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PSEG
NUCLEAR LLC

Salem/Hope Creek Generating Station

Independent Spent Fuel Storage Installation

10 CFR 72.212 Evaluation Report

NRC Docket 72-0048

Revision 7

REV. NO.	**CHANGE AND REASON FOR CHANGE**
2 (cont'd)	procedure number for Reference 6.33.5.

72.212 Section	**Description of Change**
Appendix 1, Table 3, Section 2.1.2 and 2.1.3, 2nd paragraph	Revised description of the type of fuel verification performed to accurately use the terms "independent" and "concurrent" in three places to be consistent with terminology in procedure HU-AA-101.
Appendix 1, Table 3, Section 3.4.6, 5th paragraph	Revised text to reflect resolution of ponding repair on ISFSI pad No. 1.
Appendix 2	Added ECO 1024-126, 1026-33, and 1026-41, to the list and deleted the row pertaining to FSAR changes not specifically associated with cask hardware. Corrected the dates for the initial loading campaign to reflect actual information.

REV. NO.	**CHANGE AND REASON FOR CHANGE**
3	Revised throughout to adopt Amendment 3 to the HI-STORM 100 System CoC and Revision 5 to the HI-STORM 100 FSAR for the second Hope Creek loading campaign, and to reflect cask loading procedure revisions and re-numbering. Editorial improvements and typographical corrections are also made. See 72.48 Screening 08-01 for a detailed listing of the changes made in this revision.
4	Revised throughout to adopt Amendment 5 to the HI-STORM 100 System CoC and Revision 7 to the HI-STORM 100 FSAR for Hope Creek. Editorial improvements and typographical corrections are also made. See 72.48 Coversheet/Screening H10-01 for a detailed listing of the changes made in this revision.
5	Revised throughout to add Salem spent fuel to the ISFSI and make editorial and administrative improvements. Editorial improvements and typographical corrections are also made. See 72.48 Coversheet/Screening S10-02 for a detailed listing of the non-editorial/administrative changes made in this revision.
6	Revised to add cask serial numbers for the 2011 loading campaign at Salem Unit 1, update Part 72 rule section numbers per the 2011 rule change, address seismic restraints at Salem Unit 1, and make editorial improvements.
7	Revised to add cask serial numbers for the 2012 loading campaign at Salem Unit 2, update the compliance discussion for CoC Condition 9, address seismic restraints at Salem Unit 2, and make editorial improvements.

1.0 Introduction

The United States Department of Energy (DOE) did not meet their legal obligation to begin removing spent nuclear fuel from domestic commercial nuclear reactor sites by January 31, 1998. Therefore, PSEG Nuclear is required to provide additional on-site interim storage for spent fuel from the Salem and Hope Creek nuclear power plants until such time as DOE does begin taking the fuel. PSEG began moving spent fuel from the Hope Creek Generating Station (HCGS) spent fuel pool into dry storage in 2006 to create sufficient wet storage capacity to support safe power operations and maintain full core offload capability in the spent fuel pool. Spent fuel from Salem Generating Station (SGS) Unit 1 was added to the Independent Spent Fuel Storage Installation (ISFSI) beginning in 2010. Spent fuel from SGS Unit 2 was added to the ISFSI in 2012. Spent fuel from both Salem units and Hope Creek will periodically be moved from the respective spent fuel pools to the ISFSI for the foreseeable future.

PSEG Nuclear operates an ISFSI facility for interim storage of SGS and HCGS spent fuel in dry casks under the general license provision of 10 CFR 72, Subpart K at the Salem/Hope Creek Generating Station site. Interim storage of SGS and HCGS spent fuel at the ISFSI occurs in NRC-certified dry storage casks. The Holtec International HI-STORM 100 System has been selected for the storage of spent fuel from SGS and HCGS at the ISFSI. Nuclear Regulatory Commission (NRC) Certificate of Compliance (CoC) No. 72-1014 (Reference 6.1) confers NRC approval of the HI-STORM 100 System design for use by Part 72 general licensees and the HI-STORM 100 System is listed as an NRC-approved dry spent fuel storage cask system in 10 CFR 72.214. The design and licensing basis for the HI-STORM 100 System is provided in the CoC and the supporting HI-STORM 100 System FSAR (Reference 6.2). The HI-STORM 100 System is comprised of the Multi-Purpose Canister (MPC), the HI-STORM overpack, the HI-TRAC transfer cask, and necessary ancillary equipment described in the cask FSAR.

References are identified throughout the body of this report and are listed in Section 6.0. References include analyses, calculation packages, drawings, procedures, correspondence, and other documents. The reference documents are intended to provide supporting or background information and additional detail that the reader may refer to in order to learn more about a particular topic presented in this document, but are generally not considered part of this report. A referenced document shall be considered to be a part of this report only if it is clearly annotated as being "incorporated by reference" in this report. Documents incorporated by reference into this report are subject to the same administrative controls and regulatory requirements as the main report (i.e., changes are controlled by 10 CFR 72.48).

2.0 Purpose

The purpose of this report is to document the written evaluations required by 10 CFR 72.212(b) for use of a dry cask storage system to store spent fuel at an on-site ISFSI under a 10 CFR 72 general license. For the first dry fuel storage campaign at HCGS (casks 1 through 4[1]), the written evaluations were based on HI-STORM 100 System 10 CFR 72 CoC Number 1014, Amendment 2 and HI-STORM FSAR Revision 3, including applicable interim changes (e.g., those authorized under 10 CFR 72.48). As ISFSI operations continue over time, the applicable CoC amendment

[1] PSEG FLOC numbers and manufacturer serial numbers for each cask are provided in Appendix 2 of this report.

herein will require supplemental evaluations and either a revision of this 72.212 evaluation report or the creation of a separate 72.212 evaluation report reflecting the new dry storage system or components.

The Salem/Hope Creek ISFSI is operated under the conditions of the general license granted in accordance with 10 CFR 72.210. The first four casks containing HCGS fuel were loaded and placed at the ISFSI in 2006-07 under HI-STORM 100 System CoC Amendment 2, its supporting FSAR Revision 3, plus certain changes authorized under 10 CFR 72.48, as shown in Section 5.4.1.12 and Appendix 2 to this report. An additional eight casks containing HCGS fuel were loaded in 2008 in accordance with CoC Amendment 3 and FSAR Revision 5. Casks loaded with HCGS fuel after the first 12, and all casks containing SGS fuel were/are being loaded in accordance with CoC Amendment 5 and FSAR Revision 7. The amendment of the CoC and the revision of the cask FSAR upon which this report is based varies by cask serial number as described above and as shown in Appendix 2. The CoC amendment under which casks are loaded remains the governing CoC amendment for those casks unless altered by an exemption to the Part 72 regulations (Reference 6.62). For convenience, the FSAR revision applicable to those CoC amendments is also retained as the governing document or those casks as shown in Appendix 2.

The spent fuel stored at the ISFSI will eventually be shipped offsite in transportation casks approved for shipment of spent fuel in accordance with 10 CFR 71. The HI-STORM 100 System is the storage-only counterpart of the Holtec HI-STAR 100 System, which uses an identical MPC design. The HI-STAR 100 System is the canister-based, 10 CFR 71-certified transportation package (CoC 71-9261). Because the MPC is designed to meet the requirements of both 10 CFR 71 and 10 CFR 72 for transportation and storage, respectively, the HI-STORM 100 System allows rapid decommissioning of the ISFSI by simply transferring the fuel-loaded MPCs directly from the HI-STORM storage overpack into the HI-STAR 100 transportation overpack for offsite transport without re-packaging.

4.0 Regulatory Requirements and License Conditions

10 CFR 72.210 grants a general license for the storage of spent fuel at an on-site ISFSI to holders of a 10 CFR 50 license at the associated reactor site. 10 CFR 72.212 establishes the conditions for use of a Part 72 general licensee.

One of the general license conditions is to prepare and maintain written evaluations demonstrating compliance with certain regulatory requirements, as discussed in 10 CFR 72.212(b)(2). The various "Evaluation" subsections of this report summarize the written evaluations and analyses performed to ensure that the generic HI-STORM 100 System design criteria bound the site-specific design criteria at the Salem/Hope Creek Generating Station site, or that a site-specific evaluation was performed in certain cases. This report addresses the five regulations required by 10 CFR 72.212(b) to be included, plus, for completeness, two additional regulations pertaining to program enhancements (e.g., 10 CFR 50.54 programs). Compliance with other 10 CFR 72 regulatory requirements applicable to general licensees pursuant to 10 CFR 72.13 is controlled via the associated implementing procedures and programs. The seven regulations addressed in this report are:

- 10 CFR 72.212(b)(5)(i) - Certificate of Compliance Terms, Conditions, and Specifications
- 10 CFR 72.212(b)(5)(ii) - Cask Storage Pad Design
- 10 CFR 72.212(b)(5)(iii) - Dose Analyses Pursuant to 10 CFR 72.104

5.1.2 Conclusion

As documented in Appendix 1 to this report, PSEG Nuclear has evaluated HI-STORM 100 System Certificate of Compliance No. 72-1014, including Appendices A and B, against the SGS and HCGS fuel and site-specific conditions and has determined that the applicable conditions in the CoC are met. Therefore, PSEG Nuclear complies with the requirements of 10 CFR 72.212(b)(5)(i).

5.2 10 CFR 72.212(b)(5)(ii) - Cask Storage Pad Design

10 CFR 72.212(b)(5)(ii) states that the general licensee shall perform written evaluations, before use and before applying changes authorized by an amended CoC to a cask loaded under the initial CoC or an earlier amended CoC, which establish that:

"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."

5.2.1 Evaluation

The following evaluation is specific to the design of the ISFSI pad for the Holtec HI-STORM 100S Version B-218 overpack model. Use of other HI-STORM overpack models or a different certified dry cask storage system will require re-evaluation and a revision to this report.

5.2.1.1 ISFSI Storage Pad General Description

The primary function of the ISFSI storage pad is to provide a stable foundation for supporting the storage casks under all normal, off-normal and credible accident conditions of storage, including natural phenomena such as earthquakes and tornadoes. Section 3.1.2.3 of the NRC Safety Evaluation Report for Amendment 1 to the HI-STORM 100 CoC (Reference 6.5) states that when the HI-STORM 100 System is deployed in the free-standing mode, the ISFSI pad/basemat is considered not important-to-safety (NITS). If the HI-STORM 100 System is deployed in the anchored condition, the ISFSI pad/basemat is considered important-to-safety (ITS). As shown in the evaluation below, the seismic accelerations at the Salem/Hope Creek ISFSI site are are sufficiently low to permit deployment of the HI-STORM System casks in the free-standing mode. Nonetheless, the ISFSI pad is classified as ITS, Category B (ITS-B) to assure an appropriate level of quality assurance is applied to activities associated with pad design, construction, testing, inspection, and records management.

The ISFSI facility is comprised of three separately constructed, reinforced structural concrete pads[2] and necessary supporting structures, systems, and components. Two of the concrete pads have approximate dimensions of 36 inches thick, 91 feet wide and 260 feet long, and the third differs in length only; it is approximately 248 feet, 8 inches long (Reference 6.18). The three pads are oriented with their long dimension in the north-south direction, approximately 14 feet apart edge-to-edge along their length. The west and middle pads will be used to store 68 casks each, and the east pad will be used to store 64 casks for a total ISFSI capacity of 200 casks. The west

[2] Throughout this document, the text may refer to the ISFSI "pad" or "pads" interchangeably.

sets of physical parameters for the ISFSI pad were used as inputs in the design basis cask drop and tipover analysis models, which establish alternate sets of maximum values not to be exceeded in the design of the ISFSI pad. These two sets of limiting parameters are shown in HI-STORM FSAR Table 2.2.9. ISFSI pad designers may choose either set of parameters as the limits for their design or choose a unique design basis that is shown by analysis to accomplish the required design functions of the storage pad. The designer of the Salem/Hope Creek ISFSI chose the Set 'A' parameters from HI-STORM FSAR Table 2.2.9 as the maximum limits for the pad and subgrade design as shown below:

a. Concrete thickness: ≤ 36 inches
b. Concrete compressive strength: ≤ 4,200 psi at 28 days
c. Reinforcement top and bottom (both directions)
   Reinforcement area and spacing determined by analysis
   Reinforcement shall be 60 ksi yield strength ASTM material
d. Soil Effective Modulus of Elasticity: ≤ 28,000 psi

The ISFSI pad was designed and constructed to be 36 inches thick (maximum) and is placed on compacted engineered fill (soil thickness greater than 36 inches per Reference 6.19). The pad is designed to be structurally adequate with a minimum concrete compressive strength of 3,000 psi. As-built concrete compressive strength has been determined by test to be less than 4,200 psi, in all cases. Steel reinforcing bars are placed in both directions at the top and bottom faces of the pad, and are designed in accordance with ACI 349-01. The steel reinforcement used is ASTM A516 Grade 60 (60 ksi yield strength). However, the soil effective modulus of elasticity was determined to be greater than 28,000 psi (Reference 6.18, Attachment J).

Because the ISFSI pad design does not meet all of the criteria for either ISFSI pad Set 'A' or 'B' from HI-STORM FSAR Table 2.2.9, a site-specific cask tipover analysis was performed (Reference 6.36). The results of this analysis show that the deceleration value at the top of the fuel assemblies is 39.2 g's. This deceleration value is less than the design basis value of 45 g's and is, therefore, acceptable per HI-STORM CoC, Appendix B, Section 3.4.6.a. The site-specific tipover analysis was performed using the analysis method and model described in the HI-STORM FSAR, which bounds both PWR and BWR MPCs. Thus, the site-specific tipover analysis performed for HCGS casks in Reference 6.36 provides a bounding case for SGS casks. A cask drop is not required to be postulated or analyzed because the VCT, which moves the loaded casks to, from, and within the ISFSI, is designed in accordance with ANSI N14.6 and has redundant drop protection features (Reference 6.8).

5.2.1.5 Cask Sliding and Overturning Evaluation

<u>Normal, Dry Conditions</u>

The loaded HI-STORM 100 System cask is designed to withstand a seismic event defined by three orthogonal, statistically independent acceleration time-histories as described in Section 3.4.7 of the HI-STORM 100 System FSAR. The HI-STORM 100 System FSAR states that for the purpose of performing a conservative analysis to determine the maximum Zero Period Acceleration (ZPA) that will not cause incipient tipping, the cask is considered as a rigid body subject to a net horizontal quasi-static inertia force and a vertical quasi-static inertia force. The analysis used in

r = 132.5"/2 = 66.25" (for the HI-STORM 100S Version B overpack per Reference 6.32.6, Sheet 3)

h = 111.88" (conservatively high value for the HI-STORM 100S Version B-218 with loaded MPC-32 per Reference 6.2, Table 3.2.3)

Then, r/h = 66.25/111.88 = μ = 0.592

$$0.482 + (0.592)(0.23) = 0.618, \text{ which is greater than } 0.592$$

Again, the inequality is not met.

As an alternative to evaluating the inequality using ZPAs, Section 3.4.3.a of Appendix B of the HI-STORM CoC permits use of acceleration time-histories, in which case the values of 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 must be evaluated at each time step in the acceleration time-history over the total duration of the seismic event.

For $G_V = 0.23$ g, the inequality $G_H + \mu (G_V) \leq \mu$ with $\mu = 0.53$ for sliding governs. That is, if the inequality is satisfied with $\mu = 0.53$, it will also be satisfied for the overturning case, with $\mu = 0.592$.

The inequality $G_H + \mu (G_V) \leq \mu$ with $\mu = 0.53$ has been checked with G_H equal to the vectorial sum of two instantaneous horizontal acceleration components and the corresponding instantaneous vertical acceleration, G_V over the total duration of the seismic event. The results show that the inequality is satisfied (Reference 6.20, Section 6.7).

Because the Salem/Hope Creek ISFSI site-specific seismic criteria are acceptable under both definitions of 'μ' required by the HI-STORM CoC, sliding or tipover of the HI-STORM overpack will not occur under dry ISFSI pad conditions and the casks may be deployed at the Salem/Hope Creek ISFSI in the free-standing mode.

<u>ISFSI Pad Icing (Reference 6.4)</u>

Section 3.4.3.b of the HI-STORM CoC requires an evaluation of a degraded pad/cask interface friction (such as due to icing) to ensure that an earthquake will not result in a cask tipping over or falling off the ISFSI pad. Additionally, the evaluation must ensure any impact between casks results in g-loads no greater than 45 g's.

This evaluation has been performed (Reference 6.20, Appendix K) and the results show that the casks will not tipover, fall off the pad, or experience cask-to-cask impact. Therefore, the HI-STORM 100S Version B overpacks at the Salem/Hope Creek ISFSI comply with the HI-STORM CoC in this regard.

5.2.2 Conclusion

The Salem/Hope Creek ISFSI pads are designed to adequately support the static and dynamic loads of the HI-STORM 100S Version B-218 overpacks. The ISFSI storage pads are designed for the loads and load combinations specified in NUREG-1567, NUREG-1536, and ACI 349-01, and they meet the requirements of 10 CFR 72 and the HI-STORM 100 System FSAR and Certificate of Compliance for sliding and overturning. Therefore, PSEG Nuclear complies with the requirements of 10 CFR 72.212(b)(5)(ii).

5.3 10 CFR 72.212(b)(5)(iii) – Dose Analyses Pursuant to 10 CFR 72.104

10 CFR 72.212(b)(5)(iii) states that the general licensee shall perform written evaluations, before use and before applying changes authorized by an amended CoC to a cask loaded under the initial CoC or an earlier amended CoC, which establish that:

"...the requirements of §72.104 have been met"

10 CFR 72.104 - "Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS," states the following:

"(a) During normal operations and anticipated occurrences, the annual dose equivalent to any real individual who is located beyond the controlled area must not exceed 0.25 mSv (25 mrem) to the whole body, 0.75 mSv (75 mrem) to the thyroid and 0.25 mSv (25 mrem) to any other critical organ as a result of exposure to:

(1) Planned discharges of radioactive materials, radon and its decay products excepted, to the general environment,

(2) Direct radiation from ISFSI or MRS operations, and

(3) Any other radiation from uranium fuel cycle operations within the region.

(b) Operational restrictions must be established to meet as low as is reasonably achievable objectives for radioactive materials in effluents and direct radiation levels associated with ISFSI or MRS operations.

(c) Operational limits must be established for radioactive materials in effluents and direct radiation levels associated with ISFSI or MRS operations to meet the limits given in paragraph (a) of this section."

fuel from SGS. One hundred eleven (111) of the casks were assumed to contain MPC-68s filled with HCGS spent fuel assemblies and 89 casks were assumed to contain MPC-32s filled with SGS spent fuel assemblies. The 200 casks are stored on three pads as described in Section 5.2.1.1.

Source Terms

The table below shows the fuel-related information used in the dose analyses (Reference 6.14, Section 3.2).

Table 5.3.1-1
Salem and Hope Creek Fuel Source Term Assumptions

PLANT	COOLING TIME (yrs)	AVERAGE BURNUP (MWD/MTU)	ENRICHMENT (wt % ^{235}U)	URANIUM MASS (kg)
SGS	10	57,000	3.8 – 5.0	455
HCGS	5	45,000	3.65	181

Each SGS spent fuel assembly was assumed to include a burnable poison rod assembly (BPRA), which is conservative because it increases the gamma source term. Dose rates from other PWR non-fuel hardware (e.g., thimble plugs, axial power shaping rods, control rod assemblies, etc.) compared to the fuel and BPRAs is considered negligible and is, therefore, not modeled (Reference 6.14, Section 3.2). While the CoC permits loading fuel cooled to as little as three years and with enrichment and burnup higher than that used in this dose analysis, the direct gamma and neutron dose rates computed with these source terms are considered conservative and will bound the measured dose rates.

The fuel and cask loading characteristics are checked during fuel selection to verify that they meet both the CoC and the §72.104 analysis limits. Therefore, SGS and HCGS may load fuel up to the limits for enrichment, decay heat, burnup, and cooling time established in the CoC. The dose analysis performed for use of CoC Amendment 2 at the Salem/Hope Creek ISFSI remains bounding for Amendments 3 and 5 and any fuel authorized by the CoC may be loaded. See Section 7.0 of Reference 6.14 for a more detailed explanation of the bounding nature of the source terms.

Dose Rate Analyses

The computer code MCNP4C3 was used for all dose analyses (Reference 6.14). Two comparative dose rate analyses were performed first to determine the bounding configuration of overpacks containing PWR (MPC-32) and BWR (MPC-68) canisters at the ISFSI. Uniform loading in the MPC was assumed with a homogeneous source modeled.

The direct dose rates were calculated for two cases with a dose receptor at 100 meters to determine whether the BWR or PWR casks on the outside edge of the ISFSI provided the bounding case. In the first case, the 111 overpacks containing MPC-68s were assumed to be arranged on the west side of the ISFSI. In the second case, the 89 overpacks containing MPC-32s were assumed to be arranged on the west side of the ISFSI (see Figures 3 and 4 of Reference 6.14). Per Table 35 of Reference 6.14, the bounding direct dose rate ISFSI configuration occurs when the overpacks

MPC Leak Testing

In 2006, the CoC holder removed a shop helium leak test of the MPC from the HI-STORM FSAR under the provisions of 10 CFR 72.48 and manufactured a number of MPCs without performing the leak test. Eight of those untested MPCs were loaded with HCGS spent fuel in 2008 and are currently being used to store HCGS fuel at the ISFSI. Four additional untested MPCs were delivered for use during the 2010 HCGS loading campaign. In August 2009, the NRC cited the CoC holder for removing the shop helium leak test from the FSAR without prior NRC approval (Reference 6.39). As part of its corrective actions for the violation, the CoC holder committed to restore the test to the FSAR and begin testing all future MPCs. In addition, the CoC holder committed to test all affected MPCs that were delivered to users but not yet loaded, prior to the MPCs being loaded. The four untested HCGS MPCs were successfully leak tested on-site in April 2010 and loaded with HCGS spent fuel in June 2010 (casks 13 through 16). All four MPCs met or exceeded initial fabrication requirements. The four SGS MPCs to be loaded in 2010 were successfully helium leak tested in the fabrication facility and are not affected by this enforcement action.

The eight affected HCGS MPCs in service at the ISFSI (Serial Numbers 1021-147 through -154), while not having been leak tested at the fabrication facility, are still assumed to have no credible leakage. This assumption is consistent with that made by other similarly affected HI-STORM users and is based on the MPC fabrication process (i.e., welding and non-destructive examination, including radiography) being no different for these eight MPCs than the hundreds manufactured before them that <u>were</u> leak tested. In addition, the eight untested MPCs were successfully hydrotested in the plant after fuel loading and MPC lid welding. Lastly, observations of dose over time at the TLDs located near the ISFSI give no indication of any effluent dose contribution from any of the MPCs. Therefore, there is no impact to the 10 CFR 72.104 doses presented in Table 5.3.1-2 as a result of having eight untested MPCs in service. See Reference 6.55 for additional information.

5.3.1.3 Operational Restrictions to meet ALARA Objectives

The Salem and Hope Creek Radiation Protection Programs and procedures have been reviewed in accordance with 10 CFR 72.212(b)(10), and appropriate changes have been made to the implementing procedures to address cask loading operations, transportation of the loaded casks to the ISFSI, and operation of the ISFSI (see Section 5.7 of this report). The Salem and Hope Creek Radiation Protection Programs include appropriate controls to meet as low as reasonably achievable (ALARA) objectives for radioactive materials in effluents and direct radiation exposures during cask loading, cask transport, and ISFSI operations.

5.4.1.1 Fire and Explosion

The HI-STORM 100 System is designed to withstand the effects of fire as described in HI-STORM 100 System FSAR, Sections 2.2.3.3 and 11.2.4, and the effects of explosion as described in FSAR Sections 2.2.3.10 and 11.2.11. Fire and explosion evaluations have been performed for the locations where cask loading and storage operations occur on the Salem/Hope Creek site for comparison against the generic evaluations described in the HI-STORM FSAR. These evaluations are discussed separately below.

Fire

The fire analyses described in the HI-STORM FSAR evaluate the effects of a fire on the HI-STORM overpack and on the HI-TRAC transfer cask, each containing an MPC loaded with fuel at design basis maximum heat load. The fire durations were estimated assuming 50 gallons of transporter fuel distributed in a pool of one meter width around the periphery of the cask. The different diameters of the overpack and transfer cask result in slightly different fire durations (3.6 minutes and 4.8 minutes, respectively). No credit is taken for personnel actions that could suppress the fire.

The generic fire analysis assumes an engulfing fire analyzed with a conservative 1475°F flame temperature for the duration of the fire, which is calculated based on the fuel volume and pool size. This flame temperature is taken from the NRC's radioactive material transportation regulations (10 CFR 71.73(c)(4)) and was found to be acceptable by the NRC for use in Part 72 storage fire analyses (Reference 6.5, Section 11.2.12.2 of the SER for the original HI-STORM CoC). This method of analysis is applicable and bounding for the Salem/Hope Creek site and only a comparison of fuel sources is required for this 72.212 evaluation.

Because the MPC transfer from the HI-TRAC transfer cask to the HI-STORM overpack takes place in either the Hope Creek Reactor Building or the Salem Fuel Handling Building, there is no VCT or prime mover fuel fire threat to the loaded HI-TRAC transfer cask. The fuel tank on the prime mover used to pull the loaded overpack out of the Reactor Building/Fuel Handling Building on the low profile transporter/zero profile transporter is limited to 50 gallons of diesel fuel (Reference 6.43) and is, therefore, bounded by the design basis fire analysis for the overpack described in the HI-STORM FSAR. This design feature also ensures compliance with Section 3.4.5 of Appendix B to the HI-STORM CoC, which limits the "cask transporter" to 50 gallons of diesel fuel, as discussed below.

The VCT fuel volume must be no more than 50 gallons of diesel fuel, in accordance with Section 3.4.5 of Appendix B to the HI-STORM CoC. The amount of fuel in the HCGS VCT's fuel tank is controlled by design. The volume of the fuel tank on the VCT ensures this limit is not exceeded (Reference 6.32.7). The hydraulic fluid in the VCT was also evaluated as a potential source of fuel for the fire. The hydraulic fluid for the VCT has a flash point of 580°F and a fire point of 650°F (Reference 6.49). As such, the VCT hydraulic fluid is considered non-flammable. The Salem ZPT also includes a small amount of hydraulic fluid (less than 5 gallons per Reference 6.70). The MSDS for the ZPT hydraulic fluid indicates that the flash point of the hydraulic fluid is 400°F, which also qualifies as non-flammable. Lastly, a gasoline-powered auxiliary electric generator may be used during cask preparation activities conducted in the SGS FHB.

ISFSI

Reference 6.11, Section 7.1, evaluates combustible materials and other potential fire hazards in and around the ISFSI. Reference 6.15 determines the thermal effects of the sources of combustion. The ISFSI is a fenced-in area comprised of the three concrete pads, surrounding gravel, loaded and unloaded overpacks, and conduit and control boxes associated with the overpack temperature monitoring instrumentation and security equipment. Cabling in rigid metal conduit exists, but does not contribute to the combustible load for the ISFSI fire area. There are no mechanical piping systems carrying potentially combustible, flammable, or explosive fluids either above ground or underground at the ISFSI. Transient combustibles at the ISFSI are controlled by procedure (Reference 6.54.1). Fixed and transient combustibles in the yard area near the ISFSI have been evaluated and found to be acceptable.

The ISFSI Electrical Interface/Security Building is located within the ISFSI and contains numerous cables and electrical cabinets. No fire detection or alarm system is installed in this building. However, portable fire extinguishers are located there. Although a large fire in the Electrical Interface/Security Building is unlikely due to the limited quantity of combustibles and fire detection and protection controls, an evaluation of the effect on the casks of a fire in this building was performed. The results were acceptable provided the building is at least 20 feet away from the nearest overpack (Reference 6.11), which it is. Other yard area buildings in the vicinity of the ISFSI were also evaluated for fire impact on the ISFSI and found to be acceptable.

Heavy Haul Path

Reference 6.11, Section 7.2 identifies the combustible materials and other potential fire hazards near the heavy haul path from HCGS to the ISFSI. Reference 6.15 determines the thermal effects of the sources of combustion. Permanent and transient fire hazards due to structures, tanks, and other fire sources near the heavy haul path have been evaluated and found to be acceptable. Reference 6.57 identifies the combustible materials and other potential fire hazards near the heavy haul path from the SGS egress pads to the point at which it joins the existing heavy haul path near Hope Creek.

There are no mechanical piping systems that carry combustible, flammable, or explosive fluids routed either above ground or below ground near the SGS heavy haul path except a single, underground, 4-inch diameter fuel oil pipeline. Because of its underground location and the fact that the heavy haul path was designed to protect all underground commodities over which it traverses, this fuel oil line was not considered a credible source of fire or a threat to a cask passing above it.

Other permanent and transient sources of fire near the SGS heavy haul path and in the adjacent yard area are identified and evaluated in Reference 6.57. Reference 6.15 determines the thermal effects of the sources of combustion. Permanent and transient fire hazards due to structures, tanks, and other fire sources near the heavy haul path have been evaluated. These sources were found not to be a significant threat to a cask being transported by the VCT on the heavy haul path based on the location and nature of the fire source, fire protection features, and administrative controls that which minimize the probability and effects of fires.

Table 5.4.1.2-1
HI-STORM 100 System Design Basis Tornado Missiles

Missile Description	Mass (kg)	Velocity (MPH)
Automobile (large missile)	1,800	126
Rigid solid steel cylinder (8 inch diameter) (intermediate missile)	125	126
Solid sphere (1 inch diameter) (small missile)	0.22	126

These postulated tornado missiles are consistent with the "Spectrum I" missiles in NRC NUREG-0800, Standard Review Plan (SRP) 3.5.1.4 (Reference 6.21). The large missile was evaluated for its ability to tip over the cask. The intermediate missile was evaluated for penetration through the overpack. The small missile was evaluated for damage due to its passage through a penetration in the overpack (i.e., an inlet or outlet air duct).

The Salem/Hope Creek Generating Station site is located in tornado Region I as defined in RG 1.76. The missiles listed in Table 5.4.1.2-1 above are consistent with the "Spectrum II" missiles for tornado Region I listed in SRP 3.5.1.4. SRP 3.5.1.4 permits the use of Spectrum I or II missiles in performing design work. Therefore, the generically analyzed missiles are appropriate examples of the types of tornado missiles that could impact the dry storage casks in-transit to, or at the Salem/Hope Creek ISFSI. The NRC's Safety Evaluation Report (SER) for the HI-STORM 100 System CoC (original issue) states in Section 3.4.2 (Reference 6.5):

> *"The staff concludes that the tornado and tornado missile analyses are adequate and acceptable. The phenomena analyzed are considered to envelop the corresponding phenomena at all points on U.S. territory."*

This SER statement applies to the original HI-STORM 100 overpack design, which is not being used at the Salem/Hope Creek ISFSI. In SER Section 3.4.2.2 for HI-STORM CoC Amendment 1, the NRC affirms that the tornado missile analysis performed for the HI-STORM 100 overpack design remains bounding for the HI-STORM 100S overpack design. The HI-STORM 100S Version B overpack design being used at the Salem/Hope Creek ISFSI, which is a variation of the HI-STORM 100S overpack design, was authorized by Holtec under the provisions of 10 CFR 72.48. The 10 CFR 72.48 evaluation for the HI-STORM 100S Version B overpack design concludes that the Version B overpack design continues to provide adequate tornado missile protection as discussed in HI-STORM FSAR Section 3.4.8.1. Therefore, the HI-STORM 100S Version B overpack design is governed by the CoC Amendment 1 SER statement approving the tornado missile protection design features of the 100S overpack design.

<u>Hope Creek Tornado Missile Evaluation</u>

The HCGS site-specific design basis tornado missile characteristics are described in HCGSUFSAR Table 3.5-12 and are repeated in the following table. Weights (masses) have been converted from pounds to kilograms and velocities have been converted from feet per second to miles per hour for comparison with the generic HI-STORM System design basis missiles in Table 5.4.1.2-1. The missiles listed in Table 5.4.1.2-2 below are consistent with the "Spectrum II" missiles for tornado Region I listed in SRP 3.5.1.4.

Table 5.4.1.2-3
Salem Site Design Basis Tornado Missiles

Missile Description	**Mass (kg)**	**Velocity (MPH)**
Automobile	1818	132
Utility Pole 1	713	150
Utility Pole 2	677	144(H) 115(V)
1-inch diameter steel rod	3.6	215(H) 172(V)

Based on a comparison of the kinetic energy $mv^2/2$, where 'm' is the mass of the missile and 'v' is the velocity of the missile, the automobile missile has similar effects as the HCGS automobile missile. However the utility poles and steel rod missiles are not bounded by the analyzed HCGS missiles. Therefore, a site-specific analysis of the SGS utility pole (intermediate size) and steel rod (small size) missiles was performed (Reference 6.63). The results of that analysis are:

- The intermediate missile will not cause the cask to tip over
- The intermediate and small missiles will not penetrate the one-inch outer steel shell of the overpack
- The intermediate and small missiles will not penetrate the 3-inch vent shield lid of the overpack
- Away from impact locations, the stresses in the overpack are less than ASME Code Level D stress limits

The results of the bounding HCGS missile analyses and the SGS site-specific tornado missile analyses show that the SGS spent fuel is adequately protected and the overpack will not tipover and will not be fully penetrated. Therefore, the SGS tornado missile analysis is acceptable. A tornado missile evaluation for the HI-TRAC transfer cask at SGS is not required because a fuel-loaded transfer cask never leaves the Fuel Handling Building.

5.4.1.3 Flood

The HI-STORM 100 System is designed to be capable of withstanding pressure and moving water forces associated with a flood as described in HI-STORM FSAR Sections 2.2.3.6 and 11.2.7. Table 2.2.8 of the HI-STORM 100 System FSAR shows that the MPC enclosure vessel is designed for a 125 foot static head of water without collapsing, buckling, or otherwise allowing water to intrude into the confinement boundary. The cask system, including the overpack and the MPC is also designed to withstand the forces of flood water up to a velocity of 15 feet per second without sliding or tipping over.

Based on Section 2.4 of the Hope Creek UFSAR, PSEG plant datum is 89 feet above Mean Sea Level (MSL). UFSAR Table 2.4-6 indicates that the maximum still water level at the power block due to the probable maximum hurricane is 24.8 ft. MSL, or 113.8 ft. PSEG plant datum.

of tsunami water height are bounded by the design basis flood water height discussed in Section 5.4.1.3 above.

Hurricane

Wave action on the cask resulting from a postulated design basis hurricane moving up the Delaware Bay has been evaluated as a site-specific hazard (References 6.45 and 6.48). The factors of safety against sliding and overturning due to wave action are 1.43 and 3.18, respectively, per Reference 6.48. Therefore, the casks will not slide or turn over due to design basis wave action at the ISFSI caused by the probable maximum hurricane.

5.4.1.5 Earthquake

The HI-STORM 100 System is required to withstand loads due to a seismic event in accordance with HI-STORM 100 System FSAR, Sections 2.2.3.7 and 11.2.8. In particular, the HI-STORM overpack is required to resist overturning and sliding on the ISFSI storage pad due to a seismic event. The inequality shown in HI-STORM FSAR Table 2.2.8 is not met for the Salem/Hope Creek ISFSI site seismic accelerations. However, the cask is shown not to slide or tip over using the alternative time-history analysis permitted by the CoC and described in Section 5.2.1.5 of this report. The ISFSI pad is designed to withstand the dynamic effects of an earthquake, including soil-structure interaction and soil liquefaction, as discussed in Sections 5.2.1.2 and 5.2.1.6 of this report. Therefore, the free-standing HI-STORM 100 System and the ISFSI pad are qualified for use at the Salem/Hope Creek ISFSI.

5.4.1.6 Lightning

HI-STORM 100 System overpacks are stored on an unsheltered ISFSI storage pad. The Salem/Hope Creek ISFSI is located adjacent to the HCGS Unit 1 cooling tower, which is over 500 feet high, compared to the cask height of approximately 18 feet. Therefore, the cooling tower is the most probable lightning strike target in the vicinity of the ISFSI and a strike on a cask at the ISFSI is unlikely. Nevertheless, there is a small potential for lightning to strike the HI-STORM overpacks. Sections 2.2.3.11 and 11.2.12 of the HI-STORM 100 System FSAR address the lightning strike as an accident event. The HI-STORM FSAR indicates that the HI-STORM overpack steel outer shell provides a direct path to ground, and the cask can safely conduct lighting strikes without the need for any supplemental protection against lightning strikes. Because of the mass of steel in the overpack, there is adequate protection for the MPC and the confinement boundary is unaffected.

Administrative controls are used to prohibit cask transportation on-site during severe weather (Reference 6.31.3). Therefore, while the cask system is designed to withstand a lightning strike, a lightning strike on the cask transporter while carrying a loaded HI-STORM overpack between the fuel building and ISFSI is considered very unlikely.

5.4.1.7 Burial Under Debris

Section 2.2.3.12 of the HI-STORM 100 System FSAR states that "the HI-STORM System must withstand burial under debris," and "siting of the ISFSI pad shall ensure that the storage location is not located near shifting soil." Section 5.2 of this report discusses the ISFSI pad design and the subsoil, including liquefaction, and finds the Salem/Hope Creek ISFSI pad design acceptable. The

5.4.1.8.2 Normal Air Temperature

The HI-STORM 100 System was designed and analyzed assuming a specific ambient temperature in order to establish a normal condition thermal design basis for the storage system that ensures long-term fuel integrity. The design basis normal ambient temperature (annual average) for the HI-STORM 100 System is 80°F per HI-STORM 100 System FSAR Section 2.2.1.4, Table 2.2.2, and Section 3.4.1 of Appendix B to the HI-STORM CoC. Short-term daily exceedance of this value (e.g., during summer months) is acceptable because the thermal inertia of the cask system is so large that it precludes any significant effect on the fuel caused by these daily temperature swings. The annual mean ambient temperature at the HCGS site is 11.7°C (53.1°F) per HCGS UFSAR Table 2.3-9. Therefore, the design basis normal ambient temperature for the HI-STORM 100 System bounds the site value.

The normal ambient (annual average) temperature for operations involving the HI-TRAC transfer cask is not permitted to exceed 80°F per Table 2.2.2 of the HI-STORM 100 System FSAR. This value bounds the annual site mean temperature of 53.1°F and is therefore, acceptable. Administrative controls ensure that the working area ambient temperature inside the HCGS Reactor Building and SGS Fuel Handling Building remain less than 100°F during transfer cask operations. Ambient temperatures during all phases of cask loading operations, both indoors and outdoors, are checked in accordance with procedures (References 6.31.3, 6.31.5, 6.31.7, 6.31.8, 6.31.9, 6.56.3, 6.56.5, 6.56.7, 6.56.8, and 6.56.9).

5.4.1.8.3 Soil Temperature

Section 2.2.1.4 and Table 2.2.2 of the HI-STORM 100 System FSAR limit the annual average normal soil temperature to 77°F. In the thermal analysis, this is the temperature assumed for the soil underneath the ISFSI pad (Reference 6.2, Section 2.2.1.4). This temperature was chosen by Holtec as a conservative maximum value based on the average annual soil temperature for Key West, Florida. It is conservative because lower soil temperature would result in higher heat transfer from the cask through the ISFSI pad. The location of the Salem/Hope Creek Generating Station site is over 1,000 miles north of Key West, Florida. Therefore, by simple geographic comparison, the average annual soil temperature below the ISFSI pad at Artificial Island, NJ is lower than that of Key West. However, a second check was also performed to try to quantify this value, as described below.

No site-specific soil temperature is available for the Salem/Hope Creek ISFSI site. Because the Salem/Hope Creek ISFSI pad is approximately 36 inches thick, the ground water temperature for the appropriate region of the United States was used for comparison with the limit. Approximate groundwater temperature in the Salem/Hope Creek Generating Station area is in the mid- 50 degrees Fahrenheit (Reference 6.27, pp. 31.18 – 31.20), which is well below 77°F and is, therefore, acceptable for meeting this soil temperature limit.

5.4.1.8.4 Off-Normal Environmental Temperature

The HI-STORM 100 System is designed to withstand the effects of off-normal environmental temperatures as described in HI-STORM FSAR Section 11.1.2. Table 2.2.2 of the HI-STORM 100 System FSAR specifies upper and lower bound off-normal temperature limits for the HI-STORM overpack and the HI-TRAC transfer cask. The upper bound off-normal temperature limit for the HI-STORM overpack, and for the HI-TRAC transfer cask, is defined as a 3-day average

5.4.1.10 Cask Transport Route (Heavy Haul Path)

The HCGS portion of the heavy haul path is shown in Section 8.7 of Reference 6.31.3.

HCGS Heavy Haul Path

The loaded HI-STORM overpack, resting atop the HERMIT device and low profile transporter (LPT), exits the HCGS Reactor Building through the receiving bay door to the south. The LPT includes a number of Hilman rollers to facilitate movement along two parallel rails running from inside the receiving bay to the egress pad just outside the Reactor Building receiving bay door. The LPT is pulled to the egress pad by a prime mover (similar to an airplane "tugger" vehicle).

The overpack is moved to the egress pad and the overpack lid is installed. The cask is attached to the VCT at a point approximately 50 feet south of the Reactor Building receiving bay door. The VCT is a tracked vehicle that lifts the overpack off the ground only as high as necessary to clear any undulations in the haul path between the Reactor Building and the ISFSI pad. The VCT turns 90 degrees west and travels for approximately 100 feet and turns 90 degrees north. At this point, it travels straight to the ISFSI and to the pre-determined pad location for each cask. The normal speed for the transporter is 0.4 MPH (Reference 6.32.7).

The heavy haul path is primarily an asphalt roadway with concrete turning pads at certain locations, including an "egress pad" south of the Reactor Building receiving bay door. Between the Reactor Building and the egress pad, the path is designed to support the loaded overpack on either the LPT (with the HERMIT) or suspended from the cask transporter. From the egress pad to the ISFSI, the roadway is designed to support the weight of a loaded overpack suspended from the VCT. The maximum road pressure from the tracked VCT is 50 lb/in^2 (Reference 6.28). The heavy haul path has been appropriately designed for this pressure load and the expected number of VCT and semi-truck trips over the life of the ISFSI (Reference 6.35).

SGS Heavy Haul Path

During transfer of the loaded MPC from the HI-TRAC transfer cask to the HI-STORM overpack, the loaded overpack rests on the truck bay floor but inside the collar of the ZPT (see Reference 6.71, page 12). The ZPT lifts the HI-STORM overpack using a hydraulic system which powers four structural "tabs" that engage the air inlet ducts at the bottom of the cask. The non-powered ZPT is designed to lift the overpack just high enough to clear the floor and be moved along two parallel rails running from inside the truck bay to the egress pad to the west, just outside the Fuel Handling Building truck bay door. The ZPT is pulled out of the Fuel Handling Building to the egress pad by a prime mover and a suitably designed tow bar.

The overpack lid is installed at the egress pad. The overpack is attached to the VCT at a point approximately 50 feet west of the Fuel Handling Building truck bay door. The VCT lifts the overpack off the ground only as high as necessary to clear any undulations in the haul path between the Fuel Handling Building and the ISFSI pad (Reference 6.56.3). The VCT turns 90 degrees north from the egress pad and travels to the HCGS heavy haul path. From this point, it travels to the ISFSI and to the pre-determined pad location for each cask. The VCT with the overpack travels at a normal speed of 0.4 MPH (Reference 6.32.7).

evaluated along the HCGS heavy haul path. For SGS, an evaluation of the potential collapse of site structures along the heavy haul path was performed (Reference 6.44) and concluded that the HI-STORM stability and local penetration resistance are adequate to withstand an impact load resulting from the structural failure of site structures along the heavy haul path (i.e. controlled facility building, high mast light pole, and standard light pole).

5.4.1.11.1 High-Voltage Transmission Line Towers

The on-site heavy haul path and the ISFSI are located on the opposite side of the power plant from the switchyard and associated transmission towers and high voltage power lines. Therefore, there is no threat of a transmission tower collapse or transmission line drop onto a loaded overpack.

5.4.1.11.2 Effect of a Postulated Collapse of Structures Near the ISFSI Pad

The consequences of the collapse of a utility pole or high mast light pole onto a HI-STORM cask is enveloped by the cask's design basis tornado missile evaluation and is, therefore, acceptable. The consequences of a postulated collapse of the HCGS cooling tower were evaluated in Reference 6.44. The closest estimated distance between the storage casks at the ISFSI and the collapsed part of the cooling tower is 242 feet. Hence, there is no impact of debris from a collapsed cooling tower on a storage cask at the ISFSI. The ground acceleration shock produced by the collapse of the cooling tower is approximately 0.08 g (horizontal) and 0.02 g (vertical). These acceleration values are much smaller than the design basis values for the cask system (0.25 g horizontal and 0.17 g vertical) and are, therefore, acceptable.

5.4.1.12 Deviations from the Dry Cask Storage System FSAR

Revisions 3 and 5 of the HI-STORM FSAR were the licensing basis for the first two loading campaigns at the Salem/Hope Creek ISFSI. Certain changes to Revision 3 of the HI-STORM FSAR were implemented by Holtec International on a generic basis after FSAR Revision 3 was issued. These changes were evaluated in accordance with the Holtec 10 CFR 72.48 program and are listed in prior revisions to this report, which governed previous cask loading campaigns. No CoC amendments as a result of these deviations were identified. Those changes were incorporated into subsequent revisions to the HI-STORM FSAR. No changes to FSAR Revision 5 were made by Holtec that affected the second loading campaign.

The specific details of the changes and the technical (e.g., Holtec Engineering Change Order (ECO)) and regulatory (72.48 screening or evaluation) documentation approving the changes are controlled as separate documents by Holtec. Appendix 2 to this report provides a table that lists the specific serial numbers for the cask components affected by ECO changes affecting the FSAR revision to which the hardware is certified. HI-STORM FSAR Revision 7 is being used for the 2010 and future loading campaigns. The changes to FSAR Revision 7 approved by Holtec under their 10 CFR 72.48 program (or as a result of a CoC amendment) are listed in Table 5.4.1.12-1 and the impacts of the changes on PSEG, if any, are described.

Table 5.4.1.12-1
Holtec-Implemented Changes to HI-STORM FSAR Revision 7*

Source Document	Description and Impact of Changes
ECO 5014-169	This ECO changes the word "crawler" to Vertical Cask Transporter in several locations in the FSAR. This is an editorial change and has no impact on PSEG site implementation or the evaluations summarized in this report.
ECO 5014-170, Rev. 1	This ECO allows the use of pre-cast lead sections or sheets in lieu of poured molten lead for shielding in the HI-TRAC 125D transfer cask. PSEG uses the HI-TRAC 100D model and the PSEG HI-TRAC was fabricated with poured lead before this ECO was issued. There is no impact on PSEG site implementation documents or the evaluations summarized in this report.
ECO 5014-171	This ECO adds the details of how to perform the thermal air flow test required by CoC Condition 9 to FSAR Chapter 8. This testing was performed by another HI-STORM user and was found acceptable for use by PSEG Nuclear. See discussion in Appendix 1, CoC Condition 9.
ECO 5014-172	This ECO deletes a fuel rod buckling analysis from FSAR Section 3.5, and replaces it with an alternate method of predicting fuel cladding behavior under g-loads that is described in NUREG 1864. This is an internal licensing matter between Holtec and the NRC that does not affect use of the cask in the field. There is no impact on PSEG site implementation documents or the evaluations summarized in this report.
ECO 5014-173	This ECO replaces a suggestion to use MPC water flushing with a requirement to do so, in the event the time-to-boil is approached during MPC preparation operations. Reference 6.31.6 ensures that MPC flushing will be performed if the time-to-boil is approached or exceeded by using the word "shall" for this operation..
ECO 5014-174	This ECO restores shop helium leakage testing of all MPCs to the FSAR and deletes the exemption canisters with heat loads ≤ 20 kW. This is related to the resumption of leakage testing described in the discussion of ECO 5014-124 R.1, above. All four Hope Creek MPCs delivered without having been shop-tested were tested at the site prior to use.
ECO 5014-175	This ECO revises FSAR Section 3.1.2.1.1.4 so that the description of the consideration of explosions and their pressure waves is consistent with the Technical Specifications in Appendix A the CoC. The hazards analysis performed for the PSEG ISFSI is consistent with the CoC for explosion/overpressure consideration. Therefore, there is no impact on PSEG site implementation documents or the evaluations summarized in this report.
ECO 5014-176	This ECO changes descriptions of the impact limiter for the HI-STAR transportation cask. Therefore it has no implications for the HI-STORM storage system. There is no impact on PSEG site implementation documents or the evaluations summarized in this report.
ECO 5014-177	This ECO makes changes to the HI-STORM 100U storage system design in support of a CoC amendment request. PSEG does not use the HI-STORM 100U design. Thus, there is no impact on site implementation documents or the evaluations summarized in this report.
ECO 5014-179	This ECO revises the FSAR to add constraints to use of the Supplemental Cooling System (SCS) that were made necessary by the increase in allowed maximum canister heat load approved in CoC Amendment 5. If and when PSEG needs to use the SCS, these constraints will be implemented by procedure (References 6.56.6 and 6.56.7).
ECO 5014-180	This ECO clarifies information in FSAR Section 3.5 regarding fuel cladding under g-loads that was introduced by ECO 5014-172. This is an internal licensing matter between Holtec and the NRC that does not affect use of the cask in the field. There is no impact on PSEG site implementation documents or the evaluations summarized in this report.
ECO 5014-182	This ECO adds a new set of material yield strength requirements for the MPC lid and updated results for lid lifting structural analyses. There is no impact on site implementation documents or the evaluations summarized in this report.

Table 5.4.1.12-1
Holtec-Implemented Changes to HI-STORM FSAR Revision 7*

Source Document	Description and Impact of Changes
ECO 5014-196	This ECO addresses Holtec International Bulletin 51, Revision 1. These changes are made to provide additional clarification in FSAR Chapters 1, 2, 4, and 12 so the users can correctly determine the approach for calculating the total MPC heat load for various operating scenarios. The heat load limits for long-term storage are not changed. In the Certificate of Compliance certain operations are dependent on total heat load in the MPC. This ECO adds text to the FSAR to provide guidance to the users on how to calculate the total heat load consistent with the assumptions used in the thermal analysis already performed for the system. The SGS fuel selection procedure has been revised to reflect these FSAR changes and the HCGS fuel selection procedure will be revised before casks are loaded at that station.
ECO 5014-197	This ECO modifies the FSAR instructions pertaining to MPC cooldown for unloading MPCs that were loaded under CoC Amendment 3 or later. Per Appendix 2 of this report, PSEG has loaded four MPCs containing HCGS fuel to CoC Amendment 2 and all others to Amendment 3 or later. The MPC unloading procedures for both HCGS and SGS have been reviewed and revised as required to reflect these FSAR changes.
ECO 5014-198	This ECO corrects the Technical Specification Bases in FSAR Appendix 12.A to match changes to the TS approved by the NRC in CoC Amendment 5. There are no changes to the TS requirements themselves. The PSEG DCS procedures are unaffected by these FSAR changes.
ECO 5014-199	This ECO revises the FSAR text in Chapters 8 and 9 to reflect the acceptability of performing NDE on the HI-TRAC trunnions in lieu of annual load testing. The PSEG DCS procedure was previously revised to perform NDE in lieu of load testing.

* Does not include one-time fabrication deviations addressed via the Holtec Supplier Manufacturer Deviation Report process. These are documented in the Holtec Component Completion Record for the affected cask component(s) or other document, such as a Field Deviation Report (FDR) for the ISFSI.

PSEG needed to implement two deviations from Revision 3 to the HI-STORM FSAR for the 2006-07 loading campaign that also carry over to all subsequent campaigns. They involved moving the loaded overpack outside of the Reactor Building without the lid installed and a repair of a ponding problem on one of the ISFSI pads. The location of overpack lid installation is not specifically addressed in the HI-STORM FSAR. Therefore, this evolution was addressed as a deviation under the PSEG 10 CFR 72.48 program for HCGS cask loading operations and found to be acceptable. The 72.48 review for overpack lid installation outdoors at HCGS is also applicable to SGS because the overpack design is the same, potential dose rates from the MPC with the overpack lid off are similar, and the lid is installed in the same manner and under the same procedural requirements at Salem.

The repair of the ISFSI pad ponding problem is discussed in more detail in Appendix 1, Table 3, Section 3.4.6 of this report. Both of these deviations also apply to HI-STORM FSAR Revision 5 and 7. One additional deviation from HI-STORM FSAR Revision 5 was required that permits a periodic inspection of the HI-TRAC lifting trunnions in lieu of a load test. This deviation is consistent with ANSI N14.6, which governs the trunnion design and also applies to HI-STORM FSAR Revision 7.

One additional deviation from FSAR Revision 7 is also being authorized by PSEG for SGS DCS operations only as documented in this report. It was recognized during the SGS DCS project that the Holtec generic passive cooling thermal analysis used for licensing short term operations with

5.4.1.13 CoC Holder Approval of Cask Operating Procedures

Holtec International has reviewed and approved the site dry cask storage operating procedures as required by HI-STORM FSAR Section 8.0, as documented in Reference 6.52. Holtec International also prepared the first drafts of the new Salem cask operating procedures to adopt CoC Amendment 5 and FSAR Revision 7. The Salem procedures are being created from the Hope Creek procedures previously reviewed and approved by Holtec. Furthermore, Holtec is contracted for loading services for the first Salem cask loading campaign and thus will have input to the procedure development process. Procedures are owned, understood, maintained and revised by PSEG Nuclear after the first loading campaigns at each station.

5.4.1.14 ISFSI Pad Elevation

Section 4.4.4.3 of HI-STORM FSAR Revision 7 requires users to confirm the elevation of the ISFSI pad to determine whether a site-specific thermal analysis is required. The HI-STORM FSAR requires a unique thermal analysis for ISFSI pads situated at elevation 1500 ft or higher. The Salem/Hope Creek ISFSI is located near the eastern shore of the Delaware River on land that slopes very gradually up from the shoreline. The ISFSI pad is situated well below 1500 ft. elevation. Thus, a unique thermal analysis, based on elevation, is not required for the Salem/Hope Creek ISFSI.

5.4.1.15 HI-TRAC Pedestal in SGS Transfer Pools

Because of differences in the geometry of the SGS fuel transfer pools, where MPC fuel loading takes place, and the spent fuel pool, it was necessary to design, construct, and install a pedestal for use in the transfer pools in both SGS units upon which the HI-TRAC transfer cask rests during fuel loading. This pedestal allows the MPC and HI-TRAC to be at an appropriate elevation to permit movement of fuel assemblies from the spent fuel pool into the MPC within the travel limitations of the fuel handing bridge and hoist. The configuration with the loaded HI-TRAC resting upon the pedestal in the fuel transfer pool has been analyzed (Reference 6.72) to ensure the transfer cask remains stable and will not topple over under static and dynamic loading conditions.

5.4.2 Conclusion

PSEG Nuclear complies with 10 CFR 72.212(b)(6)

5.5 10 CFR 72.212(b)(8) — Review of Part 50 Facility Impact (10 CFR 50.59)

10 CFR 72.212(b)(8) states the following:

"Prior to 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)(2) of this chapter. Results of this determination must be documented in the evaluation made in paragraph (b)(5) of this section."

the TRM. Changes to the TRM are controlled under 10 CFR 50.59. The 10 CFR 50.59 evaluation associated with DCP 8001593 (S09-284) authorized this weight restriction to be appropriately modified to allow canister lid installation.

As a result of an enforcement issue at the site of another Holtec HI-STORM user, PSEG has designed, fabricated and installed seismic lateral restraints for the stack-up configuration of the HI-TRAC/HI-STORM while inside the Salem Unit 1 and Unit 2 truck bays during loading campaign. These modifications were performed under design change packages authorized by 10 CFR 50.59 (Reference 6.76). The seismic restraints ensure the transfer cask and overpack, when in the stack-up configuration, will not topple over in an earthquake.

5.5.2 Conclusion

Activities related to storage of spent fuel under the 10 CFR 72 general license were evaluated pursuant to 10 CFR 50.59 under a variety of design change packages and none of these activities resulted in the need to request NRC approval. However, a review of the Hope Creek operating license determined that an administrative change to the operating license was required to permit ISFSI operations to proceed. That amendment was requested and approved (Hope Creek operating license amendment 169). In addition, a review of the Salem OLs and TS revealed that TS changes were required for both units for cask loading operations to be conducted at those plants. Those amendments were requested and approved by the NRC (Salem operating license amendments 277 for Unit 1 and 293 for Unit 2). No other activities or modifications related to ISFSI implementation required prior NRC approval as documented in the associated 10 CFR 50.59 evaluations. Therefore, PSEG Nuclear complies with the requirements of 10 CFR 72.212(b)(8).

5.6 10 CFR 72.212(b)(9) — Physical Security

10 CFR 72.212(b)(9) states the following:

"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 purposes of this general license, 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;

5.7 10 CFR 72.212(b)(10) — Programs

10 CFR 72.212(b)(10) states the following:

"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."

5.7.1 Evaluations

Each of the above-mentioned programs, the SGS Fire Protection Plan, and the HCGS Fire Protection Plan (HC Operating License Condition 2.C.(7)) has been evaluated for impact by the implementation of ISFSI operations. The evaluation of each program plan is summarized below with appropriate cross-references to the plan documents and implementing procedures.

5.7.1.1 Emergency Plan

The SGS and HCGS Event Classification Guides (ECGs) and Emergency Action Levels (EALs) were reviewed for impact as a result of implementing dry cask storage at the two generating stations. The ECGs were revised appropriately to address ISFSI operations, through the creation of new EAL 6.4.1.c and associated bases for both stations.

Any significant increase in the dose rate from a cask would indicate a loss of shielding effectiveness rather than a change to the source term inside the cask. This is because the amount of radioactive material in the cask is fixed at the time of loading and cannot increase (although it could re-locate due to gravity effects after a cask drop or other dynamic event). In fact, due to radioactive decay, the source term in the cask will decrease over time and dose rates would be expected to decrease, given the same amount of shielding with the source in approximately the same location inside the MPC.

The Reportability Action Levels (RALs) in the ECGs at both stations were also reviewed and revised to take into consideration new reportability requirements in the HI-STORM CoC and the Part 72 regulations. Based on the changes to the PSEG ECGs and the new ISFSI RALs and EALs, the requirements of 10 CFR 72.212(b)(10) pertaining to the reactor emergency plan are met.

5.7.1.2 Quality Assurance Program

Cask design, fabrication, assembly, and related activities are performed under Holtec's NRC-approved quality assurance program as described in Chapter 13 of the HI-STORM FSAR.

As allowed by 10 CFR 72.140(d), the existing PSEG Nuclear NRC-approved 10 CFR 50, Appendix B Quality Assurance Program for SGS and HCGS is being applied to ISFSI activities (Reference 6.10). The description of PSEG's Quality Assurance program in the PSEG Quality Assurance Topical Report (Reference 6.33.2) has been revised to include activities related to ISFSI operations as described in Appendices A and E. It was determined that these changes did not reduce the effectiveness of the QA program and could be implemented without prior NRC approval.

5.7.1.4 Radiation Protection Program

Radiation protection personnel have been trained and procedures revised to support dry cask storage loading operations in the plant and ISFSI operation. The radiation protection program (Reference 6.33.1) and relevant implementing procedures have been revised or new procedures created to support cask loading, on-site transportation, and storage operations in an ALARA manner.

Based on the modifications made to the PSEG radiation protection program and associated implementation of new and revised procedures that support cask loading, transport, and storage operations, the requirements of 10 CFR 72.212(b)(10) pertaining to radiation protection are met.

5.7.1.5 Fire Protection Plan

HCGS Evaluation

The fire hazards analysis for HCGS has been revised to address cask loading activities inside the Reactor Building, at the ISFSI, and during on-site cask transportation activities between the Reactor Building and the ISFSI. Based on the findings of the fire hazards analysis, appropriate changes have been made to the fire protection implementing procedures to assure adequate protection of the plant and dry storage casks during all phases of cask loading, transport, and storage operations (Reference 6.33.5). This includes control of transient combustible material at both the ISFSI and along the heavy haul path, as well as during fuel transfer operations in the Reactor Building. In addition, fire suppression equipment and personnel trained in its use accompany the cask while in transit from the Reactor Building to the ISFSI. The specific fire and explosion hazards associated with dry cask storage are discussed in more detail in Section 5.4.1.1 of this report. The fire protection programmatic standard (Reference 6.33.5) was reviewed and no changes were required.

SGS Evaluation

The fire hazards analysis for SGS has been revised to address cask loading activities inside the Fuel Handling Building and during on-site cask transportation activities between the Fuel Handling Building and the Hope Creek portion of heavy haul path. Based on the findings of the fire hazards analysis, appropriate changes have been made to the SGS fire protection implementing procedures to assure adequate protection of the plant and dry storage casks during all phases of cask loading and transport operations (Reference 6.33.5). This includes control of transient combustible material along the SGS portion of the heavy haul path as well as during fuel transfer operations in the Fuel Handling Building. In addition, fire suppression equipment and personnel trained in its use accompany the cask while in transit from the Fuel Handling Building to the ISFSI. The specific fire and explosion hazards associated with dry cask storage are discussed in more detail in Section 5.4.1.1 of this report.

Based on the modifications made to the PSEG fire protection program and associated implementation procedures that support cask loading, transport, and storage operations, the requirements of 10 CFR 72.212(b)(10) pertaining to fire protection are met.

6.12 Holtec Report No. HI-2043195, "HI-STORM 100 System Overpack Air Temperature Rise at 17.1 kW, Rev.0;" Holtec letter No. 9042868 to Energy Northwest, "HI-STORM Thermal Validation Test Results," dated July 12, 2004; and Energy Northwest Letter No. G02-04-134 to the NRC, "Columbia Generating Station Validation of HI-STORM 100 System Heat Transfer Characteristics," dated July 28, 2004, Docket 72-35.

6.13 PSEG Calculation No. A-5-DCS-MDC-1958, "Source Term Analysis for the Salem & Hope Creek ISFSI," Rev. 0.

6.14 PSEG Calculation No. A-5-DCS-MDC-1957, "Direct Dose Rates in the Vicinity of the Salem & Hope Creek ISFSI," Rev. 0.

6.15 PSEG Calculation No. A-5-DCS-CDC-1986, "ISFSI Fire Radiant Heat and Explosion Overpressure Analysis," Rev. 0.

6.16 Docket No. 50-354, PSEG Nuclear LLC Hope Creek Generating Station Facility Operating License No. NPF-57, through Amendment 169.

6.17 Sargent & Lundy Letter to PSEG Nuclear, "ISFSI Design and Support, External Flood Events," dated May 30, 2003, PSEG VTD No. 400066 (001).

6.18 PSEG Calculation No. A-5-DCS-CDC-1960, "ISFSI Pad Design," Rev. 0.

6.19 PSEG Calculation No. A-5-DCS-CDC-1978, "Soil Parameters for the ISFSI Pad Area," Rev. 1.

6.20 PSEG Calculation No. A-5-DCS-CDC-1964, "Soil Structure Interaction and Time History Calculation," Rev. 0.

6.21 NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 3.5.1.4, "Missiles Generated By Natural Phenomena," Rev. 2, July 1981.

6.22 NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," July 1980.

6.23 NUREG/CR-6407, "Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety," February 1996.

6.24 PSEG Nuclear Fuels Memorandum NFS 12-041, "HI-STORM 100S Cask System Thermal Validation Testing Using Air Mass Flow Rate," dated April 20, 2012.

6.25 ANSI N14.6-1993, "Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 pounds (4500 kg) or more for Nuclear Materials."

6.26 URS Report, "Geotechnical Investigation for Salem/Hope Creek ISFSI," Report Submitted by Steven D. Coppola of URS Corporation to Ms. Shelly Kugler of PSEG, August 13, 2003, PSEG VTD No. 325972 (001).

6.27 ASHRAE Applications Handbook, 1999 Edition, Chapter 31.

6.31.19 Not used.

6.31.20 RP-HC-303, "HI-TRAC Radiation Survey."

6.31.21 RP-HC-304, "HI-STORM Radiation Survey."

6.31.22 RP-HC-305, "Independent Spent Fuel Storage Installation Radiation Survey."

6.31.23 Not used.

6.31.24 HC.OP-AB.MISC-0001, "Acts of Nature."

6.31.25 HC.OP-DL.ZZ-0026, "Surveillance Log."

6.31.26 Not used.

6.31.27 Not used.

6.32 Drawings

6.32.1 Not used.

6.32.2 Not used.

6.32.3 Holtec Drawing 3928, "MPC-68/68F/68FF Basket Assembly [Licensing Drawing]," Section 1.5 of PSEG VTD No. 400006 (001), (002), and (003) (applicable revision per component CCR).

6.32.4 Holtec Drawing 3923, "MPC Enclosure Vessel [Licensing Drawing]," Section 1.5 of PSEG VTD No. 400006 (001), (002), and (003) (applicable revision per component CCR).

6.32.5 Holtec Drawing 4128, "HI-TRAC 100D Assembly [Licensing Drawing]," Rev. 5, (Section 1.5 of PSEG VTD No. 400006 (002).

6.32.6 Holtec Drawing 4116, "HI-STORM 100S, Version B [Licensing Drawing]," Section 1.5 of PSEG VTD No. 400006 (001), (002), and (003) (applicable revision per component CCR).

6.32.7 Lift Systems Drawing CT201064, "210 Ton Transporter (Hope Creek)," Rev. A, PSEG VTD No. 400036 (005).

6.32.8 PSEG Drawing No. 700002, "Cask Storage Pad Sections and Details," Rev. 0.

6.32.9 Holtec Drawing No. 4532, "Soil Mixing As-Built," Rev. 2, PSEG VTD No. 400001 (001).

6.33 Plan Documents

6.33.1 RP-AA-300, "Radiological Survey Program."

6.33.2 Salem and Hope Creek Generating Stations Quality Assurance Topical Report (QATR), NO-AA-10.

6.48 Holtec Report No. HI-2043197, Rev. 0, "Evaluation of Kinematic Stability of HI-STORM Version B Under the Postulated Probable Maximum Hurricane," PSEG VTD No. 400035 (001).

6.49 Houghton International Product Data Sheet for Cosmolubric® Hydraulic Fluid (included in cask transporter operating and maintenance manual), PSEG VTD No. 400019 (001).

6.50 Holtec Report No. HI-2043313, Rev. 2, "Design Basis Wind, Tornado, and Snow Load Evaluation for Hope Creek Generating Station," Revision 2, PSEG VTD 400021 (001).

6.51 PSEG Notification No. 20249856 and FCR No. 310 to Order 60035559.

6.52 Holtec letter to B. Gustems, PSEG dated July 26, 2006, "Holtec Review of Hope Creek Dry Cask Storage Procedures," PSEG Design Input Record No. H-1-DCS-NDI-0126.

6.53 USNRC Division of Spent Fuel Storage and Transportation Interim Staff Guidance 22, "Potential Rod Splitting due to Exposure to an Oxidizing Atmosphere during Short-Term Cask Loading Operations in LWR or Other Uranium Oxide-Based Fuel," Revision 0.

6.54 **Nuclear Common Procedures**

6.54.1 FP-AA-001, "Precautions Against Fire."

6.54.2 CC-AA-103-1001, "Implementation of Configuration Changes."

6.55 PSEG Notification No. 2042611 and Order 70100870, "MPC Shop Leakage Testing."

6.56 **SGS Procedures**

6.56.1 Not used.

6.56.2 Not used.

6.56.3 SC.MD-FR.DCS-0003, "Transport Loaded and Unloaded HI-STORM and HI-TRAC."

6.56.4 SC.MD-FR.DCS-0004, "MPC Preparation for Loading."

6.56.5 SC.MD-FR.DCS-0005, "Handling and Loading MPC."

6.56.6 SC.MD-FR.DCS-0006, "Sealing, Drying, and Backfilling of a Loaded MPC."

6.56.7 SC.MD-FR.DCS-0007, "Stack-up and Transfer of Loaded MPC."

6.56.8 SC.MD-FR.DCS-0008, "Transporting and Transferring a Loaded MPC for Unloading."

6.56.9 SC.MD-FR.DCS-0009, "Unloading a Loaded MPC."

6.56.10 Not used.

6.67 Letter from Holtec International, Andrew Fecht, to PSEG Nuclear, Tom Wallender, "Leaving Mating Device Installed Atop a Loaded HI-STORM in a ZPT," dated July 30, 2010.

6.68 Holtec Component Completion Record 1027-421-8, "MPC Supplementary Cooling System," Revision 0.

6.69 Holtec Report No. HI-2073816, "Structural Analysis of Zero Profile Transporter (ZPT)," Rev. 5, PSEG VTD 901426 (001).

6.70 Email from A. Fecht, Holtec, to B. Gutherman, PSEG, "ZPT Hydraulic Fluid Volume and MSDS," dated July 15, 2010.

6.71 Holtec Purchase Specification PS-1129, "HI-STORM Zero Profile Transporter," Revision 5, PSEG VTD 901475 (001).

6.72 Holtec Report No. HI-2104690, "Seismic/Structural Analysis of HI-TRAC/Pedestal at Salem," Rev. 2, PSEG VTD 902010 (001).

6.73 Not used.

6.74 Holtec Report No. HI-2022966, "Forced Helium Dehydrator Sourcebook," Rev. 4, PSEG VTD 902019 (001).

6.75 Holtec 10 CFR 72.48 Evaluation No. 915, "Thermal Evaluation of Loaded HI-STORM in the ZPT," Revision 1.

6.76 PSEG Design Change Package 80103873, "Salem Unit 1 DCS-Stack-up Seismic Lateral Restraints," Rev. 0.

6.77 PSEG Design Change Package 80104315, "Salem Unit 2 DCS-Stack-up Seismic Lateral Restraints," Rev. 0.

Table 1, CoC Conditions

Condition	Evaluation
1. CASK a. Model No.: HI-STORM 100 Cask System b. Description	This CoC condition describes the major HI-STORM 100 System components. PSEG Nuclear uses the HI-STORM 100 System components as described in Paragraphs 'a' and 'b' of this CoC condition. The specific components used to store HCGS and SGS spent fuel at the ISFSI are: 1. The HI-STORM 100S-218 Version B overpack. The "218" modifier designates that the 218-inch tall model of the Version B overpack is being used. See Section 1.2.1.2.1 of Reference 6.2. 2. The MPC-68 or MPC-68FF canister may be used to store HCGS spent fuel. PSEG chooses to use the MPC-68 to store HCGS spent fuel. The MPC-24, MPC-24E, MPC-24EF, MPC-32, or MPC-32F may be used to store SGS spent fuel. PSEG chooses to use the MPC-32 to store SGS spent fuel. 3. MPC loading, preparation, and transfer activities in the HCGS Reactor Building and SGS Fuel Handling Building are performed using the 100-ton HI-TRAC 100D transfer cask. Amendment 3 to the CoC made editorial clarifications to Section 1.b that have no effect on the compliance statements above. Amendment 5 to the CoC made editorial clarifications to Section 1.b that have no effect on the compliance statements above.
2. OPERATING PROCEDURES	Chapter 8 of the HI-STORM 100 System FSAR outlines the loading, unloading, and recovery procedures for the HI-STORM 100 Cask System. The procedures provided in the HI-STORM FSAR are prescriptive to the extent that they provide the basis and general guidance for plant personnel in preparing detailed, written, site-specific, loading, handling, storage and unloading procedures. Users are permitted to add, modify the sequence of, perform in parallel, or delete steps as necessary provided that the intent of the guidance given in Chapter 8 is met, and the requirements of the Technical Specifications in Appendix A to Certificate of Compliance No. 1014 are met (Reference 6.2, Section 8.0). PSEG Nuclear uses site-specific written operating procedures for implementation of cask loading, handling, movement, on-site transportation, surveillance, and maintenance of the HI-STORM 100 Cask System at the ISFSI. The site-specific operating procedures are consistent with the technical bases described in HI-STORM 100 System FSAR, Chapter 8 and the CoC. Changes in the operating procedures contained in the HI-STORM FSAR over time have been incorporated into the plant procedures as later FSAR revisions were adopted for use at the Salem/Hope Creek ISFSI.

Table 1, CoC Conditions

Condition	Evaluation
5. HEAVY LOADS REQUIREMENTS (cont'd)	Movement of a loaded HI-STORM overpack is performed in accordance with approved PSEG Nuclear procedures, and in compliance with HI-STORM 100 Cask System Certificate of Compliance, Appendix A, Section 5.5 (see Table 2 of this appendix). Lifting of a fuel-loaded HI-TRAC transfer cask and MPC is not performed outside of SGS and HCGS structures governed by 10 CFR 50. Therefore, HI-STORM 100 Cask System Certificate of Compliance 1014, Appendix B, Section 3.5, is not applicable to the SGS and HCGS cask loading operations (see also Table 3 of this appendix).
6. APPROVED CONTENTS	Procedural controls are used to ensure that the contents of the HI-STORM 100 Systems at the ISFSI meet the applicable fuel specifications and other requirements in HI-STORM Certificate of Compliance, Appendix B, Section 2.0. The detailed evaluation of compliance with CoC Condition 6 is provided in Table 3 of this appendix, which addresses compliance with the Approved Contents section of CoC Appendix B.
7. DESIGN FEATURES	Features or characteristics for the design and operation of the Salem/Hope Creek ISFSI, cask system, and ancillary equipment are in accordance with HI-STORM 100 System Certificate of Compliance, Appendix B, Section 3.0. The detailed evaluation of compliance with CoC Condition 7 is provided in Table 3 of this appendix, which addresses compliance with the Design Features section of CoC Appendix B.
8. CHANGES TO THE CERTIFICATE OF COMPLIANCE	Certificate of Compliance Condition No. 8 states the 10 CFR 72.244 regulatory requirement that the holder of the certificate who desires to make changes to the CoC, including appendices, must submit an application for amendment of the CoC to the NRC. This condition applies only to the CoC holder. Therefore, no action or implementing procedures are required by PSEG Nuclear.
9. SPECIAL REQUIREMENTS FOR FIRST SYSTEMS IN PLACE	**<u>CoC Amendments 2 and 3:</u>** CoC Condition 9 was not modified from Amendment 2 to Amendment 3. The CoC requirements were as follows in Amendments 2 and 3: "The heat transfer characteristics of the cask system will be recorded by temperature measurements for the first HI-STORM Cask Systems (for each thermally unique MPC basket design – MPC-24/24E/24F, 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

Table 1, CoC Conditions

Condition	Evaluation
9. SPECIAL REQUIREMENTS FOR FIRST SYSTEMS IN PLACE (cont'd)	The previous third paragraph of this CoC condition (now the second paragraph) was not changed in CoC Amendment 5. **CoC Amendment 5 Compliance Evaluation (Casks 13 and higher)** HCGS Compliance Evaluation (Casks 13 and higher) HCGS did not load any high burnup fuel and none of the casks have a heat load above the thresholds requiring air mass flow rate measurements or use of the SCS. Therefore, this CoC condition does not apply for HCGS casks 13-16. Condition 9 for HCGS casks beyond number 16 that have heat loads greater than 20 kW or require use of the SCS, is covered by the compliance evaluation for SGS casks 17 and higher, because the same overpack design is used for both stations' fuel and the same SCS system would be placed into service when required. See SGS discussion below. SGS Compliance Evaluation (Casks 17 and higher) SGS has loaded casks with contents and/or heat loads requiring cask air mass flow rate testing (per this CoC condition) and use of the SCS (per LCO 3.1.4). For the air mass flow rate testing requirement, Reference 6.24 confirms that the air mass flow rate test performed at Arkansas Nuclear One (ANO) on a cask with heat load exceeding 20 kW is applicable to the casks at the PSEG Nuclear ISFSI. Therefore, the cask air mass flow rate test portion of this CoC condition for Amendment 5 is met. SCS inlet and outlet temperatures and water flow rates were measured and recorded in accordance with an approved station procedure in 2010 during Salem Unit 1 cask loading. Based on a review of the PSEG SCS performance data, it can be concluded that the system was operating in accordance with Appendix 2.C of the HI-STORM FSAR. A formal submittal to the NRC summarizing the SCS validation test and analysis is in progress and is expected to be transmitted in mid-2012.

Table 1, CoC Conditions

Condition	Evaluation
12. AUTHORIZATION	By virtue of holding three 10 CFR Part 50 licenses, PSEG Nuclear also holds a general license for the storage of spent fuel at an ISFSI pursuant to 10 CFR 72.210. This CoC condition states that general licensees are authorized to use the HI-STORM 100 System under a 10 CFR 72 general license and provides direction regarding use of previously approved amendments to the CoC. PSEG Nuclear used Amendment 2 to CoC 1014 to load the four HCGS casks in the 2006-07 loading campaign and Amendment 3 to load the eight HCGS casks in the 2008 loading campaign. CoC Amendment 5 was/will be used to load casks from HCGS and SGS in 2010 and later. Revisions to this report will address the use of future CoC amendments, as necessary. See Appendix 2 to this report for the CoC amendment, FSAR revision, and approved interim design and licensing basis changes applicable to each cask loading campaign and licensed storage system component.

Table 2, CoC Appendix A — Technical Specifications

Technical Specification	Evaluation
3.1.1 Multi-Purpose Canister (MPC) (cont'd)	**CoC Amendment 5:** 1) The LCO was revised to add a 40-hour limit for vacuum drying time of casks with heat loads between 23 kW and 28.74 kW and prohibit use of the vacuum drying system (VDS) on canisters with heats loads exceeding 28.74 kW (TS Table 3-1 further restricts VDS use to 26 kW). 2) Required Action A.2 was revised to replace "return the MPC to an analyzed condition" to "return the MPC to compliance with Table 3-1." 3) New Condition B and Action B.1 were added to reflect the time limit on vacuum drying. The remaining Conditions and Required Actions were re-lettered appropriately. 4) Required Action C.2 (previously B.2) was revised to add "by adding helium to or removing helium from the MPC" to the end of the action statement. 5) New Required Action C.2.2 was added to permit an option to Action C.2 to demonstrate by analysis that all limits for cask components and contents can be met in the event the helium backfill limit is not met. 6) Required Action D.2 (previously C.2) was revised to replace "return the MPC to an analyzed condition" to "return the MPC to compliance with SR 3.1.1.3." 7) SR 3.1.1.1 was revised to refer to the vacuum drying time limits for higher heat load casks. 8) SR 3.1.1.2 was revised to add a statement that re-performance of the SR is not required after successful completion of Required Action C.2.2. 9) SR 3.1.1.3 was revised to make a grammatical correction. The above changes to this technical specification have been reflected, as appropriate, in the SGS and HCGS cask loading procedures. At HCGS, the acceptance criteria for the MPC-68/68FF are applicable, and compliance with the MPC drying and backfilling acceptance criteria is demonstrated by procedure (Reference 6.31.6). At SGS, the acceptance criteria for the MPC-32/32F are applicable, and compliance with the MPC drying and backfilling acceptance criteria is demonstrated by procedure (Reference 6.56.6). Helium leakage testing of the vent and drain port cover plates is performed in accordance with ANSI N14.5 with a "leaktight" acceptance criterion, and is also demonstrated in the same procedures.
3.1.2 SFSC Heat Removal System	LCO 3.1.2 requires the natural ventilation heat removal system of the HI-STORM 100 System to be operable at all times during storage operations at the ISFSI. Surveillance Requirement 3.1.2.1 requires periodic inspection of the overpack inlet

Table 2, CoC Appendix A — Technical Specifications

Technical Specification	Evaluation
3.1.3 Fuel Cool-Down **(for casks 1-4)**	By design, the HI-STORM 100 System is never expected to be required to be unloaded of fuel. However, if MPC unloading is required for some unforeseen reason, LCO 3.1.3 (Amendment 2) requires the MPC cavity bulk helium temperature to be less than a specific value before re-flooding of the MPC is permitted in preparation for fuel removal in the spent fuel pool. Meeting this LCO precludes significant fuel quenching or MPC pressurization due to water flashing during re-flooding. Procedural controls are used to verify whether LCO 3.1.3 is met via implementation of SR 3.1.3.1 (Reference 6.31.9) and are also used to implement the Required Actions if the LCO is not met (Reference 6.31.26). SR 3.1.3.1 allows establishing the MPC cavity bulk helium temperature prior to re-flooding by analysis or by direct measurement. If the predicted or measured bulk helium temperature is above the LCO limit, any appropriate cooling method is acceptable to reduce the bulk helium temperature to below the LCO limit to allow re-flooding operations to proceed. See also Reference 6.9.
3.1.3 MPC Cavity Re-flooding **(for casks 5-20)**	This LCO (as revised in CoC Amendment 3 and remaining in Amendment 5) requires MPC cavity pressure to be less than 100 psig prior to, and during re-flooding. Meeting this LCO precludes significant fuel quenching or MPC pressurization due to water flashing during re-flooding. Procedural controls are used to verify that LCO 3.1.3 is met via implementation of SR 3.1.3.1 (References 6.31.9 and 6.56.9) and are also used to implement the Required Actions if the LCO is not met (Reference 6.61.1). SR 3.1.3.1 allows ensuring the MPC cavity pressure prior to re-flooding meets the LCO limit by analysis or by direct measurement. If the predicted or measured pressure is above the LCO limit, re-flooding must be stopped and cannot resume until the pressure is within the LCO limit and the MPC vent port is verified not to be blocked. Because there are HCGS casks at the ISFSI that were loaded to Amendments 2, 3 and 5 of the CoC, References 6.31.9 and 6.61.1 contain instructions for meeting both sets of requirements. See Appendix 2 for the CoC amendment applicable to each cask component serial number.
3.1.4 Supplemental Cooling System	<u>**CoC Amendments 2 and 3 (casks 1 – 12):**</u> The Supplemental Cooling System (SCS) is required to be operable when high burnup (HBU) fuel (> 45,000 MWD/MTU) is in an MPC inside the HI-TRAC transfer cask. Use of the SCS ensures the HBU fuel cladding temperature remains below the applicable limit during on-site transfer cask operations. The SCS is not required for on-site transfer cask operations if all of the fuel in the MPC is burned less than or equal to 45,000 MWD/MTU. No HBU fuel was placed into dry storage in the first 12 HCGS casks. Thus this LCO is not applicable to the first 12 casks of HCGS fuel in storage at the ISFSI.

Table 2, CoC Appendix A — Technical Specifications

Technical Specification	Evaluation
Table 3-1	CoC Table 3-1 augments LCO 3.1.1 by providing the maximum permissible heat loads for use of the vacuum drying system (VDS), above which the Forced Helium Dehydration (FHD) system must be used for MPC drying. The FHD System is also required to dry any MPCs containing one or more HBU fuel assemblies. In CoC Amendment 5 the table was revised: 1) Different heat load thresholds for the various MPC models are established to require FHD System use for MPCs containing no HBU fuel. Below these heat load thresholds, MPCs containing no HBU fuel may be dried using the VDS. (Note that the VDS threshold of 26 kW in Table 3-1 is lower than the VDS threshold of 28.74 kW in LCO 3.1.1 – PSEG uses the more conservative limit of 26 kW.) 2) A new maximum heat load value of 36.9 kW is provided for any MPC. 3) A new Note 3 is added to the table that requires the HI-TRAC-to-MPC annulus to either be filled or continuously flushed with water during vacuum drying operations, based on heat load thresholds. The HCGS cask loading procedure implementing these requirements has been revised, as required, to reflect these new requirements when vacuum drying is used (Reference 6.31.6). All SGS MPCs loaded in accordance with CoC Amendment 5 will be dried using the FHD System, regardless of heat load. Thus, the vacuum drying requirements do not apply to SGS MPCs. The SGS drying and sealing procedure implements the MPC drying requirements (Reference 6.56.6).
Table 3-2	CoC Table 3-2 augments LCO 3.1.1 by providing the required helium backfill pressure ranges based on MPC model and heat load. The SGS and HCGS cask loading procedures have been appropriately revised to reflect these requirements (Reference 6.31.6 and 6.56.6).
4.0 INTENTIONALLY BLANK	None.
5.0 ADMINISTRATIVE CONTROLS AND PROGRAMS	This section of CoC Appendix A provides requirements for certain programmatic controls necessary to ensure the dry storage system is used on site in a manner consistent with the regulations and the generic cask design. Each program is addressed individually below.
5.1 Deleted	None.
5.2 Deleted	None.
5.3 Deleted	None.

Table 2, CoC Appendix A — Technical Specifications

Technical Specification	Evaluation
5.5 Cask Transport Evaluation Program	CoC Administrative Program 5.5 requires the general licensee to evaluate the conditions pertaining to transporting the fuel-loaded cask between the Part 50 facility and the ISFSI. The purpose of this program is to ensure one of two things: 1. The combination of the physical characteristics of the heavy haul path and the carry height for the cask are such that a cask drop event would be bounded by the design basis cask drop event described in the FSAR, or: 2. The cask transporter design features meet certain requirements that allow a drop event to be considered non-credible. Movement of a fuel-loaded HI-STORM overpack and MPC outside of the SGS or HCGS structures governed by 10 CFR 50 is performed in accordance with approved PSEG Nuclear procedures (References 6.31.3, 6.31.8, 6.56.3, and 6.56.8). The HI-STORM CoC requirement for a Cask Transport Evaluation Program (CTEP) is implemented by the cask transportation procedure and the design attributes of the vertical cask transporter (VCT) used to move the fuel-loaded overpack from the Hope Creek Reactor Building or the Salem Fuel Handling Building to the ISFSI. **<u>HCGS Compliance Evaluation</u>** The HI-STORM overpack containing a loaded MPC is moved outside of the HCGS Reactor Building receiving bay on a low profile transporter (LPT) to a location where the VCT can access the cask. The LPT supports the HI-STORM overpack from underneath. Therefore, consistent with Technical Specification 5.5, the Cask Transport Evaluation Program does not apply to movement of a loaded HI-STORM overpack and MPC on the LPT while in the Reactor Building receiving bay and just outside the receiving bay door. The HI-STORM overpack is moved out of the HCGS Reactor Building without its lid installed due to receiving bay door clearance limitations. The lid is installed as soon as possible after the overpack exits the Reactor Building while the cask is still on the LPT. The lid installation occurs within approximately 50 feet of the Reactor Building door and is expected to be complete in approximately 1-2 hours. Procedures and training include instructions to complete the lid installation without interruption (Reference 6.31.3). The outdoor lid installation is not addressed in the HI-STORM 100 System FSAR except for MPC transfers conducted in a Cask Transfer Facility. Therefore, as part of the Design Change Package for dry cask loading operations, a 10 CFR 72.48 screening was performed to authorize the implementation of this operating evolution as a deviation from the HI-STORM 100 System FSAR (Reference 6.34).

5.5	Cask Transport Evaluation Program (cont'd)	complete in approximately 1-2 hours. Procedures and training include instructions to complete the lid installation without interruption (Reference 6.56.3). The HI-STORM overpack and MPC are moved from just outside the SGS Unit 1 or 2 Fuel Handling Building to the ISFSI pads using the VCT. The VCT is designed in accordance with ANSI N14.6 and has redundant drop protection design features (Reference 6.8). Therefore, in accordance with Technical Specification 5.5, no maximum lift height is established and a cask drop need not be postulated along the heavy haul path. Therefore, Technical Specification 5.5 does not apply to movements of a fuel-loaded HI-STORM overpack and MPC with the VCT. Even though a cask drop is not required to be postulated, the lift height of the cask during transport to the ISFSI pad is maintained by procedure as low as practicable above the surface for prudence (Reference 6.56.3 and 6.56.8). A fuel-loaded HI-TRAC transfer cask is never moved outside of SGS structures that are governed by 10 CFR 50. Therefore, Technical Specification 5.5 does not apply to movements of a fuel-loaded HI-TRAC transfer cask and MPC at SGS.
5.6	Deleted	None.
5.7	Radiation Protection Program	The SGS and HCGS Radiation Protection Programs have been augmented to address fuel loading, cask handling, and ISFSI operations, as applicable. Implementing procedures ensure that each of the elements of the program required by Technical Specification 5.7 is addressed (References 6.31.20 through 22, 6.56.15, 6.56.16, and 6.33.1). Programmatic changes to the PSEG radiation protection program are discussed in Section 5.7.1.4 of this report.

Table 3, CoC Appendix B — Approved Contents and Design Features

Approved Contents and Design Features	Evaluation
2.1 Fuel Specifications and Loading Conditions (cont'd)	SGS spent fuel types are listed below: • Westinghouse Standard • Westinghouse V5H • Westinghouse Vantage + • Westinghouse RFA • Westinghouse RFA-2 • Westinghouse OFA The physical parameters of these fuel types are bounded by array/classes 17x17A and 17x17B as defined in HI-STORM CoC Appendix B, Table 2.1-2. The SGS fuel characterization and selection procedures (References 6.56.11, and 6.56.12) are used to ensure the initial enrichment, cooling time, decay heat, and burnup of the assemblies chosen for dry storage comply with the limits in the CoC. **<u>Specification 2.1.1.b</u>** Specification 2.1.1.b establishes loading requirements for stainless steel clad fuel mixed with zirconium-based clad fuel. This requirement is not applicable to the Salem/Hope Creek ISFSI because SGS and HCGS fuel rods are all clad with zirconium-based material. **<u>Specification 2.1.1.c</u>** Specification 2.1.1.c establishes loading requirements for BWR fuel in the 6x6A, 6x6B, 6x6C, 7x7A, and 8x8A array/classes. These requirements are not applicable to the Salem/Hope Creek ISFSI because the specified array/classes do not apply to HCGS spent fuel. See the discussion for CoC Section 2.1.1.a above for the array/classes applicable to HCGS spent fuel. This specification does not apply to SGS because it is a PWR plant. **<u>Specification 2.1.1.d</u>** Specification 2.1.1.d establishes loading requirements for BWR fuel in array/classes 10x10D and 10x10E with stainless steel channels. These requirements are not applicable to the Salem/Hope Creek ISFSI because all HCGS 10x10 fuel is in array/class 10x10A or 10x10C as discussed above for CoC Section 2.1.1.a. This specification does not apply to SGS because it is a PWR plant.

Table 3, CoC Appendix B — Approved Contents and Design Features

Approved Contents and Design Features	Evaluation
3.2 Design Features Important for Criticality Control	This CoC section establishes limits for certain design features deemed important to criticality control by the NRC for the various HI-STORM 100 System MPC models. Specifications 3.2.1 and 3.2.4 apply to 24-assembly PWR MPCs and are not evaluated further at this time because SGS uses the MPC-32. Specification 3.2.3 also does not apply to HCGS fuel because these requirements apply to a specialty BWR MPC (MPC-68F), which was custom-designed for a particular type of BWR fuel not used at HCGS. HCGS fuel may be stored in the MPC-68 and/or -68FF model canisters governed by Specification 3.2.2 as discussed below. Specifications 3.2.6 through 3.2.8 apply to all MPC models used for storage of spent fuel in the HI-STORM 100 System and are evaluated below for use at SGS and HCGS. SGS and HCGS exclusively use MPCs equipped with METAMIC™ neutron absorber. Therefore, CoC requirements related to Boral neutron absorber are not applicable and Boral-equipped MPCs may not be used to store SGS or HCGS spent fuel without a revision to this report.
3.2.2 MPC-68 and MPC-68FF	This specification establishes the following limits on the MPC-68/68FF model fuel basket design and fabrication used to store HCGS spent fuel: 1. Fuel cell pitch: $\geq$ 6.43 inches 2. ^{10}B loading in the METAMIC™ neutron absorber: ≥ 0.0310 g/cm^2 The fuel cell pitch and ^{10}B loading of the METAMIC™ neutron absorbers in the MPC are verified as part of MPC fabrication. Certification that each MPC meets these technical specification limits is provided by the CoC holder (Holtec International) in the Component Completion Record (CCR) for each serial number MPC. Each fabricated MPC-68/68FF is quality-control checked to ensure that it meets the specific design features for criticality and certified as such. A CCR cannot be issued if an as-built MPC does not meet these CoC design feature requirements. CCRs for each loaded MPC are part of the quality document file for the hardware provided by the CoC holder.

Table 3, CoC Appendix B — Approved Contents and Design Features

Approved Contents and Design Features	Evaluation
3.2.8 Neutron Absorber Tests	Specification 3.2.8 incorporates the language in HI-STORM FSAR Section 9.1.5.3 pertaining to neutron absorber testing into the CoC by reference. Neutron absorber testing is verified to meet these requirements by the CoC holder and documented in the CCR for each serial number MPC and/or maintained in Holtec's records management system.
3.3 Codes and Standards	This specification establishes the governing codes for the HI-STORM 100 System. The governing code for the construction and structural design of the HI-STORM 100 System MPC, HI-TRAC transfer cask, and the metal components in the HI-STORM overpack is the 1995 edition of the ASME Boiler and Pressure Vessel Code (ASME Code), with addenda through 1997, except for Sections V and IX. The latest effective editions of Sections V and IX may be used for activities governed by those sections (NDE and welding). The governing code for the concrete in the HI-STORM overpack is American Concrete Institute (ACI) 349-1985, as clarified in cask FSAR Appendix 1.D. NRC-approved alternatives to the ASME Code are listed in Table 3-1 of this CoC section. New or revised alternatives must be submitted to the NRC for approval prior to implementation in accordance with CoC Section 3.3.2. Alternatives to the ASME Code are requested by the CoC holder. Holtec assures that all applicable Code requirements are met during fabrication of the cask components. No PSEG action or further evaluation is required.
3.4 Site-Specific Parameters and Analyses	This CoC section establishes various requirements to be evaluated against site-specific conditions at the plant to ensure the generic cask design is bounding for the site. Each parameter is discussed separately below.
3.4.1 Average Site Temperature	The maximum average yearly temperature on-site must not exceed 80°F. As documented in Table 2.3-12 of the HCGS UFSAR, the mean maximum average yearly annual temperature at the HCGS site is 53.1°F, which is less than the 80°F acceptance criterion, and is therefore in compliance with the CoC.
3.4.2 Extreme Site Temperature	The 3-day average temperature extremes must be greater than -40°F and less than 125°F. The lowest and highest hourly temperatures measured at HCGS site are -1°F and 94°F, respectively, as stated in HCGS UFSAR Table 2.3-12. The low temperature extremes at HCGS site (averaged over a 3 day period) are greater than –40°F, and the high temperature extreme is less than 125°F. Therefore, the HCGS site temperature extremes are in compliance with the CoC.

Table 3, CoC Appendix B — Approved Contents and Design Features

Approved Contents and Design Features	Evaluation
3.4.6 Cask Drop and Tipover	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 less than or equal 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 ISFSI pad thickness, concrete compressive strength, and reinforcing bar design meet the limits for Set 'A' in HI-STORM FSAR Table 2.2.9. However the ISFSI pad subgrade modulus of elasticity exceeds the 28,000 psi limit in the HI-STORM FSAR (Reference 6.18, Attachment J). This CoC specification permits a site-specific drop and tipover analysis to be performed if this is the case. Because the VCT is designed in accordance with ANSI N14.6 with redundant drop protection features (Reference 6.8), a cask drop is not postulated or analyzed. However, the non-mechanistic tipover must be analyzed. The site-specific analysis of a HI-STORM 100S Version B overpack tipover onto the ISFSI pad was performed. The results of the analysis show that the deceleration at the top of the fuel for this event is 39.2 g's (Reference 6.36). This value is less than the HI-STORM 100 System design basis value of 45 g's. Therefore, this CoC requirement is met. Because the HI-STORM overpacks will be handled with a device designed in accordance with ANSI N14.6 and having redundant drop protection features (Reference 6.8), there is no lift height restriction above the ISFSI pad. However, as a defense-in-depth measure, the cask will be carried no higher and no longer than necessary above the pad surface. During construction of the ISFSI pads, a section of the west pad (Pad No.1, Section 1A) was found to have a problem with water ponding. The repair for this problem was performed with grout, which has a compressive strength greater than the maximum permitted value of 4,200 psi. This repair has been evaluated by Holtec as a supplier manufacturing deviation report (SMDR No. 1410, Rev. 2) and found to be acceptable as-is via Holtec 72.48 No. 778, Revision 2. Therefore, this section of pad may be used to deploy casks.
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. No engineered features such as berms or shield walls are credited in the dose analysis performed to demonstrate compliance with the dose limits of 10 CFR 72.104(a) for the Salem/Hope Creek ISFSI. Therefore, this requirement is not applicable.

Table 3, CoC Appendix B — Approved Contents and Design Features

Approved Contents and Design Features	Evaluation
3.6 Forced Helium Dehydration System	This specification establishes requirements for the Forced Helium Dehydration (FHD) System, if used for canister drying instead of vacuum drying. Holtec International has certified that the FHD System used at SGS meets the design criteria requirements in Specification 3.6.2 and has performed the thermal analysis required by Specification 3.6.3, as documented in Reference 6.74.
3.7 Supplemental Cooling System	The Supplemental Cooling System (SCS) is a water circulation system for cooling the MPC inside the HI-TRAC transfer cask during on-site transport. Use of the SCS is required by LCO 3.1.4 for HI-TRAC operation with an MPC containing one or more high burnup (> 45,000 MWD/MTU) fuel assemblies or if the MPC has a total heat load greater than 28.74 kW. Use of the SCS will be dictated by procedure at the time of loading based on the contents and heat load of a given MPC. Holtec International has certified that the SCS used at PSEG meets the design criteria requirements in TS Section 3.7.2 (Reference 6.68). Backup power supplies (TS Section 3.7.2.2) are provided in accordance with procedures (References 6.56.6 and 6.56.8).
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. This requirement is implemented by procedure (References 6.31.6, 6.56.6, 6.61.1 and 6.61.2).

FUEL LOADING CAMPAIGN	PLANT	COMPONENT MODEL AND SERIAL NUMBER (S/N)	HI-STORM COC AMNDT	HI-STORM FSAR REVISION	APPROVED INTERIM CHANGES*	FUNCTIONAL LOCATION[6] (FLOC)
2008 (Casks 5-12)	HC	MPC-68 Serial Nos. 1021-147 through –154	3	5	None	C1DCS-00S5MPC-201 (S/N 152) C1DCS-00S5MPC-202 (S/N 148) C1DCS-00S5MPC-203 (S/N 151) C1DCS-00S5MPC-204 (S/N 153) C1DCS-00S5MPC-235 (S/N 149) C1DCS-00S5MPC-236 (S/N 147) C1DCS-00S5MPC-237 (S/N 150) C1DCS-00S5MPC-238 (S/N 154)
2008 (Casks 5-12)	HC	HI-STORM 100S-218 Version B Overpack Serial Nos. 1024-193 through -200	3	5	None	C1DCS-00S5HI-STORM-201 (S/N 193) C1DCS-00S5HI-STORM-202 (S/N 200) C1DCS-00S5HI-STORM-203 (S/N 198) C1DCS-00S5HI-STORM-204 (S/N 194) C1DCS-00S5HI-STORM-235 (S/N 197) C1DCS-00S5HI-STORM-236 (S/N 196 C1DCS-00S5HI-STORM-237 (S/N 199) C1DCS-00S5HI-STORM-238 (S/N 195)
2010 (Casks 13-16)	HC	MPC-68 Serial Nos. 1021-155 through -158	5	7	1021-96R1	C1DCS-00S5MPC-101H1 (S/N 155) C1DCS-00S5MPC-102H1 (S/N 156) C1DCS-00S5MPC-103H1 (S/N 157) C1DCS-00S5MPC-104H1 (S/N 158)
2010 (Casks 13-16)	HC	HI-STORM 100S-218 Version B Overpack Serial Nos. 1024-201 through -204	5	7	None	C1DCS-00S5HI-STORM-101H1 (S/N 201) C1DCS-00S5HI-STORM-102H1 (S/N 202) C1DCS-00S5HI-STORM-103H1 (S/N 203) C1DCS-00S5HI-STORM-104H1 (S/N 204)
2010 (Casks 17-20)	Salem 1	MPC-32 Serial Nos. 1023-93 through -96	5	7	1023-57R0 1023-58R0	C1DCS-00S5MPC-135S1 (S/N 93) C1DCS-00S5MPC-136S1 (S/N 96) C1DCS-00S5MPC-137S1 (S/N 94) C1DCS-00S5MPC-138S1 (S/N 95)
2010 (Casks 17-20)	Salem 1	HI-STORM 100S-218 Version B Overpack Serial Nos. 1024-327 through -330	5	7	None	C1DCS-00S5HI-STORM-135S1 (S/N 327) C1DCS-00S5HI-STORM-136S1 (S/N 328) C1DCS-00S5HI-STORM-137S1 (S/N 329) C1DCS-00S5HI-STORM-138S1 (S/N 330)