TRANSNUCLEAR
AN AREVA COMPANY

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E-32971

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 07/24/10 to 07/23/12, Docket 72-1004

Pursuant to the requirements of 10 CFR 72.48(d)(2), Transnuclear, Inc. herewith 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 07/24/10 to 07/23/12, including indication as to whether the evaluations had associated Updated Final Safety Analysis Report (UFSAR) changes that were incorporated into the UFSAR for the Standardized NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel, NUH003.0103, Revision 12, submitted on February 1, 2012.

Should you or your staff require additional information, please do not hesitate to contact me at 410-910-6878 or Dr. Jayant Bondre at 410-910-6881.

Sincerely,

Donis Shaw

Donis Shaw
Licensing Manager

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

Enclosures:

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

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

Enclosure 1 Part 1 - DESIGN CHANGES

***Licensing Review (LR) 721004-802, Rev. 1* – (no associated UFSAR change)**

Change Description

The change involved the addition of an optional door design for horizontal storage modules, Model HSM-H. The optional door has a thinner steel section than the standard door, but is two inches thicker overall. The optional door has 3 inches of steel and 29.375 inches of concrete (overall 32.375 inches), whereas the standard door has 7.875 inches of steel and 22.5 inches of concrete (overall 30.375 inches).

Evaluation

The design functions of the HSM-H door are to provide physical protection for the dry shielded canister (DSC), and shielding from radiation emanating from the DSC at the access opening in the front wall of the HSM-H.

The structural evaluation of the optional HSM-H door was assessed. The required thickness for the limiting missile (12 inch diameter steel pipe) is 1.45 inches, which is less than the 3 inch door thickness. The maximum ductility for the limiting missile (less than 2) also remains acceptable (allowable ductility is 20).

The door connection evaluation remains unchanged between the two door types.

In conclusion, the optional door design for the HSM-H is adequate to prevent any local damage due to missile impact and qualified for the overall structural response due to missile impact load.

The shielding effectiveness of the optional HSM-H door was also assessed. The optional door provides increased shielding.

Use of the optional door has no effect on the thermal, criticality, or confinement functions of the system.

The eight 72.48 evaluation criteria were met.

***LR 721004-813, Rev. 0* – (no associated UFSAR change)**

Change Description

The change involved evaluation of the use of NUHOMS® horizontal storage modules (HSMs), Model 102's, on an inclined ISFSI pad at a general licensee site. A TN calculation evaluated the stability of the Model 102 loaded with a 61BT DSC on an incline of 2 inches over 10 feet, from side to side, for seismic, flood, tornado and missile loads. The criticality, thermal, shielding and confinement design functions were not affected.

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Evaluation

The following evaluations were performed.

HSM Overturning due to Seismic Loads

HSM and DSC peak horizontal acceleration for the inclined plane = 0.3670 g
HSM and DSC peak vertical acceleration for inclined plane = 0.1765 g
The HSM stabilizing moment M_{ST} = 20,471 kip.in
The HSM overturning moment = 17,081 kip.in
The stabilizing moment is greater than the overturning moment; therefore, the single HSM module will not overturn during a seismic event. The factor of safety against overturning = 20,471/17,081 = 1.20, which is greater than the allowable safety factor of 1.1.

HSM Sliding due to Seismic Loads

The friction force resisting sliding = 174.39 kips
The applied horizontal seismic force =135.71 kips
The force required to slide the HSM is larger than the resulting lateral seismic force and therefore the HSM will not slide.
The factor of safety against sliding is 174.39/135.71 = 1.29, which is greater than the allowable safety factor of 1.1.

Sliding Stability of the Roof on the Base Unit

a) Seismic
Stabilizing Force = 40.3 kips
Sliding Force = 31.4 kips
Stabilizing force is greater than sliding force; therefore, the roof unit will not slide.

b) Flood
Stabilizing Force = 28.4 kips
Sliding Force = 27.36 kips
Stabilizing force is greater than sliding force; therefore, the roof unit will not slide.

c) Tornado Wind
Stabilizing Force = 7.5 kips
Sliding Force = 15.29 kips

The sliding of the roof due to tornado wind load is prevented by the roof attachment angle assembly at the front and rear of the roof. Also, the sliding displacement of the roof on the wall is prevented by the 4 inch key recesses in the roof.

HSM Overturning due to Flood Load

Stabilizing moment = 19,487 kip.in
Overturning moment due to flood load = 12,237 kip.in

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The factor of safety against overturning for a single free standing HSM due to the postulated design basis flood load is 19,150/12,227 = 1.57, which is greater than the allowable safety factor of 1.1.

HSM Sliding due to Flood Load

Restoring force = 160.72 kips
The drag force due to flood water = 135.6 kips
The factor of safety against sliding for a single free standing HSM due to the postulated design basis flood load is 160.72/135.6 = 1.19, which is greater than the allowable safety factor of 1.1.

HSM Overturning due to Tornado Generated Wind Load

Stabilizing Moment = 32,435 kip.in
Overturning Moment = 17,671 kip.in
Therefore the factor of safety against overturning is 32,435/17,671 = 1.83, which is greater than the allowable safety factor of 1.1.

HSM Sliding due to Tornado Generated Wind Load

Resisting Force = 213.65 kips
Sliding Force = 125.83 kips
Therefore the factor of safety against sliding is 213.65/125.83 = 1.70, which is greater than the allowable safety factor of 1.1.

Overturning due to Tornado Generated Missile Impact Load

Based on the accident analysis, the HSM rotates a maximum of 1.09° from the vertical. Displacement at the top of the HSM = 180 x tan (1.09) = 3.42 inches. The HSM is stable against overturning.

Sliding due to Tornado Generated Missile Impact Load

A massive missile impact on a single HSM will slide the complete module approximately 0.592 inches sideways. Overturning and sliding will not occur simultaneously, so overturning gaps are not considered here. Therefore, sliding displacement of modules due to a massive missile impact is insignificant.

Stability Evaluation of the DSC on the Support Rails inside the HSM

Stabilizing moment = 1,191 kip-in
Overturning moment = 974 kips-in
Because the stabilizing moment is greater than the overturning moment, the DSC will not uplift from the support structure rails inside the HSM. The margin of safety against DSC lift off from the DSC support rails = 1191/974 = 1.22, which is greater than the required factor of safety against overturning of 1.1.

The DSC will not slide in the transverse direction due to the angle at which the rails make contact. Hence the DSC is stable in the transverse direction. However in the longitudinal direction, the DSC may slide on the rails due to seismic load, but the DSC stop plates and the seismic retainer will provide restraint.

These evaluations demonstrated that there are no adverse effects on the structural design function of the HSM loaded on the inclined ISFSI pad.

The eight 72.48 evaluation criteria were met.

***LR 721004-923 Rev. 1* – (incorporated into UFSAR Revision 12)**

Change Description

The change involved an alternative 61BTH dry shielded canister (DSC) transition rail configuration, which will improve the fabricability of these transition rails. The rails involved are the "R45" rails, which occur at 45-degree points around the DSC circumference as the rectangular basket assembly is placed into the circular DSC shell, between the "R90" rails, which occur at 90-degree points. The transition rails support the fuel tubes and transfer mechanical loads to the DSC shell. They also provide a thermal conduction path from the basket assembly to the canister shell wall.

The alternate configuration involves a one-piece, bent plate for the "R45" transition rail plate, in lieu of a two-welded-plate configuration.

Evaluation

The change has an adverse effect on the structural design function. The shielding, criticality, confinement and thermal design functions are not impacted.

The calculation which evaluated the alternate rail configuration utilized the same model and method used in the original calculation and specified in the UFSAR. Hypothetical Accident Conditions (HAC) basket stresses were evaluated for the same side drop orientations as in the original analysis. Side drop accident loadings were incrementally applied from 1g to 100g for (HAC) conditions. The highest stress increase occurred when the canister was dropped on the 161.5° Side Impact on one Transfer Cask Support Rail. The maximum stress exhibited by the basket was in the R45 stainless steel rails. The stress increase was less than 1% of the values reported in the UFSAR. Although the stress increased as a result of the change to the R45 rail rib plate, the maximum stress exhibited was well below the allowable stress intensity.

The eight 72.48 evaluation criteria were met.

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LR 721004-1028, Rev. 0 – (no associated UFSAR change)

Change Description

The change is to increase the concrete clear cover for the outlet vent cover (OVC) of horizontal storage module (HSM) models HSM-H and HSM-HS to 1.5 inches, applicable to the rebar ties around the OVC primary reinforcement.

Evaluation

The design function of the OVC is to provide shielding at the outlet vents of the HSM-H and HSM-HS.

The results of the revised analyses with 1.5 inches clear concrete cover are shown below. All stress ratios remain within design allowable limits. There are no adverse effects to the design function of the OVC.

HSM-H:

L = beam length = 166 inches
b = beam width = 24 inches
h = beam height = 12 inches
Moment Load = 129.3 kips-in
Shear Load = 3.1 kips

Provide #6 bars with #3 or #4 ties with 1 ½ inches clear cover

d = 12 inches – 1.5 inches (cover) – 0.5 inches (#4 diameter) – 0.375 inches (1/2*#6 diameter) = 9.625 inches

M_u (moment capacity) = 865.6 kip-in, which is greater than 129.3 kip-in; this is therefore satisfactory.

V_c (shear capacity) = 26.1 kips, which is greater than 3.1 kips; this is therefore satisfactory.

HSM-HS:

L = beam length = 166 inches
b = beam width = 24 inches
h = beam height = 12 inches
Moment Load = 158 kips-in
Shear Load = 3.81 kips

Provide #6 bars with #3 or #4 ties with 1 ½ inches clear cover

d = 12 inches – 1.5 inches (cover) – 0.5 inches (#4 diameter) – 0.375 inches (1/2*#6 diameter) = 9.625 inches

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M_u (moment capacity) = 865.6 kip-in, which is greater than 158 kip-in; this is therefore satisfactory.

V_c (shear capacity) = 26.1 kips, which is greater than 3.81 kips; this is therefore satisfactory.

The eight 72.48 evaluation criteria were met.

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Enclosure 1 Part 2 - NONCONFORMANCES

LR 721004-1027, Rev. 0 – *(no associated UFSAR change)*

Change Description

The change involved a plant ISFSI which has undergone differential settlement which has caused the ISFSI slab to slope, which in turn has also caused the gaps between twelve horizontal storage module (HSM) Model 102's to decrease to nonconforming values as little as 4 5/8 inches. The maximum gap between the HSM modules remains in tolerance. The nominal gap is 6 inches.

Evaluation

The evaluation addressed the effects on the thermal design function of the top side spacing between HSM modules. All the other analyses are not adversely impacted by this nonconformance. The top side spacing between HSMs provides the outlet vent for heat dissipation by natural convection.

The nonconformance was analyzed by reducing the top side spacing to 4 inches. This increased airflow outlet pressure losses and resulted in a maximum temperature increase of 3 °F for dry shielded canister (DSC) and HSM components.

The highest temperature reported for the HSM in the UFSAR for off normal conditions at a 125 °F ambient temperature is 224 °F. With the three degree increase, the concrete temperature would become 227 °F. The HSM concrete is acceptable for up to 300 °F.

The maximum DSC outer-surface temperature reported in the UFSAR for off normal conditions at a 125 °F ambient temperature is 345 °F. The temperature increase at the outer-surface due to the reduced gaps between modules is 1 °F, which would bring the DSC outer-surface temperature to 346 °F. The change results in less than 1 °F temperature change (increase) for fuel cladding for a 1 °F temperature change in the DSC shell. Therefore, the fuel cladding temperature reported in the UFSAR under storage conditions will remain unchanged.

Therefore, there is an insignificant effect on the thermal design function.

The eight 72.48 evaluation criteria were met.