

## **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**

###### *Deleted*

~~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.~~

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

- ~~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.

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

- 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 does 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

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

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 ~~740~~ **730** lbs.

#### **Reason for Proposed Change**

Some BWR assembly types to be loaded into MPC-68s have an overall weight, with 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. *Lift weights in Chapter 8 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. ~~Deleted~~ 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**

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

- a. ~~Deleted~~ 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. ~~Deleted~~ 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~~ *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, these 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

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

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 four (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 encased in stainless steel, in the lid. Such designs have been approved for other cask designs.

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

### **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.

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

- 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.



## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

### **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**

*Deleted*

~~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**

## SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

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**

*Deleted*

~~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***

SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1014 (continued)

*Required by Response to RAI 6-1.*

**Proposed Change No. 24**

*Deleted*

~~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**

*Deleted*

~~——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 (continued)

### 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)”.~~ Modified 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 *Added definition for term* “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

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

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) ~~Deleted~~ 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

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

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.

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

- 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 Section 2.2.2.4 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.



## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

- 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.

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

- 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:

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

- 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) ~~Deleted~~ 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.

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

- 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.*

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

### **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.

## SECTION II – PROPOSED CHANGES TO THE FSAR (continued)

- 11-4) ~~Deleted~~ Added new supplement 11.I 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) ~~Deleted~~ 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.