Entergy Nuclear Vermont Yankee, LLC

SPENT FUEL MANAGEMENT PLAN

Revision 4

June 2014

This Spent Fuel Management Plan for the Vermont Yankee Nuclear Power Station ("VY" or "Station") was initially prepared and filed with the Vermont Public Service Board (the "Board") pursuant to the requirements of Chapter 157 of Title 10, Vermont Statutes Annotated, and in particular 10 V.S.A. § 6522 (b)(3), as interpreted by the Board in its Order and accompanying Certificate of Public Good ("CPG") issued on April 26, 2006, in Docket No. 7082. Section 6522 (b)(3) requires that prior to the issuance of a certificate of public good for a new spent-nuclear-fuel-storage facility, the Board shall find that Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc. (collectively referred to as "Entergy VY") "has developed and will implement a spent fuel management plan that will facilitate the eventual removal of those wastes in an efficient manner."

The Spent Fuel Management Plan ("Plan") is a living document subject to revision in accordance with the requirements of Chapter 157 as interpreted by the Board, changes in federal regulation, as well as changing circumstances affecting the subject matter of the Plan.

In submitting this report, Entergy VY notes that, notwithstanding the provisions of state law being applied in this case, 10 V.S.A. § 6522, the NRC has "exclusive authority over [commercial nuclear] plant construction and operation." The U.S. Supreme Court in *Pacific Gas & Electric Co. v. State Energy Resources Conservation and Development Commission*, 461 U.S. 190, 206-07 (1983) found that the NRC "was given exclusive jurisdiction to license the transfer, delivery, receipt, acquisition, possession and use of nuclear materials" and "[u]pon these subjects no role was left for the states." "Under the federal licensing scheme . . . it is not the states but rather the NRC that is vested with authority to decide under what conditions to license a [spent nuclear fuel] storage facility." *Skull Valley Band of Goshute Indians v. Nielson*, 376 F.3d 1223, 1250 (2004), *cert. denied*, 546 U.S. 1060 (2005). By submitting this report, Entergy VY does not waive any rights under federal law.

Entergy Nuclear Vermont Yankee, LLC

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LIST OF ATTACHMENTS

1.0 GENERAL

1.1 Definitions

- **72.212 Report** refers to the site-specific evaluation, required by 10 CFR § 72.212, that Entergy VY completed prior to operating the dry fuel storage ("DFS") system at the Station.

- **CAB** refers to the Containment Access Building at the Station.

- **CFR** refers to the Code of Federal Regulations.

- **CPG** means a "**Certificate of Public Good**" issued by the Vermont Public Service Board.

- **CTF** refers to a cask-transfer facility.

- **DOE** refers to the U.S. Department of Energy.

- **Full Core Offload** refers to the operation of removing all fuel assemblies from the reactor vessel. This could be required during the term of the operating license if a major reactor vessel repair or certain other maintenance were required. It will be required as an early step in the decommissioning process. It will be Entergy VY's goal to sequence dry cask loading campaigns such that Full Core Offload capability will be available during the license renewal period. Full Core Offload capability will continue to require the use of a temporary spare fuel rack.

- **FSAR** is an acronym for Final Safety Analysis Report. The FSAR for the SNF dry storage system was prepared by Holtec per requirements specified in 10 CFR Part 72, and is a compilation of information and analyses to support the NRC licensing review. The information provided in the FSAR includes a general description of the design of the dry storage system, its operation, and the supporting analyses for the demonstration of its performance under various operating, hypothetical accident and extreme environmental accident conditions, and its compliance with the regulatory requirements for the assurance of the public health and safety.

- **HOLTEC** refers to Holtec International.

- **HI-STAR** refers to Holtec's system used to transport SNF off-site.

- **HI-STORM Overpack** or "**Storage Overpack**" means the cask that receives and contains the sealed MPCs containing SNF. It provides the radiation shielding, ventilation passages, missile protection and protection against natural phenomena and accidents for the MPC. The HI-STORM overpack is approximately 200 tons in weight, 11 feet in diameter, and approximately 19 feet high.

- **HI-TRAC transfer cask or HI-TRAC** means the transfer container used to house the MPC during MPC fuel loading, unloading, drying, sealing and on-site transfer operations to a HI-STORM storage overpack or HI-STAR storage/transportation overpack. The HI-TRAC shields the loaded MPC, allowing loading operations to be performed while limiting radiation exposure to personnel.

- **Independent Spent Fuel Storage Installation** ("**ISFSI**" or "**Facility**") means a facility designed, constructed and licensed for the interim storage of SNF and other radioactive materials associated with spent-fuel storage in accordance with 10 CFR Part 72.

- **Multi-Purpose Canister** (or "**MPC**") means the sealed canister consisting of a honeycombed fuel basket for SNF storage, contained in a cylindrical canister shell.

- **NEI** is an acronym for the Nuclear Energy Institute.

- **Non-mechanistic tip-over** is a postulated cask tip-over event that is not based on any previously observed causal event or mechanism, but which is assumed in order to provide conservatism in risk assessments to prove that no fuel damage will occur as a result of the tip-over.

- **NRC** is an acronym for the U.S. Nuclear Regulatory Commission.

- **Reactor Building** refers to the reactor building at the Station.

- **Regulatory Guides** (or "Reg. Guides") are guidance documents drafted by NRC (and before the NRC, by the AEC) staff to provide guidance to licensees on implementing specific parts of the NRC regulations, techniques used by NRC staff in evaluating specific problems or technical issues.

- **SNF** is an acronym for Spent Nuclear Fuel.

- **Station** means the Vermont Yankee Nuclear Power Station.

1.2 General Facility Description

Use of the ISFSI or Facility involves several major areas at the Station owned by Entergy Nuclear Vermont Yankee, LLC, in Vernon, Vermont: the Reactor Building where the SNF is currently stored in the Station's spent-fuel pool; the CAB, the ISFSI pad (to which the fuel will be transported for interim storage in a Storage Overpack); and the transfer path between the CAB and the ISFSI pad. The ISFSI pad is a highly-engineered structure which has been designed and constructed to support loaded Storage Overpacks (which weigh about 200 tons each) and to ensure that no damage to the SNF occurs as a result of "non-mechanistic tip-over." The specific soil properties, soil depths, concrete properties and pad thickness have been thoroughly evaluated; the results are documented in the 72.212 Report and the ISFSI pad has been constructed to meet these standards. See Tab 2. The transfer path between the CAB and the ISFSI pad has been evaluated, and it has been determined that the existing roadway is adequate to protect underground utilities.

1.3 Location

The ISFSI pad is located north of the Reactor Building, approximately 210 feet west of the high water mark of the Connecticut River as shown on the Site Plan attached as Tab 1 to this Plan. As agreed in paragraph 1 of the Memorandum of Understanding between Entergy VY and the Vermont Department of Public Service dated June 21, 2005 ("DFS MOU"), a line-of-sight barrier has been constructed on the north and east sides of the ISFSI pad (See Tab 3).

1.4 Loading Campaigns

1.4.1 2008 Loading Campaign

During the summer of 2008, Entergy VY loaded 340 SNF assemblies into five Holtec Storage Overpacks and placed them on the ISFSI pad such that any one of the five casks can be retrieved without relocation of any of the other casks, providing access to individual casks. The 2008 loading campaign restored Full Core Offload capability.

1.4.2 2011 Loading Campaign

During the summer of 2011, Entergy VY loaded 272 SNF assemblies into four Holtec Storage Overpacks and placed them on the ISFSI.

1.4.3 2012 Loading Campaign

During the summer of 2012, Entergy VY loaded 272 SNF assemblies into four Holtec Storage Overpacks and placed them on the ISFSI. These four Overpacks (#10, #11, #12 and #13) were placed south of the Overpacks (#2, #3, #4 and #5) that were placed into storage on the ISFSI pad in an earlier campaign.

1.5 Future Loading Campaigns

As of June 2014, there are 2627 SNF assemblies remaining in the spent-fuel pool, configured so that high-decay-heat assemblies of SNF are surrounded by low-decay-heat assemblies of SNF, as agreed in paragraph 9 of the DFS MOU. There are an additional 368 SNF assemblies in the Reactor Core. The Planned Loading Schedule details VY's plan to reduce the number of fuel rods stored in the Spent Fuel Pool based on, among other factors, the normal cooling period for SNF after it is unloaded from the Reactor Core and efficient work scheduling. The current schedule for future loading campaigns is:

PLANNED LOADING SCHEDULE		
Loading Campaign Years	Number of Casks to be Processed	SNF Assemblies Discharged to ISFSI Pad
2019	32	2176
2020	13	820*

*Includes one Damaged Fuel Container consisting of fuel debris

2.0 OPERATING PROCEDURES

2.1 Design and Operational Requirements

The Facility is sited, designed and operated in compliance with the applicable NRC licensing requirements found at 10 CFR Part 72, Subparts E, F & G, NRC Regulatory Guides and the FSAR for the SNF prepared by Holtec as well as the DFS MOU, the design and/or operational requirements set forth by the Board in its Order and CPG dated April 26, 2006, and such other requirements that were set forth in applicable permits from the Vermont Agency of Natural Resources or other governmental authority having jurisdiction over the Facility.

2.2 Facility Security

Security for the Facility is established and operated in compliance with the NRC licensing requirements found at 10 CFR Part 72, Subpart H and Part 73, and other applicable NRC Regulatory Guides.

2.3 Staffing

The operators of the Facility are trained in compliance with the training and certification requirements found at 10 CFR Part 72, Subpart I.

3.0 LONG TERM PLANNING FOR STORAGE OF SPENT NUCLEAR FUEL

3.1 Construction of Separate ISFSI Pad

The ISFSI described in Section 1.2 is an 8 x 5 array that was constructed to support 36 Storage Overpacks. (NOTE: Four storage locations were to be unused to allow retrievable of any casks should the need arise). At shutdown in late 2014, VY will need 58 total Storage Overpacks to store the 3879 SNF assemblies that were generated during VY's lifetime. Hence, an additional ISFSI pad is required. VY is in the process of submitting a CPG Request for a separate ISFSI pad to be constructed as part of decommissioning activities. All necessary regulatory approvals will be obtained prior to construction of this new ISFSI. The SNF remaining in the spent-fuel pool will be transferred to one of the two ISFSI pads and managed pursuant to the operating procedures outlined in Section 2.0 above, pending removal by the federal government. The DOE has not provided a schedule to accept SNF that would realistically preclude the need for the new pad.

The specific location of the new ISFSI pad is being evaluated at this time and is expected to be within close proximity of the existing ISFSI pad.

3.2 Station Shutdown; Amendment of Spent Fuel Management Plan

This Spent Fuel Management Plan is being amended to take into account the new ISFSI referenced in Section 3.1 and other changed circumstances, including updated information regarding the DOE's removal schedule for SNF from Vermont Yankee. VY is evaluating multiple cask vendors (and casks) to identify the most efficient means to address SNF storage. The current long range plan is based on the DOE starting to accept spent fuel from VY in 2025 and be complete by 2052. The amended Plan will also take into account the management of SNF remaining in the spent-fuel pool pending transfer to dry casks.

3.3 License Renewal; Amendment of Spent Fuel Management Plan

Since VY will permanently shut down in late 2014, there is no need to amend the Spent Fuel Management Plan for the obtained License Renewal.

3.4 Long Term Storage of Spent Nuclear Fuel at the Station

It is uncertain when DOE will begin taking fuel from the Station. In its April 26, 2006, Order and accompanying CPG in Docket No. 7082, the Board required VY to address the possibility that SNF could remain at the Station through 2082. Because of the uncertainty of future events over the relevant time period, it is expected that this section will need to be amended over time to address changed circumstances as they arise.

To address the Board's requirements in Docket No. 7082, Entergy VY will perform the following actions:

- Entergy VY will comply with all applicable NRC requirements for the storage of SNF in dry or wet storage until DOE meets its obligation under the federal law to take title to the SNF.
- By 2018 (ten years after the first fuel loading into an MPC/Overpack) Entergy VY will develop a formal inspection and maintenance program for the MPC/Overpack assemblies with recognition that MPC/Overpack assemblies could be stored on site as long as 75 years.
- In advance of 2028 (twenty years after the first fuel loading into an MPC/Overpack), Entergy VY will undertake a program to seek renewal of applicable cask Certificates of Compliance as provided in 10 CFR 72.212 if the Certificate of Compliance has not been renewed by Holtec.
- If all SNF is not removed from the Station by 2047 (forty years after construction of the ISFSI pad), aging-management procedures for the ISFSI pad will be developed consistent with the NRC License Renewal requirements for concrete structures for reactors.
- If all SNF is not removed from the Station by 2048 (forty years after placing into service of the ISFSI temperature monitoring system) aging management procedures for the ISFSI pad temperature monitoring system will be developed consistent with the NRC License Renewal requirements for similar instrumentation systems for reactors.

4.0 TRANSFER AND CLOSURE PROCEDURES

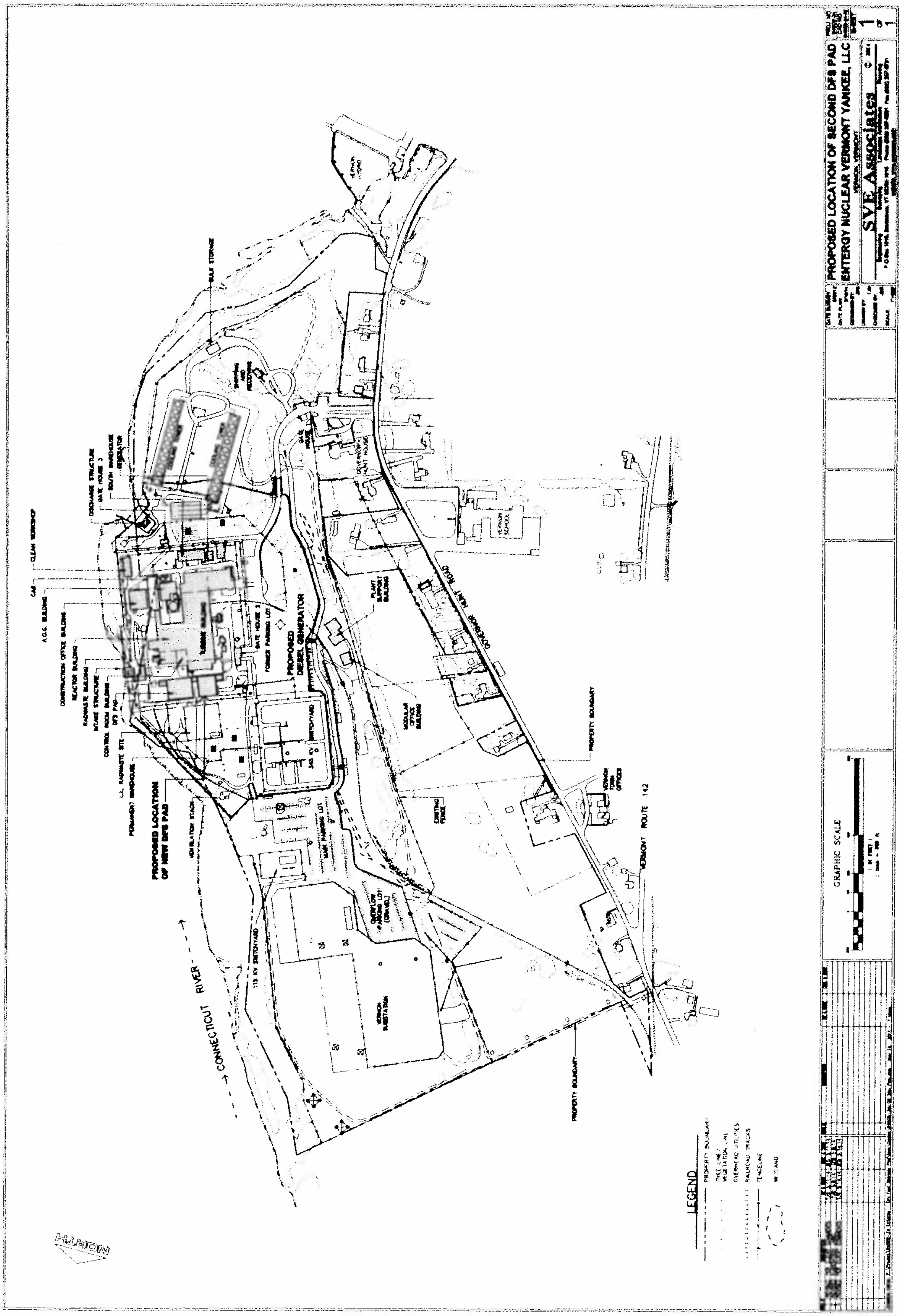
4.1 General

Under federal law, removal of SNF from the Station is the legal responsibility of DOE. VY has agreed in memoranda of understanding with the State of Vermont in Docket Nos. 6545 and 7082 to use its commercial best efforts to ensure that high-level SNF stored at the Station is removed from the site in a reasonable manner and as quickly as possible to an interim or permanent location outside of Vermont. Entergy VY, individually and through the NEI, also continues to work with state and federal officials and authorities to support the prompt implementation of a federal repository for SNF.

4.2 Transfer Procedure from ISFSI to Long-Term Repository

Entergy VY would likely construct a CTF to facilitate transportation of SNF off site. The transportation sequence would be as follows:

- The HI-TRAC would be placed over the Overpack;
- The MPC would be raised out of the Overpack and into the HI-TRAC;
- The HI-TRAC/MPC would be placed over the HI-STAR;
- The MPC would be lowered into the HI-STAR; and
- The HI-STAR would be removed from the chamber, if used, and readied for shipment.
- The HI-STAR would then be loaded on either specially designed rail or over-road transportation vehicles for transportation to the designated federal SNF repository.



TAB 1 - SITE PLAN

TAB 2

ENTERGY NUCLEAR

10CFR72.212 Evaluation Report

Appendix G VY Specific Information

for Independent Spent Fuel Storage Installations

Utilizing the Holtec, International HI-STORM 100 Cask System

Revision 4

APPLICABLE SITES

ANO Unit 1: [ ]	GGNS: [ ]	W-3: [ ]
ANO Unit 2: [ ]	RBS: [ ]	ECH: [ ]
IPEC Unit 1: [ ]	JAF: [ ]	PNPS: [ ]
IPEC Unit 2: [ ]	VY: [X]	WPO: [ ]
IPEC Unit 3: [ ]		

Safety-Related: ____ Yes
X No

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VERMONT YANKEE 10CFR72.212 EVALUATION REPORT
RECORD OF REVISIONS

Issue Date	Revision Number	Affected Sections	Description
04/07/08	0	N/A	Initial Release
05/01/08	1	10.2, 10.7, Appendix B Section 3.8, Appendix D	• LBDCR LIC 08-04 • Section 10.2 revised to enhance basis for tornado comparison • Section 10.7 added to address snow and ice • Appendix B Section 3.8 revised to note that monitoring for combustible gas will be perform during the entire MPC lid welding operation • Appendix D was revised as a result of a change to the Hazards Analysis
03/12/09	2	15, 18 Appendix B Appendix D	• LBDCR LIC 09-02 • Section 15 and 18 revised to reference EN-DC-212 • Section 18 revised to change revision of reference 31 from rev 2 to rev 3 due to EC 12270 which revised the hazards evaluation • Appendix B was revised to reference EN-DC-212 • Appendix D was revised due to the revised hazards analysis setback distances
5/31/11	3	8.3 12 14 18 Appendix B Appendix C Appendix D	• LBDCR LIC 11-01 • Sections 8.3 and 18 were revised to reflect results of new 72.104 Evaluation • Section 12 was revised due to changes to 10CFR73.55 • Section 14 was revised to include a table referencing the Engineering Report associated with each ISFSI component. • Section 18 was revised to reflect new hazards evaluation per EC 24349 • Section 18 was revised to reference EC 28665 for the stack-up restraints • Section 18 was revised to reference EC 28768 for the 2011 loading campaign • Re-titled Appendix B to "List of Procedures" and identified additional related procedures • Procedures were removed from Section 18 to eliminate duplication with Appendix B • Appendix C was revised to reflect that VY will perform temperature monitoring and annual inspections of the vent screens • Appendix C and section 18 were revised based on the final disposition of the MPC Helium leak test issue • Appendix C was revised to discuss disposition of applicable HIBs • Appendix C was revised to reflect the adoption of HOLTEC 72.48 No. 812 for bolt torque requirements. • Appendix D was revised to reflect new hazards evaluation per EC 24349 • Editorial changes made throughout to recognize that first campaign is complete and to add discussion on the second campaign

5/9/12	4	Various 7.5 7.11 8.0 Appendix B Appendix C	• LBDCR LIC 12-02 • Revised various sections due to changes in the formatting of 10CFR72.212 (Revision bars not included) . This also resulted in the renumbering of sections. • Updated Section 7.5 for 2011 annual dose values • Updated Table in Section 7.11 showing the engineering report numbers for the additional HI-STORMS and MPCs. • Added Section 8 Reference to EC 34606 for 2012 Loading Campaign • Updated Appendix B list of procedures due to procedure revisions. • Updated Appendix B to incorporate ECOs 5014-192 and 5014-199 • Updated Appendix C to note that visual inspection and NDE is an acceptable alternative to load testing of the trunnions per ANSI N 14.6

VERMONT YANKEE 10CFR72.212 EVALUATION REPORT

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1.0 PURPOSE

This purpose of this evaluation report is to document the reviews required by Title 10 of the Code of Federal Regulations, Part 72, Subpart K, Paragraph 72.212, for use of the Holtec International (Holtec) HI-STORM 100 Cask System (Ref. 1) at the Vermont Yankee Nuclear Power Station (VY) in Vernon, Vermont.

2.0 BACKGROUND

As a 10 CFR Part 50 Licensee, Entergy qualifies as a 10 CFR Part 72 General Licensee for storage of spent fuel at its Interim Spent Fuel Storage Installation (ISFSI) at the VY site.

As a 10 CFR Part 72 General Licensee, Entergy must conform to certain conditions set forth by the NRC as stipulated in 10 CFR 72, Subpart K. This evaluation report documents that those conditions are met for storage of spent fuel using the Holtec HI-STORM 100 Cask System at the VY site.

The format of this evaluation report is a listing of the specific requirements quoted from 10 CFR 72, Subpart K (in Italics), followed by a discussion of how each requirement is satisfied.

3.0 10 CFR 72.210

"A general license is hereby issued for the storage of spent fuel in an independent spent fuel storage installation at power reactor sites to persons authorized to possess or operate nuclear power reactors under 10 CFR Part 50 or 10 CFR Part 52."

Entergy is authorized by the NRC to operate a nuclear power reactor at the VY site by Nuclear Power Station License No. DPR-28 (Docket No. 50-271) consistent with the provisions of 10 CFR Part 50. Thus, Entergy has been granted a general license for the storage of spent fuel at an ISFSI at the VY site.

4.0 10CFR72.212(a)(1)

"The general license is limited to that spent fuel which the general licensee is authorized to possess at the site under the specific license for the site."

There is no limitation on the amount of fuel that VY can posses under the 10CFR50 license (DPR-28) for the site. The VY site is authorized under License DPR-28 for the storage of no more than 3353 fuel assemblies in the spent fuel pool.

5.0 10CFR72.212(a)(2)

"This general license is limited to storage of spent fuel in casks approved under the provisions of this part."

The spent fuel storage casks listed in 10 CFR 72.214 are approved for storage of spent fuel under the conditions specified in their respective Certificate of Compliance (CoC). The cask design that VY has decided to use at the VY ISFSI is the HI-STORM 100 dry cask storage system (CoC 1014). The HI-STORM 100 System was originally certified by the NRC in accordance with 10 CFR 72, Subpart L in May, 2000. CoC 1014 has been amended since that time.

VY conducts its loading campaigns in accordance with CoC 1014, Amendment 2 and HOLTEC FSAR Revision 4.

6.0 10CFR72.212(a)(3)

"The general license for the storage of spent fuel in each cask fabricated under a Certificate of Compliance shall commence upon the date that the particular cask is first used by the general licensee to store spent fuel, shall continue through any renewals of the Certificate of Compliance, unless otherwise specified in the Certificate of Compliance, and shall terminate when the cask's Certificate of Compliance expires. For any cask placed into service during the final renewal term of a Certificate of Compliance, or during the term of a Certificate of Compliance that was not renewed, the general license for that cask shall terminate after a storage period not to exceed the length of the term certified by the cask's Certificate of Compliance. Upon expiration of the general license, all casks subject to that general license must be removed from service."

The beginning of the twenty-year general license is when the first fuel assembly is loaded into a HI-STORM 100 cask. Current options upon approaching the end of life include: 1) renew the ISFSI license (via renewal of the cask CoC), 2) buy a different cask design and transfer the fuel, or 3) ship the fuel to another location (i.e., a permanent repository). VY will evaluate the options following 15 years of operation. This evaluation will provide a 5-year buffer to the end of the initial ISFSI license to determine the steps to be taken. This activity is tracked by LO-LAR-2011-00104 CA 00001.

7.0 10CFR72.212(b)

"The general licensee must:"

7.1 10CFR72.212(b)(1)

"Notify the Nuclear Regulatory Commission using instructions in §72.4 at least 90 days prior to first storage of spent fuel under this general license. This notice may be in the form of a letter, but must contain the licensee's name, address, reactor license and docket numbers, and the name and means of contacting a person responsible for providing additional information concerning spent fuel under this general license. A copy of the submittal must be sent to the administrator of the appropriate Nuclear Regulatory Commission regional office listed in appendix D to Part 20 of this chapter."

Entergy notified the NRC by letter (Ref. 2) of its intent to begin the loading of spent fuel into a storage cask under the provisions of the general license for the VY site. The letter indicated that VY planned to start storing spent fuel by November 2007 (i.e., the earliest date expected); and that VY would be using the HI-STORM 100 dry cask storage system.

7.2 10CFR72.212(b)(2)

"Register use of each cask with the Nuclear Regulatory Commission no later than 30 days after using that cask to store spent fuel. This registration may be accomplished by submitting a letter using instructions in §72.4 containing the following information: the licensee's name and address, the licensee's reactor license and docket numbers, the name and title of a person responsible for providing additional information concerning spent fuel storage under this general license, the cask certificate number, the CoC amendment number to which the cask conforms, unless loaded under the initial certificate, cask model number, and the cask identification number. A copy of each submittal must be sent to the administrator of the appropriate Nuclear Regulatory Commission regional office listed in appendix D to part 20 of this chapter."

The registration requirement is incorporated into VY Procedure OP 2224.

7.3 10CFR72.212(b)(3)

"Ensure that each cask used by the general licensee conforms to the terms, conditions, and specifications of a CoC or an amended CoC listed in §72.214."

Entergy applied the Engineering Change process to ensure that each cask conforms to the terms, conditions and specifications required by the CoC.

7.4 10CFR72.212(b)(4)

"In applying the changes authorized by an amended CoC to a cask loaded under the initial CoC or an earlier amended CoC, register each such cask with the Nuclear Regulatory Commission no later than 30 days after applying the changes authorized by the amended CoC. This registration may be accomplished by submitting a letter using instructions in §72.4 containing the following information: the licensee's name and address, the licensee's reactor license and docket numbers, the name and title of a person responsible for providing additional information concerning spent fuel storage under this general license, the cask certificate number, the CoC amendment number to which the cask conforms, cask model number, and the cask identification number. A copy of each submittal must be sent to the administrator of the appropriate Nuclear Regulatory Commission regional office listed in appendix D to part 20 of this chapter."

VY has not applied changes authorized by an amended CoC to a cask loaded under an earlier CoC.

7.5 10CFR72.212(b)(5)

"Perform written evaluations, before use and before applying the changes authorized by an amended CoC to a cask loaded under the initial CoC or an earlier amended CoC, which establish that:

(i) The cask, once loaded with spent fuel or once the changes authorized by an amended CoC have been applied, will conform to the terms, conditions, and specifications of a CoC or an amended CoC listed in §72.214;

(ii) Cask storage pads and areas have been designed to adequately support the static and dynamic loads of the stored casks, considering potential amplification of earthquakes through soil-structure interaction, and soil liquefaction potential or other soil instability due to vibratory ground motion; and

(iii) The requirements of §72.104 have been met. A copy of this record shall be retained until spent fuel is no longer stored under the general license issued under §72.210."

See Appendix A for review of compliance with CoC requirements.

The VY ISFSI is located on the north-end of the VY site within the existing Protected Area. The ISFSI consists of a 76' x 132' x 3' thick storage pad with appropriate access. Access to the storage pad is provided by a 30' x 132' concrete apron located adjacent to the south edge of the storage pad. There is a concrete access ramp on the east side and west side of the concrete apron.

The concrete pad will provide storage locations for thirty-six (36) Holtec HI-STORM 100 Overpacks arranged in a 5 x 8 array. This arrangement provides four (4) extra spaces that will allow access to any HI-STORM 100 Overpack.

The ISFSI storage pad is a reinforced concrete slab founded on engineered fill placed on existing soils. Seismic input at VY is at bedrock which lies from 20 to 30 feet below the pad. Strain compatible soil properties were determined and acceleration time histories were developed at the bedrock elevation. The results of these analyses were used as design input to the soil structural interaction analysis and the assessment of liquefaction potential. The results demonstrated that liquefaction will not occur at VY. The structural interaction analysis output was used as design input to the seismic analysis of the storage pad and the sliding and tipping analysis of the casks on the storage pad.

Design Criteria

The VY ISFSI pad analysis uses the following primary parameters found in the HI-STORM 100 FSAR, Table 2.2.9, Parameter Set "A" (Ref. 1):

- Maximum compression strength of concrete (f'_c) at 28 days curing = 4.2 ksi
- Minimum compression strength of concrete (f'_c) at 28 days curing = 3.0 ksi.

- Maximum modulus of elasticity (E_{sg}) of subgrade = 28 ksi.
- Maximum slab thickness (t) = 36"
- Pad reinforcement (top and bottom, both directions): 60 ksi yield strength ASTM material

The analysis assessed the pad design for the condition where the overpacks are fully "glued" to the pad surface and therefore delivers all the moment that results from the seismic accelerations. The sliding analysis computes the maximum displacements of the casks for various soil conditions and coefficients of friction (from 0.0 to 0.8) between the cask and storage pad to ensure the casks will not impact each other or slide off the pad.

The HI-STORM 100 System design basis requires that neither a non-mechanistic tip-over nor an 11-inch vertical drop of a loaded cask onto the ISFSI pad results in cask deceleration levels greater than 45g's at the top of the fuel for the HI-STORM 100 Overpack. The cask deceleration is a function of the following factors associated with the ISFSI pad:

- Modulus of elasticity of the soil subgrade
- Thickness of concrete pad
- Compressive strength of concrete
- Strength of concrete reinforcement

The engineered backfill meets the design basis established in the Holtec FSAR. The design basis for the engineered backfill requires the material stiffness of the supporting backfill material to limit fuel deceleration due to a postulated HI-STORM 100 Overpack tip-over event. The source materials, in-place properties, and method of placement of the engineered backfill are identified in Reference 3; and satisfy the Holtec design basis requirements. The GZA Report (Ref. 3) limits the net allowable bearing pressure under the storage pad to 2 tons/ft^2. In accordance with the GZA Report recommendations a minimum 4'0" thick sub-base course was placed under the storage pad to provide frost line protection. Therefore, the storage pad and engineered backfill are founded upon a non-frost susceptible sub-grade.

Since VY specified and verified the properties in the HI-STORM 100 FSAR, Table 2.2.9, Parameter Set "A", the cask deceleration limit of less than or equal to 45 g's for a cask tip-over was met.

VY is utilizing a Vertical Cask Transporter (VCT) to carry and position the overpacks on the storage pad. The VCT and all components associated with the lifting and transport of the overpacks will prevent the drop of an overpack by design compliance with ANSI N14.6 (Ref. 4) combined with the use of redundant drop protection features including hydraulic check values and wedge locks or by enhanced safety margins. Therefore, the 11-inch drop event is not applicable to VY.

Applicable Loads & Combinations

The load combinations used in the design of the reinforced concrete ISFSI pad are in compliance with the HI-STORM 100 FSAR and NUREG-1536 (Ref. 5). Concrete material used in the construction of the pads is made of air-entrained, normal weight concrete with a twenty-eight day compressive strength between 3000 and 4200 psi.

Design Basis Earthquake (DBE) Spectra

The response spectra used as input at the bedrock elevation under the pad was the VY design basis DBE horizontal and vertical (2/3 of the horizontal) spectra at 5% damping. The ZPA for the horizontal spectrum is defined as 0.14 g. This was used as the "target" spectra for the development of the required time histories.

Finite Element Design/Analysis Models

Analysis of the ISFSI pad was performed using finite element techniques. The computer code used in this analysis was ANSYS (Ref. 6).

Conclusion

As demonstrated by the above analyses, all HI-STORM 100 CoC and FSAR analysis requirements are met for normal storage, seismic, tipover, and sliding considerations:

- The requirements of HI-STORM 100 FSAR, Table 2.2.9, Parameter Set "A" were met
- The load combinations used in the design of the reinforced concrete ISFSI pad are in compliance with the HI-STORM 100 FSAR and NUREG-1536
- Seismic evaluations addressed the effects of soil structural interaction and liquefaction

10CFR72.104 requires that for normal operation, the annual dose to any real individual beyond the controlled area must not exceed 25 mrem whole body and 75 mrem to the thyroid, or 25 mrem to any other organ from any discharges or direct radiation.

Chapter 5 of the HI-STORM 100 Cask System FSAR provides a description of the general methodology and analyses performed to estimate the annual dose for various cask placement configurations and distances from the cask storage area for a design loaded cask at 47,500 MWD/MTU burnup and 3-year cooling. The results of the analysis are shown in Table 5.4.7 of the FSAR.

A site-specific analysis was conducted for the VY ISFSI (Ref. 7) to determine the dose associated with loading the first 13 casks. The analysis assumed a conservative placement of the casks on the pad relative to the off-site boundary. The analysis determined, based on regional loading, that the dose contribution from the 13 casks was 1.86 mr/year and based on uniform loading the dose contribution would be 3.30 mr/year.

VY calculates the dose from all plant sources per the ODCM methodology at location DR-53. For 2011 the total dose from all plant sources was determined to be 16.21 mrem. Conservatively, adding the dose associated with the 13 casks results in a total dose of 18.07 mr/year for regional loading and 19.51 mr/year for uniform loading.

Additionally, VY reports the results of direct exposure measurements taken at the west site boundary to the Vermont Department of health (Reference 8). For 2011, the direct exposure measurement was 15.25 milliRoentgen which is equivalent to 9.15 millirem (.6 X 15.25).

This measurement demonstrates that the ODCM methodology used to determine dose is conservative.

7.6 10CFR72.212(b)(6)

"Review the Safety Analysis Report referenced in the CoC or amended CoC and the related NRC Safety Evaluation Report, prior to use of the general license, to determine whether or not the reactor site parameters, including analyses of earthquake intensity and tornado missiles, are enveloped by the cask design bases considered in these reports. The results of this review must be documented in the evaluation made in paragraph (b)(5) of this section."

The HI-STORM 100 FSAR referenced in CoC 1014 and the related NRC Safety Evaluation Report (SER) have been reviewed, and a determination made that the reactor site parameters at VY, including analyses of earthquake intensity and tornado missiles, are enveloped by the cask design bases considered in these reports. The details of this review are provided in the sections that follow.

Earthquake Intensity

The HI-STORM 100 System CoC Amendment 2 and FSAR including Revision 4 specify several acceptable seismic evaluation criteria. VY chose to perform a dynamic seismic analysis (Ref. 9) of the cask/ISFSI pad assemblage with appropriate recognition of soil/structure interaction effects to ensure that the casks will not tip over or undergo excessive sliding under the site's Design Basis Earthquake. The analysis was performed using a coefficient of friction from 0.0 to 0.8 in consideration of various pad surface conditions.

The analysis determined that the maximum horizontal displacements of the overpacks for any condition are smaller than half of the free space between adjacent overpacks and less than the distance between the external edge of the overpack and the edge of the ISFSI storage pad.

Tornado and Tornado Missiles

A review of the required design values indicates that the VY site-specific tornado wind and missile design criteria are enveloped by the Holtec generic design criteria as listed in Holtec FSAR Tables 2.2.4 and 2.2.5. Holtec assumed a maximum tornado wind speed of 360 mph (290 mph rotational and 70 mph translational) with a pressure drop of 3 psi was analyzed. The VY site tornado parameters include a tornado with a 300 mph maximum wind speed with a 3 psi pressure drop.

UFSAR (Ref. 10) Section 2.3.6 defines the maximum tornado wind speed as 300 mph. UFSAR Section 12.2.1 specifies that Class I structures are designed against penetration by tornado-created missiles. The missiles that were considered were a 4 inch x 4 inch x 16 foot long wood post and a 2 inch x 12 inch x 16 foot long wood plank. The following is a comparison of the VY site specific missiles and the Holtec design missiles:

	Missile description	Mass (lbs)	Velocity (mph)	Comment
Holtec FSAR Missiles	Automobile	3960	126	High kinetic energy missile which deforms on impact
	8 inch diameter rigid solid steel cylinder	275	126	Rigid missile to test penetration resistance
	1 inch diameter steel sphere	0.48	126	Small rigid missile to pass through any opening.
VY UFSAR Missiles	4 inch x 4 inch x 16 foot long wood post	89	300	
	2 inch x 12 inch x 16 foot long wood plank	134	300	

The Holtec 8 inch diameter solid steel cylinder was used to verify the penetration resistance of the storage cask. The VY wood missiles do not have the same capability of the solid steel missile to penetrate the cask. EPRI testing (Reference 11) demonstrated that a large portion (50-70 inches) of a wood pole missile disintegrated into splinters upon impact with 12 and 16 inch reinforced concrete panels. The faces of the panels were undamaged. The storage cask wall is 27.5 inch thick high density concrete confined within 1" thick steel inner and outer shells (total thickness of wall is 29.5 inches). Therefore, it is concluded that the VY wood missiles will disintegrate into splinters upon impact with the cask causing no significant damage.

However, the wood missiles will also transfer their kinetic energy to the cask. The VY wood missiles are comparable to the Holtec high kinetic energy missile which deforms on impact (automobile).

- (Kinetic energy of 2 x 12 x 16 wood plank) / (Kinetic energy of automobile) = $[(300)^2 * (134)] / [(126)^2 * (3960)]$

- (Kinetic energy of 2 x 12 x 16 wood plank) / (Kinetic energy of automobile) = 0.192

The kinetic energy imposed on the storage cask by a VY design missile is only 19.2% of the Holtec design automobile missile. The Holtec high energy missile bounds the VY wood missiles.

VY does not have any design missiles comparable to the Holtec solid steel rigid missile to test penetration or a small rigid missile to pass through any cask opening. Therefore, the Holtec design tornado missile analysis envelopes the VY UFSAR missiles in relationship to the design of the HI Storm casks.

Flooding

VY is designed to withstand the effects of the probable maximum flood (PMF). The maximum PMF stillwater elevation is 252.5 feet mean sea level (MSL). Wave effects, including runup, could produce flooding as high as 254 feet MSL. The bottom of the loaded

HI-STORM 100 System in position on the ISFSI pad is at an elevation of 254 feet. Therefore, the submergence (obstruction) of the HI-STORM 100 Overpacks is not a concern.

Average Ambient Temperatures and Temperature Extremes

Average Ambient Temperature

CoC Appendix A: The temperature of 80 °F is the maximum average yearly temperature.

VY UFSAR, Table 2.3.2 provides temperature data for the Vernon, Vermont area during the time period from 1951 to 1960. The mean daily maximum when averaged for a year is approximately 59 degrees. Therefore, this CoC requirement is considered met.

Ambient Temperature Extremes

CoC Appendix A: The allowed temperature extremes, averaged over a 3-day period, shall be greater than -40 °F and less than 125 °F.

UFSAR Table 2.3.2 provides temperature data for the Vernon, Vermont area. The extreme maximum is 100 degrees F, that is less than 125 degrees F. The extreme minimum is – 33 degrees F, which is greater than -40 degrees F. Therefore, this requirement is conservatively met. Therefore, this CoC requirement is met.

Fire and Explosion

There are various potential fire and explosion hazards areas near the ISFSI and along the haul path from the Reactor Building to the ISFSI including transformers, fuel oil tanks, a wooden visual barrier structure, and Radwaste Storage areas.

See Appendix D for a summary of the scope and results of the Hazards evaluation. Administrative controls are established as part of VY's fire protection program to ensure activities are controlled consistent with the results of this evaluation. In addition Administrative controls ensure that any transient combustibles are evaluated and controlled as required.

Lightning

The HI-STORM 100 system is a large metal/concrete cask stored in an unsheltered ISFSI. If the HI-STORM Overpack is hit with lightning, the lightning will discharge through the steel shell of the overpack to ground. The Multi Purpose Canister (MPC) provides the confinement boundary for the spent nuclear fuel. The effects of the lightning strike will be limited to the overpack. The lightning current will discharge into the overpack and directly into the ground via the installed grounding system. The MPC will be unaffected. This event does not result in the release of activity.

Snow and Ice

The HI-STORM 100 System is designed to accommodate a snow and Ice loading of 100 pounds per square foot (CFSAR section 2.2.1.6). The UFSAR, section 2.3.5.3, documents that the worst case snow loading is 70 pounds per square foot. Based on this, the HOLTEC design conditions bound the site specific UFSAR requirements.

7.7 10CFR72.212(b)(7)

"Evaluate any changes to the written evaluations required by paragraphs (b)(5) and (b)(6) of this section using the requirements of §72.48(c). A copy of this record shall be retained until spent fuel is no longer stored under the general license issued under §72.210."

As indicated in Entergy Procedure EN-LI-112, any changes to the written evaluations required by 10CFR72.212(b)(6) will be evaluated using the requirements of §72.48(c) and a copy of this record will be retained per Entergy Procedure EN-AD-103 until spent fuel is no longer stored under the general license issued under §72.210. The cask system vendor, Holtec, performs change evaluations in conformance with similar procedural requirements. See Appendix C of this evaluation report.

7.8 10CFR72.212(b)(8)

"Before use of the general license, determine whether activities related to storage of spent fuel under this general license involve a change in the facility Technical Specifications or require a license amendment for the facility pursuant to §50.59(c) of this chapter. Results of this determination must be documented in the evaluations made in paragraph (b)(5) of this section."

Several design modifications, including an Engineering Change that covers the ISFSI installation, have received a 10CFR50.59 review, and have been implemented in support of dry fuel storage at VY. None of these modifications required a change to the VY operating license or technical specifications. An integrated 10CFR50.59 Evaluation (included in Reference 12) was completed on the initial ISFSI installation, and it was concluded that an NRC review is not required. Subsequent changes have been evaluated under 10CFR50.59.

7.9 10CFR72.212(b)(9)

"Protect the spent fuel against the design basis threat of radiological sabotage in accordance with the same provisions and requirements as are set forth in the licensee's physical security plan pursuant to §73.55 of this chapter with the following additional conditions and exceptions:

(i) The physical security organization and program for the facility must be modified as necessary to assure that activities conducted under this general license do not decrease the effectiveness of the protection of vital equipment in accordance with §73.55 of this chapter;

(ii) Storage of spent fuel must be within a protected area, in accordance with §73.55(e) of this chapter, but need not be within a separate vital area. Existing protected areas may be

expanded or new protected areas added for the purpose of storage of spent fuel in accordance with this general license;

(iii) For the purpose of this general license, personnel searches required by §73.55(h) of this chapter before admission to a new protected area may be performed by physical pat-down searches of persons in lieu of firearms and explosives detection equipment;

(iv) The observational capability required by §73.55(i)(3) of this chapter as applied to a new protected area may be provided by a guard or watchman on patrol in lieu of video surveillance technology;

(v) For the purpose of this general license, the licensee is exempt from requirements to interdict and neutralize threats in §73.55 of this chapter; and

(vi) Each general licensee that receives and possesses power reactor spent fuel and other radioactive materials associated with spent fuel storage shall protect Safeguards Information against unauthorized disclosure in accordance with the requirements of §73.21 and the requirements of §73.22 or §73.23 of this chapter, as applicable."

The ISFSI is located within the VY Protected Area. During transport to the ISFSI pad from the Reactor Building, the overpack will not exit the Protected Area. The site Security Plan and Physical Protection Program provide the appropriate controls during this transient activity. The VY Security Plan has been updated to include the VY ISFSI in accordance requirements of 10 CFR 50.54(p).

In addition to the above security measures, VY has applied interim safeguards and security compensatory measures, and implemented additional security measures associated with access authorization for the VY ISFSI (Ref.13).

7.10 10CFR72.212(b)(10)

"Review the reactor emergency plan, quality assurance program, training program, and radiation protection program to determine if their effectiveness is decreased and, if so, prepare the necessary changes and seek and obtain the necessary approvals"

Emergency Plan

The VY Emergency Plan (Ref. 14) is maintained to meet the regulations in 10 CFR 50.47, 10 CFR 50.54, 10 CFR 50.72, and 10 CFR 50 Appendix E. 10 CFR 50.47(b) lists the sixteen planning standards that must be met in the Emergency Plan. The VY Emergency Plan was reviewed to determine if changes were required to support implementation of the Holtec HI-STORM 100 System at the VY ISFSI will decrease the effectiveness of the Emergency Plan.

Construction and implementation of the ISFSI was determined to not decrease the effectiveness of the VY Emergency Plan or implementing procedures as it relates to Part 50 activities. However, the HI-STORM 100 FSAR does contain provisions to establish procedures to:

- Address establishing emergency action levels and implementation of the emergency action program. (Section 8.0)
- Include written procedures to account for such things as emergency response. (Section 8.0)
- Address removal of the material blocking the air inlet ducts prior to the fuel clad reaching its short-term temperature limit.
- Include emergency action plan provisions for corrective actions for cask burial under debris

The VY Emergency Plan and Procedure AP 3125 were revised to address ISFSI action levels and implementation of the emergency response. Site Procedures OP 3127 and DP 3201 address corrective actions for abnormal events (e.g., blocked HI-STORM 100 air inlet ducts). When an event is declared, the Plant Emergency Director's/Site Recovery Manager's responsibility is to make the notification and ensure availability of response staff. The corrective actions are implemented in accordance with plant procedures commensurate with the safety significance of the situation.

Quality Assurance Program

The Entergy Quality Assurance Program Manual (QAPM) (Ref. 15) was reviewed to assure compliance with the requirements of 10CFR72 for the handling, transporting and storage of dry fuel storage canisters.

The Holtec HI-STORM 100 Storage System quality assurance requirements in the HI-STORM 100 FSAR and CoC 1014 impose the requirements of 10CFR72 on both licensees and certificate holders. The QAPM applies to all activities associated with structures, systems, and components which are safety related or controlled by 10CFR72. The methods of implementation of the requirements of the QAPM are commensurate with the item's or activity's importance to safety. The applicability of the requirements of the QAPM to other items and activities is determined on a case-by-case basis. The QAPM implements 10CFR50, Appendix B; 10 CFR 71, Subpart H; and 10 CFR 72, Subpart G.

Holtec uses a graded quality approach on various subcomponents associated with the HI-STORM 100 overpack, the HI-TRAC transfer cask, the MPC, and the ancillary components used to facilitate cask loading and onsite transport. This approach is covered by VY Quality related procedures and has been used at other Entergy sites. VY has notified the NRC of its intent to apply its 10CFR50 Quality Assurance Program to its ISFSI activities (Ref.. 16).

Therefore, the current Entergy QAPM is not impacted by any requirements for the Holtec HI-STORM 100 system.

Training Program

The Holtec HI-STORM 100 Storage System training program requirements are found in the HI-STORM 100 FSAR and CoC 1014, which invoke the requirements of 10CFR72 and require cask design-specific topics for personnel training. The VY Training Department used the Systematic Approach to Training, which is based on 10CFR50 and INPO guidelines, to develop and revise training programs to meet these requirements. The training program addresses all training requirements identified in the HI-STORM FSAR and CoC 1014, as well as requirements in other parts of the 10CFR72 regulations. Corresponding training modules shall include the following elements, at a minimum:

- HI-STORM 100 System Design (overview)
- ISFSI Facility Design (overview)
- SSCs Important to Safety (overview)
- HI-STORM 100 FSAR (overview)
- NRC SER (overview)
- CoC 1014 Conditions
- HI-STORM 100 Tech Specs, Approved Contents, Design Features
- Regulatory Requirements (e.g. 10CFR72.48, 10CFR72 Subpart K, 10CFR 20, 10CFR73
- Required Instruments and use
- Operating Experience Reviews
- HI-STORM and ISFSI Procedures (list is in Appendix B)

The Systematic Approach to Training was employed to determine what positions and what level of training was required for the VY staff.

Radiation Protection Program

The Holtec HI-STORM 100 Storage System radiological protection requirements are found in the HI-STORM 100 FSAR and CoC 1014, which invoke the requirements of 10CFR72 and provide cask-specific requirements. The VY Radiological Protection Program has been reviewed and implementing procedures developed or modified as necessary to address dry spent fuel cask loading, unloading, and storage operations. In addition, the requirements in HI-STORM 100 CoC, Appendix A, Section 5.7 "Radiation Protection Program," have been addressed.

7.11 10CFR72.212(b)(11)

"Maintain a copy of the CoC and, for those casks to which the licensee has applied the changes of an amended CoC, the amended CoC, and the documents referenced in such Certificates, for each cask model used for storage of spent fuel, until use of the cask model is discontinued. The licensee shall comply with the terms, conditions, and specifications of the CoC and, for those casks to which the licensee has applied the changes of an amended CoC, the terms, conditions, and specifications of the amended CoC, including but not limited to, the requirements of any AMP put into effect as a condition of the NRC approval of a CoC renewal application in accordance with §72.240."

HOLTEC Certificate of Compliance No. 1014 and documents referenced therein are controlled and maintained by the document control process until turnover to VY. Once turned over to VY the documents will be maintained per Procedure EN-AD-103.

For additional information (specific documents, drawings, ECOs and 72.48 screens and evaluations) on any of the ISFSI components refer to the referenced Engineering Report identified in the following Table.

VY-RPT-08-0003	HI-STORM Overpack - S/N 065 Asset ID OP-DFS-01
VY-RPT-08-0004	HI-STORM Overpack - S/N 066 Asset ID OP-DFS-02
VY-RPT-08-0005	HI-STORM Overpack - S/N 067 Asset ID OP-DFS-03
VY-RPT-08-0006	HI-STORM Overpack - S/N 068 Asset ID OP-DFS-04
VY-RPT-08-0007	HI-STORM Overpack - S/N 069 Asset ID OP-DFS-05
VY-RPT-08-0008	Multi-Purpose Canister - S/N 058 Asset ID MPC-DFS-01
VY-RPT-08-0009	Multi-Purpose Canister - S/N 059 Asset ID MPC-DFS-02
VY-RPT-08-0010	Multi-Purpose Canister - S/N 060 Asset ID MPC-DFS-03
VY-RPT-08-0011	Multi-Purpose Canister - S/N 061 Asset ID MPC-DFS-04
VY-RPT-08-0012	Multi-Purpose Canister - S/N 062 Asset ID MPC-DFS-05
VY-RPT-08-0013	HI-TRAC Fuel Transfer Cask - S/N 006 Asset ID FTC-DFS-01
VY-RPT-11-0005	HI-STORM Overpack - S/N 240 Asset ID OP-DFS-06
VY-RPT-11-0006	HI-STORM Overpack - S/N 241 Asset ID OP-DFS-07
VY-RPT-11-0007	HI-STORM Overpack - S/N 242 Asset ID OP-DFS-08
VY-RPT-11-0008	HI-STORM Overpack - S/N 461 Asset ID OP-DFS-09
VY-RPT-11-0009	Multi-Purpose Canister - S/N 305 Asset ID MPC-DFS-06
VY-RPT-11-00010	Multi-Purpose Canister - S/N 306 Asset ID MPC-DFS-07
VY-RPT-11-00011	Multi-Purpose Canister - S/N 307 Asset ID MPC-DFS-08
VY-RPT-11-00012	Multi-Purpose Canister - S/N 308 Asset ID MPC-DFS-09
VY-RPT-12-00005	HI-STORM Overpack - S/N 569 Asset ID OP-DFS-10
VY-RPT-12-00006	HI-STORM Overpack - S/N 570 Asset ID OP-DFS-11
VY-RPT-12-00007	HI-STORM Overpack - S/N 571 Asset ID OP-DFS-12
VY-RPT-12-00008	HI-STORM Overpack - S/N 572 Asset ID OP-DFS-13
VY-RPT-12-00009	Multi-Purpose Canister - S/N 362 Asset ID MPC-DFS-10
VY-RPT-12-00010	Multi-Purpose Canister - S/N 363 Asset ID MPC-DFS-11
VY-RPT-12-00011	Multi-Purpose Canister - S/N 364 Asset ID MPC-DFS-12
VY-RPT-12-00012	Multi-Purpose Canister - S/N 365 Asset ID MPC-DFS-13

7.12 10CFR72.212(b)(12)

"Accurately maintain the record provided by the CoC holder for each cask that shows, in addition to the information provided by the CoC holder, the following:(i) The name and address of the CoC holder or lessor;(ii) The listing of spent fuel stored in the cask; and(iii) Any maintenance performed on the cask."

Cask Vendor - The Holtec HI-STORM 100 System is designed by and fabricated under the supervision of:

Holtec International Inc.
Holtec Center
555 Lincoln Drive West
Marlton, NJ 08053

All Special Nuclear Material (SNM) possessed by VY is closely controlled, inventoried, and reported semi-annually per NRC requirements (10CFR74). VY approves all fuel assemblies for dry storage and ensures all related documentation (DOE/NRC 741 & 742 forms) is processed and maintained per the requirements of Entergy Procedures EN-NF-104, EN-NF-200, and EN-NF-201. SNM inventory updates will be made in a timely manner to reflect the exact location of any reportable quantity of SNM. The location of specific fuel assemblies loaded into a given cask is determined and documented in accordance with Procedures EN-DC-215, EN-RE-210 and EN-DC-212.

Maintenance performed on the casks will be documented in accordance with the maintenance procedures under the controls provided in the Entergy Quality Assurance Program Manual.

7.13 10CFR72.212(b)(13)

"Conduct activities related to storage of spent fuel under this general license only in accordance with written procedures."

It is the policy of VY, and required by the Entergy QAPM, that VY use approved written procedures for important to safety activities.

7.14 10CFR72.212(b)(14)

Make records and casks available to the Commission for inspection.

(c) The record described in paragraph (b)(12) of this section must include sufficient information to furnish documentary evidence that any testing and maintenance of the cask has been conducted under an NRC-approved quality assurance program.

(d) In the event that a cask is sold, leased, loaned, or otherwise transferred to another registered user, the record described in paragraph (b)(12) of this section must also be transferred to and must be accurately maintained by the new registered user. This record must be maintained by the current cask user during the period that the cask is used for storage of spent fuel and retained by the last user until decommissioning of the cask is complete.

(e) Fees for inspections related to spent fuel storage under this general license are those shown in §170.31 of this chapter.

Records and documentation are stored at VY in accordance with the Entergy Document Control and Records Management Program, and are available to the NRC for review upon request.

Maintenance and testing will be performed via approved procedures including those identified in EN-MA-100 that provide documentary evidence that the maintenance testing has been conducted under the Entergy QAPM, which has been approved by the NRC. Each facility's component/equipment database provides the safety-related component classification for input into any required maintenance and testing.

This record of cask that cask is sold, leased, loaned, or otherwise transferred to another registered user will be maintained by VY, as required

8.0 REFERENCES

1) *Final Safety Analysis Report for the HI-STORM 100 Cask System*, HI-2002444, Rev. 4, Holtec International (US NRC Docket No. 72-1014)

2) VY's notification to the NRC by letter (BVY 07-013, dated March 13, 2007) of its intent to begin loading spent fuel into dry storage casks.

3) GZA GeoTechnical Engineering Report, January 2004

4) ANSI N14.6 – 1993, Radioactive Materials – Special Lifting Devices for Shipping Containers Weighing 10,000 lbs. or more

5) NUREG-1536, "Standard Review Plan for Dry Cask Storage System"

6) ANSYS, A general purpose finite element modeling package for numerically solving a wide variety of mechanical problems

7) *Dose vs Distance for the Vermont Yankee ISFSI*, Holtec Report No. HI-2114926, Holtec International, Revision 1, VY-RPT-11-00015, "72.104 Dose vs Distance for 13 Loaded HI-STORMS on the Vermont Yankee ISFSI"

8) Letter from S.P. Skibniowsky (VY) to Dr. William Irwin (Vermont Dept. of Health), Dose and Exposure Calculations and Related Supporting Documentation – December 2011, dated January 6, 2012

9) Entergy Calculation No. VYC-2435, Vermont Yankee Nuclear Power Plant ISFSI Facility Concrete Storage Pad Design

10) Vermont Yankee Updated Final Safety Analysis Report

11) EPRI NP-440, Full-Scale Tornado-Missile Impact Tests, dated July 1977

12) EC 1604 "2008 Loading Campaign"

13) NRC Security Order, June 15, 2006

14) Vermont Yankee Emergency Plan

15) Entergy Quality Assurance Program Manual (QAPM)

16) BVY 07-031 "Intent to use 10CFR50 Appendix B Quality Assurance Program for Independent Spent Fuel Storage Installation Notification Pursuant to 10CFR72.140(d)", dated April 18, 2007

17) NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, July 1980

18) ANSI N14.5 – 1997, American National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials

19) ENTV-PR-001, Hazard Evaluation for the ISFSI and Haul Path, Enercon Services, Inc., Revision 4 (VY-RPT-08-0017)

20) EC-24349 "North Warehouse East Wall Fire Shield Modification for Hi-Storm Overpack Fire Hazard Protection"

21) Letter, ENO to USNRC, "Follow-up Actions Taken to NRC Enforcement Discretion Letter EA-09-190, Holtec Elimination of Multi-Purpose Canister (MPC) Shop Helium Leak Rate Test," ENOC-10-00034, BVY 10-062, dated November 2, 2010

22) Letter, USNRC to ENO, "Response to Non-helium Leak Tested Holtec Multi-purpose Canisters (MPCs) as Described in Enforcement Discretion Letter No. EA-09-190," NVY 11-004, dated January 26, 2011

23) EC 28665 "Seismic Restraints for Dry Fuel Storage Stack-up"

24) EC 28768 "2011 Loading Campaign"

25) EC 23549 "Vertical Cask Transporter Haul Path - Turning Pads Numbers 2 and 4"

26) EC 34606 "2012 Loading Campaign"

APPENDIX A - COMPLIANCE WITH HI-STORM 100 CASK SYSTEM CERTIFICATE OF COMPLIANCE

A. CERTIFICATE OF COMPLIANCE CONDITIONS

A review of the CoC was performed and a discussion of each condition is provided below.

A.1 Condition 1 – Cask Evaluation

a. Model No.: HI-STORM 100 Cask System

The HI-STORM 100 Cask System (the cask) consists of the following components: (1) interchangeable multi-purpose canisters (MPCs), which contain the fuel; (2) a storage overpack (HI-STORM), which contains the MPC during storage; and (3) a transfer cask (HI-TRAC), which contains the MPC during loading, unloading, and transfer operations. The cask stores up to 68 Boiling Water Reactor (BWR) fuel assemblies.

b. Description

The HI-STORM 100 Cask System is certified as described in the Final Safety Analysis Report (FSAR) and in the U. S. Nuclear Regulatory Commission's (NRC) Safety Evaluation Report (SER) accompanying the Certificate of Compliance. The cask comprises three discrete components: the MPCs, the HI-TRAC transfer cask, and the HI-STORM overpack.

The MPC is the confinement system for the stored fuel. It is a welded, cylindrical canister with a honeycombed fuel basket, a baseplate, a lid, a closure ring, and the canister shell. It is made entirely of stainless steel except for the neutron absorbers and aluminum heat conduction elements (AHCEs), which are installed in some early-vintage MPCs. The canister shell, baseplate, lid, vent and drain port cover plates, and closure ring are the main confinement boundary components. The honeycombed basket, which is equipped with neutron absorbers, provides criticality control.

There are eight types of MPCs: the MPC-24, MPC-24E, MPC-24EF, MPC-32, MPC-32F, MPC-68, MPC-68F, and MPC-68FF. The number suffix indicates the maximum number of fuel assemblies permitted to be loaded in the MPC. All eight MPCs have the same external diameter.

The HI-TRAC transfer cask provides shielding and structural protection of the MPC during loading, unloading, and movement of the MPC from the spent fuel pool to the storage overpack. The transfer cask is a multi-walled (carbon steel/lead/carbon steel) cylindrical vessel with a water jacket attached to the exterior. Two sizes of HI-TRAC transfer casks are available: the 125 ton HI-TRAC and the 100 ton HI-TRAC. The weight designation is the maximum weight of a loaded transfer cask during any loading, unloading, or transfer operation. Both transfer cask sizes have identical cavity diameters. The 125 ton HI-TRAC transfer cask has thicker lead and water shielding and larger outer dimensions than the 100 ton HI-TRAC transfer cask.

The HI-STORM 100 or 100S storage overpack provides shielding and structural protection of the MPC during storage. The HI-STORM 100S is a variation of the HI-STORM 100 overpack design that includes a modified lid which incorporates the air outlet ducts into the lid, allowing the overpack body to be shortened. The overpack is a heavy-walled steel and concrete, cylindrical vessel. Its sidewall consists of plain (un-reinforced) concrete that is enclosed between inner and outer carbon steel shells. The overpack has four air inlets at the bottom and four air outlets at the top to allow air to circulate naturally through the cavity to cool the MPC inside. The inner shell has channels attached to its interior surface to guide the MPC during insertion and removal, provide a flexible medium to absorb impact loads, and allow cooling air to circulate through the overpack. A loaded MPC is stored within the HI-STORM 100 or 100S storage overpack in a vertical orientation. The HI-STORM 100A is a variant of the HI-STORM family and is outfitted with an extended baseplate and gussets to enable the overpack to be anchored to the concrete pad in high seismic applications The HI-STORM 100A applies to both the standard (HI-STORM 100) and the HI-STORM 100S overpacks that are classified as the HI-STORM 100A and HI-STORM 100SA, respectively.

The Cask system and components that will be used for the VY ISFSI are the MPC-68, the 100 ton HI-TRAC transfer cask and the HI-STORM 100S storage overpack. These components were designed and fabricated in accordance with the CoC No. 1014 and HI-STORM FSAR requirements.

A.2 Condition 2 – Operating Procedures

Written Operating procedures shall be prepared for cask handling, loading, movement, surveillance and maintenance. The user's site specific written operating procedures shall be consistent with the technical basis described in Chapter 8 of the FSAR.

Written procedures for the above activities are identified in Appendix B of this evaluation report. These procedures are consistent with the technical basis provided in Chapter 8 of the HI-STORM 100 FSAR.

A.3 Condition 3 – Acceptance Test and Maintenance Program

Written cask acceptance tests and maintenance program shall be prepared consistent with the technical basis described in Chapter 9 of the FSAR.

Written cask acceptance tests were developed consistent with the technical basis described in Chapter 9 of the FSAR; and are included in the list of procedures in Appendix B of this evaluation report. Maintenance activities on the casks will be performed in accordance with VY's maintenance procedures; and the specific activities identified in Chapter 9 of the FSAR will be integrated into the VY Maintenance program.

A.4 Condition 4 – Quality Assurance

Activities in the areas of design, purchase, fabrication, assembly, inspection, testing, operation, maintenance, repair, modification of structures, systems and components, and decommissioning that are important to safety shall be conducted in accordance with a Commission-approved quality assurance program which satisfies the applicable requirements of 10 CFR Part 72, Subpart G, and which is established, maintained, and *executed with regard to the cask system.*

VY will apply the VY Quality Assurance Program to ISFSI activities that are important to safety. VY notified the NRC of its intent to use the existing 10CFR50 QAP in letter BVY 07-031 (Ref. 16).

A.5 Condition 5 – Heavy Loads Evaluation

Each lift of an MPC, a HI-TRAC transfer cask, or any HI-STORM overpack must be made in accordance to the existing heavy loads requirements and procedures of the licensed facility at which the lift is made. A plant-specific regulatory review (under 10 CFR 50.59 or 10 CFR 72.48, if applicable) is required to show operational compliance with existing plant specific heavy loads requirements. Lifting operations outside of structures governed by 10 CFR Part 50 must be in accordance with Section 5.5 of Appendix A and/or Sections 3.4.6 and 3.5 of Appendix B to this certificate, as applicable.

Lifting of the loaded HI-TRAC and transfer of the MPC from the HI-TRAC to the HI-STORM 100 are integral to a structure (Reactor Building) governed by 10CFR50 regulations. The Reactor Building Crane, which will perform the lifts in the Reactor Building, is single-failure-proof. All lifts will be in accordance with the site's heavy load control program PP7023, which is consistent with VY commitments to NUREG-0612 (Ref. 17).

A Low Profile Transporter (LPT) will be used to transport the loaded HI-STORM 100 Overpack from the Reactor Building to the Containment Access Building (CAB). The LPT is a device providing support from underneath (i.e. steel platform mounted on rollers) with no lifting capabilities.

The Vertical Cask Transporter (VCT) is utilized to lift the loaded HI-STORM 100 Overpack from the LPT and transport it from the CAB to the storage pad for final placement. The VCT and all components associated with the lifting and transport of the overpacks will prevent the drop of an overpack by design compliance with ANSI N14.6, combined with the use of redundant drop protection features including hydraulic check valves and wedge locks or by enhanced safety margins. VY is, therefore, in compliance with Section 5.5 of Appendix A by meeting the requirements specified in Section 5.5.a.3 as allowed by Note 3 on Table 5-1.

A.6 Condition 6 – Approved Contents

Contents of the HI-STORM 100 Cask System must meet the fuel specifications given in Appendix B to this certificate.

The fuel selection specifications are implemented by Procedure EN-DC-215, Fuel Selection for Holtec Dry Cask Storage. This procedure ensures that the requirements of CoC 1014, Appendix B are satisfied.

A.7 Condition 7 – Design Features

Features or characteristics for the site, cask, or ancillary equipment must be in accordance with Appendix B to this certificate.

The design features identified in Appendix B have been addressed as discussed in various sections of this report.

A.8 Condition 8 – Changes to the Certificate of Compliance

The holder of this certificate who desires to make changes to the certificate, which includes Appendix A (Technical Specifications) and Appendix B (Approved Contents and Design Features), shall submit an application for amendment of the certificate.

No changes to the CoC are required for the VY ISFSI at this time.

A.9 Condition 9 – Special Requirements for First Systems in Place

The heat transfer characteristics of the cask system will be recorded by temperature measurements for the first HI-STORM Cask Systems (for each unique MPC basket design - MPC-24/24E/24EF, MPC-32/32F, and MPC-68/68F/68FF) placed into service, by any user, with a heat load equal to or greater than 10 kW. An analysis shall be performed that demonstrates the temperature measurements validate the analytic methods and predicted thermal behavior described in Chapter 4 of the FSAR.

Validation tests shall be performed for each subsequent cask system that has a heat load that exceeds a previously validated heat load by more than 2 kW (e.g., if the initial test was conducted at 10 kW, then no additional testing is needed until the heat load exceeds 12 kW). No additional testing is required for a system after it has been tested at a heat load equal to or greater than 16 kW.

Each first time user of a HI-STORM 100 Cask System Supplemental Cooling System (SCS) that uses components or a system that is not essentially identical to components or a system that has been previously tested, shall measure and record coolant temperatures for the inlet and outlet of cooling provided to the annulus between the HI-TRAC and MPC and the coolant flow rate. The user shall also record the MPC operating pressure and decay heat. An analysis shall be performed, using this information, that validates the thermal methods described in the FSAR which were used to determine the type and amount of supplemental cooling necessary.

Letter reports summarizing the results of each thermal validation test and SCS validation test and analysis shall be submitted to the NRC in accordance with 10 CFR 72.4. Cask users may satisfy these requirements by referencing validation test reports submitted to the NRC by other cask users.

The portion of this CoC requirement pertaining to cask heat load applies to all general licensees using the Holtec HI-STORM 100 System. VY has confirmed that this CoC requirement has been successfully implemented by other HI-STORM 100 System users based on the heat loads of MPC-68/68F/68FFs to date. Energy Northwest loaded an MPC-68 series canister with a heat load greater than 16 kW at Columbia Generating Station. Therefore, no temperature data are required to be taken, and no reports need to be submitted.

The portion of this CoC requirement pertaining to the Supplemental Cooling System (SCS) applies only to general licensees using the Holtec HI-STORM 100 System who load high burnup fuel (burnup > 45,000 MWD/MTU). CoC Appendix A, LCO 3.1.4 requires the SCS to be used only if high burnup fuel is loaded into the MPC. VY does not plan to load high burnup fuel at this time. Therefore, this requirement of the CoC is not applicable.

A.10 Condition 10 – Pre-Operational Testing and Training Exercise

A dry run training exercise of the loading, closure, handling, unloading, and transfer of the HI-STORM 100 Cask System shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies. The training exercise shall not be conducted with spent fuel in the MPC. The dry run may be performed in an alternate step sequence from the actual procedures, but all steps must be performed. The dry run shall include, but is not limited to the following:

a. Moving the MPC and the transfer cask into the spent fuel pool.

b. Preparation of the HI-STORM 100 Cask System for fuel loading.

c. Selection and verification of specific fuel assemblies to ensure type conformance.

d. Loading specific assemblies and placing assemblies into the MPC (using a dummy fuel assembly), including appropriate independent verification.

e. Remote installation of the MPC lid and removal of the MPC and transfer cask from the spent fuel pool.

f. MPC welding, NDE inspections, pressure testing, draining, moisture removal (by vacuum drying or forced helium dehydration, as applicable), and helium backfilling. (A mockup may be used for this dry-run exercise.)

*g. Operation of the Supplemental Cooling System.**

*h. Transfer cask upending/downending on the horizontal transfer trailer or other transfer device, as applicable to the site's cask handling equipment.**

i. Transfer of the MPC from the transfer cask to the overpack.

j. Placement of the HI-STORM 100 Cask System at the ISFSI.

k. HI-STORM 100 Cask System unloading, including cooling fuel assemblies, flooding MPC cavity, removing MPC lid welds. (A mockup may be used for this dry-run exercise.)

* Not applicable to VY at this time.

The demonstrations were performed in an alternate step sequence from the actual procedures. The demonstration criteria identified in the Certificate of Compliance Condition 10 are satisfied in the following defined scenarios:

- Scenario #1 – MPC Inter-Cask Transfer Operations (Stack-up)
- Scenario #2 – HI-STORM Handling and Transport Operations
- Scenario #3 – HI-TRAC/MPC Spent Fuel Pool Placement and Fuel Loading
- Scenario #4 – MPC Sealing Operations
- Scenario #5 – MPC Welding Operations

- Scenario #6 – MPC Unloading Operation

The extent to which the above activities are simulated is documented in the Dry Fuel Storage Project Cask Handling Operation NRC Demonstration Plan. In some cases (e.g., Welding) the activity will be simulated by setting up welding equipment but not actually completing the activity. The extent of simulation was discussed with the NRC to ensure that the intent of the License Condition was satisfied.

A.11 Condition 11 – Supplemental Cooling System

When the Supplemental Cooling System is in operation to provide for decay heat removal in accordance with Section 3.1.4 of Appendix A the licensee is exempt from the requirements of 10 CR 72.236(f).

VY does not require a supplemental cooling system at this time.

A.12 Condition 12 – Authorization

The HI-STORM 100 Cask System, which is authorized by this certificate, is hereby approved for general use by holders of 10 CFR Part 50 licenses for nuclear reactors at reactor sites under the general license issued pursuant to 10 CFR 72.210, subject to the conditions specified by 10 CFR 72.212, and the attached Appendix A and Appendix B. The HI-STORM 100 Cask System may be fabricated and used in accordance with any approved amendment to CoC No. 1014, listed in 10 CFR 72.214. Each of the licensed HI-STORM 100 System components (i.e., the MPC, overpack, and transfer cask), if fabricated in accordance with any of the approved CoC Amendments, may be used with one another provided an assessment is performed by the CoC holder that demonstrates design compatibility.

No VY action is required on this condition.

COC APPENDIX A – TECHNICAL SPECIFICATIONS

Compliance with the Holtec HI-STORM 100 System CoC, Appendix A, "Technical Specifications," is discussed below.

Limiting Conditions for Operation (LCOs) and Surveillance Requirements (SRs)

LCO 3.1.1 – Multi-Purpose Canister (MPC)

This LCO establishes the MPC fuel cavity drying and helium backfill acceptance criteria for establishing the required heat transfer and corrosion-resistant environment for the stored fuel. With regard to MPC cavity drying, VY choose to use a vacuum drying system. Therefore, the drying acceptance criteria for the Forced Helium Drying system in Table 3-1 of HI-STORM 100 CoC Appendix A do not apply. The helium backfill pressure range for MPC-68/68F/68FF in Table 3-2 of HI-STORM 100 CoC Appendix A is used as the acceptance criterion rather than the "gram-moles/liter" acceptance criterion. This will be controlled by OP 2223 "MPC Fuel Loading Preparations and Sealing Operation"

LCO 3.1.2 – SFSC Heat Removal System

This LCO establishes operability and surveillance requirements for the HI-STORM overpack natural ventilation heat removal system. For loaded HI-STORM overpacks stored on the ISFSI pad, a temperature monitoring system was installed to support surveillances of the inlet and outlet air ducts for blockage. This will be administratively controlled by OP 2224 "MPC Transfer Operations and HI-STORM 100 Transport," and the periodic surveillance will be controlled by ESOMS Electronic operator rounds. If any air duct blockage or damage is found, the air ducts will be restored to an operable condition within the completion time established for the condition in the LCO.

LCO 3.1.3 – Fuel Cooldown

This LCO establishes requirements for ensuring that the bulk temperature of the MPC fuel cavity gas is less than or equal to 200°F before re-flooding the cavity with water in the event an MPC needs to be unloaded. This is controlled by Procedure OP 2225, MPC Unloading Operations.

LCO 3.1.4 – Supplemental Cooling System

This LCO establishes operability requirements for a supplemental cooling system required to be used if one or more high burnup fuel assemblies (burnup $\geq$ 45 GWD/MTU) are loaded into the MPC. Currently, VY does not plan on loading any high burnup fuel assemblies. Therefore, this LCO is not applicable to dry cask storage at VY at this time.

LCO 3.2.2 – Transfer Cask Surface Contamination

This LCO establishes removable alpha, beta, and gamma radiation contamination limits for the transfer cask surface and accessible portions of the MPC during on site transport operations. This is controlled by Procedure OP 2224, MPC Transfer Operations and HI-STORM Transport.

LCO 3.3.1 – Boron Concentration

This LCO establishes minimum soluble boron concentration requirements in the MPC water during fuel loading in certain MPC designs at pressurized water reactor (PWR) plants. Since the VY reactor is a BWR, this LCO does not apply.

Section 5.4 – Radioactive Effluent Control Program

This program implements the requirements of 10 CFR 72.44(d).

a. *The HI-STORM 100 Cask System does not create any radioactive materials or have any radioactive waste treatment systems. Therefore, specific operating procedures for the control of radioactive effluents are not required. Specification 3.1.1, Multi-Purpose Canister (MPC), provides assurance that there are not radioactive effluents from the SFSC.*

b. This program includes an environmental monitoring program. Each general license user may incorporate SFSC operations into their environmental monitoring programs for 10 CFR Part 50 operations

c. An annual report shall be submitted pursuant to 10 CFR 72.44(d)(3).

An annual report be submitted to the Commission in accordance with Sec. 72.4, specifying the quantity of each of the principal radionuclides released to the environment in liquid and in gaseous effluents during the previous 12 months of operation and such other information as may be required by the Commission to estimate maximum potential radiation dose commitment to the public resulting from effluent releases. On the basis of this report and any additional information that the Commission may obtain from the licensee or others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate. The report must be submitted within 60 days after the end of the 12-month monitoring period.

An annual report will be submitted pursuant to 10 CFR 72.44(d)(3) requirements in accordance with VY Procedure AP 0069.

Section 5.5 – Cask Transport Evaluation Program

This program provides a means for evaluating various transport configurations and transport route conditions to ensure that the design basis drop limits are met. For lifting of the loaded TRANSFER CASK or OVERPACK using devices which are integral to a structure governed by 10 CFR Part 50 regulations, 10 CFR 50 requirements apply. This program is not applicable when the TRANSFER CASK or OVERPACK is in the FUEL BUILDING or is being handled by a device providing support from underneath (i.e., on a rail car, heavy haul trailer, air pads, etc.).

a. For free-standing OVERPACKS and the TRANSFER CASK, the following requirements apply:

1. The lift height above the transport route surface(s) shall not exceed the limits in [CoC] Table 5-1 except as provided for in Specification 5.5.a.2. Also, the program shall ensure that the transportation route conditions (i.e., surface hardness and pad thickness) are equivalent to or less limiting than either Set A or Set B in HI-STORM FSAR Table 2.2.9.

2. For site-specific transport route surfaces that are not bounded by either the Set A or Set B parameters of FSAR Table 2.2.9, the program may determine lift heights by analysis based on the site-specific conditions to ensure that the impact loading due to design basis drop events does not exceed 45 g's at the top of the MPC fuel basket. These alternative analyses shall be commensurate with the drop analyses described in the Final Safety Analysis Report for the HI-STORM 100 Cask System. The program shall ensure that these alternative analyses are documented and controlled.

3. The TRANSFER CASK or OVERPACK, when loaded with spent fuel, may be lifted to any height necessary during transportation between the FUEL BUILDING and the CTF and/or ISFSI pad, provided the lifting device is designed in accordance with ANSI N14.6 and has redundant drop protection features.

4. *The TRANSFER CASK and MPC, when loaded with spent fuel, may be lifted to those heights necessary to perform cask handling operations, including MPC transfer, provided the lifts are made with structures and components designed in accordance with the criteria specific in Section 3.5 of Appendix B to Certificate of Compliance 1014, as applicable.*

Lifting of the loaded HI-TRAC and transfer of the MPC from the HI-TRAC to the HI-STORM 100 are integral to a structure (Reactor Building) governed by 10CFR50 regulations. The Reactor Building Crane, which will perform the lifts in the Reactor Building, is single-failure-proof. All lifts will be in accordance with the site's heavy load control program PP7023, which is consistent with VY commitments to NUREG-0612.

A Low Profile Transporter (LPT) is used to transport the loaded HI-STORM 100 Overpack from the Reactor Building to the Containment Access Building (CAB). The LPT is a device providing support from underneath (i.e. steel platform mounted on rollers) with no lifting capabilities.

The Vertical Cask Transporter (VCT) is then utilized to lift the loaded HI-STORM 100 Overpack from the LPT and transport it from the CAB to the storage pad for final placement. The VCT and all components associated with the lifting and transport of the overpacks will prevent the drop of an overpack by design compliance with ANSI N14.6, combined with the use of redundant drop protection features including hydraulic check valves and wedge locks or by enhanced safety margins. VY is, therefore, in compliance with Section 5.5 of Appendix A of the CofC by meeting the requirements specified in Section 5.5.a.3 as allowed by Note 3 on Table 5-1.

Section 5.7 – Radiation Protection Program

1. *Each cask user shall ensure that the Part 50 radiation protection program appropriately addresses dry storage cask loading and unloading, as well as ISFSI operations, including transport of the loaded OVERPACK and TRANSFER CASK outside of facilities governed by 10 CFR Part 50. The radiation protection program shall include appropriate controls for direct radiation and contamination, ensuring compliance with applicable regulations, and implementing actions to maintain personnel occupational exposure As Low As Reasonably Achievable (ALARA). The action and criteria to be included in the program are provided below.*

2. *As part of its evaluation pursuant to 10 CFR 72.212(b)(2)(i)(C), the licensee shall perform an analysis to confirm that the dose limits of 10 CFR 72.104(a) will be satisfied under the actual site conditions and ISFSI configuration, considering the planned number of casks to be deployed and the cask contents.*

3. *Based on the analysis performed pursuant to [item 2], the licensee shall establish individual cask surface dose rate limits for the HI-TRAC TRANSFER CASK and the HI-STORM OVERPACK to be used at the site. Total (neutron plus gamma) dose rate limits shall be established at the following locations:*

    a. *The top of the TRANSFER CASK and the OVERPACK*

   b. *The side of the TRANSFER CASK and OVERPACK*

   c. *The inlet and outlet ducts on the OVERPACK*

4. *Notwithstanding the limits established in [item 3], the measured dose rates on a loaded OVERPACK shall not exceed the following values:*

   a. *20 mrem/hr (gamma + neutron) on the top of the OVERPACK*

   b. *110 mrem/hr (gamma + neutron) on the side of the OVERPACK, excluding inlet and outlet ducts*

5. *The licensee shall measure the TRANSFER CASK and OVERPACK surface neutron and gamma dose rates as described in [item 8] for comparison against the limits established in [item 3] or [item 4], whichever are lower.*

6. *If the measured surface dose rates exceed the lower of the two limits established in [item 3] or [item 4], the licensee shall:*

   a. *Administratively verify that the correct contents were loaded in the correct fuel storage cell locations,*

   b. *Perform a written evaluation to verify whether placement of the as-loaded OVERPACK at the ISFSI will cause the dose limits of 10 CFR 72.104 to be exceeded, [and]*

   c. *Perform a written evaluation within 30 days to determine why the surface dose rates were exceeded.*

7. *If the evaluation performed pursuant to [item 6] shows that the dose limits of 10 CFR 72.104 will be exceeded, the OVERPACK shall not be placed into storage until the appropriate corrective action is taken to ensure the dose limits are not exceeded.*

8. *TRANSFER CASK and OVERPACK surface dose rates shall be measured at approximately the following locations:*

   a. *A minimum of four (4) dose rate measurements shall be taken on the side of the TRANSFER CASK approximately at the cask mid-height plane. The measurement locations shall be approximately 90 degrees apart around the circumference of the cask. Dose rates shall be measured between the radial ribs of the water jacket.*

   b. *A minimum of four (4) TRANSFER CASK top lid dose rates shall be measured at locations approximately half way between the edge of the hole in the top lid and the outer edge of the top lid, 90 degrees apart around the circumference of the top lid.*

   c. *A minimum of twelve (12) dose rate measurements shall be taken on the side of the OVERPACK in three sets of four measurements. One measurement set shall be taken at approximately the cask mid-height plane, 90 degrees apart* *around the circumference of the cask. The second and third measurement sets shall be taken approximately 60 inches above and below the mid-height plane, respectively, also 90 degrees apart around the circumference of the cask.*

d. A minimum of five (5) dose rate measurements shall be taken on the top of the OVERPACK. One dose rate measurement shall be taken at approximately the center of the lid and four measurements shall be taken at locations on the top concrete shield, approximately half way between the center and the edge of the top concrete shield, 90 degrees apart around the circumference of the lid.

e. A dose rate measurement shall be taken on contact at the surface of each inlet and outlet vent duct screen.

A site specific analysis has been performed in accordance with the HI-STORM CoC Appendix A, Sections 5.7.2 and 5.7.3. Based on this analysis, the overpack and transfer cask surface dose limits to be used for the VY site are as follows:

CoC Appendix A Reference		**Location**	**Site-Specific Calculated Overpack Surface Dose rate (mrem/hr)**		
			Neutron	**Gamma**	**Total**
5.7.3	a(1)	The top lid of the transfer cask	31.83	17.80	49.63
	a(2)	The top lid of the overpack i. center of top lid ii. middle of top lid	 0.78 0.567	 0.74 0.77	 1.52 1.44
5.7.3	b(1)	The side of the transfer cask (mid-height)	32.54	96.40	128.94
	b(2)	The side of the overpack i. mid-height ii. 60 in. above mid-height iii. 60 in. below mid-height	 0.41 0.04 0.41	 0.54 0.39 0.53	 0.95 0.43 0.95
5.7.3	c(1)	The inlet air duct of the overpack	5.02	4.96	9.99
	c(2)	The outlet air duct of the overpack	1.02	1.64	2.66

The calculated dose rates on the top and on the side of the overpack are lower than the CoC Appendix A, Section 5.7.4 limits of 20 mrem/hr and 110 mrem/hr, respectively. Therefore, the calculated total surface dose rates above are the appropriate limits to apply for comparison to measured values.

VY Procedure OP 2530 implements the dose rate measurement requirements of CoC Appendix A, Section 5.7.8 for the HI-TRAC transfer cask and HI-STORM 100 overpack. The measured dose rates are compared to the limits established in the table above in accordance with CoC Appendix A, Section 5.7.5. If measured dose rates exceed the established limits, the actions required by CoC Appendix A, Sections 5.7.6 and 5.7.7 (if required) will be implemented.

COC APPENDIX B – APPROVED CONTENTS AND DESIGN FEATURES

Section 2.1 – Approved Contents

Approved Contents
Fuel Specifications and Loading Conditions
2.1.1 Fuel to be Stored in the Hi-Storm 100 SFSC System
2.1.2 Uniform Loading
2.1.3 Regionalized Fuel Loading

VY procedure EN-DC-215, Fuel Selection For Holtec Dry Cask Storage, is used to select fuel assemblies for storage in the HI-STORM 100 System that meet all applicable requirements of CoC No. 1014, Amendment 2, Appendix B, Section 2.

Section 2.4 – Decay Heat, Burnup and Cooling Time Limits for ZR-Clad Fuel

Decay Heat, Burnup and Cooling Time Limits for ZR-Clad Fuel
2.4.1 Uniform Fuel Loading for Decay Heat Limits for ZR-Clad Fuel
2.4.2 Regionalized Fuel Loading Decay Heat Limits for ZR-Clad Fuel
2.4.3 Burnup Limits as a Function of Cooling Time for ZR-Clad Fuel
2.4.4 When complying with maximum fuel storage location decay heat limits, users must account for the decay heat from both the fuel assemble and any NON-FUEL HARDWARE, as applicable for the fuel storage location, to ensure the decay heat emitted by all contents in a storage location does not exceed the limit.

Use of approved fuel contents is controlled by EN-DC-215, Fuel Selection for Holtec Dry Cask Storage.

Section 3.1 – Site Location

The HI-Storm Cask System is authorized for general use by 10CFR Part 50 license holders at various site locations under the provisions of 10CFR72 Subpart K.

VY is a 10CFR Part 50 licensee, and will use a General License in accordance with Part 72, Subpart K.

Section 3.2 – Design Features Important for Criticality Control

This section of the CoC addresses certain design features important for criticality control for all HI-STORM 100 System MPC models certified under 10 CFR 72. Sections 3.2.1 and 3.2.3 through 3.2.5 pertain to the MPC-24, MPC-68F, MPC-24E/EF, and MPC-32/32F models, respectively. The MPC-68F is a BWR model not licensed for use by VY. The MPC-24, MPC-24E/EF, and MPC-32/32F are PWR MPC models. Therefore, these CoC sections are not applicable to the VY ISFSI.

Section 3.2.2 – MPC-68/68FF

1. *Fuel cell pitch ≥ 6.43 inches*
2. *^{10}B loading in the neutron absorbers: ≥ 0.0372g/cm^2 (Boral) and ≥ 0.0310g/cm^2 (METAMIC)*

The fuel cell pitch and ^{10}B loading of the neutron absorbers in the MPC are verified as part of MPC fabrication. Certification that each MPC meets these technical specification limits is provided by Holtec in the Component Completion Record (CCR) for each serial number MPC. The design of each MPC-68 is checked to ensure that it meets the specific design features for criticality. Each MPC is then manufactured and certified that it meets the design requirements.

Section 3.2.6 – Fuel Spacers

Fuel spacers shall be sized to ensure that the active fuel region of intact fuel assemblies remains within the neutron poison region of the MPC basket with water in the MPC.

The VY fuel assembly design is 176.2 inches long with a maximum active fuel length of 150 inches. In accordance with HI-STORM FSAR, Table 2.1.10, no fuel spacers are required.

Section 3.2.7 – METAMIC B_4C Content

The B_4C content in METAMIC shall be $\leq$ 33.0 wt.%.

The limit is verified to be met by Holtec International during the MPC fabrication process as documented in the Component Completion Records for the MPCs.

Section 3.2.8 - Neutron Absorber Tests

Section 9.1.5.3 of the HI-STORM 100 FSAR is hereby incorporated by reference into the HI-STORM 100 CoC. The minimum ^{10}B for the neutron absorber material shall meet the minimum requirements for each MPC model specified in Sections 3.2.1 through 3.2.5 above.

This CoC requirement is verified to be met by Holtec International during the neutron absorber fabrication process as documented in the Component Completion Records for the MPCs.

Section 3.4 – Site-Specific Parameters and Analysis

Section 3.4.1 - Maximum Normal Ambient Temperature

The temperature of 80 °F is the maximum average yearly temperature.

VY UFSAR, Table 2.3.2, provides temperature data for the Vernon, Vermont area during the time period from 1951 to 1960. The mean daily maximum when averaged for a year is approximately 59 degrees. Therefore, this requirement is considered met.

Section 3.4.2 – Ambient Temperature Extremes

The allowed temperature extremes, averaged over a 3-day period, shall be greater than -40 °F and less than 125 °F.

VY UFSAR, Table 2.3.2, provides temperature data for the Vernon, Vermont area. The extreme maximum temperature is 100 degrees F, which is less that the 125 degrees F. The extreme minimum is -33 degrees F. which is greater than the -40 degrees F. Therefore, this requirement is met.

Section 3.4.3 - Seismic Criteria

a. *The resultant horizontal acceleration (vectorial sum of two horizontal Zero Period Accelerations (ZPAs) at a three-dimensional seismic site), G_H, and vertical ZPA, G_V, on the top surface of the ISFSI pad, expressed as fractions of 'g', shall satisfy the following inequality:*

$$G_H + \mu G_V \leq \mu$$

where μ is either the Coulomb friction coefficient for the cask/ISFSI interface or the ratio r/h, where 'r' is the radius of the cask and 'h' is the height of the cask center-of-gravity above the ISFSI pad surface. The above inequality must be met for both definitions of μ, but only applies to ISFSIs where the casks are deployed in a freestanding configuration. Unless demonstrated by appropriate testing that a higher coefficient of friction value is appropriate for a specific ISFSI, the value used shall be 0.53. If acceleration time-histories on the ISFSI pad surface are available, G_H and G_V may be the coincident values of the instantaneous net horizontal and vertical accelerations. If instantaneous accelerations are used, the inequality shall be evaluated at each time step in the acceleration time history over the total duration of the seismic event.

If this static equilibrium based inequality cannot be met, a dynamic analysis of the cask/ISFSI pad assemblage with appropriate recognition of soil/structure interaction effects shall be performed to ensure that the casks will not tip over or undergo excessive sliding under the site's Design Basis Earthquake.

a. *For free-standing casks, under environmental conditions that may degrade the pad/cask interface friction (such as due to icing) the response of the casks under the site's Design Basis Earthquake shall be established using the best estimate of the friction coefficient in an appropriate analysis model. The analysis should demonstrate that the earthquake will not result in cask tipover or cask a cask to fall off the pad. In addition, impact between casks should be precluded, or should be considered an accident for which the maximum g-load experienced by the stored fuel shall be limited to 45 g's.*

VY chose to perform a dynamic seismic analysis of the cask/ISFSI pad assemblage with appropriate recognition of soil/structure interaction effects to ensure that the casks will not tip over or undergo excessive sliding under the site's Design Basis Earthquake.

The ISFSI storage pad is a reinforced concrete slab founded on engineered fill placed on existing soils. Seismic input at VY is at bedrock which lies from 20 to 30 feet below the pad. Strain compatible soil properties were determined and acceleration time histories were developed at the bedrock elevation. The results of these analyses were used as design input to the soil structural interaction analysis and the assessment of liquefaction potential. The results demonstrated that liquefaction will not occur at VY. The structural interaction analysis output was used as design input to the seismic analysis of the storage pad and the sliding and tipping analysis of the casks on the storage pad.

The sliding and tipping analysis determined that the maximum horizontal displacements of the overpacks for any condition are significantly smaller than half of the free space between adjacent overpacks and also significantly less than the distance between the external edge of the overpack and the edge of the ISFSI storage pad. Therefore, the overpacks will not interact with each other and will not slide off the pad. In addition, this calculation determined that the overpacks will not tip over. The analysis used coefficients of friction ranging from 0.0 to 0.8, which covers the range of potential pad surface conditions (such as due to icing).

Section 3.4.4 - Flood

The analyzed flood condition of 15-fps water velocity and a height of 125 feet of water (full submergence of the loaded cask) are not exceeded.

VY is designed to withstand the effects of the probable maximum flood (PMF). The maximum PMF stillwater elevation is 252.5 feet mean sea level (MSL). Wave effects, including runup, could produce flooding as high as 254 feet MSL. The storage pad is at elevation 254 feet MSL and the grade surrounding the pad is at elevation 252 feet MSL. The bottom of the loaded HI-STORM 100 System in position on the ISFSI pad is at an elevation of 254 feet. Therefore, the loaded cask is not submergence or subjected to water flow. The HOLTEC FSAR analyzed flood condition of 15-fps water velocity and a height of 125 feet of water (full submergence of the loaded cask) is not exceeded at VY.

Section 3.4.5 - Fire and Explosion

The potential for fire and explosion shall be addressed, based on site-specific considerations. This includes the condition that the on-site transporter fuel tank will contain no more than 50 gallons of diesel fuel while handling a loaded OVERPACK or TRANSFER CASK.

The HI-STORM 100 FSAR postulated fire event for the overpack was performed using the following key inputs, as described in HI-STORM 100 FSAR Section 11.2.4.2.1:

1) A diesel fuel volume of 50 gallons maximum,
2) The HI-STORM overpack engulfed in flame for 3.622 minutes, and
3) A flame temperature of 1475 °F

The generic overpack fire analysis shows that the fuel cladding temperature, MPC internal pressure, and overpack outer shell steel temperature all remain below their respective short term temperature limits.

The ISFSI fire hazards evaluation is based on the HI-STORM overpack and not the HI-TRAC transfer cask because the MPC is transferred into the HI-STORM overpack prior to embarking on the transport route. Flammable fuel will be in the vicinity of the overpack during transport from the Reactor Building to the ISFSI pad and at the pad while the cask is being placed in its designated position. Combustible and flammable materials will be under administrative controls and be evaluated.

The fire protection requirements for the ISFSI are contained in 10CFR72.122(c), Subpart F, General Design Criteria, *Protection Against Fires and Explosions*. A review of the Fire Protection Program reveals that structures, systems and components important to safety are designed and located such that they can continue to perform their safety function effectively under credible fire exposure conditions. The Hazard Evaluation for the ISFSI and Haul Path (Ref. 19) evaluates the fire hazards, and identifies sources of explosions, respectively, involved in the onsite transportation and dry storage of spent fuel in MPCs enclosed in HI-STORM 100 ventilated overpacks at the VY site (cf. Appendix D of this evaluation report). All fire hazards are evaluated in comparison to the design basis overpack fire event as described in Chapter 11 of the HI-STORM FSAR.

The methodology employed during development of the ISFSI Fire Hazards Analysis consisted of the following steps:

1) Identify the design basis fire as established in Holtec HI-STORM 100 Final Safety Analysis Report,

2) Identify the travel path for the HI-STORM 100 overpack and the location of the ISFSI storage pad,

3) Identify all credible fire sources,

4) Evaluate the potential impact of each credible fire source on the HI-STORM overpack.

Some of the fire sources were eliminated based on established administrative controls or adequate shielding. The remaining fire sources were evaluated using either a comparison of total combustible energy content (if the total is below that of the design basis fire) or evaluated using standard heat transfer techniques to quantify potential heat addition to the HI-STORM 100 overpack during its transport and its permanent residence at the ISFSI pad.

The short-term maximum overpack outer shell steel temperature limit of 600° F was compared to a steady-state surface temperature calculation methodology. A steady-state temperature profile was considered to be a conservative assumption. Any finite fire duration would be expected to result in a lower temperature. The HI-STORM 100 FSAR states in Section 11.2.4.2.1 that the time constant for the overpack is 127.7 hours, or approximately five days. This implies that significant heat from a fire would not penetrate the thick concrete walls during any realistic time estimate for a site fire. The types of fires evaluated in the fire hazards analysis could be expected to be mitigated by either being extinguished, moving the cask hauler away from the fire source or otherwise shielding the casks from the fire, within one day, or one tenth of the thermal time constant. Therefore, it was conservative to assume steady-state surface temperatures and acceptable to compare them to a short term criteria.

The design basis fire is an engulfing fire around the overpack that results when the diesel fuel contents of a hypothesized VCT fuel tank are spilled around the overpack and assumed to burn in place. The combustion material is 50 gallons of diesel fuel, which is assumed to burn for 3.622 minutes at 1475°F. The ambient temperature is assumed to be 100°F. The resulting calculation shows that the HI-STORM 100 outer shell reaches 570°F, which is below the 600°F short-term temperature limit for the outer shell steel specified in HI-STORM 100 FSAR Table 2.2.3. Knowing that the thermal energy content of diesel fuel is 130,000

BTU/gal, the energy content of the design basis fire can be calculated. Therefore, the energy involved is 6.5 MBtu. This worst case design basis fire bounds any engulfing or non-engulfing fire involving combustible material with less than this energy content.

The results of the evaluation concluded that all potential fire hazard exposures presented an acceptable risk. Some of the exposures were determined to be non-credible sources of fires during the limited time involved in cask transfer. Others were evaluated as being bounded by the design basis fire in terms of total energy content, and therefore being acceptable. The rest were evaluated for their impact on the overpack surface temperatures using heat transfer equations and conservative assumptions.

Since the ISFSI pad and overpack transport pathway is exterior to and sufficiently separated from plant structures, no automatic fire detection or suppression systems were incorporated into the designed of the ISFSI. Several yard fire hydrants are installed along the transport pathway. Two additional fire hydrants are located east of the ISFSI pad. The fire hydrants along with the trained Fire Brigade provide sufficient capacity and capability to minimize the adverse effects of a fire on the overpacks and all associated components. The overpacks are designed so that no adverse effects will results due to fire suppression activities.

See Appendix D of this evaluation report for additional details on fire hazards and also details on explosion hazards.

Section 3.4.6 - Cask Drop and Tip-Over

For free-standing casks, the ISFSI pad shall be verified by analysis to limit cask deceleration during design basis drop and non-mechanistic tip-over events to ≤ 45 g's at the top of the MPC fuel basket. Analyses shall be performed using methodologies consistent with those described in the HI-STORM 100 FSAR. A lift height above the ISFSI pad is not required to be established if the cask is lifted with a device designed in accordance with ANSI N14.6 and having redundant drop protection features.

The HI-STORM 100 System design basis requires that neither a non-mechanistic tip-over nor an 11-inch vertical drop of a loaded cask onto the ISFSI pad results in cask deceleration levels greater than 45g's at the top of the fuel for the HI STORM 100 Overpack. The cask deceleration is a function of the following factors associated with the ISFSI pad:

- Modulus of elasticity of the soil subgrade
- Thickness of concrete pad
- Compressive strength of concrete
- Strength of concrete reinforcement

In accordance with the HI-STORM 100 CoC, the ISFSI owner has the option of constructing the pad to comply with specific limits set forth in the cask FSAR without performing a site specific cask drop analysis. The ISFSI pad is designed in accordance with the "Set A" requirements in HI-STORM 100 FSAR, Table 2.2.9.

The engineered backfill meets the design basis established in the Holtec FSAR. The design basis for the engineered backfill requires the material stiffness of the supporting backfill material to limit fuel deceleration due to a postulated Hi-Storm Overpack tip-over event. The source materials, in-place properties, and method of placement of the engineered backfill are identified in GZA GeoTechnical Engineering Report, dated January 2004 and satisfy the Holtec design basis requirements. The GZA Report limits the net allowable bearing pressure under the storage pad to 2 tons/ft^2. In accordance with the GZA Report recommendations a minimum 4'0" thick sub-base course was placed under the storage pad to provide frost line protection. Therefore, the storage pad and engineered backfill is founded upon a non-frost susceptible sub-grade.

Since VY specified and verified the properties in HI-STORM 100 FSAR , Table 2.2.9, parameter "Set A", the cask deceleration limit of less than or equal to 45 g's for a overpack tip-over was met.

VY is utilizing a Vertical Cask Transporter (VCT) to carry and store the overpacks on the storage pad. The VCT and all components associated with the lifting and transport of the overpacks will prevent the drop of an overpack by design compliance with ANSI N14.6, combined with the use of redundant drop protection features including hydraulic check valves and wedge locks or by enhanced safety margins. Therefore, the 11-inch drop criterion/restriction is not applicable to VY.

Section 3.4.7 - Berms and Shield Walls

In cases where engineered features (i.e., berms and shield walls) are used to ensure that the requirements of 10CFR72.104(a) are met, such features are to be considered important to safety and must be evaluated to determine the applicable Quality Assurance Category.

Berms or shields walls are not required or used at the VY ISFSI, and are not credited in the shielding analysis performed to demonstrate compliance with 10 CFR 72.104(a).

Section 3.4.8 - Minimum Working Area Ambient Temperature

LOADING OPERATIONS, TRANSPORT OPERATIONS, and UNLOADING OPERATIONS shall only be conducted with working area ambient temperatures ≥ 0 °F.

Loading and unloading operations will be performed in the Reactor Building where the ambient temperature is controlled to be greater than 0 Degrees F. Procedures restrict Vertical Cask Transporter operations with the HI-STORM 100 overpack to temperatures greater than or equal to 10°F and a maximum temperature of 100°F.

Section 3.4.9 – Cask Air Duct Blockage for Extended Period

For those users whose site-specific design basis includes an event or events (e.g., flood) that result in the blockage of any OVERPACK inlet or outlet air ducts for an extended period of time (i.e., longer than the total Completion Time of LCO 3.1.2), an analysis or evaluation may be performed to demonstrate adequate heat removal in available for the duration of the event. Adequate heat removal is defined as fuel cladding temperatures remaining below the short term temperature limit. If the analysis or evaluation is not performed, or if fuel cladding temperature limits are unable to be demonstrated by analysis or evaluation to remain below the short term temperature limit for the duration of the event, provisions shall be established to provide alternate means of cooling to accomplish this objective.

The VY ISFSI is designed to withstand the effects of the probable maximum flood (PMF). The maximum PMF stillwater elevation is 252.5 feet mean sea level (MSL). Wave effects, including runup, could produce flooding as high as 254 feet MSL. The storage pad is at elevation 254 feet MSL and the grade surrounding the pad is at elevation 252 feet MSL. The bottom of the loaded HI-STORM System in position on the ISFSI pad is at an elevation of 254 feet. Therefore, the ISFSI pad elevation is above the probable maximum flood level for the site, and flooding of the casks during storage operations is not a concern.

Therefore, there are no postulated site-specific design basis events (e.g., floods) that could potentially result in the blockage of any HI-STORM inlet or outlet air ducts for an extended period of time. Accordingly, this CoC requirement is not applicable to the VY ISFSI.

Section 3.6 – Forced Helium Dehydration System

Sections 3.6.1 and 3.6.2 – System Description and Design Criteria

Use of the Forced Helium Dehydration (FHD) system, (a closed-loop system) is an alternative to vacuum drying the MPC for moderate burnup fuel (≤ 45,000 MWD/MTU) and mandatory for drying MPCs containing one or more high burnup fuel assemblies. The FHD system shall be designed for normal operation (i.e., excluding startup and shutdown ramps) in accordance with the criteria in Section 3.6.2.

This section is not applicable since VY will not use a FHD system.

Section 3.6.3 – Fuel Cladding Temperature

A steady-state thermal analysis of the MPC under the forced helium flow scenario shall be performed using the methodology described in HI-STORM 100 FSAR Subsections 4.4, with due recognition of the forced convection process during FHD system operation. This analysis shall demonstrate that the peak temperature of the fuel cladding under the most adverse condition of FHD system operation is below the peak cladding temperature limit for normal conditions of storage for the applicable fuel type (PWR or BWR) and cooling time at the start of dry storage.

This section is not applicable since VY will not use a FHD system.

Section 3.6.4 – Pressure Monitoring During FHD Malfunction

During an FHD malfunction event, described in HI-STORM 100 FSAR Section 11.1 as a loss of helium circulation, the system pressure must be monitored to ensure that the conditions listed therein are met.

This section is not applicable since VY will not use a FHD system.

Section 3.7 – Supplemental Cooling System (SCS)

The SCS is a water circulation system for cooling the MPC inside the HI-TRAC transfer cask during on-site transport. Use of the Supplemental Cooling System (SCS) is required for post-backfill HI-TRAC operations of an MPC containing one or more high burnup (> 45,000

MWD/MTU) fuel assemblies. The SCS shall be designed for normal operation (i.e., excluding startup and shutdown ramps) in accordance with the criteria in Section 3.7.2.

The HI-STORM 100 casks loaded at VY do not contain any fuel assemblies burned greater than 45,000 MWD/MTU. Thus, the supplemental cooling system is not required at this time.

Section 3.8 – Combustible Gas Monitoring During MPC Lid Welding

During MPC lid welding operations, combustible gas monitoring of the space under the MPC lid is required, to ensure that there is no combustible mixture present in the welding area.

A risk of hydrogen production and a flammable atmosphere could exist inside the MPC due to oxidation of neutron absorber panels while the MPC is filled with water. Upon MPC lid installation, any gas generated would be trapped in the gas space under the lid created when the MPC water level is lowered to facilitate lid welding. Purging of the space under the MPC lid is performed prior to pre-heating, welding or grinding operations per OP 2223 MPC Fuel Loading Preparations and Sealing Operation. Continuous sampling for combustible gas buildup is performed during the MPC lid-to-shell weld, including NDE. Continuous sampling is also maintained during any repairs to the weld, if required. If completion of the weld of the MPC is interrupted for any reason, combustible gas concentration is verified less than or equal to 2 % (50% of lower explosive limit) prior to continuing welding.

During unloading operations, sampling of the MPC internal atmosphere occurs prior to penetration to the cask internals in the unloading sequence per OP 2225, MPC Unloading Operation. The weld cutting process is not expected to be an ignition source due to low temperature and no sparks, the cask will be vented during the refill sequence, and any gases in the cask should be expelled from the cask with introduction of water. Without any gases in the cask, combustion of the hydrogen will not be possible even if an ignition source were to be available. With helium in the cask initially, a hydrogen burn cannot occur due to the lack of oxygen to initiate and sustain the burn. The primary defenses for flammable gases during unloading are first, minimization of gases by venting and purging, and second, the exclusion of ignition sources.

APPENDIX B - LIST OF PROCEDURES

VY requires new or revised site-specific procedures in order to address specific fuel transport and storage activities at the facility. The key procedures (latest revision unless otherwise noted) VY will use are listed below.

1. DP 2220, MPC Off-loading, Storage, and Handling
2. DP 2221, MPC Prior to Use Inspections and Handling
3. DP 2222, HI-STORM 100S Overpack Storage, Prior to Use Inspections, and Handling
4. OP 2223, MPC Fuel Loading Preparations and Sealing Operations
5. OP 2224, MPC Transfer Operations and HI-STORM Transport
6. OP 2225, MPC Unloading Operations
7. DP 2226, MPC Alternate Cooling
8. DP 2227, Vacuum Drying System (VDS) Operation
9. DP 2228, Low Profile Transporter (LPT) Operation
10. DP 2229, Vertical Cask Transporter (VCT) Operation
11. DP 2230, HI-TRAC Offloading, Storage, Prior to use Inspections and Handling
12. EN-DC-215, Fuel Selection for Holtec Dry Cask Storage
13. EN-RE-210, Reactor Core and MPC Cask Fuel Verification
14. OP 2505, Handling Transfer and Storage of Site Radioactive Material
15. OP 2530, Radiological Monitoring Requirements for the HI-STORM 100 Dry Fuel Storage System
16. OP 3127, Natural Phenomenon
17. DP 3201, DFS Equipment Handling and Storage Abnormal Conditions
18. AP 3125, Emergency Plan Classification and Action Level Scheme
19. AP 0010, Situational Reporting Requirements
20. AP 0042, Plant Fire Protection and Fire Prevention

APPENDIX B (cont'd)

21. AP 0069, Routine Report due to state and Federal Agencies
22. AP 0156, Notification of Significant Events
23. AP 0172, Work Schedule Risk Management – On Line
24. OP 1100, Refuel Platform Operation
25. OP 1101, Management of Refueling Activities and Fuel Assemble Movement
26. OP 4530, Dose Rate Radiation Surveys
27. DP 4531, Radioactive Contamination Surveys
28. AP 4601, Environmental Radiation Surveillance Program
29. PP 7023, Control of Heavy Loads Program Document
30. EN-LI-108, Event Notification and Reporting
31. EN-AD-103, Document Control and Records Management Program
32. OP 5241, Lifting Fixtures and Equipment
33. EN-DC-212, Caskloader Computer Code – Model Development and Updating
34. Deleted
35. EN-MA-100, Fundamentals of Maintenance
36. EN-MA-118, Foreign Material Exclusion
37. EN-MA-119, Material Handling Program
38. EN-PL-194, Dry Fuel Storage
39. EN-DC-211, Dry Fuel Storage Management
40. EN-LI-115, HI-STORM 100 Independent Spent Fuel Storage Installation Licensing Document Preparation and Control
41. EN-LI-112, 10CFR72.48 Evaluations
42. EN-NF-104, Special Nuclear Material Program
43. EN-NF-200, Special Nuclear Material Control

44. EN-NF-201, Special Nuclear Material Reporting

45. EN-IS-109, Compressed Gas Cylinder Handling and Storage

46. PP 7206, Use of Lifting Systems

47. EMMP-INSP-5240-11 Reactor Building Crane Electrical Periodic Inspections

48. EMMP-INSP-5240-13 Reactor Building Crane Hoist Limit Switch Adjustments for Refueling Outage Settings

49. EMMP-INSP-5240-14 Reactor Building Crane Hoist Limit Switch Adjustments for DFS Cask Handling Settings

50. MMMP-INSP-5240-11 Reactor Building Crane Periodic And Wire Rope Inspections

51. MMMP-INSP-5240-13 Reactor Building and Turbine Building Crane Frequent Inspection Checklist

52. EN-FAP-OU-108, Fuel Handling Process

53. EN-DC-160, Dry Fuel Storage Document Control

54. EN-OP-116, Infrequently Performed Tests or Evolutions

55. OP 2200, Operation of Reactor and Turbine Bridge Cranes

56. OPOP-NFPC-2184, Normal Fuel Pool Cooling System

APPENDIX C - 72.48 REVIEWS & OUTSTANDING CASK LICENSING BASIS DOCUMENT CHANGES

The primary licensing documents of record used in this 72.212 evaluation report are HI-STORM 100 CoC 1014, Amendment 2 and Revision 4 of the HI-STORM 100 System FSAR.

This section documents deviations from the HOLTEC FSAR and identifies changes applicable to the VY ISFSI evaluated in accordance with 10CFR72.48.

VERMONT YANKEE SPECIFIC DEVIATIONS FROM HOLTEC FSAR (Revision 4)

Document Area	Requirement	Justification for Deviation
FSAR Chapter 2: Principal Design Criteria		
Section 2.2.1.4	Confirmation of soil annual average soil temperature is to be performed by the licensee.	VY does not perform regular soil sampling. The Holtec FSAR (CFSAR) assumes a bounding average soil temperature of 77 degrees F. The design concern here is that in warm climates there could be an adverse effect on the thermal analysis. For cold climates this concern is not applicable and VY is bounded by the CFSAR analysis.
FSAR Section 4: Thermal Evaluation		
Section 4.5.6	During normal handling and onsite transfer operations the water jacket shielding water is contained in the water jacket.	This will normally be the case with the exception of when the cask is placed into and lifted out of the pool. This is acceptable because the cask will be monitored based on an established time to boil calculation and if additional cooling is necessary equipment will be pre-staged to accomplish cooling. In addition during this time neutron shielding will be provided by the water in the MPC. It should be noted that this is due to HI-TRAC trunnion loading limitations and has been done at other stations.
FSAR Section 5: Shielding		
Section 5.1 Criteria 1	The minimum distance between the ISFSI to the controlled area boundary must be at least 100 meters	On the land side the ISFSI is greater than the 100 meters required. On the river side, there is not 100 meters to the site boundary however due to the river the occupancy is very limited and is also monitored by Security. This is also consistent with the current approach to meeting 10CFR50 off-site dose calculations.
FSAR Chapter 8: Operating Procedures		
Section 8.0	User-Developed procedures and the design and operation of any alternate equipment must be reviewed by the Certificate Holder prior to implementation	HOLTEC review is not considered warranted and will be noted as an exception in the 72.212 report. VY used procedures that were used at another Entergy plant, had independent reviews by personnel that are very knowledgeable in dry fuel storage and completed compliance reviews against 10CFR72, Holtec CoC and Holtec FSAR requirements.

Section 8.1	The air temperature rise test shall be performed between 5 and 7 days after installation of the HI-STORM 100 lid to allow thermal conditions to stabilize.	Air Temperature rise test not required per HOLTEC. See report HI-2043249 Rev.0 for results that justify not performing the test.
Table 8.1.5	HI-STORM 100 System Torque Requirements	Table 8.1.5 of the HOLTEC FSAR is revised to replace the torque requirements for the HI-TRAC Pool Lid Bolts, The HI-TRAC Transfer Lid Bolts, the MPC Lift Cleat Stud Nuts and the HI-STORM Lid Nuts to hand tight.
FSAR Chapter 9; Testing, Inspection, Maintenance		
Section 9.1.1	Fabrication and Nondestructive Examination (NDE)	References 21 and 22 document disposition of the Non-Helium leak tested MPC weld issue.
Section 9.1.1 Item 4	Inspection plan shall be reviewed and approved by Holtec in accordance with its QA program.	Holtec review and approval of the inspection plan for welds performed at VY does not provide significant increased assurance of compliance with the CoC, safety in loading or storing the cask, or the intent of the FSAR. VY had independent reviews by personnel that are very knowledgeable in Inspection requirements and completed compliance reviews against 10CFR72, Holtec CoC and Holtec FSAR requirements. Therefore, additional review is not considered necessary.
9.2.1	Perform Load Test of transfer cask trunnions annually	HI-STORM FSAR, Section 9.1.2 describes initial load testing requirements and requires compliance with ANSI N 14.6 and NUREG 0612. ANSI N 14.6, Section 6.3.1, requires that annual load testing be performed or in cases where surface cleanliness and conditions permit, load testing may be omitted and dimensional checks and nondestructive examination in accordance with Section 6.5 is sufficient. Substitution of NDE for load testing is consistent with the referenced standard and industry practice. Inspections and NDE of the trunnions are performed in accordance with written procedures.
Table 9.2.1	Monthly overpack vent screen visual examination for damage, holes, etc	The CFSAR section 9.2.6 recognizes that temperature monitoring is an acceptable alternative to monthly vent screen monitoring. Therefore, VY performs temperature monitoring and an annual inspection of vent screens.
Section 9.2.4	The pressure relief valves used on the water jacket for the HI-TRAC transfer cask shall be calibrated on an annual basis (or prior to the next use if the period of out of use exceeds one year).	The pressure relief valves used on the water jacket are either recalibrated or replaced before each dry fuel storage campaign. They are purchase with the appropriate qualifications as required by the site's QA program.
Other	Operating experience	Vender welding procedures perform a verification of

Issues		the MPC closure ring to MPC shell fillet weld per HIB No. 42 Procedure OP2224 was revised to ensure for proper alignment prior to placing the mating device onto the HI-STORM per HIB No.46 Procedure OP 2223 was revised to ensure for verification of proper heat generation rates per HIB 45R2 and HIB 48R1.

HOLTEC GENERIC CHANGES TO FSAR (Revision 4)

1. <u>Holtec Engineering Change Order (ECO) No. 5014-121</u>

This change which pertains to field helium leak testing of the MPC vent and drain port cover plates was issued in June 2005, and affects the following HI-STORM 100 FSAR sections, appendices, tables, and figures:

Sections 7.1.3, 8.1.1, 8.1.6, and 9.1.3
Appendix 12.A (Bases B3.1.1)
Table 9.1.1
Figure 8.1.1

The above change did not require a §72.48 screening or evaluation because the FSAR changes support changes to the CoC made by the NRC in response to a public comment on the Amendment 2 rulemaking. Therefore, prior NRC approval of the changes has already been received. ECO 5014-121 adds the following text to the Background section of Bases B3.1.1:

"The allowable leakage rate shall be selected by the user at a value less than or equal to 2.7×10^{-6} atm-cc/sec (He) with a helium pressure under the cover plates of at least 1 atmosphere and vacuum outside the cover plates, which is equivalent to the required acceptance criterion for leak testing of confinement boundary welds performed during shop fabrication. The ANSI N14.5 (Ref. 18) definition of leak tight can be used, if desired, by the user."

VY intends to use the leak tight criterion of ANSI N14.5 as the acceptance criterion for leak testing the MPC vent and drain port cover plates. Performance of the helium leak tests will be by qualified VY personnel or by certified contract personnel utilizing approved procedures meeting the testing requirements specified in ECO 5014-121.

2. <u>Holtec ECO No. 5014-122</u>

This change clarifies language in Section 1.2.1.3.1.2 of the HI-STORM 100 FSAR pertaining to the description of mechanical properties of the neutron absorber material in the MPC. This ECO did not require a §72.48 screening or evaluation because it was considered an editorial clarification. This clarification bears upon the structural analysis of the MPC basket, and has no effect on the implementation of dry fuel storage at VY or this evaluation.

3. **Holtec §72.48 Screening No. 751**

This change consists of twelve distinct modifications to the HI-STORM 100 FSAR. Changes 1-9 and the third sub-change in Change 12 are either editorial or minor clarifications to the FSAR text. These changes have no effect on the implementation of dry storage at VY or this evaluation. The first two sub-changes in Change 12 involve the elimination of the 5-year shielding effectiveness test for the HI-TRAC transfer cask. The initial shielding effectiveness test was performed during fabrication of the HI-TRAC. The first periodic re-test would have been required within five years.

4. **Holtec §72.48 Screening/Evaluation No. 812**

This change (in part) revises Table 8.1.5 of the HOLTEC FSAR to replace the torque requirements for the HI-TRAC Pool Lid Bolts, The HI-TRAC Transfer Lid Bolts, the MPC Lift Cleat Stud Nuts and the HI-STORM Lid Nuts to hand tight.

5. **Holtec ECO No. 5014-192 72.48 No. 956**

This change adds discussion to the HOLTEC FSAR Section 4.5.3.1 in order to present the rational for allowing bulk water removal from the MPC using a Helium or Nitrogen blow-down process.

6. **Holtec ECO No. 5014-199 72.48 No. 978**

This change creates consistency in the HOLTEC FSAR with regard to testing of special lifting devices used with the HI-STORM 100 System. Instead of mandating annual load testing, the testing is required to be in accordance with ANSI N14.6-1993 which allows load testing or periodic NDE in lieu of load testing.

APPENDIX D – HAZARDS EVALUATION FOR THE VY ISFSI AND HAUL PATH

1.0 Introduction

This summary of the hazards analysis is provided to give a summary of the hazards that were addressed and the resulting administrative controls that are included in plant procedures.

The hazards evaluation demonstrated that the assumptions regarding site-specific hazards affecting the cask are not exceeded at the VY site, and that the VY ISFSI operations do not place the VY plant outside of its licensing basis. A description of site-related hazards to the cask and ISFSI operation-related hazards to the plant are provided, along with results of the analysis of those hazards.

2.0 Hazards Walkdown

In order to systematically develop the appropriate hazard information, a site walkdown of the VY ISFSI and haul path was performed from the Containment Access Building (CAB) to the VY ISFSI Facility Pad.

3.0 Hazards Evaluation

3.1 Falling Objects

During the Haul Path Hazards Walkdown, a number of objects were identified as having the potential of falling onto the ISFSI Facility Pad or onto the travel path of the cask. These objects are discussed in the sections that follow. The following were considered.

- Plant Stack
- North Warehouse
- Wooden Visual Barrier
- Security Towers
- Light Towers
- Liquid Nitrogen Tank No. TK-1001-1
- Containment Access Building
- Construction Office Building
- Light Tower No. 12

As a result of the review of these potential falling objects, it is concluded that the design basis and the accident analysis presented in the Holtec HI-STORM 100 FSAR remain the bounding case. Procedures have established administrative controls that suspend cask transport operations during high wind conditions to ensure cask protection from falling objects or flying debris.

3.2 Explosion/Fire Source

There were numerous items identified during the Haul Path Hazards Walkdown that had potential for explosion and/or fire. There were various transformers, fuel oil tanks, a new wooden visual barrier structure, and Radwaste Storage areas near the ISFSI Facility Pad and along the haul path.

In general, fire hazards can be compared to the design basis fire in Section 11.2.4.2.1 of the CFSAR, which assumes 50 gallons of burning transporter fuel engulfing the HI-STORM overpack. This analysis assumes a fire emissivity of 1, and a surface emissivity of 0.9, a flame temperature of 1475°F, an ambient air temperature of 100°F, and an air temperature into the HI-STORM 100 ventilation path of 300°F. The HI-STORM 100 safety analysis does not, however, evaluate exposure of the HI-STORM 100 overpack to nearby non-engulfing fires. Therefore, a modified version of the Holtec approach was applied to the VY HI-STORM 100s exposed to nearby fire hazards.

A non-engulfing fire causes the cask or overpack surface temperature to rise due to radiative heat transfer. There are two reasons for dismissing this type of fire hazard from further evaluation. The first is if there is no line of sight from the fire to the cask or ISFSI. Any intermediate object that serves as a shade will prevent radiative heat transfer from occurring. The second is if there is no credible ignition source. This approach will be applied to the haul path only. Specifically, it is not credible that buildings adjacent to the haul path will spontaneously ignite while the transport cask is in close proximity. Such ignition events are usually associated with unusual activities or vehicle collisions, and administrative controls on activities near the haul path can be credited with avoiding these types of events.

Specific hazards evaluated include:

- North Warehouse
- Diesel Fuel Oil Tank
- North Radwaste Storage Area
- Wooden Visual Barrier
- Transformer No. T-11-1A
- Radwaste Storage In LSA/Box Containers
- Transformer No. T-12-1A
- Construction Office Building
- Fuel Oil Storage Tank (Tank No. TK-40-1A)
- Containment Access Building (CAB)
- Diesel Fire Pump Day Tank
- Transient and Parked Vehicles near the ISFSI, including fuel tankers
- Radwaste Compactor Area
- Bottles of compressed gases
- CO_2 tanks

3.3 Chemical Release Source

During the Haul Path Hazards Walkdown, the only chemical release sources that were identified included Carbon Dioxide Tank No. TK-115-1 and Liquid Nitrogen Tank No. TK-1001-1.

3.4 High Energy Line Break

There were no high energy lines identified during this walkdown. As a result, there was no potential for any damage to the cask or cask transporter from a high energy line break.

3.5 Flooding Sources

The primary flooding source is the Connecticut River. The VY UFSAR contains a flooding analysis that addresses the river. The design of the ISFSI Facility Pad resulted in a pad elevation that provides adequate cask storage system protection from any potential flooding impacts due to the Probable Maximum Flood (PMF). Plant Operations Procedures Number OP 2224, OP 2225 and OP 2229 have a precaution regarding transport during conditions that could result in the flooding of the Connecticut River. Specific hazards evaluated include:

- Liquid Radwaste Tanks
- Surge Tank No. TK-11A
- Condensate Storage Tank
- Hypochlorite Tanker Shipments

3.6 Pressurized Components/Rotating Missile Sources

There were two types of potential missile sources identified during this walkdown. The first type was rotating equipment such as pumps and motors. The second type was compressed gas cylinders. Specific hazards evaluated:

- Gas Cylinders
- Carbon Dioxide Tank No. TK-115-1
- Carbon Dioxide Tank No. TK-115-1 Pumps
- Liquid Nitrogen Tank No. TK-1001-1
- Liquid Nitrogen Tank No. TK-1001-1 Pumps
- A/C Unit Compressors and Fans
- Nitrogen Gas Cylinders

3.7 Transient Obstacles

There were no transient obstacles identified during this walkdown. As a result, there was no potential for any damage to the cask or cask transporter from transient obstacles. Transient vehicles are discussed in the Fire/Explosion section.

3.8 Overhead Power Line Clearance

There were no overhead power lines identified during this walkdown. As a result, there was no potential for any damage to the cask or cask transporter from overhead power lines.

3.9 Radiation Monitors

There were no radiation monitors identified during this walkdown. As a result, there was no potential for any damage to the cask or cask transporter from radiation monitors. However, their radiological readings may increase during cask storage and cask transport operations. Radiological monitoring needs to consider the likelihood of these increased readings. Appropriate responses and actions need to be taken as needed to address these occurrences. Consideration should be given to establishing administrative or procedural controls in recognition of this fact.

3.10 Environmental TLD

There were some environmental TLDs identified during this walkdown, as indicated on SVE Associates Thermo Luminescent Dosimeter Locations for Entergy VY. There is no potential for any damage to the cask or cask transporter from TLDs. Conversely, there are negligible effects on these TLDs as a result of the cask transport. TLD No. DR-45 is the closest to the haul path but during travel past its location, the radiation effects will be negligible. TLD No. DR-46 is over 500 feet away from the pad and therefore, the radiation effects of cask storage on this TLD is also negligible.

3.11 Existing Structures, Systems and Components

There were no other miscellaneous existing structures, systems or components identified during this walkdown. As a result, there was no potential for any damage to the cask or cask transporter from miscellaneous SSCs.

4.0 Required Administrative Controls

4.1 Based on the hazards analysis, administrative controls were established to:

4.1.1 Suspend cask transport operations during high winds.

4.1.2 Inspect the CAB pre-haul to assure that there is no possibility of the leakage of potentially explosive gases.

4.1.3 Maintain a fire watch while the cask is inside the CAB.

4.1.4 Suspend all activities potentially involving compressed flammable gas when the cask is within 27 feet.

4.1.5 Ensure permanent storage of compressed flammable gas bottles will be at a distance of at least 27 feet from the nearest surface of the HI-Storms on the ISFSI Pad.

4.1.6 Perform a pre-haul inspection to evaluate transient combustibles that may exist near the haul path that were not previously evaluated.

4.1.7 Ensure that any forklift in the North Warehouse is stored more than 22.4 feet from the nearest surface of a HI-STORM on the ISFSI Pad.

4.1.8 Ensure no HI-STORM is placed within 20 feet of the east wall of the North Warehouse, as measure from the wall outside surface to the North/South centerline of the overpack.

4.1.9 Ensure established safe setback distances (identified in Ref 19) are observed and maintain a distance of at least 27 feet for trucks carrying compressed gas bottles and 10 feet for gasoline powered vehicles.

4.1.10 Establish a fire watch at the compactor room area during cask transport operations.

4.1.11 Suspend cask transport operations in the event the Radwaste storage in LSA boxes located east of the Radwaste building ignite and cause a fire.

4.1.12 Establish a caution regarding transport during conditions that could cause a flood.

4.1.13 Use EN-IS-109 during handling and storage of compressed gas cylinders located about 50 feet south of the ISFSI Pad.

4.1.14 Use EN-IS-109 during handling and storage of nitrogen gas cylinders located west of the Reactor Building Railway entrance.

4.1.15 Establish radiological monitoring controls that recognize the likelihood of increased readings during cask storage and transport operations.

4.1.16 A pre-haul inspection will be made and any potential compressed flammable gas sources will be removed.

4.1.17 The CAB sprinkler system shall be operable during HI-STORM transport to mitigate any potential fire within the structure.

5.0 Conclusion

The hazards identified during the ISFSI and haul path hazards walkdown do not exceed the design basis and accident analysis presented in the Holtec HI-STORM 100 FSAR, which remain the bounding case.

In some cases the hazards analysis identifies the need to establish administrative controls to ensure that hazards are controlled to ensure there is no impact on the ISFSI facility or load path. These administrative controls are included in procedures.

TAB 3

STATE OF VERMONT
PUBLIC SERVICE BOARD

Petition of Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc. for a Certificate of Public Good, under 30 V.S.A. § 248, to Construct a Dry-Fuel-Storage Facility at Vermont Yankee Nuclear Power Station	)	Docket No. ________

MEMORANDUM OF UNDERSTANDING

This is a Memorandum of Understanding, made as of June 21, 2005 (hereafter the "MOU"), between Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc. (collectively hereafter the "Company"), and the Vermont Department of Public Service (the "DPS").

Preliminary Statement

The Vermont Yankee Nuclear Power Station (the "Station") is licensed by the Nuclear Regulation Commission ("NRC") to operate until March 21, 2012. The Station will have insufficient capacity to store spent-nuclear fuel ("SNF") in its existing spent-fuel pool, however, sometime prior to March 21, 2012.

Entergy VY proposes to construct a dry-fuel-storage ("DFS") facility at the Station to store SNF. Before it may do so, the Company must petition the Public Service Board (the "PSB") for a certificate of public good ("CPG") authorizing the construction and operation of a DFS facility under 30 V.S.A. § 248.

Chapter 157 of Title 10, Vermont Statutes Annotated, may prevent the PSB from considering the Company's DFS petition. In hearings on legislation proposing to authorize the Company to petition the PSB for a CPG authorizing a DFS facility under 30 V.S.A. § 248, the General Assembly asked questions and raised certain concerns about the proposed DFS facility.

To address these questions and concerns and facilitate the enactment of legislation by the General Assembly authorizing the Company's petition to the Board under 30 V.S.A. § 248, the Company and the Department hereby enter into this MOU and agree as follows:

1. **Line-of-Sight Barriers.** The Company will erect a wall to the extent required to provide line-of-sight protection on the north and east sides of the DFS pad. In addition, the Company will construct a protective structure if and to the extent required by the NRC, whether the result of a site-specific study or otherwise.

2. **Location of DFS Pad.** The Company will construct the DFS pad at a location set back at least 100 feet from the Connecticut River's 500-year floodplain, as depicted in the Flood Insurance Rate Study and on the Flood Insurance Rate Map, both dated September 27, 1991,

prepared by the Federal Emergency Management Agency for the Town of Vernon, Vermont (the "Floodplain"), in a location adjacent to the Company's existing facilities within the Station's Protected Area. If the Company determines that to comply with applicable NRC requirements it must, or the NRC directs the Company to, locate the DFS pad and any related facilities at a different location within the Owner Controlled Area ("OCA") of the Station, the Company will consider and use its best efforts to locate such facilities in a way that will minimize impacts on access to and use of lands within the OCA.

3. **Cask Spacing.** The Company will locate casks on the DFS pad in a manner such that access to individual casks will be maintained to the greatest extent possible. Under cask loading currently anticipated through the end of the Company's existing NRC license, this will result in individual access to each cask.

4. **Access Roads.** The Company will not construct roads providing access to the DFS pad closer than 100 feet from the Floodplain except that existing roads may be maintained (but not enlarged) within 75 feet of the Floodplain.

5. **Monitoring.** The Company will monitor the temperature on each cask located on the DFS pad continuously using an electronic-monitoring system contemplated by the Company's current DFS-system design. Monthly the Company will manually conduct radiation surveillance of each such cask. The DPS and the Company, in consultation with the Department of Health, will develop a protocol for reporting the results of such monitoring and surveillance to the DPS and the Department of Health.

6. **De-icing.** The Company will not use corrosive or flammable chemicals on or within fifteen feet of the DFS pad for purposes of de-icing.

7. **Out-of-State Waste.** The Company will not store waste generated outside of the state of Vermont at the Station.

8. **Off-Site Transfer.** The Company will use its commercial best efforts to ensure that high-level SNF stored at the Station is removed from the site in a reasonable manner and as quickly as possible to an interim or permanent location outside of Vermont.

9. **Pool Density.** The Company will configure the spent-fuel pool so that high-decay-heat assemblies of SNF are surrounded by low-decay-heat assemblies of SNF.

10. **Security.** The Company will be responsible for all costs of security for the Station required under its license from or otherwise by the NRC except that during decommissioning it will have the right to use funds from the Decommissioning Trust Fund to pay for such security.

11. **Clean Energy Development Fund.** The parties acknowledge that the General Assembly is concurrently with this MOU enacting legislation authorizing the Company to file a petition for approval to construct and operate a DFS facility under 30 V.S.A. § 248 based upon this MOU, including specifically the Company's agreement to fund a Clean Energy Development Fund established by the legislation (the "Fund"). The Company hereby agrees that if the Board issues to the Company a CPG authorizing such construction and operation, and if the Company obtains all approvals necessary to uprate the Station, the Company will pay to the

State of Vermont for deposit into the Fund payments calculated to total $15,625,000 during the period commencing January 1, 2006, and ending March 21, 2012. Payments will be made in equal quarterly amounts of $625,000 per quarter commencing as of January 1, 2006, with the initial payment to be due when the Company receives all such approvals and to include all quarterly payments due up to that time and with the last payment to be due on January 1, 2012.

12. **Preemption.** The Company agrees that it will not file an action or petition based on or otherwise seek, claim, defend or rely on the doctrine of federal preemption to prevent enforcement of its express obligations under this MOU.

13. **NRC Requirements.** Nothing in this MOU, including specifically Paragraph 12, shall be interpreted as prohibiting or restricting the Company from complying with any requirements or order of or any of its obligations under its license or otherwise to the NRC.

14. **Governing Law.** This MOU is governed by Vermont law and any disputes hereunder will be decided by the PSB.

15. **DPS Obligations.** The DPS will support the issuance of an order and findings by the PSB approving this MOU, subject to the DPS's obligations under Title 30 of the Vermont Statutes Annotated.

16. **Non-MOU Positions.** This MOU does not limit the DPS's ability to investigate issues or advocate positions that are relevant in the proceeding before the PSB in which the Company seeks a CPG for the DFS facility. Other than the specific conditions included in this MOU, the DPS will advocate for any further conditions on the Company and the physical attributes and operations of the DFS facility that the DPS believes are necessary to support a finding of public good pursuant to 30 V.S.A. § 248.

17. **Precedential Effect.** The parties agree that this MOU will not be construed by any party or tribunal as having precedential impact on any future proceeding involving the parties, except as necessary to implement this MOU or to enforce an order of the PSB resulting from this MOU.

ENTERGY NUCLEAR VERMONT YANKEE, LLC

By: [signature]
Name: Jay K. Thayer
Title: Vice-President of Operations and duly authorized agent

ENTERGY NUCLEAR OPERATIONS, INC.

By: [signature]
Name: Jay K. Thayer
Title: Vice-President of Operations and duly authorized agent

STATE OF VERMONT
DEPARTMENT OF PUBLIC SERVICE

By:________________________________
Name: David O'Brien
Title: Commissioner of the Department of Public Service