AREVA

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E-39211

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Subject: Submittal of Biennial Report of 10 CFR 72.48 Evaluations Performed for the Standardized NUHOMS® System, CoC 1004, for the Period 07/24/12 to 07/23/14, Docket 72-1004

Pursuant to the requirements of 10 CFR 72.48(d)(2), AREVA Inc. (AREVA) hereby submits the subject 10 CFR 72.48 summary report. Enclosure 1 provides a brief description of changes, tests, and experiments, including a summary of the 10 CFR 72.48 evaluation of each change implemented from 07/24/12 to 07/23/14, including indication as to whether the evaluations had associated Updated Final Safety Analysis Report (UFSAR) changes that will be incorporated into the UFSAR for the Standardized NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel, NUH003.0103, in the next update.

Should you or your staff have any questions regarding this submittal, please do not hesitate to contact Mr. Don Shaw at 410-910-6878 or me at 410-910-6820.

Sincerely,

Paul A Triska

Paul Triska
Vice President, Technical Services

cc: B. Jennifer Davis (NRC SFST), provided in a separate mailing

Enclosure:

1. Report of 10 CFR 72.48 Evaluations Performed for the Standardized NUHOMS® System For the Period 07/24/12 to 07/23/14

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REPORT OF 10 CFR 72.48 EVALUATIONS PERFORMED FOR THE STANDARDIZED NUHOMS® SYSTEM FOR THE PERIOD 07/24/12 to 07/23/14

Enclosure 1 Part 1 - DESIGN CHANGES

LR 721004-1067 Rev. 0 – (will be incorporated into next UFSAR revision)

Change Description

The change involves an alternate design option to reduce the maximum length of the spent fuel assembly from 171.76 inches to 171.23 inches. This change provides an alternate option of the 24PHBL dry shielded canister (DSC) configuration, designated as "24PHBL DSC with Alternate Shifted Shielding Option" or 24PHBL DSC (ASSO). This alternate configuration includes a modified top shield plug assembly design with a thicker top shield plug (the minimum lead thickness increased from 4.3 to 4.7 inches) and a thicker top shield plug cover plate (thickness increased from 0.3 to 0.4 inches). To accommodate the changes in the DSC top shield plug assembly, the dimensions of the DSC siphon and vent block assembly shelf are also increased by 0.5 inches. The 24PHBL DSC (ASSO) shell length is maintained constant by reducing the DSC cavity length by 0.5 inches (from 173.28 to 172.78 inches). Likewise, the DSC basket length is also reduced accordingly by reducing the DSC support rod length by 0.5 inches (from 172.75 to 172.25 inches). This design change option takes advantage of the reduced fuel assembly length by providing additional shielding at the DSC top end to reduce personnel dose exposure from gamma radiation during DSC top end closure operations.

Evaluation Summary

The primary safety functions of the NUHOMS®-24PHB system to provide confinement, structural integrity, criticality control, reject decay heat, and ALARA occupational exposure are not adversely impacted by the addition of the NUHOMS®-24PHBL DSC (ASSO option) to the NUHOMS® UFSAR.

The total dry weight of the 24PHBL DSC (ASSO option) is marginally higher by 431 pounds relative to the standard 24PHBL DSC (SSO option). A calculation has been completed that concludes the limiting lift weight is controlled by the lift of a loaded 24PHBL DSC (Wet) in a standardized transfer cask (TC) from the spent fuel pool to the decon area. The weight of a loaded wet standardized TC in this configuration (without the TC top cover plate and the DSC inner and outer top cover plates) is 198,000 lb, which is within the 100-ton capacity of the lifting crane.

The maximum heat load of both the NUHOMS®-24PHBL DSC (ASSO option) and the NUHOMS®-24PHBL DSC (SSO option) is limited to 24kW. Changing the cavity length does not impact the thermal evaluations described in UFSAR Chapter N.4, Appendix N. The calculated temperatures remain unchanged by the change in cavity length.

The handling of the 24PHBL DSC (ASSO) is identical to the original 24PHBL DSC described in the UFSAR. The DSC outer top cover plates and weld details are identical relative to the original 24PHBL DSC. The 24PHBL DSC (ASSO) DSC grapple assembly design is the same as the 24PHBL DSC (SSO). The 24PHBL DSC (ASSO) is functionally equivalent to the currently approved 24PHBL DSC and has been designed to interface with the TC, transfer equipment, and the HSM without any changes.

No new thermal, shielding or criticality analyses are required. New structural evaluations have been performed to evaluate the 24PHBL DSC (ASSO) using identical methods and criteria as described in the UFSAR for the original 24PHBL DSC (SSO).

All eight 72.48 evaluation criteria were met.

LR 721004-1079 Rev. 0 – (will be incorporated into next UFSAR revision)

Change Description

The changes involve the introduction of new Basket Option 3 for the 37PTH DSC. The new basket option consists of a reduction in poison plate thickness and the thickness of the center section basket plates, intended to accommodate the fabrication of a larger cell size with a corresponding larger fuel gauge size.

The changes include: (1) using only full thickness MMC poison plate for Basket Option 3 with no option for pairing aluminum plate with poison plate, (2) reducing the poison plate thickness, and (3) reducing the thermal conductivity requirement of the poison plates (neutron absorber), (4) revising the basket to shell diametrical gap range resulting in a change to the nominal basket OD associated with the maximum gap, (5) revising the center basket plates (Item 2 on Drawing NUH37PTH-30-11) dimensions and materials, and (6) provide for a split poison plate option that replaces the chevron "L" shape with two discrete plates, which requires additional poison plate mounting attachments in the center section of the plates.

Evaluation Summary

The 37PTH internal basket assembly contains fuel compartments that define a storage position for each of the 37 fuel assemblies, provides criticality control and heat transfer capability. Criticality control is maintained through fixed poison (poison plates), soluble boron during fuel loading operations and the favorable geometry provided by the welded basket plates, which form the fuel compartments. Heat transfer is provided through the basket plates, poison plates, and solid aluminum rails that form the heat conduction paths to carry decay heat produced by the spent fuel assemblies to the DSC shell. Structural support for the fuel assemblies is provided by the stainless steel basket plates that are welded together to form the fuel compartments. The solid aluminum transition rails are provided at the basket periphery to form the cylindrical shape of the basket, provide structural support to the basket weldment and heat transfer. No credit is taken for the poison plates in the structural analyses.

The ability of the basket to provide criticality control, structural support for the spent fuel, and decay heat rejection is not adversely affected by the subject design changes since the following design attributes are satisfied:

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- Regarding criticality control, the analysis results indicate that the most limiting k_{eff} for Basket Option 3 is 0.9289, which is bounded by the most limiting k_{eff} of 0.9394 for Basket Option 1 as currently reported in the UFSAR, and satisfies the established upper safety limit (USL) of 0.95 considering all applicable biases and uncertainties, such that the 37PTH system is maintained in a safe sub-critical condition. The change in basket plate material has no effect on criticality design since the material types have similar chemical compositions and mass densities.
- Regarding thermal performance, the thermal analysis results demonstrate that the maximum fuel temperatures for Basket Option 3 are maintained within the established limits of 752 °F for the normal conditions of storage and the normal and off-normal conditions of transfer, and 1058 °F for the off-normal and accident conditions of storage and the accident conditions of transfer. The most limiting calculated temperatures are 737 °F for the normal condition of transfer compared to the 752 °F allowable limit, and 863 °F for the accident condition of transfer compared to the 1058 °F allowable limit. For the reduction in basket to shell gap for Basket Option 3, the resultant hot gap radial clearance was verified to be sufficient to accommodate the free thermal expansion of the basket in the radial direction. Likewise, the free thermal expansion of the basket in the axial direction was found to be adequate and bounded by the clearances for Basket Options 1 and 2. The split plate option for the poison plate was also verified to have no adverse impact on the credited thermal design function.
- Regarding pressure control, the thermal evaluation results demonstrate that the internal DSC cavity pressures for Basket Option 3 are bounded by Basket Options 1 and 2 and remain within the specified design pressures of 15 psig for normal, 20 psig for off-normal and 140 psig for accident conditions.
- Regarding structural and confinement boundary design, the structural analysis results demonstrate that the DSC shell and other confinement boundary features satisfy ASME Code allowable values for Basket Option 3 for all loading conditions of storage and transfer, and the basket component stresses remain well within the ASME Code design basis limits. The bucking evaluation demonstrates that the basket remains stable for side drop accident events.

The subject design changes would not result in more than a minimal increase in the likelihood of occurrence of a malfunction of a system structure, or component (SSC) important to safety previously evaluated in the UFSAR.

The changes have no adverse impact on the shielding effectiveness of the 37PTH system, including the storage configuration while in the HSM-H and the transfer configuration while in the OS200 TC, and therefore cannot adversely affect dose consequences.

All eight 72.48 evaluation criteria were met.

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LR 721004-1112 Rev. 0 – (will be incorporated into next UFSAR revision)

Change Description

This introduces a number of changes to the HSM model 152 loaded with a 32PT-L125 DSC. The design changes for the HSM include: (1) adding a rail spacer to accommodate all DSC length configurations for new and existing models, (2) an increase in the concrete clear cover to the top shield block of the HSM, and (3) reducing the weld between the rear baseplate to the rail. In addition, a design option has been added for a stainless steel DSC axial retainer, and alternate welding design options in two locations for the DSC support structure. The changes also incorporate new lifting embedments design to improve the alignment of attachment hardware and to meet code requirements.

Evaluation Summary

A structural evaluation of the HSM Model 152 has been performed to assess the impacts of the increased HSM roof concrete clear cover, different welding configurations for the DSC support structure, and a longer rails spacer.

A rail spacer is designed to reduce the gap between the support structural stop plate and the 32PT-L125 to limit the impact of a seismic event. A spacer length of 11 inches was evaluated with the rail spacer either bolted or pinned. The analysis results indicate that the rail spacer is in compliance with the allowable compressive stress limits.

The stress evaluation was performed for the DSC Axial Retainer for carbon steel and stainless steel materials. The axial retainer is in compliance with the allowable stress limits.

The concrete cover is increased in the roof of the HSM Model 152 and results in a 4% reduction in strength for the out of plane shear and bending capacities. The stress ratios for shear and axial direction against the concrete capacities were recalculated for the roof. For both of the loadings, the stress ratios are still within acceptable limits. Therefore, there is no effect on the structural adequacy of the roof.

The weld between the cross beam and rail gusset plate (of the HSM Model 152 support structure) is reduced to eliminate interference between the weld at the narrow location between the bottom of the cross-beam and the top of the beam flange of the rail. The welds at the top and side of the crossbeam remain the same, and the weld at the bottom of crossbeam has a minimum length of 4 inches and a weld size of ⅜ inches. This is in compliance with the required weld capacity and these changes comply with code requirements and are within allowable stress limits.

The rear baseplate is provided for leveling the DSC support structure and serves no function during storage. The evaluation of the weld between the rear baseplate and the rail was performed. The minimum required weld between rail and rear base plate is 2 inches long, however the new weld will be more than 13 inches. This is in compliance with the required weld capacity and these changes comply with code requirements and are within allowable stress limits.

Based on the above discussion the structural design function of the HSM Model 152 modules is not adversely affected as a result of these changes The changes do not create an unanalyzed structural or seismic condition nor do they change the HSM Model 152 structural or seismic design parameters as described in the UFSAR.

All eight 72.48 evaluation criteria were met.

LR 721004-1198 Rev. 0 – (will be incorporated into next UFSAR revision)

Change Description

This change involves an option to grout the through-hole penetrations in the roof of the HSM Model 152. The physical change will prevent water accumulation in the through-holes, which can freeze and cause cracking damage to the HSM Roof. The filling of the through-holes has been implemented at previous/existing HSM sites utilizing a design with a through-hole in the roofs. The NRC had expressed a concern about cracking in the HSM roof that was observed in a short period of time at the TMI-2 ISFSI at Idaho National Laboratory (INL).

NRC requested that AREVA provide a list of sites utilizing CoC No. 1004 in conjunction with thru-hole penetrations via letter dated February 2, 2012. AREVA notified NRC by AREVA Letter # E-32270, dated March 1, 2012, from Jayant Bondre to the U.S. NRC-Document Control Desk, which addressed the Identification of Sites Using Horizontal Storage Modules with Thru-Hole Penetrations for all sites utilizing the NUHOMS® design. AREVA addressed NRC concerns/issues and provided recommendations to users related to the HSMs thru-hole penetrations for the sites using this HSM.

Evaluation Summary

The HSM Model 152 is a freestanding reinforced concrete structure designed to provide environmental protection and radiological shielding for the DSC. This design change option includes a revision to the structural analysis for the HSM-152 module loaded with DSCs containing 32 design basis PWR fuel assemblies. The revised structural evaluation includes options with or without grouting in the roof penetration holes. The relevant accident conditions are Extreme Wind and Tornado Missiles [UFSAR R.11.2.3/M.11.2.3] and Blockage of Air Inlet and Outlet Openings [UFSAR R.11.2.6/M.11.2.7], which are both natural phenomena. The structural evaluation of the change to the HSM-152 still demonstrates ample margin to the required limit against design allowable limits. In addition, this change has no impact on dose.

All eight 72.48 evaluation criteria were met.

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LR 721004-1304 Rev. 0 – (no associated UFSAR change)

Change Description

The change involves reducing the minimum required thermal conductivity of the poison plates (neutron absorber) in the 61BTH Type 2 DSC for a full thickness of the plates and a maximum heat load of 31.2 kW.

Evaluation Summary

The poison plates are passive components of the basket that provide criticality control and a heat conduction path from the stored fuel assemblies to the 61BTH DSC shell. This change has no impact on the criticality function since the required minimum areal density of the B-10 poison material is unchanged. Reducing the thermal conductivity of the poison plates increases the maximum temperature of basket components. The effects on the thermal performance of the 61BTH Type 2 DSC have been evaluated. The bounding accident transfer condition for the 61BTH Type 2 DSC is the loss of the liquid neutron shield occurring coincidently with the loss of sunshade and the loss of air circulation. The reduced minimum thermal conductivity of the poison plates results in an increase of the maximum fuel cladding temperature from 830 °F for the transfer accident case described in the UFSAR to 861 °F – a 31 °F increase. This maximum fuel cladding temperature remains well below the limit of 1058 °F for this accident case identified in the UFSAR. As a result of this temperature increase for the accident case, the internal pressure of the DSC also increases from 68.7 psig (UFSAR Table T.4-24) to 69.2 psig. This increased DSC pressure also remains well below the design pressure of 120 psig.

The effect on the time limits for normal and off-normal transfer operations of the 61BTH Type 2 DSC with the reduced poison plate conductivity has also been evaluated. The time limits specified in the thermal analysis remain bounded by the evaluations described in the UFSAR.

All eight 72.48 evaluation criteria were met.

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Enclosure 1 Part 2 – NONCONFORMANCES

LR 721004-857 Rev. 1 – (no associated UFSAR change)

Change Description

The change involved an HSM repair at an ISFSI where the concrete repair of the top of the docking collar/outdoor door opening of the HSM – averaging 4 inches deep and equivalent to 1/3 of a cubic yard of patch material – did not meet the compressive strength requirements as stated in the AREVA specification. The repair area of the module is on the upper portion of the outer ring of the door opening. This change involves two nonconformances. First, the compressive strength of the concrete repair mix at 28 days was 4440 psi rather than 5,000 psi as specified in the AREVA specification. The second nonconformance concerned test cylinder diameters that were not recorded as required by ASTM C39.

Evaluation Summary

The HSM base provides physical protection to the DSC stored in the HSM module from tornado-generated missiles and shielding from the radiation generated by the spent fuel in the DSC.

With regard to the first nonconformance, the mix material was tested for critical concrete characteristics. The shielding and thermal performance of the HSM will not be adversely impacted by the repair material. The density of the repair material meets the requirements of the fabrication specification. In addition, the elemental density of hydrogen important for neutron shielding is not impacted by the repair. The nominal density of water for the repair material is 224 lb/yd^3, which exceeds the value of 197 lb/yd^3 used in the analysis.

The structural performance of the HSM using the concrete repair mix on the small repaired area on the upper portion of the outer ring of the door opening with a compressive strength below the value of 5,000 psia assumed in the AREVA specification was further evaluated.

Even though the average concrete strength is well over 5000 psi, the following table demonstrates that the HSM design analysis as described in UFSAR Section 8.1.1.5.E is still more than adequate when a concrete compressive strength of 4440 psi is considered. This is a conservative approach because it assumes all of the concrete in the front wall has a compressive strength of 4440 psi, where in reality this is only true at the repair location that has an approximate volume of 1/3 cubic yard and average depth of 4 inches. As mentioned in UFSAR Section 8.2.10.4, the load combination procedure combines the factored normal operation, off normal, and postulated accident loadings imposed on the HSM. The front wall moment and shear capacities remain above the governing load combinations reported in UFSAR Table 8.2-18. Therefore, the design analysis of the HSM remains valid as described in the UFSAR.

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	Ultimate Moment Capacity (kip-in/ft)		Governing Moment Load Combination (kip-in/ft)	Ultimate Shear Capacity (kip/ft)		Governing Shear load Combination (kip/ft)
f'c (psi)	5000	4440	-	5000	4440	-
Normal Thermal Condition	881.00(2)	880.20(3)	533.00(2)	40.50(2)	38.15(4)	28.93(2)
Accident Thermal Condition(1)	788.00(2)	787.56(3)	681.63(2)	38.40(2)	36.19(4)	42.73(2)

(1) The original concrete compressive strength during a thermal accident condition is considered to be 4500 psi as shown in UFSAR Table 8.1-3. Even though the repair material will not reach thermal accident temperatures, the resulting concrete compressive strength considered for the 4440 psi concrete during a thermal accident condition is conservatively reduced by a ratio of 4500/5000.
(2) Values shown are as reported in UFSAR Table 8.2-18.
(3) Values shown are calculated per UFSAR Equation 8.1-6.
(4) Values shown are calculated per UFSAR Equation 8.1-7.

Local damage potential caused by a missile impact to the repaired area is greatly reduced because most of the area is covered by the door (less than 3 inches of the top of the base will be exposed to impact). A bounding missile impact of a rigid penetration missile consisting of a 280 pound, 8-inch diameter blunt-nosed hardened steel object is postulated and analyzed for effects on penetration, scabbing, and perforation of the HSM in UFSAR Section 8.2.2.2.C. Penetration, perforation, and scabbing thickness values are recalculated in accordance with UFSAR Equations 8.2-5, 8.2-7, and 8.2-9, respectively, using a concrete compressive strength of 4440 psi. This is a conservative approach because (1) it assumes all of the concrete in the front wall has a compressive strength of 4440 psi, and (2) the exposed repair area is much less than the size of the postulated missile. The resulting values are shown in the table below along with the original values obtained using a concrete compressive strength of 5000 psi for comparison. All thicknesses for penetration, perforation, and scabbing remain below the 30-inch thickness of the front wall. Therefore, the front wall will provide adequate resistance to penetration, perforation, and scabbing.

f'c (psi)	Penetration depth (in)	Perforation thickness (in)	Required Wall Thickness for Scabbing (in)
5000	4.67	12.95	27.7
4440	4.80	13.24	28.1

The repair, therefore, is shown to have an insignificant impact on the structural performance of the HSM described in the UFSAR.

Concerning the second nonconformance of not recording the diameter of the test cylinders, documentation is available to confirm that cylinder caps were used during the molding and curing of the specimens. The use of cylinder caps provides assurance that the nominal diameter of the cylinder is maintained during the hardening of the concrete. Consequently, the nominal area used to calculate the nominal strength is acceptable.

The eight 72.48 evaluation criteria were met.

LR 721027-1075 Rev. 1 – (incorporated into UFSAR Revision 13)

Change Description

During the fabrication of R45 transition rails for NUHOMS® 61BT DSCs and the 61BTH Type 1 DSCs, material was removed from the inner support webbing to assist in providing access to the weld stud access holes.

Evaluation Summary

This evaluation addresses the impact of this nonconformance on the structural and thermal functions of the R45 transition rails as described in the UFSAR. The 61BTH Type 1 DSC is the existing 61BT DSC with no modifications, except for an option for a fixed top grid instead of the removable basket hold-down ring and increased poison loading. Therefore, the 61BTH Type 1 thermal analyses are bounding due to the increased heat loading on this design option. In addition, the structural analyses are bounding for the 61BTH Type 1 design since they have the same basket designs, and resulting weight loadings.

Adverse effects are observed on the (1) thermal stresses, (2) weld stresses, (3) stresses of the webbing plate, and (4) bucking of the webbing plate. The safety functions are adversely impacted by the material removal in the inner webbing support, but remain below the bounding limits analyzed in the UFSAR.

The R45 transition rail is 164.0 inches long (nominal) with seven attachment hole cut-outs (corresponding to seven notches in the webbing plate). With a size of 3.15 inches in length, this represents 22.05 inches of the length notched, or 13% of the webbing plate. The thermal stress increase only has a local impact on the DSC and remains bounded by other analyzed thermal stresses.

The eight 72.48 evaluation criteria were met.

LR 721004-1113 Rev. 0 – (no associated UFSAR change)

Change Description

During final inspections of an HSM-H array, it was discovered that the base units for two HSMs had a back-to-back gap that varied from ¾ inches on one of the back edges to 15/16 inches on the other back edge, with no contact at all along the back-to-back surfaces of these two HSMs. This "no contact" condition conflicts with the AREVA specification, which requires the modules to be in contact with a maximum top roof-to-roof gap of ¾ inches.

Evaluation Summary

Gaps of up to 15/16 inches between adjacent HSM-H modules with no contact anywhere along the affected surfaces may adversely impact the shielding function of the HSM-H described in Appendix T of the UFSAR. Therefore, a revised shielding analysis was performed to demonstrate that the NUHOMS® HSM-Hs are acceptable for storage in this configuration "as is" when loaded with 61BTH Type 1 DSCs containing 61 design basis BWR fuel assemblies. The shielding analysis determined the dose rates on and around a 3X2 array of HSM-H modules loaded with the design basis fuel assemblies stored in enclosed DSCs with a maximum back-to-back gap of 1.0 inch and a maximum side-to-side gap of 0.75 inch between adjacent HSM-H modules. The maximum dose rates at the three locations listed in UFSAR Technical Specification 1.2.7(f) must not exceed:

a) 700 mrem/hr at the front bird screen,
b) 100 mrem/hr at the HSM door centerline,
c) 20 mrem/hr at the end shield wall exterior.

For normal conditions of operation analyzed, the dose rates for the revised shielding analyses with the gaps identified does not vary significantly from those reported in the UFSAR and remain below the values listed in the Technical Specifications (TS).

For accident conditions, 10 CFR 72.106(b) requires that the dose at the site boundary be limited to 5000 mrem per accident. The increase in dose at the site boundary with continual occupancy by an individual (assumed in the UFSAR to be at 100 meters) with the specified gaps between HSM-H modules is 42 mrem. The dose increased from 590 mrem with no gaps to 632 mrem with these gaps – an increase of approximately 7% and well below the accident dose limit.

The eight 72.48 evaluation criteria were met.

LR 721004-1119 Rev. 0 – (no associated UFSAR change)

Change Description

This change involves a nonconformance in which the DSC grapple ring is fabricated approximately 0.027 inches thinner than the required thickness depicted in the UFSAR drawing.

Evaluation Summary

The change will increase the stress felt on the grapple ring during DSC unloading operations from the HSM. The reduced grapple thickness results in a stress of 23.65 ksi (an insignificant increase in stress from the original analysis stress of 23.08 ksi, and well below the allowable stress of 34.8 ksi. The grapple ring is used only during extraction operations.

The eight 72.48 evaluation criteria were met.

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LR 721004-1182 Rev. 0 – (no associated UFSAR change)

Change Description

This change involves a nonconformance in which the DSC lifting lugs have a larger overhang from the reinforcing plate, and therefore, a shorter lug-to-reinforcing-plate weld.

Evaluation Summary

The only purpose of the lifting lugs is to facilitate the lifting of the DSC and placement of the DSC into the transfer cask prior to insertion of the fuel and installation of the top cover plates. Using less weld material to attach the lifting lugs to the reinforcing plate will cause an increase in the amount of stress that will occur in the welds during the lift. The change results in a stress intensity in the lifting lug weld of 28,356 psi versus 27,160 psi in the base design. The increased stress is below the maximum allowable value of 30,000 psi. The change results in a maximum shear stress of 16,196 psi versus a value of 15,389 psi in the original base design; this is still below the allowable value of 18,000 psi. The increased stresses in the lifting lug welds remain below the code allowable for normal, off-normal and accident conditions. Therefore, it is concluded that the lifting lug weld remains structurally adequate for its intended design function. The DSC will not break free and drop during lifting as a result of this reduced weld material.

The eight 72.48 evaluation criteria were met.

LR 721004-1184 Rev. 0 – (no associated UFSAR change)

Change Description

This change involves acid cleaning of the MMC neutron absorbers for NUHOMS® 61BTH Type 1 DSCs where iron oxide deposits in the form of orange/brown blooms were observed. The fabricator of the MMC neutron absorbers will be cleaning the plates via nitric acid soaking using a controlled procedure. The cleaning of these plates is not a part of the normal fabrication process and is considered to be a repair to these plates.

Evaluation

The MMC neutron absorbers maintain criticality safety of the fuel while the DSC is filled with water during loading operations, and also aid the basket assembly in thermal conduction of heat throughout the fuel storage lifetime. The impact of the nitric acid cleaning on the design functions of the MMC neutron absorbers is a reduction in thickness, and a possible reduction in thermal conductivity and areal density of the boron carbide due to the reduction in thickness. The thickness of the MMC neutron absorber plates still conforms to the AREVA design and licensing drawings.

To investigate further, a trial cleaning of 4 samples of the neutron absorbing plates subjected to four different cleaning iterations of differing time and solution temperatures was conducted. Following the testing, one sample that experienced the largest thickness reduction was sent for metallographic testing. A comparison of these test results was then made with the original qualification and acceptance reports for the MMC material.

The required thermal conductivity of the neutron absorber per UFSAR Section T.4.3 is 97.3 W/m-k. The minimum thermal conductivity of the MMC plate following the acid cleaning (as tested) was 169 W/m-k. Therefore, the thermal design function of the plate meets the acceptance criteria.

The measured thickness of the cleaned samples showed a maximum reduction of 0.0012 inches. Since the minimum tolerance of the plate thickness is 0.120 inches, the lowest value of thickness resulting from this acid cleaning is 0.118 inches. From the TS, Table 1-1v, the minimum areal density for Basket Type A is 21 mg of B-10/cm^2. After cleaning with the reduced thickness, the areal density is 24.07 mg of B-10/cm^2, which is still well above the minimum requirement of the license. The metallographic test results also confirm that the nitric acid cleaning does not remove a significant portion of the aluminum encasing the boron carbide.

A procedure was developed by the fabricator and approved by AREVA and the customer to control the cleaning temperatures and times within the scope of that qualified. This procedure includes a repeat of the required visual inspection in accordance with the acceptance criteria of UFSAR Section T.9.1.7.2.

The eight 72.48 evaluation criteria were met.

LR 721004-1191 Rev. 0 – (no associated UFSAR change)

Change Description

This change involves two nonconformances in which (1) lift lug pads were slightly undersized, and (2) lift lug pads were installed with incorrect spacing between the lift lug pad and the DSC support ring.

Evaluation

The lifting lugs are used to facilitate the placement of the DSC into the transfer cask prior to insertion of spent fuel in the DSC. There is an increase in stresses in the lift lug pad and the DSC shell resulting from these nonconformances. A structural evaluation was performed of the increased stresses in the lifting lug pad and the DSC shell. The increased stresses remain below the ASME code allowable for normal, off-normal and accident conditions.

The eight 72.48 evaluation criteria were met.

LR 721004-1200 Rev. 0 – (no associated UFSAR change)

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Change Description

This change involves a nonconformance in which the hold down ring for a 61BTH Type 1 DSC basket had several locations of reduced material thickness. Grind marks on the hold down ring reduced the plate thickness from 0.375 inches (design) to a minimum nominal thickness of 0.357 inches.

Evaluation Summary

The function of the hold down ring is to support the basket structure longitudinally. The decreased plate thickness will result in a minor increase in the stresses in the hold down ring that must be evaluated. The 90° side drop load case was determined to bound all other load cases. The maximum membrane + bending stress intensity was found to be 45.91 ksi. To account for the reduced plate thickness, the stress value was conservatively increased by a factor of $(0.375/0.357)^2$ = 1.10 resulting in an increase in stress to 50.5 ksi. This increased stress is below the design code allowable value of 57.06 ksi described in the UFSAR.

The eight 72.48 evaluation criteria were met.

LR 721004-1222 Rev. 0 – (no associated UFSAR change)

Change Description

This situation involved the assessment and acceptance of the condition of a 61BT DSC and its enclosed loaded fuel that were subjected to a hydrogen deflagration event during the welding of the inner top cover plate.

Evaluation Summary

The primary function of the DSC is to provide confinement for the spent nuclear fuel. This is achieved by the stainless steel shell and two inner cover plates (top and bottom ends) welded to the shell assembly. There are redundant outer cover plates (top and bottom) to assure confinement integrity.

A calculation was completed in order to determine the pressure to which components may have been subjected during the deflagration event. The analysis concluded that the maximum instantaneous pressure due to the energy release from the deflagration of hydrogen was 48.2 psig (62.9 psia). Another calculation was then completed to assess the effects on those components due to that pressure. The results of that calculation concluded that:

- The DSC components maximum stress intensity remained below the ASME Level A allowables during the transient, and were therefore not adversely affected, and
- With regard to the GE 8x8 spent fuel assemblies stored in the DSC, the hydrogen gas deflagration pressure load is bounded by evaluations performed in the general licensee's 10 CFR Part 50 safety analysis report, and therefore the fuel assemblies were not adversely affected.

The fuel assembly cladding and the DSC confinement boundary are the two fission product barriers associated with a loaded 61BT DSC. The calculation results indicate that there was no adverse effect on the DSC components or enclosed fuel assemblies. Therefore, no associated design basis limit for the fuel assembly cladding or the DSC confinement fission product barrier was exceeded.

The eight 72.48 evaluation criteria were met.

LR 721004-1248 Rev. 0 – (no associated UFSAR change)

Change Description

This change involves a nonconformance in which the aluminum shims between the DSC basket and the rails for certain 61BTH Type 1 DSCs were fabricated below the nominal design thickness specification of 0.31 inches. The actual thickness of the aluminum shims on these DSCs varied between 0.19 and 0.25 inches thick.

Evaluation Summary

The primary function of the aluminum shims is to ensure that the basket meets the required diameter and to transfer heat from the basket to the rails. They are also used to transfer the load between the basket and the rails. The thinner shims result in a reduction in heat transfer from the fuel assemblies to the DSC shell, resulting in a higher temperature of the basket. A calculation was performed to evaluate the effects of the thinner shims (assumed to be 0.19 inches thick) on the thermal properties of the DSC. The calculation concludes that for normal, off-normal, and accident operating conditions, the fuel cladding temperatures for the 61BTH Type 1 DSC are bound by the current evaluation in the UFSAR and remain below the allowable temperature limits. In addition, the thermal calculation indicates no impact on the maximum external temperature of the DSC shell. The increased basket component temperatures were also evaluated for their impact on structural material properties. The thinner aluminum shims would result in a 0.5 psi rise in the internal pressure of the basket. However, the design normal, off-normal, and accident pressures remain bounding. The increased structural loads are all bound by existing analyses or negligible in effect.

The eight 72.48 evaluation criteria were met.

REPORT OF 10 CFR 72.48 EVALUATIONS PERFORMED FOR THE STANDARDIZED NUHOMS® SYSTEM FOR THE PERIOD 07/24/12 to 07/23/14

LR 721004-1285 Rev. 0 – (no associated UFSAR change)

Change Description

This change involves a nonconformance in which a local deviation caused the canister shell on a 61BTH Type 1 DSC to be below the minimum required thickness in one area. The nominal design thickness of the DSC shell specified is 0.50 inches. The actual reduced thickness of the shell in one area is 0.486 inches.

Evaluation Summary

The shell is part of the confinement boundary and supports the DSC structurally. The local reduction in thickness in the shell (minimum of 0.486 inches) causes an increase in stresses experienced by the canister shell. A bounding calculation was performed for a similar condition in which a shell thickness of 0.40 inches was evaluated. The calculation evaluated the increased stresses and determined that the maximum stress felt by the canister in both normal and accident conditions remained below ASME code allowables. The most significant case evaluated was a stress of 17.85 ksi compared to the allowable value of 24.3 ksi (for the 0.40-inch shell thickness). Therefore, although the shell will experience a local increase in stresses as a result of the thinner section for this nonconformance (minimum of 0.486-inch thickness), the stress in this section will remain below code allowables. Hence, this will not affect the structural design function of the DSC. The canister shell remains in compliance with the allowable criteria identified in the UFSAR for the normal, off-normal and accident conditions.

The eight 72.48 evaluation criteria were met.

LR 721004-1290 Rev. 0 – (no associated UFSAR change)

Change Description

This change evaluates a gap under the support rail plate in the area of the rail extension plate and support rail of the HSM Model 152 DSC Support Structure. The maximum gap evaluated is 0.05 inches, 3 inches wide (along entire width of the support rail plate), and 6 inches long. A calculation was initially performed to support a nonconformance that had been dispositioned as "use-as-is", but was subsequently repaired. While the repair rendered the calculation unnecessary for resolution of the nonconformance, since the calculation had been completed it needed a license compliance 72.48 review.

Evaluation Summary

The HSM Model 152 DSC support structure supports the DSC during loading, unloading and storage. The original structural calculation qualified the HSM Model 152 support structures for all applicable normal, off-normal and accident loads described in UFSAR Appendix R. The DSC weight on the support structure is simulated as nine mass elements instead of a uniformly distributed load. The revised structural analysis for the HSM-152 module loaded with DSCs containing 32 design basis PWR fuel assemblies considering the theorized gap concludes that normal, off-normal and accident condition results remain unchanged and bounded by the original analysis. The deflection in the DSC shell as a result of the evaluated gap is negligible and the increase in shell stress due to the unsupported span is only 0.002 ksi. Since the stress increase is approximately three orders of magnitude lower than the reported stresses, the stress ratios reported are unaffected. The evaluated gap under the support rail plate does not introduce an adverse change in the safety function of the HSM.

The eight 72.48 evaluation criteria were met.

LR 721004-1298 Rev. 1 – (no associated UFSAR change)

Change Description

This change involves a nonconformance in the gap between HSM end modules discovered during installation of some NUHOMS® HSM Model 102 modules. During inspections of the NUHOMS® HSM Model 102s it was discovered that the gap between the shield wall of one phase of HSMs and the adjacent HSMs installed by the subsequent phase exceeds the design tolerance of 6" ± 3/4 ". Measured from the lower edge of the HSM, the gap between the shield wall and the adjacent HSMs (E69 and W69) ranges from 6 13/16 inches at the west edge of W69 to 6½ inches at the east edge of E69. The gap between the end wall and the adjacent roof measures 7 1/16 to 7 3/8 inches, which also exceeds the design tolerance of 6" ± 3/4". *The disposition is to use these modules "as-is" and to perform the necessary* evaluation to demonstrate that this nonconformance is acceptable.

Evaluation Summary

The NUHOMS® HSM Model 102 protects the 24PHBL DSC from the potentially adverse effects of natural phenomena hazards, such as earthquake, tornado, tornado missiles, flood, and extreme ambient conditions. In addition, the massive concrete walls of the HSM base and roof provide substantial neutron and gamma radiation shielding. These larger gaps between back-to-back HSM 102 modules may adversely affect the shielding function of the HSM Model 102 as described in UFSAR Appendix N. The effect of these larger gaps on the shielding design function of the HSM Module 102 loaded with 24 PHBL DSCs containing 24 design basis PWR fuel assemblies was evaluated in a revised calculation using the 3-D Monte Carol particle transport computer code MCNP5, Version 1.4.

The revised shielding calculation was performed modeling a 7 ⅜ inch gap between the existing phase end shield wall and the adjacent subsequent phase HSM base to quantify the maximum and average dose rate impact on the affected module at the ISFSI. Results demonstrate that for normal conditions of operation, the dose rates with these gaps do not vary significantly from those reported in the UFSAR. The credible accidents listed in the UFSAR for the 24PHBL system were also analyzed in the revised shielding calculation to determine the increased dose consequences. The increase in dose consequences of all applicable accidents due to the enlarged gaps is no more than 0.5% at any distance. Therefore, the increase in accident dose consequences from this nonconformance is considered to be minimal and not statistically significant. The thermal and structural design functions of the HSM Model 102 are not adversely impacted as a result of the out of specification gap between the HSMs.

The eight 72.48 evaluation criteria were met.