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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053
Telephone (856) 797-0900
Fax (856) 797-0909

July 10, 2006

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Reference: 1. USNRC Docket No. 72-1014 (HI-STORM 100), TAC L23850
2. Holtec Project 5014
3. Letter from C. Regan (NRC) to E. Rosenbaum (Holtec), dated 6 June 2006
4. Holtec Letter 5014587, dated 18 February 2006

Subject: Response to RAI on License Amendment Request #3 to HI-STORM 100 CoC

Dear Sir:

Via letter (Reference 3), the SFPO requested that we provide additional information on our proposed amendment (Reference 4) to our HI-STORM 100 Certificate of Compliance. We herein respond to the SFPO's request.

The text matter in the proposed revised HI-STORM 100 FSAR (Attachment 4) has been amended to incorporate the changes arising from the RAI. Likewise, the verbiage in the Proposed CoC (Attachment 3) has been updated in response to the RAI. Several RAIs requested that we provide updated copies of Holtec Proprietary documents and calculation data files or, in one instance, a GE Proprietary document. Withholding from public disclosure is requested for these items, and an affidavit pursuant to 10 CFR 2.390 is attached. We note that the NRC has previously held earlier versions of the Holtec documents and files from public disclosure.

The following attachments all are provided in electronic format:

Attachment 1: Written Responses to NRC Request for Additional Information

Attachment 2: Revised Summary of Proposed Changes

Attachment 3: Revised Proposed CoC Changes in Markup Format – Deletions are shown in strikeout. Insertions are marked by vertical bars in the right margin.

Attachment 4: Proposed Revised FSAR Sections – Information on the new HI-STORM 100U overpack is compiled in supplements to each chapter, each numbered as xx.I where

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xx is the chapter that is supplemented. Revised sections are notated as Rev. 3.F in the footer.

Attachment 5: Affidavit Pursuant to 10CFR2.390 – Affidavit requesting that information in Attachments 7 through 10 claimed as proprietary, and appropriately marked as such, be withheld from public disclosure. This attachment has been provided in hardcopy format as well as in electronic format.

Attachment 6: GE/SNC/Holtec Proprietary Information Agreement – Holtec has entered into an agreement with GE and SNC to withhold GE Proprietary information from public disclosure. Therefore, Attachment 5 covers GE Proprietary information as well.

Attachment 7: HI-STORM 100U Bill of Materials – Withholding from public disclosure of this attachment is requested (see Attachment 5).

Attachment 8: Letter from GE Nuclear Energy (BWR Grid Thickness Reference) – Withholding from public disclosure of this attachment is requested (see Attachments 5 and 6).

Attachment 9: Structural and Thermal Calculation Packages – Withholding from public disclosure of this attachment is requested (see Attachment 5).

Attachment 10: Structural and Thermal Data Files – Withholding from public disclosure of this attachment is requested (see Attachment 5).

Sincerely,

Evan Rosenbaum, P.E.
Project Manager, LAR 1014-3

Approved:

Stefan Anton, Dr.-Ing.
Licensing Manager

cc: Mr. Christopher Regan, NRC
Holtec Groups 1, 2 and 4
HUG Main and Licensing Committees

Attachment 1 to Holtec Letter 5014603
Holtec Responses to NRC RAIs

General:

G.1. Justify inclusion of the 16x16 CE System 80+ assembly as approved contents for the Multi-Purpose Canisters (MPCs).

The 16x16 CE System 80+ assembly is 178.3 inches tall, excluding manufacturing tolerances and any swelling and deformations experienced during irradiation in the reactor. The current MPC (see Drawing 3923, Revision 13) has a cavity dimension of 178.3125 inches. Thus the clearance would be 0.0125 inches. The fuel assembly manufacturing tolerances alone appear sufficient to make this assembly unable to fit in the current MPC design. Furthermore, the applicant has recognized that the assembly does not physically fit into the MPC. The SAR should be revised to remove the changes that were made in order to include the fuel assembly in the approved contents list or additional justification should be provided to demonstrate that the fuel assembly will fit in the MPC and thus be included in the approved contents list.

This information is needed to confirm compliance with 10 CFR 72.11(a) and 72.236(a).

Holtec Response: The 16x16 CE System 80+ fuel assembly has been removed from the approved contents. Both the Proposed Revised FSAR and the Proposed Revised Technical Specifications have been modified to reflect this removal. Note that other changes to the assembly class 16x16A will be retained.

Chapter 1 - General Description

1.1 Provide ASME specifications, or more detailed requirements and criteria, for the alternative materials mentioned for the items listed as important to safety items in SAR Chapter 1, drawing 4762, sheet 2, rev. 0, and SAR table 2.I.7.

The bill of materials states "or equivalent" for numerous important to safety items. The staff appreciates that flexibility of material choice is possible and desired for these components. However, the phrase "or equivalent" does not convey sufficiently what the substitute material may be or what the desired material properties must be. The staff notes that the applicant has previously employed the "alloy x" method for handling certain material substitutions.
This information is required for compliance with 10 CFR 72.25(c)(3).

Holtec Response: We concur with the Staff's concern that the phrases "or equivalent" and "or equal" have the potential to be misused to replace the specified material for an important to safety item with an inadequate material because of the lack of specificity in these terms. To eliminate this deficiency, a definition for "Equivalent (or Equal) Material" has been added to Table 1.0.1 of the Proposed Revised FSAR. This new definition is referred to in Table 2.I.7, which serves as the Bill-of-Materials in the FSAR, to ensure the correct usage of the term "or equal" when used to denote a substitute material.

A clarifying note has also been added to Drawing 4762, which is a manufacturing processing document (rather than a Licensing document). By incorporating clarifying definitions for the terms "equivalent" and "equal" in both the upper-tier document (the FSAR) and the lower-tier document (Drawing 4762), the Q.A. imperative of configuration management is assured to be satisfied.

1-2. Include the Bill of Materials (BOM) for the HI-STORM 100U submitted as Attachment 6 to the February 18, 2006, transmittal letter in the FSAR or propose equivalent information from the BOM to be added to the FSAR. [November 30, 2005, RAI 1-3]

The BOM provides a needed compendium linking the item number and nomenclature of the various components with the identification of the material reference specification to be used in fabrication, nominal dimensions, and its safety classification that can be used for evaluation of the cask system. It should be noted that a similar Bill of Materials, BM-1575, for the HI-STORM 100 Overpack is currently included in the FSAR, Section 1.5,

This information is needed to determine compliance with 10 CFR 72.24 (c)(3), 10 CFR 72.236 (b), and 10 CFR 72.236 (l).

Holtec Response: The practice of including detailed Bills-of-Materials wholesale in the FSAR was discontinued, with the SFPO's concurrence, several years ago in favor of including all relevant information in the FSAR. The Bill-of-Materials on Drawing 4762, intended to serve as a manufacturing document, is ill-suited to be part of the FSAR, where every piece of information, no matter how trivial, is subject to a cumbersome assessment process before any modification can be made. To fulfill the objective of completeness in the FSAR, the practice adopted by us and endorsed by the SFPO has been to include all critical information such as the material, dimensions and ITS Category of the components in the body of the FSAR. Accordingly, licensing drawing 4501, included in Section 1.5 of the Proposed Revised FSAR, contains the material type (i.e., carbon steel, stainless steel, concrete, etc.) and critical dimensions of the HI-STORM 100U components and Table 2.I.7 in the FSAR lists the material and ITS Category of the components. In this manner, all information on materials that bears upon the intended function of the system has been incorporated in the Proposed Revised FSAR, without the added non-essential information that a manufacturing document such as a Bill-of-Materials inevitably must contain.

Chapter 2 - Principal Design Criteria

2-1 Provide adequate details of the joint (minimum depth of 24") configuration including the joint width and joint material used between the portion of the top pad surrounding the Cavity Enclosure Container (CEC) and that portion of the top pad that serves as the transporter riding surface. [November 30, 2005, RAI 2-1]

The details should be sufficient to determine if the joint will be a true isolation joint to preclude loading of the CEC outer shell caused by a defined maximum differential settlement across the transporter riding surface. The details of a typical expansion joint added to Drawing 4501, Sheet 3, as an illustrative detail, appears only as a straight line

at the toe of the slope for the transition between top pad portions, without any other detail.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: Details of the expansion joint, including joint materials, have been added to Licensing Drawing 4501 as requested.

2-2. Revise the FSAR to indicate that the integrity of the caulking system used in conjunction with the concrete top pad and the corrosion protection coating of the CEC will undergo routine visual surveillance at an appropriate frequency based on service conditions and material manufacturer's recommendations as part of the Independent Spent Fuel Storage Installation's (ISFSI's) preventive maintenance program. [November 30, 2005, RAI 2-2]

The NRC staff considers the caulk seals to be secondary barriers in the corrosion protection system that are to preclude surface moisture access to the below grade portions of the Vertically Ventilated Module (VVM).

This information is needed to determine compliance with 10 CFR 72.236 (g) of the CEC.

Holtec Response: The visual surveillance requested in this RAI is included, albeit in a different chapter (Chapter 9). It is noted that Item 4, Interfacing SSCs, in Table 9.I.1 of Proposed Revised FSAR Supplement 9.I, reads, "Ensure that ... the interface between the surface pad and the Container Flange is grouted (or caulked) if necessary." The surveillance is performed on an annual basis, which is more stringent than that recommended by the material manufacturer for limiting environmental conditions.

Chapter 3 - Structural Design

3-1. Provide for the inclusion of corrosion protected steel reinforcement within the protective concrete coating of the Concrete Enclosure Container (CEC).

The staff observes that the 5 inch thick concrete coating specified for protection of the CEC against corrosion is unreinforced. It is recognized that the use of reinforcement within concrete used for shielding purposes may introduce the potential for creating unintended voids within the concrete shield should the concrete mix bridge across the reinforcement during emplacement. However, in the case of the HI-STORM 100-U design, the specified concrete around the CEC is for corrosion control only. To better aid this concrete's purpose of forming a water-retarding, corrosion inhibiting layer, the staff suggests that some reinforcement be included. Reinforcement would aid in controlling the size of any shrinkage cracks that are bound to eventually form in this protective concrete layer.

This information is required for compliance with 10 CFR 72.25(c)(3).

Holtec Response: Proposed Revised FSAR Supplement 3.I, Section 3.I.4.1, has been revised to incorporate corrosion protected reinforcement in the form of fibers or steel wire within the concrete encasement solely to control cracking.

3-2. Re-include on Drawing 4501, Sheet 5, the bottom view of the closure lid assembly showing the vertical lid buttress and the location of the section cut, previously identified as Section F-F, and re-include the revised Drawing 4501, Sheet 6, reflecting the increased size of the inlet openings. [November 30, 2005, RAI 3-2]

The details to be provided on the referenced drawings are necessary for the NRC staff review and evaluation.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The lid bottom view has been restored to Sheet 5 of the drawing, as requested. A sheet that provides dimensional details of the shield domes, inlet and outlet plates, and closure lid outer shell has been added as well.

3-3. Clarify what design characteristics and configurations of the HI-STORM 100U are in fact addressed by the Calculation Package for the HI-STORM 100U, Holtec Report No. HI-2053389, Rev. 1, dated February 17, 2006. [November 30, 2005, RAI 3-3].

The scope of Holtec Report No. HI-2053389 is referred to as "including all of its versions" yet only a single design concept appears to be addressed based on the figures included in the calculation and the proposed FSAR supplements.

This information is needed to determine compliance with 10 CFR 72.238.

Holtec Response: We regret the lack of editorial clarity in the Calculation Package. The introductory material in Holtec Report HI-2053389 has been revised to clarify the intent of the report. The re-wording clarifies that as individual calculations for the HI-STORM 100U are revised, updated, or added to support allowable ongoing changes after initial licensing new Supplements 1, 2, etc. are added, but that the original calculations remain in the report as "Supplement 0". The report itself is specific to the HI-STORM 100U and is the repository for all calculations that support the HI-STORM 100U design, either for initial licensing (Supplement 0), or for subsequent modifications permitted under the 10 CFR 72.48 process or for new licensing submittals.

3-4. Provide justification for the assumption that a rigid foundation pad results in a conservative response for the HI-STORM 100U system under seismic loading conditions. [November 30, 2005, RAI 3-3]

Previous Soil Structure Interaction (SSI) analyses of 2 foot thick ISFSI pads show that the bending flexibility of the pad results in amplification at the cask center of gravity (c.g.) of as much as 1.6 above the cask base acceleration. (Reference: Bjorkman, et al., "Influence of ISFSI Design Parameters on the Seismic Response of Dry Storage Casks," SMiRT-16, 2001, Washington, D.C.) While the amount of bending amplification from a sub-surface foundation may not be as great, amplification is still expected. The assumption of a rigid foundation implies no amplification and biases the behavior of the system.

This information is needed to determine compliance with 10 CFR 72.236 (l)

Holtec Response: The inflexible foundation pad assumption is not intended to be a mandatory element of the seismic solution model. It was made to define a well-posed problem to analyze a single VVM surrounded by a substrate of limiting strength properties and a reference top concrete pad. As such, the model treated in the Proposed Revised FSAR considers the scenario of a single VVM ISFSI wherein the foundation pad is founded on bedrock and subject to a specified strong seismic motion.

In real life ISFSIs, the bedrock may be at a much greater depth than the base mat of the VVM, and pilings or other means may be used to support the weight of the VVMs. To deal with the variety of circumstances that may occur in the use of the "100U" technology at a given site, it is necessary to set down the essentials of the SSI model in a prescriptive manner in the Proposed Revised FSAR so as to ensure that the seismic evaluation for every specific site shall be carried out using a consistent process. The essentials of the methodology that is to be followed by a site when performing a seismic evaluation has been added to Proposed Revised FSAR Subsection 3.I.4.7.1 as "non-alterable" text matter, i.e., one that cannot be amended using the §72.48 process. The Proposed Technical Specification (TS) has been modified to mandate the site-specific analysis in accordance with the methodology prescribed in Subsection 3.I.4.7, and to require that the increased safety factors (specified in Subsection 2.I, Table 2.I.6 for seismic qualification) be met or exceeded to satisfy the requirement of the Technical Specification.

3-5. Provide justification for the assumption that the lower portion of the CEC outer shell and the baseplate in the region of the exterior gussets at the Foundation Anchor Housings are rigid, and that this assumption results in a conservative response to seismic loading conditions. [November 30, 2005, RAI 3-3]

Lateral inertia forces acting on the loaded MPC are resisted by the external gusset plates welded to the CEC shell and baseplate. The circumferential distribution of radial forces acting on the gussets will be highly asymmetric and deform the gusset into the CEC shell, and apply shear and vertical tension to the weld joining the gusset to the baseplate. This will induce stresses in the shell and welds that have not been accounted for or evaluated in the design based on the calculations in Holtec Report No. HI-2053389.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The assumption of a rigid connection at the gusset locations was intended to ensure that the transmitted shear loading is maximized at those locations. The stresses in the CEC shell at the gusset connection locations are local stresses and, as such, need not be evaluated for Level D events. However, the gusset and the welds connecting the gusset to the CEC are subject to primary stresses and require evaluation. It is noted that the anchor lugs provide only a shear connection. The axially directed foundation anchor clips, as stated in the Proposed Revised FSAR, are an optional item, which will be utilized only at those sites where a high water table requires their use to prevent uplift from buoyancy when the CEC is empty (i.e., without the MPC). For this reason, no foundation anchor clips are included in the representative LS-DYNA simulation for earthquake analysis in the illustrative analysis provided in Subsection 3.I.4.7.2. Holtec has expanded the calculation package as necessary to demonstrate structural integrity of all anchor housing welds and gussets in the load path. The expanded calculation uses shear loads from a revised seismic response analysis (see responses to RAIs 3-7 and 3-11) with the rigid constraint removed at the shell-gusset connection, and steel (elastic) gussets added.

3-6. Provide justification that the analysis of a single VVM on a support foundation with lateral dimensions at least three times those of the top pad bounds the results for multiple VVMs on the support foundation for seismic loads. [November 30, 2005, RAI 3-3]

The SSI analysis considers only a single VVM on the support foundation, when in prac multiple VVMs be anchored to the pad at relatively close spacings. Based on the extensive length and width of the foundation pad in the seismic analysis model, it is much too large for a single VVM. Note that while Section 1.I.1 states that each VVM functions completely independent from any other VVM, the figures included in the documentation seem to indicate by section cuts into the figures that the support foundation extends beyond the VVM representation.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The seismic analysis has been performed and summarized in the Proposed Revised FSAR using a single VVM to serve as a sample solution following the prescribed methodology. In actual application, the number of VVMs, their spacing, and arrangement are apt to be unique for each ISFSI. The single VVM solution, strictly speaking, covers only one out of an infinitely large number of scenarios; the extent of the boundary considered, together with the non-reflective boundary conditions, is appropriate to accomplish the intent of the simulation to provide a representative solution using the solution methodology (see response to RAI 3-4).

At an ISFSI populated with an array of VVMs, it is reasonable to expect that the response obtained from a single VVM solution will be modified by the presence of multiple VVMs arrayed in a relatively tight pitch. However, the response of an individual VVM is not expected to be dramatically modified as there are no resonance or other discontinuous response mechanisms intrinsic to the physical problem. Therefore, by requiring that the single VVM solution meet or exceed the doubled safety factor threshold (i.e., two instead of one) (see responses to RAI 3-4 and RAI 3-7) provides the assurance that the solution of the multi-VVM geometry, if it were computationally feasible, will not produce an unacceptably low safety factor (i.e., less than 1.0).

3-7. Provide justification for not explicitly modeling the divider shell restraints, the VVM divider shell, the upper and lower MPC guides, the loaded MPC, and closure lid for the seismic analysis. Also, provide justification for how the mass of these components was distributed to the top flange ring and baseplate for the proposed seismic model. [November 30, 2005, RAI 3-3]

Based on the information provided, it is not clear what basis was used to conservatively characterize the 50% load distribution to the top flange ring and bottom baseplate for the participation in the soil structure interaction. Also, distributing mass uniformly to the top flange prevents asymmetric loading of the top flange by the lid, divider shell and MPC and leads to non-conservative results.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The Staff is correct in its observation in this RAI that the effect of MPC-to-CEC impact has not been explicitly simulated in the seismic analysis model. A simplified approach of lumping the mass of the MPC to the bottom and top guide locations in the CEC, used in the Proposed Revised FSAR, was motivated by the small gap available to the MPC for rattling during the vibratory input of an earthquake, and by the fact that the inertia forces associated with seismic events are apt to be a fraction of those for which the MPCs are qualified (45g under transverse (lateral) deceleration) under the postulated HI-STORM tip-over event at a surface ISFSI.

To provide a comprehensive response to this RAI, and to set down a new reference solution methodology for the Proposed Revised FSAR, a state-of-the-art dynamic model of the single VVM, including all rattling components, has been incorporated into FSAR Subsection 3.I.4.7.1. A sample analysis, illustrating the model and the evaluation is documented in Subsection 3.I.4.7.2. The following key attributes are required to be included in the model of the VVM:

i. The Cavity Enclosure Container (CEC) modeled using finite elements to simulate its shell, bottom plate, the Divider shell, and MPC guides in an explicit manner (mass lumping of components internal to the CEC is not permitted).
ii. The MPC shell, baseplate, and top lid modeled using appropriate finite elements.
iii. The fuel basket, a multi-flange beam made of intersecting plate elements, modeled with appropriate finite elements arrayed to simulate inter-plate connectivity (through longitudinal fillet welds) in an explicit manner.
iv. Each fuel assembly modeled inside its fuel basket cell cavity with the nominal fuel/cell gap assembly.
v. The nominal small gaps between the fuel basket and the MPC explicitly modeled, as is the gap between the MPC and the CEC at the upper and lower MPC guide locations.
vi. Each fuel assembly represented by an equivalent homogenous, isotropic prismatic beam of an equivalent elastic modulus that to match a lowest frequency response of the actual fuel assembly,
vii. The VVM closure lid modeled to capture its mass distribution and its lateral load transfer function during the seismic event.

viii The other features of the enveloping soil substrate grade and the top concrete pad remain as described in Subsection 3.I.4.7 of the Proposed Revised FSAR; the subgrade/CEC interface is permitted to open and close (i.e., it is not bonded) to simulate the real life structure in a faithful manner, and the top of foundation is driven by a specified seismic event.

The above prescription, together with those items described in the response to RAI 3-4, together set the methodology that is presented in Subsection 3.I.4.7.1 of the Proposed Revised FSAR.

The Proposed TS has been revised to require that a site-specific seismic analysis in accordance with the FSAR methodology inn Subsection 3.I.7.4.1 be performed. The mandated methodology as noted in the companion responses requires that the appropriate site-specific substrate and support down to bedrock (viz, response to RAI 3-8) to be modeled. The above methodology summary is incorporated by reference into the Proposed TS, and cannot be changed through the 72.48 process.

3-8. Demonstrate that the SSI model is adequate in depth and lateral extent to produce reasonably accurate results for the response under seismic loads. [November 30, 2005, RAI 3-3]
The buried support foundation and multiple VVMs anchored to the pad together with the entrapped soil between the VVMs could be considered the structure in the SSI analysis. The soil beneath the support foundation and the soil surrounding the exterior of the multiple VVMs are absent from the model. It should be demonstrated that the omission of the soil beneath the pad and around the exterior of the multiple VVMs leads to conservative results.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The solution presented in the Proposed Revised FSAR provides one example of the application of the methodology, and is not meant to provide a bounding solution that sites may cite to avoid additional simulations. As noted in the response to RAI 3-7, a site-specific analysis is mandated by the Technical Specification. The Proposed Revised FSAR and Proposed Technical Specifications have been revised to eliminate all text that infers that compliance can be shown by making a comparison of the input seismic event at the top of foundation with a pre-analyzed set of values in this FSAR.

3-9. Provide information that demonstrates the ability of LS-DYNA to accurately perform SSI analysis for buried structures under seismic loads. The information can be in the form of published benchmarks that have used accepted SSI computer codes such as SASSI (System for Analysis of Soil Structure Interaction). Provide a copy of Reference 1 by Stojko in CALC07. [November 30, 2005, RAI 3-3]

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The requested Stojko reference is provided as part of the RAI response package (Supplement No. 3.9.1). In addition,it is noted that the matter of using LS-DYNA for SSI analyses has recently been addressed in detail in NUREG/CR-6896, Assessment of Seismic Analysis Methodology for Deeply Embedded Nuclear Power Plant Structures, February 2006. In this document, several comparisons were made between SASSI and LS-DYNA where LS-DYNA was restricted to provide a linear solution (no soil/structure separation permitted). The LS-DYNA models involved approximately 275,000 nodes and 291,000 elements. Good agreement was observed between the results from the two programs. Subsequently, LS-DYNA was used to evaluate the effects of incorporation of soil/structure interfaces being able to open and close; the results showed that under strong motion seismic events, the non-linear effects could be significant. The overall conclusions reported in NUREG/CR-6896 support acceptance of LS-DYNA as an appropriate tool for the seismic evaluation of buried structures.

3-10. Provide a copy of the LS-DYNA SSI input and output files for the seismic analyses performed. [November 30, 2005, RAI 3-3]

CALC07 states that "the entire model is developed with brick elements." From the figure of the model provided in the calculation, the NRC staff cannot determine how many elements there are through the thickness of the shell and whether reduced integration was used.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The requested I/O files are provided as part of the RAI response package (Supplement No.3.10.1). CALC07 has been revised to clarify that CALC04 provides the basis for using a single layer of brick elements to model the CEC shell in the representative seismic analysis, and also been updated to reflect the revised sample simulation documented in Subsection 3.I.4.7.2.

3-11. Provide a seismic analysis for the 100U VVM system reflecting the above RAIs in which concrete around part of the CEC is used as the corrosion mitigation measure. [November 30, 2005, RAI 3-3]

The NRC staff considers that based on the table of options for corrosion mitigation in Section 3.I.4.1 of the proposed FSAR supplement, it is likely that many areas of use will be in a mild soil environment. As such, some users will not elect to use an impressed current cathodic protection system, therefore, concrete will possibly be the most prevalent mitigation measure.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The response to RAI 3-7 commits to providing a solution in the FSAR including the MPC and its internals so as to capture the effect of rattling on the seismic response. As part of this solution, the effect of a 5-inch layer of concrete surrounding the CEC container shell is also included by suitably increasing the weight of the CEC container cylindrical

shell. The concrete is slightly heavier than the surrounding substrate, but even though unreinforced, is stiffer than the surrounding substrate. By accounting only for its added mass of the concrete (and not its structural capacity) and attaching it to the CEC shell in a uniform manner (an increase in shell density), the solution is assured to be conservative.

3-12. Clarify the intent of the heading description "METHOD" used on the cover sheet of each of the nine separate calculations included in Holtec Report No: HI-2053389. Explain what constitutes a change in evaluation method performed with ANSYS software or where the method is described as "Strength of Materials." [November 30, 2005, RAI 3-3] The language of 10 CFR 72.48(a)(2) addresses a "departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses." The NRC staff must assure that the items important to safety have been evaluated by means acceptable to the NRC to demonstrate that the storage system will reasonably maintain confinement of radioactive material under the required design conditions. The NRC staff must have an understanding of what would constitute a departure in method of evaluation for these calculations. For example, it is not clear in CALC 009, which states the method as "ANSYS," or in CALC 008, which states the method as "Strength of Materials," what would constitute a "departure from method of evaluation." Such "method" heading and descriptions are too vague and do not adequately bound the methodology and could potentially lead to misapplication of 10 CFR 72.48.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The calculation package has been revised and re-issued to ensure that each "METHOD" page provided at the beginning of the separate calculations provides a clear description of the methodology used and assumptions incorporated.

3-13. Provide a detailed description of the appropriate methodology and its application that is used in the seismic calculations. [November 30, 2005, RAI 3-3]

The NRC staff must understand what would be considered a departure from method of evaluation in the context of 10 CFR 72.48. See also RAI 3-12.

This information is needed to determine compliance with 10 CFR 72.236 (l)

Holtec Response: The details of the methodology and its application are now incorporated in the Proposed Revised FSAR in Subsection 3.I.4.7.1 as noted in our response to RAIs 3-4 and 3-7. These responses are incorporated in Subsection 3.I.4.7 as unalterable (by the §72.48 process) text matter. The Proposed TS has been revised to reference the methodology in Subsection 3.I.4.7 and to require that a site-specific analysis using the methodology prescribed in the FSAR always be performed.

3-14. Provide a drawing(s) to demonstrate the extent of the CEC concrete encasement with 5 inches of cover. Also, identify the "appropriate guidelines for commercial concrete" that would be used to design and construct this concrete component. Provide a seismic analysis of the VVM system incorporating the "concrete encasement." [Revised FSAR Section 3.I.4.1 submitted in response to the November 20, 2005, staff RAI]

This proposed "concrete encasement" concept is now a possible configuration for the corrosion mitigation measure for the VVM, but there is a lack of adequate information to evaluate this concept.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: A figure showing the concrete encasement has been added to Proposed Revised FSAR Supplement 2.I. The statement "The concrete encasement shall be installed using appropriate guidelines for commercial concrete" has been clarified to read "The concrete encasement shall be installed using written procedures and applicable guidance from the ACI Code (e.g. ACI 318 [3.3.2]) or equivalent as appropriate for commercial concrete." A conservative evaluation of the system response to a seismic event is being provided as part of the response to these RAIs (see RAI response 3-11, which points to RAI response 3-7).

3-15 Justify the use of Table 5.3 of the L. M. Poukhonto reference to conclude that a minimum 5 inches of concrete cover ("concrete encasement") of the CEC, with cylindrical dimensions of 18' high with a diameter exceeding 7', will provide for a 100-year service life, so as to guarantee a service life of 40 years for the VVM. [Revised FSAR Section 3.I.4.1 submitted in response to the November 20, 2005, staff RAI]

The NRC staff notes that the referenced table is contained in Section 5.2.3.1, entitled "Concrete as Protective Material for Reinforcement." The introductory paragraph is as follows: "One of the aspects of combined working of concrete and reinforcement is that concrete provides chemicophysical protection to the reinforcement from corrosion. The chemical effect of the concrete lies in its alkalinity, which makes for the formation of an oxide layer on the reinforcement surface (passivation) and protects it from corrosion." This mechanism applies to conditions where there is bonding between the concrete and steel whereas the proposed concept has an epoxy coating on the formed steel plate surface.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: The application of the concrete encasement around the CEC is analogous to the application of a cement-mortar overcoat around small and large diameter steel water pipes endorsed by ANSI/AWWA standard C205-00. ANSI/AWWA C205-00 requires a minimum cement-mortar overcoat thickness of ¾ inch unless otherwise specified by the purchaser. The required 5 inch minimum concrete encasement thickness is more conservative than specified by ACI 318 and other ACI codes, all calling for up to 3 inches of concrete cover over steel reinforcement in aggressive environments. Table 5.3 of the L. M. Poukhonto reference provides the rates of corrosion/degradation of concrete and indicates a 1.2 mm/yr surface depth failure

rate for concrete in a strongly aggressive environment. Thus, for a 100-year service life in a strongly aggressive environment, one would need at least 120 mm (4.72 inches) of concrete thickness (for corrosion control purposes only). Considering that the concrete encasement is restricted to mild soil environments (unless used in conjunction with cathodic protection) and has a non-structural role, the 5 inch concrete encasement thickness is considered more than sufficient to provide reasonable assurance that a 40 year service life can be achieved. In addition, reinforcement of the concrete encasement (see response to RAI 3-1) will ensure control of shrinkage cracks to minimize the migration of moisture within the concrete. Finally, an inspection of the interior surface of the CEC once within 20 years (see response to RAI 9-1) will provide further evidence that the CEC is maintaining its integrity.

Proposed Revised FSAR Supplement 3.I, Section 3.I.4.1 has been revised to incorporate a paragraph along the lines of the above narrative.

The fact that the CEC is coated will not significantly reduce the effectiveness of the concrete encasement to provide chemicophysical protection. ANSI/AWWA C205-00 endorses cement-mortar overcoat over dielectric coatings. Where moisture should penetrate, the coating itself provides the needed corrosion mitigation and if the coating is damaged, the moisture would exhibit more of the chemicophysical properties of the concrete than that of the soil to provide protection to the damaged area. The concrete encasement has the additional roles of acting as a physical barrier between the soil and coated CEC thus enabling a more homogenous environment for the CEC.

Furthermore, if the mild environment is such that "the concrete encasement is submerged in water or the moisture content of the concrete is near the saturation level, the transport of oxygen to the steel will be so low that corrosive attack will be negligible even after long periods. The depletion of oxygen at the surface of the steel makes the initiation of corrosion very difficult." [Ref. 1* pages 97, 105 and 127]. In any case, there will be negligible aeration of the subgrade surrounding the concrete encasement due to the cover provided by the top reinforced concrete pad and transporter support pad provide.

Finally, as further defense-in-depth, the CEC has a $1/8^{th}$ inch corrosion allowance.

3-16. Justify the classification of the lower MPC guides as not-important-to-safety (NITS) because these are in the lateral load path between the MPC and the support foundation. The upper MPC guides should also be addressed for the same reason. [November 30, 2005, RAI 1-3]

The current proprietary information in the BOM and in Table 2.I-7 indicates these guides are NITS yet it appears from the design that an integrated analysis for seismic loading would show the guides as being important in transferring lateral loads.

This information is needed to determine compliance with 10 CFR 72.236 (l).

* Reference 1: Bertolini et. al., " Corrosion of Steel in Concrete", 2004 – ISBN 3-527-30800-8.

Holtec Response: The upper and lower MPC guides play the role of shims in any seismic analysis. To eliminate the Staff's concerns, however, both the lower and upper MPC guides have been upgraded to ITS-C. Table 2.I.8 in the Proposed Revised FSAR has been updated, as has the BOM.

3-17. Revise the proposed Drawing 4501, Sheet 4, Rev. 1, to reflect a version similar to Rev. 0.

The current proposed version has eliminated the details of the Foundation Anchor Housing (Detail K), the shell guide and the associated welds, and all ITS-C (Important-to-Safety-Class C) items. The same is true for the divider shell and the container shell. Based on RAI 3-16, the upper and lower MPC guides may also need to be re-added to the drawing. Proposed Sheet 4, Rev. 1, of Drawing 4501, does not provide adequate information for the Important-to Safety items.

This information is needed to determine compliance with 10 CFR 72.236 (l).

Holtec Response: Views of the divider shell, upper and lower MPC guides, divider shell restraint, and anchor housings have been restored to Sheet 4 of the drawing, as requested.

Chapter 4 - Thermal Evaluation

4-1 Provide a copy of a drawing or any other design information for both Boiling Water Reactor (BWR) and Pressurized Water Reactor (PWR) bounding fuel assembly types, where the grid spacer height and thickness are explicitly given.

Based on the staff's review, the grid spacer height and thickness dimensions used by the applicant to calculate the flow resistance of the bounding fuel assembly types do not appear to be conservative.

This information is needed to determine compliance with 10 CFR 72.11, 72.24(d), and 72.236.

Holtec Response: A copy of our source for the thickness of the BWR fuel assembly grid spacer thickness is provided as part of this RAI response package. This document is the proprietary property of GE and should be withheld from public disclosure.

Our sources for the BWR fuel assembly grid spacer height and the PWR fuel assembly grid spacer height and thickness are the intellectual property of GE and Westinghouse, respectively, and our agreements with these entities do not permit us to transmit these sources to any third party. They can, however, be made available for inspection at Holtec or NRC as long as possession is not transferred and no copies are made. An SFPO representative has inspected these source documents during a June 28th meeting. We understand that the access to the information provided to the Staff in this manner meets the NRC's need for a fact based safety evaluation.

4-2 Modify the Computational Fluid Dynamics (CFD) fuel assembly flow resistance calculations based on the shear stress method by allowing a larger number of thermal-hydraulic iterations and decreasing the residuals convergence criteria to values that are at least 1.0E-06 or lower. The above CFD calculation is described in Holtec Report No. HI-2043285.

The staff determined, based on the applicant's CFD developed models, that wall shear stresses are approximately 10% higher than the applicant's calculated results. The use of accurate resistance parameters may result in smaller thermal margins as compared to the margins claimed by the applicant.
This information is needed to determine compliance with 10 CFR 72.11, 72.24(d), and 72.236.

Holtec Response: We have extended the FLUENT solution for one evaluation of the design-basis BWR fuel assembly by approximately 11000 iterations and reduced all residuals by 2-3 orders of magnitude. The results of these extended evaluations indicate no significant changes in computed shear stresses.

We have, however, previously performed thermal evaluations for a limiting MPC-68 in both aboveground and underground casks with significantly (23.6%) higher hydraulic resistance than used in the evaluations presented in the Proposed Revised FSAR. These thermal evaluations resulted in increases in peak clad temperature of 10°F (underground) and 12°F (aboveground), resulting in margins to the long-term clad temperature limit of 91°F and 52°F, respectively. Thus, even if the hydraulic resistance were to increase by 10% above the level used in the evaluations presented in the Proposed Revised FSAR, remaining margins would still be significant (approximately 96°F and 58°F, respectively). Thus, it can be concluded that the margins in the design-basis thermal evaluations are sufficiently large to encompass any uncertainties in the hydraulic resistance calculations.

In order to permit the SFPO to evaluate whether the above quoted peak clad temperature margins are sufficiently large to provide assurance of safety, we understand that a more detailed description of the method of shear stress post-processing that we have used in this alternate method calculation (our design-basis is what we refer to in our proprietary calculations package HI-2043285 as the pressure drop method) is required. Such an expanded description has been added to Section C.3.1 in Appendix C of HI-2043285, which is provided separately.

4-3 Provide updated thermal calculation packages (HI-2043317 and HI-2043168) for the PWR and BWR fuel configurations provided in the FSAR. These calculation packages should include input and output files (e.g., gambit data base, FLUENT case and data files for the two-dimensional (2-D) and three-dimensional (3-D) models described in the FSAR). In order to provide an acceptable response, the staff suggests that the applicant to review Interim Staff Guidance (ISG) 21, dated April 5, 2006.

This information is needed to determine compliance with 10 CFR 72.11, 72.24(d), and 72.236

Holtec Response: The latest revisions of these two Holtec calculation packages, including electronic copies of all data files, are provided separately.

Chapter 6.0 - Criticality Evaluation

6-1 Revise the FSAR to accurately reflect the proposed change regarding "F" and non-"F" series MPCs.

The application proposes to combine the specifications of the "F" series and non-"F" series MPCs. As a result, various changes have been made to the FSAR (text, figures, etc.). Several items do not appear to be consistent with the intent of the proposed change. The FSAR (text, figures, etc.) should be modified in a manner that is consistent with the proposed change. Examples are listed below. This list may not be all-inclusive.

a. Drawing 3923, Revision 13, Sheet 3 (the drawing for the MPCs), Note 4 makes reference to the secondary containment requirement for transportation. While the "F" series MPCs were designed to provide for secondary containment, secondary containment is no longer required for transportation. Thus, this note should be updated to reflect the change in the requirements. Other items on this and the other drawings that address this previous requirement should be updated accordingly as well.

b. Some information seems to be missing in the first bullet of the Table 2.1.22 "Other Limitations" section. The information appears to deal with the Thoria rod canister approved for loading into the MPC-68.

c. The titles for Tables 6.2.41 through 6.2.45 previously described the tables' information as applicable to the MPC-68F and the MPC-68FF. The MPC-68FF has been removed; however, based upon the text of Section 6.2.4.1, it appears that the MPC-68 should be added to the title of these tables.

d. The "F" series MPCs are still noted in some places in the FSAR text: the middle paragraph of page 6.4-9 (68FF), the paragraph at the bottom of page 6.4-16 (32F), and the MPC labels in Table 6.C.1 on pages Appendix 6.C-12,13 (24EF).

e. The contents specifications have been combined for the MPC-68 and 68FF (Table 2.1-1 of Technical Specifications, Appendix B). Previously, the MPC-68 was approved for storage of one Thoria rod canister (rods from Dresden Unit 1). However, in combining the specifications, the Thoria rod canister is no longer permissible for loading in the MPC-68.

This information is needed to confirm compliance with 10 CFR 72.11(a) and 72.236(a) and (b).

Holtec Response:

a. Holtec uses common licensing drawings for transportation and storage for consistency. The currently approved transportation CoC still requires the F-shell as secondary containment. A transportation license amendment is currently in preparation that, among other changes, removes the secondary containment function of the F-shells. Until this amendment is approved, we need to keep the notes on the licensing drawings for consistency with the transportation CoC. After the approval of the transportation LAR, we will remove the notes under 72.48.

b. and e. Table 2.1.22 of the Proposed Revised FSAR and Table 2.1-1 of the Technical Specifications, Appendix B, have been modified to re-instate the Thoria rod canister as approved content of the MPC-68. This also qualifies this canister for the MPC-68FF.

c. and d. The Proposed Revised FSAR has been modified to address these comments. Note that in addition to the pages and sections listed in the RAI, a change was made on Page 6-12.

Chapter 9 - Acceptance Criteria and Maintenance Program

9-1 Propose, in the Technical Specifications (TS), at least one inspection of the CEC for exterior corrosion at installations that do not have an Impressed Current Cathodic Protection System (ICCPS).

The proposed TS specify inspections for cathodically protected CECs in cases where ICCPS operation has been outside the acceptable TS criteria. However, for systems lacking an ICCPS, there is no specific requirement to verify that the performance of the coating system is adequate. NRC regulations are generally formulated upon the premise that a system be designed according to best engineering practice and the continued performance of important-to-safety components be confirmed through periodic inspections or surveillance. The FSAR, as submitted, appears to lack a specific requirement for verifying the absence of significant soil induced corrosion of the CEC, where no ICCPS is employed. The staff considers at least one mandatory inspection, not to exceed a 20-year interval, to be appropriate.

This information is required for compliance with 10 CFR 72.25(c)(3).

Holtec Response: Holtec proposes that VVM ISFSIs not employing impressed current cathodic protection be subject to visual and UT inspections of at least one representative VVM to check for significant wall thinning (greater than 1/8 inch) and pitting (greater than 1/4 inch depth) of the CEC at an interval not to exceed 20 years. The inspections will be performed on the inside surface of the CEC. The VVM chosen for inspection is not required to be in use or to have previously contained a loaded MPC. A VVM with a loaded MPC may be inspected using remote devices with the VVM lid removed. The oldest VVM or VVM considered to be most vulnerable to corrosion degradation shall be selected for inspection.

ATTACHMENT 2

LAR 1014-3, REVISION 3

SUMMARY OF PROPOSED HI-STORM 100 SYSTEM CHANGES

SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014

Proposed Change No. 1

A new overpack design, designated HI-STORM 100U, is added. This requires the following changes to the CoC:

a. Section 1.b - Add a description of the HI-STORM 100U.

b. Section 10 – Clarify that item j is only applicable to the existing aboveground overpacks.

c. Appendix A, Section 1.1 – Update definitions to reflect the additional overpack.

d. Appendix A, LCO 3.1.2 – Update completion times for required actions and update surveillance requirements to reflect the additional overpack.

e. Appendix A, Section 5.7 – Editorial changes to reflect the additional overpack, specifically:
   - Clarify that items 5.7.3.a and 5.7.3.b are only applicable to the existing aboveground overpacks.
   - Add new item 5.7.4.c to provide dose rate limits for the additional overpack.
   - Modify items 5.7.6.b and 5.7.7 to remove reference to cask "placement", as the additional overpack is loaded in place at the ISFSI.
   - Clarify that item 5.7.8.b and 5.7.8.c are only applicable to the existing aboveground overpacks.
   - Insert a new item 5.7.8.d to specify dose measurement locations for the additional overpack.
   - Renumber existing item 5.7.8.d to 5.7.8.e.

f. Appendix B, Section 1.0 - Update definitions to reflect the additional overpack.

g. Appendix B, Section 3.3 – Clarify that the existing ASME Code discussion only applies to the existing aboveground overpacks, and add reference to new Table 3-2 that provided requirements for the additional overpack.

h. Appendix B, Table 3-2 – Add new table to specify ASME Code paragraphs applicable to the additional overpack.

i. Appendix B, Section 3.4 – Add new site-specific parameters (Items 3.4.3.d, 3.4.6.c, 3.4.6.d and 3.4.7) for the additional overpack.

j. Section 3.5.1 – Clarify that CTF structure requirements are not applicable to the additional overpack.

Reason for Proposed Change

The HI-STORM 100U provides a unique combination of features not available from the currently approved overpack designs,

Justification for Proposed Changes

Additional information has been added to each FSAR chapter to justify this new design. The majority of this information is contained in numbered supplements 1.I through 13.I, with one supplement corresponding to each FSAR chapter.

Proposed Change No. 2

Section 9 – Delete requirement to perform thermal validation tests on loaded systems.

Reason and Justification for Proposed Changes

Testing was only required between 10 kW and 16 kW thermal load. Sufficient tests have been performed at or above 16 kW that no further testing would be required.

Proposed Change No. 3

Increase the design basis maximum decay heat loads. Together with this increase, a new decay heat regionalizing scheme is introduced. This requires the following changes to the CoC:

a. Appendix A, LCO 3.1.2 – Update completion times and surveillance requirements to reflect the increase.

b. Appendix A, LCO 3.1.4 – Update note to permit site-specific determination of time limit for disabling SCS.

c. Appendix A, Table 3-1 – Update threshold decay heat loads to reflect the increase in the design basis maximum decay heat loads and updated vacuum drying analyses.

d. Appendix A, Table 3-2 – Update backfill requirements to reflect the increase.

e. Appendix B, Figure 2.1-1 and 2.1-2 – Increase number of storage locations in Region 1 of 24-assembly MPC designs to reflect new regionalized loading scheme.

f. Appendix B, Section 2.4 – Update Table 2.4-1 to reflect increase in the design basis maximum decay heat loads. Update Table 2.4-2 and the associated discussion to reflect the new decay heat regionalizing scheme that is part of the increase in the design basis maximum decay heat loads.

g. Appendix B, Table 2.4-3 – Update coefficients to reflect the increase.

Reason for Proposed Change

Clients need higher cask and assembly heat loads than previously approved to meet future dry storage needs.

Justification for Proposed Changes

Structural

The increase in decay heat loads do not affect the design basis temperatures in Table 2.2.3, which are used for structural calculations. Therefore, this change has no impact on the structural evaluation.

Thermal

Chapter 4 of the FSAR has been extensively revised to provide justifications for the increased heat loads and to demonstrate that all fuel cladding and cask component temperatures and MPC internal pressures remain below design limits.

Shielding

The shielding analysis in Chapters 5 and 10 have been modified to reflect the increase in heat load. The increase in heat load results in a higher allowable burnup for a specific cooling time. Therefore, the analysis in Chapters 5 and 10 was revised. The maximum permissible burnups of 65,000 and 68,200 for BWR and PWR fuel remain unchanged.

The coefficients in Table 2.4-3 for the PWR fuel assemblies were recalculated to apply a 5% penalty in the decay heat. This penalty is identical to the penalty already applied for BWR fuel assemblies. In the previous revision of the FSAR (LAR 1014-2), no penalty was applied to the PWR fuel assemblies because the margin in the allowable decay heat in the thermal analysis was greater than 5%. In the revised thermal analysis presented in this LAR the margin in the thermal analysis is reduced below 5%. Therefore, the 5% penalty was applied for PWRs in determining the coefficients in Table 2.4-3.

Proposed Change No. 4

Appendix B, Table 2.1-1 – Increase the maximum fuel assembly weight for BWR fuel in the MPC-68 from 700 lbs to 710 lbs.

Reason for Proposed Change

Some BWR assembly types to be loaded into MPC-68s have an overall weight, including channels, that exceed 700 lbs. All other characteristics of these assemblies are consistent with the CoC.

Justification for Proposed Change

The structural evaluations in Chapter 3 are updated to reflect the increased fuel weight. Other technical disciplines are not affected by this change.

Proposed Change No. 5

Addition of the CE 16x16 System 80-type fuel has been eliminated from this amendment request. Several of the changes previously requested are conservative for non-System 80 fuel, and are left in the Proposed Revised Technical Specification. ~~This change is intended to allow CE 16x16 System 80-type fuel to be qualified for the HI-STORM system. These assemblies were previously excluded mainly due to their fuel length. Four distinct CoC changes are necessary in order to qualify this fuel type:~~

a. ~~Appendix B, Table 2.1-1 – Increase the maximum fuel length for PWR MPCs (MPC-24, MPC-24E/EF, MPC-32/32F) from 176.8 inches to 178.3 inches.~~
b. Appendix B, Table 2.1-1 – Increase the maximum fuel assembly weight for PWR fuel from 1680 lbs to 1720 lbs for assemblies that do not required upper and lower fuel spacers. For assemblies that require fuel spacers, the current maximum fuel assembly weight of 1680 lbs applies.
c. Appendix B, Table 2.1-2 – For Fuel Assembly Array/Class 16x16 A, change the maximum Fuel Rod Clad ID from 0.03320 inches to 0.03350 inches, and change the minimum Guide/Instrument Tube Thickness from 0.0400 inches to 0.0350 inches.
d. Appendix A, LCO 3.3.1 f.: Change the minimum soluble boron concentration for Array Class 16x16A for All Intact Fuel Assemblies from 1,300 to 1,400 ppmb (enrichment up to 4.1 wt%) and from 1,900 to 2,000 ppmb (enrichment up to 5.0 wt%).

Reason for Proposed Change

a. ~~The System 80 assemblies have a fuel assembly length of up to 178.3 inches, which exceeds the previously approved maximum fuel assembly length.~~

b. Including non-fuel hardware, the System 80 assemblies have a maximum fuel assembly weight of 1720 lbs. *This change is conservative for non-System 80 fuel and is left in the Proposed Revised Technical Specification.*
c. The design of the System 80 assemblies fit into array/class 16x16A with the exception of the Clad ID and Guide Tube Thickness. *This change is conservative for non-System 80 fuel and is left in the Proposed Revised Technical Specification.*
d. A slightly increased soluble boron concentration is required as a result of the change in Clad ID and Guide Tube Thickness. *This change is conservative for non-System 80 fuel and is left in the Proposed Revised Technical Specification.*

Justification for Proposed Change

a. ~~No changes have been proposed in the FSAR text or drawings to modify the MPC (increased length) to allow the longer fuel. The modifications to the MPC will not affect the CoC or its Appendices and is possible under 72.48.~~
b. The structural evaluations in Chapter 3 are updated to reflect the increased fuel weight. Other technical disciplines are not affected by this change.
c. Structural Not affected
Thermal The thermal performance of the ~~CE~~ 16x16*A array class* ~~System 80~~ fuel assemblies are bounded by the thermal evaluations in Chapter 4 for the design basis PWR fuel assembly.
Shielding The minor dimensional changes in the cladding and the guide tubes will not have an impact on the source terms calculated in Chapter 5. Therefore, theses changes do not affect the shielding analysis.
Criticality Criticality evaluations in Chapter 6 were updated to account for these changes. The calculations demonstrate that the reactivity of the system remains below the regulatory limit with these changes applied. For the MPC-32, the soluble boron requirements for loading and unloading need to be adjusted (see below).
d. Criticality The revised criticality calculations for assembly array/class 16x16A in Chapter 6 require these revised soluble boron concentration to demonstrate that the reactivity of the system remains below the regulatory limit.

Proposed Change No. 6

Appendix B, Table 2.1-1 – Change the MPC-32 fuel storage locations for fuel with APSRs from "13, 14, 19 and/or 20" to "7, 8, 12-15, 18-21, 25 and/or 26" and allow CRAs, RCCAs and CEAs in any location. This will increase the maximum number of these components (from 4 to 12 for APSRs, still positioned at the center of the MPC).

Reason for Proposed Change

Some users of the system have larger numbers of control components that they intend to load into the MPC-32. Limiting the number of control components to 4 presents an unnecessary restriction in this case.

Justification for Proposed Change

The shielding calculations in Chapter 5 are revised to show the effect of the revised number of control components. Other technical disciplines are not affected by this change.

Proposed Change No. 7

The restriction that fuel debris can only be loaded into the MPC-24EF, MPC-32F, MPC-68F and MPC-68FF canisters is eliminated. This requires the following change to the CoC:

a. Appendix B, Table 2.1-1 – Delete table entries for MPC-68, MPC-24E and MPC-32. Change titles of table entries for MPC-68FF, MPC-24EF and MPC-32F to specify that these entries are also applicable to MPC-68, MPC-24E and MPC-32, respectively. *The Dresden Unit 1 Thoria rod canister, previously included in the MPC-68 entry in this table, is added to the combined MPC-68/68FF entry in the table.*

Reason and Justification for Proposed Change

The special features that separated the MPC-24EF, MPC-32F and MPC-68FF from their "non-F" counterparts were only required to meet secondary containment requirements for fuel debris in transportation governed by 10 CFR 71. Changes to 10 CFR 71 have eliminated the need for these features.

Proposed Change No. 8

Section 1.b – Modify text to require that all MPC confinement boundary components and any MPC components exposed to spent fuel pool water or the ambient environment be made of stainless steel or, for MPC internals, neutron absorber or aluminum.

Reason and Justification for Proposed Change

The current wording of this item precludes using materials other than stainless steel for the MPC lid, which would prevent modifying the lid design to increase shielding through the use of lead or neutron absorber materials. The modified wording would permit the use of such materials, appropriately enchased in stainless steel, in the lid. Such designs have been approved for other cask designs.

Proposed Change No. 9

A threshold heat load below which operation of the Supplemental Cooling System (SCS) would not be required is added and the SCS design criteria is modified to simplify the system. This requires the following CoC changes:

a. Appendix A, LCO 3.1.4 – Modify applicability to add the threshold heat load.

b. Appendix B, Section 3.7.1 – Modify discussion to add the threshold heat load.

c. Appendix B, Section 3.7.2.2 – Modify the discussion to replace the coolant temperature rise criteria with a maximum coolant temperature criteria.

Reason and Justification for Proposed Changes

a. High burnup fuel assemblies can have sufficiently low decay heat loads to satisfy ISG-11 rev. 3 requirements without needing active cooling. This simplifies loading operations and, consequently, may lower occupational doses.

b. High burnup fuel assemblies can have sufficiently low decay heat loads to satisfy ISG-11 rev. 3 requirements without needing active cooling. This simplifies loading operations and, consequently, may lower occupational doses.

c. The size of the SCS components will be inversely proportional to the allowable coolant temperatures. Allowing higher coolant temperatures and larger coolant temperature rises will permit the use of smaller heat exchange and pumping equipment. Many spent fuel pool areas have little space available for equipment, so the reduction in equipment size will ease loading operations. Smaller pumping equipment will also reduce power requirements, easing the design of the required redundant power source.

Proposed Change No. 10

Minor editorial changes are made throughout the CoC and FSAR. This requires the following changes to the CoC:

a. Section 1.b – Clarify description of anchored casks.

b. Section 11 – Correct typographical error.

c. Appendix A, Section 1.0 – Clarify definitions of Loading Operations, Storage Operations, Transport Operations, and Unloading Operations.

d. Appendix A, LCO 3.1.1 – Correct editorial error in SR 3.1.1.2.

e. Appendix B, Section 1.0 – Clarify definitions of Cask Transfer Facility, Loading Operations, Transfer Cask, Transport Operations, and Unloading Operations.

Reason and Justification for Proposed Changes

These changes are all to correct minor typographical and editorial errors, or clarify the meaning of statements for users. Questions by multiple users have indicated imprecise wording that should be corrected to reduce the potential for misinterpretation by users.

Proposed Change No. 11

Appendix B, Section 1.0 – Modify the definition of NON-FUEL HARDWARE to include individual parts of these items.

Reason and Justification of Proposed Change

~~For at least one fuel type (CE 16x16 System 80),~~*In some cases, it may be advantageous for* users ~~plan~~ to disassemble control components into individual control rods, shorten the control rods as necessary and then store them in the guide tubes of fuel assemblies. ~~This is necessary, since the presence of the complete control assembly would significantly (by about 15 inches) increase the required cavity length of the MPC.~~ The effect of any of the non-fuel-hardware devices is appropriately considered in the structural, thermal, shielding and criticality evaluations documented in the HI-STORM 100 FSAR. The effects of individual rods will be bounded by the effects of the entire device. Storing individual rods in guide tubes is therefore considered acceptable, and no additional evaluation is required for this condition.

Proposed Change No. 12

Section 9 – Added requirements for air flow measurements for first cask loaded.

Reason and Justification of Proposed Change

Required by response to RAI 4-9.

Proposed Change No. 13

Appendix A, LCO 3.1.1 – Revised to clarify required actions to "return the MPC to an analyzed condition" and to restore required helium leak test on vent and drain port cover plate welds.

Reason and Justification for Proposed Change

Required by response to RAIs 12-1 and 12-5.

Proposed Change No. 14

Appendix A, LCO 3.1.2 – Revised to clarify actions in response to a partial blockage condition (i.e., up to 50% blocked). Revised SR to reflect latest thermal analyses.

Reason and Justification for Proposed Change

Partial blockage change is made due to recent user confusion. Revised SR required by response to RAI 4-11.

Proposed Change No. 15

Appendix A – Added new LCO 3.1.5 for Impressed Current Cathodic Protection System.

Reason and Justification for Proposed Change

Required by response to RAI 3-5.

Proposed Change No. 16

Appendix A, Table 3-2 – Modified tolerance on backfill requirements in g-moles per liter to eliminate gap between upper end of g-moles per liter range and lower end of psig range.

Reason and Justification for Proposed Change

Required by response to RAI 12-5.

Proposed Change No. 17

Appendix A, Section 5.7 – Updated radiation protection program requirements.

Reason and Justification for Proposed Change

Required by response to RAI 12-3.

Proposed Change No. 18

Appendix B, Section 1.0 – Revised definition of DAMAGED FUEL ASSEMBLY.

Reason and Justification for Proposed Change

Required by response to RAI 1-4.

Proposed Change No. 19

Appendix B, Section 2.4.2 – Corrected equations for regionalized loading.

Reason and Justification for Proposed Change

Equations as presented contained typographical errors.

Proposed Change No. 20

Appendix B, Table 3-2 – Clarified ASME Code edition being applied.

Reason and Justification for Proposed Change

Required by response to RAI 3-1.

Proposed Change No. 21

Appendix B, Section 3.9 – Added new section on Corrosion Mitigation Measures.

Reason and Justification for Proposed Change

Required by response to RAI 3-5.

Proposed Change No. 22

Appendix A, LCO 3.1.1 – Restore helium leak test for MPC vent and drain port cover plate welds.

Reason and Justification for Proposed Change

This leak test has been restored in LAR 1014-4, undergoing parallel SFPO review. Restored in this LAR for consistency.

Proposed Change No. 23

Appendix B, Table 2.1-1 – Add Dresden Unit 1 Thoria rod canister to allowable contents for MPC-68/68FF.

Reason and Justification for Proposed Change

Required by Response to RAI 6-1.

Proposed Change No. 24

Appendix B, Section 3.4, Item 7 – Modified to require site-specific seismic evaluation and to incorporate methodology description in HI-STORM FSAR by reference.

Reason and Justification for Proposed Change

Required by Response to RAI 3-4.

Proposed Change No. 25

Appendix B, Section 3.10 – Added new section to require periodic monitoring of underground ISFSIs that do not employ an impressed current cathodic protection system.

Reason and Justification for Proposed Change

Required by Response to RAI 9-1.

SECTION II – PROPOSED CHANGES TO THE FSAR

Proposed Changes to Chapter 1

Section 1.0

1-1) Section 1.0 – Added text to describe that 10 CFR 71 change allows for fuel debris to be loaded in MPC-24E, MPC-32 and MPC-68. Added text to explain presence of chapter supplements (numbered x.I where x is the chapter number) for the HI-STORM 100U overpack design.

1-2) Table 1.0.1 – Added definition for the term "critical characteristic". *Added definition for the term "equivalent (or equal) material". Added definition for term "method of evaluation (or methodology)".* Modifed definition of "HI-STORM overpack" to reflect presence of new HI-STORM 100U design. Added definitions for the terms "HI-STORM 100U System", "HI-STORM 100U Vertical Ventilated Module" and "Vertical Ventilated Module" to reflect addition of HI-STORM 100U overpack design.

1-3) Table 1.0.3 – Modified justifications for exceptions to NUREG-1536 paragraphs 4.V.4.a and 4.V.4.b to correspond to changes in Chapter 4.

1-4) Modified definition of DAMAGED FUEL ASSEMBLY.

Section 1.2

1-5) ~~Section 1.2.1 – Modified existing text and added a new footnote to reflect the addition of CE 16x16 System 80 fuel to the allowed contents for the HI-STORM System.~~

1-6) ~~Section 1.2.1.1 – Modified text to reflect the addition of CE 16x16 System 80 fuel to the allowed contents for the HI-STORM System.~~ Modified text to reflect proposed CoC language on MPC materials of construction.

1-7) Section 1.2.1.2.1 – Corrected ACI code reference.

1-8) Section 1.2.1.2.2 – Made editorial changes to HI-TRAC nomenclature to reflect that there are multiple designs of nominally 125-ton weight HI-TRACs.

1-9) Section 1.2.2.2 – Modified text to reflect the addition of a threshold heat load for use of the Supplemental Cooling System, because it may be possible to meet ISG-11r3 clad temperature limits for low enough decay heats without needing active system.

1-10) Section 1.2.3 – Consolidated discussions of "normal" MPC designs (MPC-24E, MPC-32 and MPC-68) and "F-type" MPC designs (MPC-24EF, MPC-32F and MPC-68FF). This

simplifies the discussions in light of the allowance for fuel debris to be loaded in MPC-24E, MPC-32 and MPC-68.

1-11) Table 1.2.1 – Modified noted column to reflect new ability to load fuel debris in MPC-24E, MPC-32 and MPC-68.

1-12) Table 1.2.2 – Modified backfill limits to reflect changes in Chapter 4.

1-13) Figures 1.2.2 through 1.2.4 – Modified to remove basket supports, which were not representative of actual hardware.

1-14) Modified Table 1.2.2 to match CoC Appendix A.

Section 1.3

1-15) Modified text to reflect that UST&D is now owned by Holtec.

Section 1.5

1-16) Added 100U licensing drawing.

Section 1.6

1-17) Added new reference used in Section 1.0.

Appendix 1.C

1-18) Fixed text to clarify materials. Second page was deleted previously, but new text was not added appropriately. Corrects previous oversight.

Appendix 1.D

1-19) Correct several ACI code references. Updated discussion of temperature effects on concrete to reflect Chapter 4 changes. Reduced concrete weight to 140 pcf, which is appropriately evaluated in Chapters 4 and 5.

Proposed Changes to Chapter 2

Section 2.0

2-1) Section 2.0.1 – Modified text to reflect the addition of a threshold heat load for use of the Supplemental Cooling System, because it may be possible to meet ISG-11r3 clad

temperature limits for low enough decay heats without needing active system. Modified regionalized loading discussions to reflect changes in Chapter 4.

2-2) Section 2.0.2 – Corrected ACI Code reference. Corrected shielding discussion to match wording in 10 CFR 72.104.

2-3) Section 2.0.3 – Corrected HI-TRAC nomenclature in thermal and shielding discussions. Modified text to reflect the addition of a threshold heat load for use of the Supplemental Cooling System, because it may be possible to meet ISG-11r3 clad temperature limits for low enough decay heats without needing active system.

2-4) Table 2.0.1 – Modified criteria and basis columns for stainless steel accident design temperature to match discussion in subsection 2.2.2.3 and for neutron absorber accident design temperature to match Chapter 4. Increased maximum MPC decay heats to reflect changes in Chapter 4. Modified fuel assembly weights *to reflect changes made in Proposed Technical Specifications (see Proposed Change No. 5 in Section I of this Summary of Proposed Changes)*~~and lengths to reflect the addition of CE 16x16 System 80 fuel to the allowed contents for the HI-STORM System~~.

2-5) Table 2.0.2 – Corrected ACI Code reference in entry for concrete compressive strength.

2-6) Table 2.0.3 – Modified ambient temperature specifications for HI-TRAC analyses per ANSI/ANS 57.9.

2-7) Modified Table 2.0.1 to reflect restoration of helium leak test on vent and drain port cover plate welds.

Section 2.1

2-8) *Deleted.*~~Section 2.1.1 – Modified existing text to reflect the addition of CE 16x16 System 80 fuel to the allowed contents for the HI-STORM System.~~

2-9) Section 2.1.3 – Modified discussion to reflect new ability to load fuel debris in MPC-24E, MPC-32 and MPC-68.

2-10) Section 2.1.6 –Modified design basis thermal fuel assembly discussion and regionalized loading discussion to reflect changes in Chapter 4.

2-11) Section 2.1.9 – Deleted phrase "ZR clad" throughout section, because ISG-11 rev. 3 renders the discussions in this section applicable to all cladding types. Updated regionalized loading scheme to allow more flexibility for users when preparing cask loading plans.

2-12) *Deleted.*~~Table 2.1.1 – Modified one entry to reflect the addition of CE 16x16 System 80 fuel to the allowed contents for the HI-STORM System.~~

2-13) Table 2.1.3 – Modified two values for array class 16x16A to reflect the *changes made in the Proposed Technical Specification (see Proposed Change No. 5 in Section I of this Summary of Proposed Changes).* ~~addition of CE 16x16 System 80 fuel to the allowed contents for the HI-STORM System.~~

2-14) Table 2.1.5 –Modified design basis thermal fuel assembly entries to reflect changes in Chapter 4.

2-15) Table 2.1.13 – Deleted to reflect changes made in Section 2.1.9 regionalized loading discussions.

2-16) Table 2.1.16 – Modified two values for array class 16x16A to reflect the *changes made in the Proposed Technical Specification (see Proposed Change No. 5 in Section I of this Summary of Proposed Changes).* ~~addition of CE 16x16 System 80 fuel to the allowed contents for the HI-STORM System.~~

2-17) Tables 2.1.17 through 2.1.24 – Consolidated tables for "normal" MPC designs (MPC-24E, MPC-32 and MPC-68) and "F-type" MPC designs (MPC-24EF, MPC-32F and MPC-68FF). This reduces the number of tables in light of the allowance for fuel debris to be loaded in MPC-24E, MPC-32 and MPC-68.

2-18) Tables 2.1.26 and 2.1.27 – Modified to reflect changes made in Section 2.1.9 regionalized loading discussions.

2-19) Table 2.1.28 – Modified all PWR fuel coefficients to reflect changes in Chapter 4 thermal analysis.

Section 2.2

2-20) Section 2.2.2.3 – Added discussion to clarify the basis of increased off-normal and accident condition design temperatures in Table 2.2.3.

2-21) Table 2.2.3 – Modified several off-normal and accident condition design temperatures, which are appropriately reflected in Chapter 3 structural analyses. Consolidated some entries for overpack steel components which had identical design temperatures.

2-22) Table 2.2.7 – Corrected ACI Code reference for overpack concrete.

2-23) Modified Section2.2.2.4 to reflect restoration of helium leak test on vent and drain port cover plate welds.

SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

Section 2.3

2-24) Section 2.3.3.1 – Clarified that there are multiple types of CTF designs and indicated which design criteria are applicable to each type.

2-25) Section 2.3.5.2 – Updated dose rate design objectives to reflect changes in Chapter 5.

Section 2.4

2-26) Modified text to reflect proposed CoC language on MPC materials of construction.

Section 2.6

2-27) Corrected ACI Code reference. Added new references used in Section 2.2.

Appendix 2.A

2-28) Corrected ACI Code references.

Appendix 2.C

2-29) Modified Supplemental Cooling System requirements to permit increased coolant temperatures and to eliminate coolant temperature rise restriction. This will permit simplification of the system design without affected cooling efficiency.

Proposed Changes to Chapter 3

Section 3.0

3-1) Deleted list of significant changes to Chapter 3 associated with Revision 1: "This revision ...". – No longer applicable.

3-2) Updated references to ACI 318.1 to identify code year as 1989 (Revised 1992) – Clarification.

3-3) Updated references to Chapter 4 in Table 3.0.1 for free thermal expansion – Consistent with Chapter 4 revisions.

Section 3.1

3-4) Added "In some early vintage MPCs" where reference is made to aluminum heat conduction elements – Aluminum heat conduction elements are no longer required in MPCs.

3-5) Updated references to ACI 318.1 to identify code year as 1989 (Revised 1992) – Clarification.

3-6) Corrected reference to HI-STAR FSAR in Table 3.1.3 for Load Case I.D. F3.a – Incorrect reference.

3-7) Replaced references to HI-STAR FSAR Appendix 3.I for Load Case I.D. E2 and E5 (Baseplate) in Table 3.1.4 with references to Section 3.4 – HI-STAR FSAR evaluation is no longer bounding due to increase in design basis fuel weight.

Section 3.2

3-8) Added footnote to Table 3.2.1 to clarify maximum fuel weights used to determine MPC bounding weights – Rev. 3.A increases maximum PWR and BWR fuel assembly weights.

Section 3.3

3-9) Updated references to ACI 318.1 to identify code year as 1989 (Revised 1992) – Clarification.

3-10) Added "In early vintage MPCs" where reference is made to aluminum heat conduction elements – Aluminum heat conduction elements are no longer required in MPCs.

Section 3.4

3-11) Added "found in early vintage MPCs" where reference is made to aluminum heat conduction elements – Aluminum heat conduction elements are no longer required in MPCs.

3-12) Deleted reference to Appendix 3.D – Appendix 3.D was removed from FSAR as part of LAR 1014-2.

3-13) Revised Subsection 3.4.3.6 to remove cross reference to HI-STAR FSAR for bounding MPC lifting analyses – MPC baseplate analysis in HI-STAR FSAR is no longer bounding due to increased fuel weights in HI-STORM FSAR.

3-14) Updated references to Chapter 4 in Subsections 3.4.4.2 and 3.4.4.2.1 for free thermal expansion – Consistent with Chapter 4 revisions.

3-15) Deleted confirmatory closed form solution for Load Case I.D. E1.a and E1.c in Subsection 3.4.4.3.1.2 – Not required.

3-16) Updated MPC baseplate analysis results in Subsection 3.4.4.3.1.4; also updated Table 3.4.4 accordingly – Load Case E2 now evaluated in Subsection 3.4.3.6; results for Load Case E5 previously omitted.

3-17) Corrected allowable stresses for shear and bending stress in MPC cover plate in Subsection 3.4.4.3.1.8; also revised Table 3.4.9 accordingly – 0.967 factor only applicable to shell, not MPC lid; corrected typo.

3-18) Revised Subsection 3.4.4.4.1 to adjust for increase in maximum fuel assembly weights; also revised Tables 3.4.3, 3.4.4, and 3.4.6 accordingly -

3-19) Revised allowable stress and safety factor for HI-STORM top lid strike in Subsection 3.4.8.1; also revised Table 3.4.9 accordingly – Design temperature for HI-STORM top and bottom lids raised to 450°F in LAR 1014-2.

Section 3.5

3-20) Changed reference for fuel cladding temperature limits to ISG-11 – Consistent with Chapter 4.

3-21) Delete fuel rod stability analysis assuming cladding supports fuel pellet mass – Not required.

Section 3.6

3-22) Added ACI 349-97 to 3.6.1.a (4) – Clarification for ISFSI Pad embedment for HI-STORM 100A

3-23) Minor editorial changes and corrections.

Section 3.7

3-24) Revised reference to Chapter 4 for peak fuel cladding temperatures in Table 3.7.1 – Consistent with Chapter 4 revisions.

Appendix 3.A

3-25) Deleted references to Appendix 3.X – Appendix 3.X was removed from FSAR as part of LAR 1014-2.

3-26) Updated references to ACI 318 to identify code year as 1995 – Clarification.

Proposed Changes to Chapter 4

This Chapter has been substantially re-written to improve clarity and add 3-D modeling. Because of extensive editing a clean chapter is provided with this supplement. A list of principal changes are provided below:

4-1) Generalized regionalized storage to permit a continuum of fuel storage configurations over a range X, where X is the ratio of inner region to outer region fuel storage cells heat load limits.

4-2) Permissible MPC heat load is increased to 34 kW (uniform loading) and 36.9 kW (regionalized loading).

4-3) Helium operating pressure raised to 7 atm.

4-4) A new Section 4.6 added to group all thermal analyses in support of off-normal and accident events evaluated in Chapter 11.

4-5) Added new supplement 4.I for evaluation of the HI-STORM 100U underground overpack.

Proposed Changes to Chapter 5

Section 5.0

5-1) The footnote on page 5.0-1 concerning the HI-STORM 100S Version B has been removed.

Justification: In this LAR the HI-STORM 100S Version B is now incorporated into all chapters of the FSAR. Therefore, a footnote in Chapter 5 stating that the NRC has not reviewed and approved the design of the 100S Version B is no longer necessary and would be out of place since the remainder of the chapters do not have such a footnote even though they contain information on the HI-STORM 100S Version B.

5-2) The burnups and cooling times analyzed in the chapter were changed.

Justification: This change is due to the change in the allowable heat loads and the regionalized loading changes. The maximum allowable burnup in the CoC has not been changed.

5-3) Dose results for the HI-STORM 100 and HI-STORM 100S have been removed.

Justification: The HI-STORM 100S Version B results are bounding and therefore are the only results presented.

5-4) HI-TRAC results are only presented for a single burnup and cooling time combination rather than two combinations.

Justification: This change was made to reduce the volume of information. This is acceptable because the results for the bounding combination are presented.

5-5) The sentence regarding the 5% margin in the thermal analysis for PWR fuel assemblies in Section 5.2.5.3 was removed.

Justification: A 5% penalty is now applied in the determination of the coefficients for the allowable burnup versus enrichment and decay heat equation. The PWR coefficients in Chapter 2 and the CoC have been changed accordingly.

5-6) The concrete density was reduced to 140 lb/cuft and all dose rates were changed accordingly. Appendix 5.E was also deleted because of this change.

Justification: It is desired to permit a wider range of concrete densities for flexibility in implementing the HI-STORM 100 System at various sites.

5-7) The discussion concerning concrete temperatures in Section 5.3.2 was changed.

Justification: This change was made to reflect the revised thermal analysis.

5-8) The number of CRAs in the MPC-24 and MPC-32 has been changed and the number of APSRs in the MPC-32 has been changed and the dose analysis revised accordingly.

Justification: This change was made to provide additional flexibility to the users.

5-9) A brief discussion in Section 5.2.5.3 on the lower enrichment used for the equation relating burnup, enrichment, and decay heat has been added. The sentences were taken directly from an RAI response during the LAR 1014-2 process.

Justification: This change is being made to provide clarity for users of the HI-STORM 100 Systems.

Proposed Changes to Chapter 6

6-1) Modified the chapter to remove specific discussion of the "F" shells and clarified the discussion of damaged fuel and fuel debris. Changes were made to Tables 6.1.1 through 6.1.6, 6.1.12, 6.2.2, 6.2.19, 6.3.6, 6.4.10, 6.4.11, 6.4.14, and Appendix 6.C to incorporate changes in the dimensions for the 16x16A assembly array/class

6-2 Corrected titles of Tables 6.2.41 through 6.2.45 to specify that they apply to the MPC-68 as well as the MPC-68F.

6-3 Modified text on pages 6.4-9, 6.4-16, 6.C-12 and 6.C-13 to eliminate reference to "F" shells.

Proposed Changes to Chapter 7

7-1) Editorial changes to clarify the discussion of damaged fuel and fuel debris.

7-2) Restored helium leak testing of vent and drain port cover plate welds.

Proposed Changes to Chapter 8

8-1) Editorial proposed changes addressing the existence of the HI-STORM 100U VVM, applicability to the HI-STORM 100U VVM and references to Supplement 8.I.

8-2) Modified to reflect restoration of vent and drain port cover plate helium leak test.

8-3) Added cautions to ensure that fuel rods are not exposed to air during water draindown immediately prior to MPC lid welding or during MPC reflood for unloading.

Proposed Changes to Chapter 9

9-1) Modified to reflect restoration of vent and drain pot cover plate weld helium leak testing.

Proposed Changes to Chapter 10

10-1) Dose results in Section 10.3 and 10.4 have been changed.

Justification: These changes are conforming changes being made because of the decrease in concrete density and the change in analyzed burnups in Chapter 5.

Proposed Changes to Chapter 11

This Chapter has been substantially revised to enhance clarity of presentation and evaluation of results. Because of extensive editing a clean chapter is issued with this supplement. A list of principal changes are provided below:

11-1) Analytical details supporting the evaluations are moved to the discipline chapters as itemized in 2.and 3.to avoid information clutter and enhance clarity of presentation.

11-2) Thermal analyses supporting evaluation of off-normal events are moved to Subsection 4.6.1.

11-3) Thermal analyses supporting evaluation of accident events are moved to Subsection 4.6.2.

11-4) Added new supplement 11.1 for evaluation of the HI-STORM 100U underground overpack.

11-5) Modified discussions in Section 11.1 to reflect restoration of helium leak testing of vent and drain pot cover plate welds.

11-6) Modified discussion of tip-over accident dose requirements to reflect RAI request.

Proposed Changes to Chapter 12

12-1) Table 12.1.1 – Added technical specification 5.4 (Radioactive Effluent Control Program) to the entry for Shielding and Radiological Protection. This tech spec already existed, but was not listed in the table. The Cask Transfer Facility was removed from the entry for Structural Integrity. This item is a design criteria, not a technical specification.

12-2) Section 12.2.10 and Tables 12.2.1 through 12.2.3 – Updated examples to reflect new regionalized loading scheme from Chapter 4 and revised burnup equation coefficients from Chapter 2.

12-3) Bases for LCO 3.1.1 – Restored discussions on helium leak testing of vent and drain port cover plate welds.

12-4) Bases for LCO 3.1.2 – Clarified definition of operability to alleviate user confusion. Modified completion time and surveillance requirements discussions to reflect changes in analysis results for aboveground casks and to incorporate new values for underground casks.

12-5) Bases for LCO 3.1.4 – Updated to reflect addition of threshold heat load for SCS operation. Clarified when the SCS should be declared inoperable to alleviate user confusion.

12-6) Added Bases for LCO 3.1.5 to reflect addition of new LCO in the technical specification.

Proposed Changes to Chapter 13

13-1) Section 13.1 – Renumbered section to reflect subsection deletions in CoC Amendment 2.

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 5014603
Non-Proprietary Attachment

AFFIDAVIT PURSUANT TO 10 CFR 2.390

I, Evan Rosenbaum, being duly sworn, depose and state as follows:

(1) I am the Holtec International Project Manager for LAR 1014-3 and have reviewed the information described in paragraph (2) which is sought to be withheld, and am authorized to apply for its withholding.

(2) The information sought to be withheld is Attachments 7 through 10 to Holtec letter Document ID 5014603, containing Holtec Proprietary information.

(3) In making this application for withholding of proprietary information of which it is the owner, Holtec International relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4) and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10CFR Part 9.17(a)(4), 2.390(a)(4), and 2.390(b)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

AFFIDAVIT PURSUANT TO 10 CFR 2.390

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by Holtec's competitors without license from Holtec International constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

c. Information which reveals cost or price information, production, capacities, budget levels, or commercial strategies of Holtec International, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future Holtec International customer-funded development plans and programs of potential commercial value to Holtec International;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs 4.a and 4.b, above.

(5) The information sought to be withheld is being submitted to the NRC in confidence. The information (including that compiled from many sources) is of a sort customarily held in confidence by Holtec International, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by Holtec International. No public disclosure has been made, and it is not available in public sources. All

disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within Holtec International is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his designee), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside Holtec International are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information classified as proprietary was developed and compiled by Holtec International at a significant cost to Holtec International. This information is classified as proprietary because it contains detailed descriptions of analytical approaches and methodologies not available elsewhere. This information would provide other parties, including competitors, with information from Holtec International's technical database and the results of evaluations performed by Holtec International. A substantial effort has been expended by Holtec International to develop this information. Release of this information would improve a competitor's position because it would enable Holtec's competitor to copy our technology and offer it for sale in competition with our company, causing us financial injury.

AFFIDAVIT PURSUANT TO 10 CFR 2.390

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to Holtec International's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of Holtec International's comprehensive spent fuel storage technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology, and includes development of the expertise to determine and apply the appropriate evaluation process.

The research, development, engineering, and analytical costs comprise a substantial investment of time and money by Holtec International.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

Holtec International's competitive advantage will be lost if its competitors are able to use the results of the Holtec International experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to Holtec International would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive Holtec International of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 5014603
Non-Proprietary Attachment

AFFIDAVIT PURSUANT TO 10 CFR 2.390

STATE OF NEW JERSEY)
) ss:
COUNTY OF BURLINGTON)

Mr. Evan Rosenbaum, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at Marlton, New Jersey, this 10th day of July, 2006.

Evan Rosenbaum
Holtec International

Subscribed and sworn before me this 10th day of July, 2006.

MARIA C. MASSI
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 25, 2010

GE - Nuclear Energy

Nuclear Fuel P. O. Box 780, Castle Hayne Road, Wilmington, NC 28401-0780

FAX

Date: 8/21/98

Number of pages including cover sheet: 6

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To Scott Pellet | From Rick Fennell

Co./Dept. Holtec Intl | Co. Southern Nuclear

Phone # 609-424-0999 x651 | Phone # 205-992-7293

Fax # 767-0909 | Fax # -5536

To — y Noble

Phone:

Fax phone:

CC:

Phone: (910) 675 8*292

Fax phone: (910) 675-5764 8*292-5764

GE/SPC/SNC Proprietary Data

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please comment

- Signed Copy of Holtec/SNC/GE agreement - 8/21/98
- letter with Spacer Dimensional Data
  (includes SNC overlay for # of spacers)

→ No 7x7 data (GE3) or GE4 data would need archive search — believe that bounding designs are provided

→ No Siemens 9x9 spacer data — advise if Comm Ed has not provided

→ By our recollection, the GE6 spacer dimensions will be identical for the GE5-GE7 8x8 designs

→ Advise if a formal GE/Siemens historical data survey is required for Hatch GE3 thru GE7

8/21/98

PROPRIETARY INFORMATION AGREEMENT
PAGE 1/3

THIS AGREEMENT, by and between Southern Nuclear Operating Company acting for the Georgia Power Company (hereinafter referred to as "SNC"), General Electric Company (hereinafter referred to as "GE"), and Holtec International (hereinafter refaured to as "Holtec") is in connection with the GE proprietary information listed in Attachment A which SNC desires to have transmitted to Holtec. Such proprietary information will be used in conjunction with SNC and Holtec working together to provide dry cask storage systems for irradiated GE nuclear fuel currently at Edwin I. Hatch Nuclear Units 1 and 2 (hereinafter referred to as the "Purpose").

Whereas, such proprietary information may either be provided to SNC under this AGREEMENT, or has been provided to SNC by GE under the Engineering, Fuel Fabrication and Related Services contract (hereinafter referred to as the "Contract"), between SNC and GE for Edwin I. Hatch Nuclear Plant Units 1 and 2 (hereinafter referred to as "Plant Hatch"), effective as of 1 April, 1984 as amended, which Contract contains provisions restricting use, publication, and disclosure of proprietary information provided by GE under such contract; and

Whereas, Holtec and SNC desire to use such proprietary information for the limited Purpose as described herein and GE is willing to permit SNC to transmit the GE proprietary information listed in Attachment A to Holtec provided that SNC and Holtec agree to be bound by the provisions herein.

1. To the extent that GE proprietary information is involved, it is agreed that SNC shall clearly identify such GE proprietary information when furnishing it to Holtec.

2. Holtec shall maintain all GE proprietary information in confidence and not disclose such information or transmit any documents or copies containing such information to any third party, except SNC, without the prior written consent of GE. The proprietary information shall be used solely in connection with the Purpose and shall not be used in any other work without the prior written consent of GE. In the event Holtec submits any of such proprietary information to SNC, Holtec shall specifically identify such proprietary information as being proprietary to GE. Holtec shall not use such proprietary information with any third party to promote its services or products nor shall Holtec make any claims to third parties based on such proprietary information or use thereof.

3. All GE proprietary information furnished by SNC to Holtec remains the property of GE. Holtec shall return to SNC such GE proprietary information upon conclusion of the work hereunder.

4. Holtec shall maintain appropriate policies and procedures adequate to protect the confidential nature of the proprietary information, including agreements with their employees to prevent unauthorized disclosure or publication of such information. Access to the proprietary information shall be limited to those of its employees having a need for such access in connection with the Purpose.

5. If proprietary information is required to be disclosed pursuant to lawful subpoena, enforceable law or rule, applicable regulation or judicial or administrative order, Holtec shall promptly notify GE and use its best efforts to limit the disclosure and the information to be disclosed if and as reasonably requested by GE.

PROPRIETARY INFORMATION AGREEMENT CON'T
PAGE 2/3

6. The foregoing obligations shall continue in force for an initial period of ten (10) years following disclosure of proprietary information to Holtec, and for additional periods of like duration provided that ninety (90) days prior to the termination of any such period, GE certifies to Holtec that the information continues to be proprietary information and has not become available to the public.

7. For purposes of this AGREEMENT, "proprietary information" is that which is transmitted or otherwise disclosed to Holtec in written, visual, or oral form and which is:

a. protected by GE from publication and unrestricted disclosure to or use by others,
b. not in the public domain and does not subsequently become part of the public domain,
c. not otherwise known to Holtec without restriction, and,
d. designated as proprietary information at the time the information is furnished by GE.

8. This agreement shall be governed and construed in accordance with the laws of the State of Georgia as between GE and SNC, and in accordance with the laws of the State of New York as between GE and Holtec.

9. This agreement may be executed in any number of counterparts, each of which shall be deemed an original but all of which together shall constitute one and the same instrument.

10 This agreement may be amended by, and only by a written instrument duly executed by each of the Parties.

11. An authorized representative of each party has signed triplicate copies of this agreement in the space provided below to indicate acceptance of and agreement with the above provisions, effective as of the last date of signature set forth below.

Holtec International

Name (typed) Scott A. Collet
Signature
Date 8-21-98

General Electric Company

Name (typed)
Signature
Date

Southern Nuclear Operating Company

Name (typed) L. B. [illegible]
Signature
Date 8/21/98

PROPRIETARY INFORMATION AGREEMENT
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ATTACHMENT A

No.	Title or name of document	Comments
1.	Hatch Reload Plenum Volumes	Attachment to letter LDN98108, 7/21/98
2.	Hatch Reload Rod Free Volumes	Attachment to letter LDN98114, 7/24/98
3.	Hatch Fuel Criticality and Thermal Data	SNC Spreadsheet File FUELHDAT.wk4, 7/24/98
4.	Spacer Dimensional Data	Attachment to letter LDN98128, 8/21/98