decommissioning until 2072;

2. Escalating the year-end decommissioning trust fund balance at a rate of 2% per year, the maximum permitted by NRC regulations;

3. Committing to make an additional deposit of $60 million to the decommissioning trust in 2026; and

4. Requesting, pursuant to 10 CFR 50.12, an exemption from the requirements of §50.82(a)(8)(i)(A) in order to permit use of the funds in the decommissioning trust for both decommissioning and spent fuel management.

For purposes of its revised plan and supporting financial analysis, ENVY continued to use a decommissioning trust balance as of 12/31/07 rather than the significantly lower balance as of 9/30/08 as the starting point for future fund balance escalation. It also assumed a 2017 start date for Yucca Mountain operations, future expansion of Yucca Mountain capacity beyond the

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61 *See* NUCLEAR REGULATORY COMMISSION, OFFICE OF NUCLEAR REACTOR REGULATION, VERMONT YANKEE NUCLEAR POWER STATION-REVIEW OF THE SPENT FUEL MANAGEMENT PLAN , dated July 16, 2008, *available at* www.nrc.gov., ADAMS Accession No. ML081700564.

62 See ENTERGY NUCLEAR OPERATIONS, INC., REVISED SPENT FUEL MANAGEMENT PLAN PURSUANT TO 10 CFR 50.54(BB), dated Oct. 14, 2008, available at www.nrc.gov., ADAMS Accession No. ML082910294.

current 70,000 MTU limit, and acceptance and transport of VY spent fuel on the schedule set out in a DOE plan published in 2004. All of these assumptions are subject to significant debate at the present time.

3. Vermont Yankee's Spent Fuel Management Plan in the Event of License Extension

Spent fuel management has been a major issue in the NRC proceedings on ENVY's application for license extension. In particular, the State of Massachusetts asserted that ENVY should significantly reduce the number and density of spent fuel assemblies stored in the VYNPS reactor storage pool and transfer a significant number of those assemblies to dry cask storage in order to reduce the risks of pool fires due to accidents or malicious acts.[63] In addition, the State of Vermont contended that the ENVY application fails to adequately assess the environmental impacts of spent fuel storage at the VYNPS site lasting for a period of time that will be significantly longer than contemplated in the Generic EIS and perhaps even indefinitely.[64]

Both of these contentions were deemed inadmissible in the VYNPS relicensing proceeding by the Atomic Safety and Licensing Board because they conflicted with generic rules of the NRC.[65] On appeal by the Massachusetts Attorney General, the Board's decision was upheld by the Commission.[66] Massachusetts subsequently filed both a petition for rulemaking with the NRC and a petition for judicial review with the First Circuit.[67] The First Circuit ruled

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63 *See* Massachusetts Attorney General's Request For a Hearing and Petition for Leave to Intervene With Respect To Entergy Nuclear Operations Inc.'s Application For Renewal Of The Vermont Yankee Nuclear Power Plant Operating License and Petition For Backfit Order Requiring New Design Features To Protect Against Spent Fuel Pool Accidents, with supporting declarations, expert reports, and attachments, Docket No. 50-271, filed May 26, 2006.

64 *See* Vermont Department of Public Service Notice of Intention to Participate and Petition to Intervene with Exhibits and Declaration, Docket No. 50-271, filed May 26, 2006.

65 *See* Entergy Nuclear Vermont Yankee, LLC, & Entergy Nuclear Operations, Inc.,

(Vermont Yankee Nuclear Power Station), 64 N.R.C. 131 (2006), 2006 WL 5365836 (N.R.C.).

66 *See* Entergy Nuclear Vermont Yankee, LLC, & Entergy Nuclear Operations, Inc., (Vermont Yankee Nuclear Power Station), 65 NRC 113, 2007 WL 172517 (N.R.C.).

67 *See* Massachusetts Attorney General's Petition for Rulemaking To Amend 10 C.F.R. Part 51, Docket No. PRM-51-10, 71 Fed. Reg. 64,169 (Aug. 25, 2006) (public notice) *and* Commonwealth of Massachusetts v. U.S. Nuclear

that Massachusetts' only available means of relief was its petition for rulemaking.[68] Subsequently, the NRC approved Massachusetts participation as a state in the Vermont Yankee license renewal proceeding in order to protect its petition for rulemaking.[69] However, on August 1, 2008, the NRC denied the Massachusetts petition for rulemaking.[70] On September 29, 2008, Massachusetts sought judicial review of the NRC decision in the First Circuit.[71] On November 6, 2008, this case was consolidated with a similar case filed by the State of Connecticut in the Second Circuit.[72] The State of Vermont and DPS are seeking to intervene in the consolidated cases.

Spent fuel management was also a significant issue in the so-called Dry Cask Storage Docket before the PSB, where the New England Coalition adopted a position very similar to that advanced by the State of Massachusetts in the NRC license renewal docket.[73] The Citizens Awareness Network raised additional issues regarding spent fuel management, particularly issues associated with transfer of spent fuel assemblies from wet to dry storage and the duration and extent of spent fuel storage and the VYNPS site.[74]

Thus, it is readily foreseeable that spent fuel management will be a major issue in the consideration of the extension of VYNPS commercial operation by both the Vermont legislature and the PSB. Furthermore, whether or not the VYNPS license extension is approved by the NRC and a Certificate of Public Good for extended commercial operation is approved by Vermont authorities, spent fuel management will certainly be a major issue in the Certificate of

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Reg. Comm'n, No. 07-1482 (1st Cir., filed March 22, 2007).

68 *See* Massachusetts v. United States, 522 F.3d 115 (1st Cir. 2008).

69 *See* Entergy Nuclear Vermont Yankee, LLC & Entergy Nuclear Operations, Inc., No. 50-271 (Nuc. Reg. Comm'n May 12, 2008), *available at* www.nrc.gov, ADAMS Accession No. ML081330431.

70 *See* NRC Denial of Petitions for Rulemaking, Docket Nos. 51-10 & 51-12 (Aug. 1, 2008), *available at* www.nrc.gov, ADAMS Accession No. ML081890124.

71 *See* Massachusetts v. United States, No. 08-2267 (1st Cir., filed Sept. 29, 2008).

72 *See* Blumenthal v. United States, No. 08-4833 (2nd Cir., filed Oct. 1, 2008).

73 *See* PSB Final Order, Docket 7082, April 26, 2006, at 9-10.

74 *See id.*, at 10.

Public Good proceeding for the second VYNPS dry cask storage facility projected by ENVY to come into service in 2015. This appears certain because the second dry cask storage facility will be necessary even if VYNPS is shut down in 2012.[75] As a result, it would seem that the principal difference between shut down and continued operation scenarios for VYNPS in 2012 will not be the existence but instead the capacity, configuration, manner of operation, and life expectancy of the second dry cask storage facility.

These are, of course, still very important and likely quite controversial issues. They are also complex issues, with significant technical, economic, legal, and political implications in their own right. The complexity inherent in these issues is compounded by their interplay with another set of issues affecting spent fuel management at every nuclear reactor and spent fuel storage facility in the nation – the profound uncertainties associated with the Yucca Mountain repository and the evolving federal policy response to the continuing conundrum of what to do with spent nuclear fuel and other high level nuclear waste. This interplay has many ramifications.

For instance, the 2012 shutdown scenario envisioned in ENVY's 10 CFR § 50.54(bb) Report would appear to be too optimistic regarding the opening of the Yucca Mountain repository and the initiation of spent fuel removal from VYNPS to be relied upon for planning purposes. Based on the best available information at this time, it would appear that the earliest plausible date for the opening of Yucca Mountain is 2020 and not 2017.[76] Moreover, there are significant uncertainties regarding the funding, licensing, construction and operation of the Yucca Mountain repository which would make it prudent to use both a "base case" and a "contingency case" for Vermont planning purposes. A 2020 date would be appropriate for the opening of Yucca Mountain in the "base case," but a considerably later date would be appropriate for the "contingency case" in order to analyze the effects of an extended Yucca Mountain delay.

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75 *See* VYNPS Report pursuant to 10 CFR 50.54(bb) re Program for Maintenance of Irradiated Fuel, Docket No. 50-271, filed March 21, 2007.

76 *See* Werner, *supra* note 25.

There are even more ramifications in a 2032 shutdown scenario. In particular, it is evident that an inherent ramification of the widespread license extensions being approved for existing nuclear plants will be significant additional amounts of spent fuel being generated. As a result, at this point in time, it is debatable whether the "contingency case" for a 2032 shutdown scenario should be based on the assumption of significantly expanded capacity for Yucca Mountain or on the presumed existence and operation of a second repository, but one or the other would clearly be appropriate. In addition, the existence of additional spent fuel combined with repository uncertainties would appear to entail longer periods of at-reactor storage. For example, the Department of Energy's recently proposed update for its Waste Confidence Rule would appear to contemplate the need for at-reactor storage periods following plant shutdowns of up to 50 to 60 years.[77] Similarly, an inherent ramification of a Vermont Yankee license extension will be significant additional amounts of spent fuel being generated by the plant, with necessary implications for both the required capacity and life expectancy of spent fuel management facilities at the site.

The extended life expectancy of spent fuel management facilities in even a 2012 but especially a 2032 shutdown scenario makes comprehensive analysis of the sources and amounts of funding for spent fuel management very important. Arguably, such information is currently required by 10 CFR § 50.54(bb) as that regulation now reads, but only at a point in time five years before the expected shutdown of an operating plant like Vermont Yankee. However, the NRC has recently proposed a new rule intended to obtain information regarding the future funding of spent fuel management on a timetable more comparable to the information currently provided for decommissioning, with the express recognition that such information is required sooner to assure the availability and adequacy of the required funding later.[78]

This financial information is especially important where, as here, funds previously collected from ratepayers for both decommissioning and spent fuel management are commingled

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77 *See* Consideration of Environmental Impacts of Temporary Storage of Spent Fuel After Cessation of Reactor Operation, 73 Fed. Reg. 59547 (proposed October 9, 2008) (to be codified at 10 C.F.R., pt. 51), *available at* www.nrc.gov, ADAMS Accession No. ML082600597, esp. p. 11.

78 *See* Proposed Rule, Decommissioning Planning, 73 FR 3812-01, 2008 WL 166867 (F.R.) (January 22, 2008).

in the same trust funds and where most, if not all of ENVY's spent fuel management costs – at least for waste generated through 2012 – would presumably be paid by DOE as damages in the pending spent fuel litigation. But, such may well not be the case for spent fuel generated after 2012. Damage awards by the Court of Claims in the spent fuel litigation between the nuclear utilities and DOE have been exclusively retrospective; prospective payments have been involved only in settlements. In addition, of course, no damage award to date has involved reimbursement of storage costs for spent fuel generated during a license extension. Indeed, there would be a legal issue of whether DOE's breach of the Standard Contract would be the proximate cause of the storage costs for spent fuel generated during a license extension – especially if the original 70,000 MTU capacity of Yucca Mountain contemplated in the NWPA has been exhausted as anticipated by spent fuel generated by 2010. In the case of Vermont Yankee, of course, spent fuel associated with a license extension would not begin to be generated until 2012 and would not be ready for transport until 2017, even assuming that Yucca Mountain was completed and accepting waste by that time.

4. Vermont Yankee's Spent Fuel Management Plan in the Event the Enexus Transaction Occurs

The effect of the proposed Enexus transaction on ENVY's spent fuel management plan is necessarily speculative at this time. In summary, the proposal would transfer the ultimate ownership and control of VYNPS through ENVY from Entergy to Enexus. As such, it requires the approval of the PSB in addition to the NRC. The implications of this transfer, if it occurs, will not be determinable until the pending Enexus proceedings before the PSB have concluded and the terms and conditions of any approval of the Enexus transaction are known.

5. Vermont Yankee's Spent Fuel Management Plan in the Event of an ENVY Bankruptcy Filing

The effect on Vermont Yankee's spent fuel management plan of a bankruptcy filing by ENVY would be much less uncertain than the effects on contractual commitments discussed in Chapter 5 of this Report. This is because a bankruptcy filing is generally not a bar to enforcement by federal agencies of ongoing regulatory obligations, especially where the obligations in question involve protection of public health and safety as they do with spent fuel

management. Of particular comfort with respect to spent fuel management obligations would be that they typically involve compliance with regulations that specify actions other than the payment of money. Additionally, the extent to which spent fuel management funds are held in dedicated trust funds disbursement from which are subject to NRC approval would also provide protection for Vermont interests. However, any damage awards paid by DOE to ENVY as reimbursement for spent fuel management costs incurred at VY would likely be considered general assets of the bankruptcy estate.[79] As a result, they cannot be assumed to be available to fund any shortfall which may otherwise exist with respect to future spent fuel management funding.

6. Spent Fuel Management Recommendations

In view of the discussion above, the following recommendations would appear to be appropriate:

2012 Shutdown Scenario

a. The "base case" for Vermont planning purposes should include a date of 2020 for the initial acceptance, transportation and shipment of spent fuel to the proposed Yucca Mountain repository;

b. There should also be a "contingency case" for planning purposes which should include a much later date for the initial acceptance, transportation and shipment of spent fuel to the proposed Yucca Mountain repository in order to assess the effects of such an extended delay;

c. ENVY should be requested for its assessment of the effects these changed assumptions would have on the spent fuel management and decommissioning plans incorporated in its October, 2008 10 CFR 50.54(bb) Report to the NRC; and

d. ENVY should also be requested to make its analyses for a 2012 shutdown scenario to be more explicit than its March, 2007 and October, 2008 10 CFR 50.54(bb) Reports to the NRC

79 *See, e.g.*, In re Torwico Electronics, Inc., 8 F.3d 146 (3d Cir.1993), *cert. denied*, Torwico Electronics, Inc. v. New Jersey Dept. of Envt'l Protection & Energy, 511 U.S. 1046 (1994); In re Chateaugay Corp., 944 F.2d 997 (2nd Cir. 1991); In re Coporacion de Servicios Medicos Hospitalarios de Fajardo, 805 F.2d 440 (1st Cir. 1986); Penn Terra, Ltd. v. Department of Envt'l Resources, Comm. of Pa., 733 F.2d 267 (3d Cir.1984); New York v. Mirant New York, Inc., 300 B.R. 174 (S.D.N.Y.2003); In re Gandy, 327 B.R. 796 (Bankr. S.D.Tex. 2005); and In re Psychotherapy and Counseling Center, Inc., 195 B.R. 522, 36 Collier Bankr.Cas.2d 1, 50 Soc.Sec.Rep.Serv. 836, Med & Med GD (CCH) P 44,417 (Bankr. D.D.C. 1996).

with respect to the sources and amounts of funding required for spent fuel management.

2032 Shutdown Scenario

a. The "base case" for Vermont planning purposes should include a date of 2020 for the initial acceptance, transportation and shipment of spent fuel to the proposed Yucca Mountain repository;

b. There should also be a "contingency case" for planning purposes which should include a much later date for the initial acceptance, transportation and shipment of spent fuel to the proposed Yucca Mountain repository in order to assess the effects of such an extended delay;

c. Serious consideration should also be given to the "contingency case" for planning purposes assuming the need for either a significantly expanded Yucca Mountain or a second repository in an alternate location in order to accommodate the additional spent fuel associated with the numerous license extensions which have been or will be approved for existing nuclear plants;

d. ENVY should be asked to prepare a spent fuel management analysis for a 2032 shutdown scenario comparable to the one it has prepared for a 2012 shutdown scenario because the results of such an alternative analysis are not at all obvious; and

e. ENVY should also be requested to make its analyses for a 2032 shutdown scenario to be explicit with respect to the sources and amounts of funding required for spent fuel management.

B. Low-Level Radioactive Waste Management

When it comes to radioactive waste, not all waste is created equal. High-level waste, including spent nuclear fuel, garners the most attention because of its long-term, lethal levels of radiotoxicity. Low-level radioactive waste (LLRW), on the other hand, typically attracts less attention. However, the much larger volumes of LLRW requiring disposal and the recent closing to most generators of a critical disposal facility in South Carolina is focusing increased attention on the LLRW issue, both nationally and in Vermont, notwithstanding the lower levels and shorter durations of its radiotoxicity.

1. Definition of Low Level Radioactive Waste

Low level radioactive waste contains lower levels of radioactivity than spent nuclear fuel and is classified in three categories: A, B and C. [80] Class A waste is nominally safe after 100 years, Class B waste after 300 years, and Class C waste after 500 years. Nuclear power plants generate significant quantities of LLRW each year, through daily maintenance activities, reactor cleanup systems, and disposable protective clothing. Class A waste comprises the bulk of LLRW from nuclear power plants, about 85 to 90 percent. [81]

2. Vermont's LLRW Generation

Vermont Yankee is, by far, the largest LLRW generator in Vermont. For recent years, the following table identifies volumes of low-level radioactive waste created by Vermont generators.[82]

Vermont Waste Volumes
(Prepared for Shipment)
(Cubic feet)

	2001	**2002**	**2003**	**2004**	**2005**	**2006**
Vermont Yankee	1543	833	943	10,806*	2,154	2,153
University of Vermont	15.0	5.5	6.6	6.0	4.1	0
VA Medical Center	1.0	1.7	0.88	1.8	1.1	1.7
Middlebury College	2.0	2.0	1.5	1.5	1.5	5
VT Dept of Health	0	0	0	0	0	0

* The increase in Vermont Yankee volume in 2004 was the result of the major outage work required for a power uprate intended to increase the plant's output by 20%.

80 LLRW classifications are formally defined in the Nuclear Regulatory Commission rule found at 10 C.F.R. § 61.55. Generally, Class A has the lowest radioactivity and Class C has the highest radioactivity.

81 *The "Other" Waste Disposal Issue*, 112 Power Engineering 3 (March, 2008), at 8, *available at* 2008 WLNR 7767414.

82 Uldis Vanags, Vermont Member, Texas Low-level Radioactive Waste Disposal Compact Commission, *Report to the House and Senate Committees on Natural Resources and Energy Status of the Texas Low-level Radioactive Waste Disposal Compact*, January 31, 2008, at 3.

By comparison, in its last completed decommissioning study (January 2007), Vermont Yankee projected it will have 267,578 cubic feet of low-level decommissioning waste.[83]

3. Vermont's LLRW Storage and Disposal Efforts

In the 1980s there was a prolonged effort to address Vermont's need for disposal of low-level radioactive waste by the Vermont Low-level Nuclear Waste Advisory Committee. Then, in 1990, in order to meet mandates of federal law, the Vermont General Assembly passed legislation that required Vermont to search for an in-state disposal location for low-level radioactive waste, while at the same time negotiating with other states to form a compact for disposal. In negotiations conducted by the Agency of Natural Resources, the state of Texas indicated a willingness to enter into compact discussions with Vermont, and in 1993, the Texas and Maine legislatures approved compact legislation, followed by an affirmative statewide referendum in Maine in November 1993. The Vermont General Assembly approved Vermont's entry into the compact in April 1994. An interstate compact requires Congressional approval. Bills to establish the compact were introduced in the 103rd (1994), 104th (1995-6) and 105th (1997-8) Congresses. The compact was passed in 1998, and President Clinton signed the compact into law on September 20, 1998. In April 2002, with the shutdown and decommissioning of the Maine Yankee Nuclear Plant, the state of Maine elected to withdraw from the Compact, as allowed by Compact sections 7.03 and 7.05. The withdrawal became effective in April 2004.[84]

4. National LLRW Storage and Disposal Developments

The Texas compact is the 10th compact that has been ratified by Congress. The compacts are:

Texas Maine-Vermont Compact (Texas host)	Central-Midwest (Illinois host)
Atlantic (South Carolina host)	Midwest (Ohio host)
Rocky Mountain (using Northwest facilities)	Appalachian (Pennsylvania host)
Southwest (California host)	Southeast (North Carolina host)

83 *Id.*, at 3 n. 2

84 *Id.*, at 2.

Northwest (Washington host) Central States (Nebraska host)

The development of disposal facilities by individual compacts envisioned by the Low-Level Radioactive Waste Policy Amendments Act of 1985 has not occurred. States selected to host new compact facilities have all experienced difficulties developing sites, and efforts to locate sites are stopped or stalled in all compacts. Only the Northwest and Atlantic compacts remain secure with usage of the existing Hanford, Washington and Barnwell, South Carolina sites as disposal facilities.

A prime driving force for the lack of compact progress was the continued availability until recently of the Barnwell site, and the emergence of the private (non-compact) Envirocare of Utah facility in Clive, Utah (now called Energy Solutions). With considerably lower disposal prices, Energy Solutions has become the disposal facility of choice for Class A waste. Barnwell's higher prices have resulted in its use primarily for Class B and C waste and special requirement disposal items which Energy Solutions does not currently accept.

South Carolina, host state for the Atlantic Compact's Barnwell site, began to exclude access to non-compact members as of July 1, 2008. The Energy Solutions facility had considered expanding its acceptance to include Class B and C waste, but has abandoned this plan. Therefore, the Texas Compact facility appears to be the only future disposal option for Class B and C Vermont wastes.

5. Changes in Federal Law and Regulation

No changes have occurred in federal law or regulation during the past year. The controlling law is the Low-Level Radioactive Waste Policy Amendments Act of 1985 that established the compact system. The law created incentives for states to join multi-state compacts which could exclude wastes from states outside the compact. Although compacts have been formed, the law has not yet resulted in development of additional disposal facilities. Because of this, there are calls for congressional intervention to revise the low-level radioactive waste law. However, currently there is no active proposed legislation in this area. Since Vermont has invested $12.5 million in the Texas Compact, Vermont will want to monitor future

developments in this area in the Congress.[85]

6. Status of Licensing the Texas Compact Facility

The State of Texas is required by the compact, which is federal law, to act in good faith to develop a disposal facility. The former Texas Natural Resources Conservation Commission (TNRCC) (now the Texas Commission on Environmental Quality – TCEQ), the licensing body for the state of Texas, completed its work reviewing the Hudspeth County Sierra Blanca site. In July 1998, the Texas Office of Administrative Hearings recommended the license application for the Sierra Blanca site be rejected based on lack of information for inferred faulting at the site and failure to address potentially adverse socioeconomic impacts. Though exceptions to this opinion were filed based on the record developed in the case, the full Commission accepted the administrative law judges' recommendations and rejected the site on October 22, 1998.

Following rejection of the proposed Hudspeth County site, other possible sites emerged. However, a new location needed approval of the Texas legislature. Proposals for a disposal facility were strongly debated in the 1999 and 2001 Texas legislative sessions, but these sessions adjourned without passing legislation. A major issue debated in the Texas legislature was whether the disposal facility could accept waste from the Department of Energy (DOE) in addition to Compact waste, a proposal supported by developer WCS.[86] In 1999, the legislature terminated the Texas Low-Level Radioactive Waste Disposal Authority and assigned its responsibilities to TCEQ.

In May 2003, the 78th Texas Legislature passed HB 1567 which signaled a policy shift in the statutory framework governing low-level radioactive waste disposal in Texas. Significant changes in the law included the privatization of the disposal facility, the authorization for such a facility to accept federal waste as well as waste from Texas Compact participants, and the requirement that fees on waste received at the proposed facility would be deposited in the State's general revenue fund. The development of the compact facility by a private developer, regulated by the state of Texas, is a change from the plan anticipated when the Compact was made.

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85 *Id.*, at 4.

86 DOE wastes are projected to have significantly larger volumes than Compact wastes.

The primary private candidate site is a 16,000-acre hazardous and mixed waste disposal facility in Andrews County, owned by private developer Waste Control Specialists (WCS). In August 2004, the TCEQ received an application for a proposed Compact facility from WCS in Andrews County. The TCEQ issued notification of administrative completeness on February 18, 2005 and held a public meeting in Andrews County on March 31, 2005.

The 79th Texas Legislature began with some controversy concerning the storage of uranium mill tailings from the Fernald Environmental Management Project in Ohio at the WCS facility in Andrews County. Ultimately, the Department of State Health Services issued a permit to expand storage capacity at the WCS facility with a non-binding license condition that requires WCS to work with the Legislature on technical aspects. Currently, Fernald waste is accepted and stored at the WCS facility in Andrews County.[87]

Significant progress has been made with the licensing of the Compact site in 2007 and 2008. The Texas Commission on Environmental Quality (TCEQ) project team has evaluated the technical merits of the WCS application and on December 10, 2007 issued an initial draft license including pre-construction, construction, operational, and maintenance requirements. On August 13, 2008, TCEQ Office of Chief Clerk mailed the Notice of Technical Summary and Executive Director's Preliminary Decision, Licensing Order & Final Draft License and the Draft Environmental Analysis to WCS and adjacent land and mineral rights owners. Upon WCS publishing the official TCEQ notice, the public will have 30 days to provide comment and request a hearing.[88] Opposition from state and national environmental organizations, including the Sierra Club, is expected.[89]

WCS projects the following timetable for the balance licensing process for and the initiation of LLRW waste disposal at the Compact facility[90]:

09/17/08 – Close of public comment period and filing of request for public hearing

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87 *See* VANAGS, *supra* note 82, at 4-5.

88 *See* http://www.tceq.state.tx.us/permitting/radmat/licensing/wcs_license_app.html#wcs_status

89 *See, e.g.*, http://texas.sierraclub.org/conservation/brochureWCS.pdf

90 *See, e.g.*, http://www.wcstexas.com/PDF_downloads/Timeline_2007_0619.pdf

09/17/09 – Proposal for decision by TCEQ

11/15/09 – Final License issued by TCEQ

12/15/10 – LLRW disposal begins.

The rate setting process for the Compact facility will require rulemaking at the TCEQ with input from the operator, the users (waste generators) and the public. The rulemaking for rate setting was initiated earlier this year.

The Texas Compact Commission originally consisted of eight members -- six members from Texas and one member from Vermont and another from Maine. With Maine's withdrawal from the compact, the membership has been reduced to seven. Governor Perry has yet to appoint the six Texas members to the Compact Commission and authorize its operation. This would begin the management process for setting policy and administration. [91]

7. Summary of Compact Costs

According to the Compact, Vermont will pay $25 million to join the compact, and an additional $2.5 million to the county in which the facility will be located. These compact fees are not altered by Maine's withdrawal from the compact. In addition to these fees associated with joining the compact, Vermont generators will pay disposal fees based on the volume and type of radioactive waste to be disposed.

The completed sale of Vermont Yankee to ENVY changed the cost impact to Vermont ratepayers. As part of the sale transaction, ENVY assumed the responsibility and liability for disposing of low-level radioactive waste, including decommissioning waste. Vermont utilities are purchasing Vermont Yankee power from ENVY at negotiated, fixed prices through 2012, which do not change regardless of the costs incurred by ENVY for waste disposed. Therefore, Vermont ratepayers are no longer exposed to cost increases associated with low-level radioactive waste disposal, at least through 2012.[92]

In September 2003, Texas requested payment of the initial $12.5 million non-host party state contribution from Vermont. Vermont made the payment, all of which came from Vermont

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91 *See* VANAGS, *supra* note 82, at 5.

92 While Vermont ratepayers are no longer exposed, ENVY and the other generators listed in the Vanags report

Yankee, in three installments ending in November 2004. The remaining $12.5 million of the non-host party state contribution will be due when the Compact facility opens.

Due to the rejection of the Sierra site and subsequent consideration of the Andrews County site, development costs for a facility may increase. However, two considerations may mitigate the effects of these costs for Vermont. First, it is possible that a developer may invest corporate resources for a significant portion of the development. Second and more importantly, the compact language establishes that Vermont waste generators will pay the same disposal rates as Texas generators, and the Texas generation of waste may increase significantly with the potential construction of new nuclear power stations. Presently there are six new power reactors planned for Texas with pending construction and operating license applications with the Nuclear Regulatory Commission.

Vermont state costs to administer the compact are also paid by Vermont waste generators through assessments in accordance with 10 V.S.A. § 7067 (3). These state costs averaged approximately $40,000 per year in 2006.[93] However, they increased to $65,000 per year in 2007.[94]

While future costs are inherently uncertain, considering the above factors, the most recent report to the Vermont Legislature from the State's Nuclear Engineer concludes that the cost estimates envisioned at the time of acceptance of the Compact are still reasonable.[95]

8. Recommendations Regarding Vermont's Continued Participation in Texas Compact

Circumstances have changed since the original compact negotiations that could not have been foreseen, including the availability of Energy Solutions' facility for Class A waste, Texas' denial of the Sierra Blanca site, the development of the Compact facility by a private developer, and the consequent schedule delay for disposal in Texas. However, it appears the Texas Compact

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continue to be exposed to these cost risks.

93 *See* VANAGS, *supra* note 82, at 6.

94 Personal communication with Uldis Vanags, Nov. 10, 2008.

95 *See* VANAGS, *supra* note 82, at 6.

facility will be the only future option for off-site disposal of VY Class B and C wastes.

Accordingly, in his most recent report to the Legislature, the Vermont Nuclear Engineer concluded that the State's participation in the Texas Compact continues to be desirable and recommended that the State continue to actively monitor Compact activities in Texas. He also recommended that Vermont should monitor the constitution of the Texas Compact Commission and should be ready to support the role of its two Commission members.[96]

9. Interim Storage of LLRW at Vermont Yankee

The Energy Solutions facility in Utah remains available to all Vermont generators, including Vermont Yankee, for disposal of Class A radioactive waste. Class A waste constitutes the vast majority of LLRW produced by Vermont Yankee, and all of the LLRW produced by the other small generators in Vermont. Thus, based on the present schedule for the Texas Compact LLRW facility, onsite storage will be required only for VY's Class B and C waste and only until December 15, 2010.

This circumstance is not expected to be an impediment to continued operation of Vermont Yankee. The volume of Class B and C waste which the plant produces is small compared to its annual low-level radioactive waste generation in total. To store this waste, VY has a storage facility on-site licensed by the NRC. This facility consists of shielded concrete vaults with sufficient capacity to store the expected volumes of Class B and C waste generated by VY for at least 5 years, or until 2013.[97] Assuming that the Texas Compact facility becomes operational by December, 2010 as projected, this interim storage capacity should be more than sufficient for VY's purposes in the near term. In addition, since disposal access for Class B and C waste is a national problem affecting many nuclear power plants, waste storage and processing vendors are constantly exploring new options to provide interim storage at approved facilities that could become available to Vermont Yankee (if needed) in the future.

96 *Id.*, at 7.

97 *Id.*, at 3-4.