PMSTPCOL PEmails

From: Foster, Rocky
Sent: Wednesday, August 17, 2011 5:07 AM
To: Chappell, Coley; Agles, James; Elton, Loree
Cc: STPCOL
Subject: Fuel Drop RAI Response Assessment 081511 R3.docx
Attachments: Fuel Drop RAI Response Assessment 081511 R3.docx

To All,

Here are additional follow up questions provided by BNL concerning the RAI response to 09.01.02-4. Hopefully we can discuss them during our OI telecom this morning.

Thanks,

Rocky

Hearing Identifier: SouthTexas34Public_EX
Email Number: 2993

Mail Envelope Properties (26E42474DB238C408C94990815A02F0965A2013AEF)

Subject: Fuel Drop RAI Response Assessment 081511 R3.docx
Sent Date: 8/17/2011 5:07:16 AM
Received Date: 8/17/2011 5:07:18 AM
From: Foster, Rocky

Created By: Rocky.Foster@nrc.gov

Recipients:
"STPCOL" <STP.COL@nrc.gov>
Tracking Status: None
"Chappell, Coley" <ccchappell@STPEGS.COM>
Tracking Status: None
"Agles, James" <jaagles@STPEGS.COM>
Tracking Status: None
"Elton, Loree" <leelton@STPEGS.COM>
Tracking Status: None

Post Office: HQCLSTR01.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	212	8/17/2011 5:07:18 AM
Fuel Drop RAI Response Assessment 081511 R3.docx	14755	

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Return Notification: No
Reply Requested: No
Sensitivity: Normal
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Question: Regarding RAI response to item (a) of RAI 09.01.02-4,

1. The response discusses two deep drop locations. The staff is concerned that two deep drop locations may be insufficient to represent the worst case loading on the baseplate. The staff requests clarification whether other deep drop cases were considered. For example, would a different deep drop location produce higher forces on the leveling screw/leveling pad? Were the steel liner and the concrete floor of the pool evaluated for loads due to an accidental fuel assembly drop? If conducted, provide the results of these evaluations. If not conducted, provide the technical basis for not needing to check this.

2. The response indicates that maximum bending stresses in the baseplate "are judged to occur" in the drop case at location (a). Provide the value of the peak effective plastic strain in the baseplate corresponding to the drop case at location (a).

3. The Spent Fuel Storage Racks Technical Report, Rev 1, states that the drop analysis considered a fuel assembly dropped through the air and loading a dry fuel rack. Confirm that the no water assumption identified in the technical report is still applicable.

4. Clarify (i) whether leveling screws are included in the model; (ii) how welds are modeled (e.g., type of elements and type of material stress-strain curved used, etc.); and (iii) what element type is used for the baseplate and for the support plates.

5. SRP 3.8.4 Appendix D specifies the load combination for drop analysis: $D + L + F_d$. Clarify whether dead load and live load, including the weight of fuel assemblies, were taken into account in the deep drop analysis. If not, provide the technical basis for excluding these loads.

6. In Figure 4, holes are shown penetrating the large support plates. However, no holes are shown for the small support plates. Please clarify the modeling of the small support plates, which contain 5 holes. If the holes are not modeled, provide the technical basis for this assumption. Explain the physical meaning of the effective plastic strain shown in Figure 4. A similar issue exists for the baseplate effective plastic strain shown in Figure 2, where added holes for water drainage are not modeled.

Question: In the response to item (b), the applicant indicates that a bilinear isotropic material model is used in the analysis, to account for permanent deformation of rack structural components due to a fuel drop. The staff requests that the applicant define the ultimate strain limit used in the shallow drop analysis. Also discuss what happens when this limit is reached in a specific finite element.

Question: In the response to part (e) of RAI 09.01.02-4, the applicant states:

> "The maximum vertical deformation [of the baseplate] is 0.87 inches. The rack design provides approximately 2.0 inches of nominal overlap between the neutron absorbing plates and the bottom of the fuel assembly active fuel zone. Therefore, it is concluded that the deformation of the baseplate will not lead to a loss of neutron shielding of the rack."
>
> "It is noted that the integrity of the welds between the cell walls and baseplate were considered in the evaluations of the deep drop cases. It was found that although the welds

that attach the immediate surrounding cell walls could potentially fail, the welds adjacent to this cell will maintain their integrity. Therefore, significant separation between the cell walls and the baseplate will not occur."

The staff requests clarification whether failure of the welds was directly observed in the LS-DYNA analysis, and is accounted for in the 0.87" vertical deflection. If this is not the case, provide an estimate of the additional vertical deflection due to failure of the welds.

Question: From information in the Spent Fuel Storage Racks Technical Report, Rev 1, the dropped weight is 1,263#, and the drop height is 5.9'. In in-#s, the potential energy is 89,420 in-#. This is the amount of energy that is available to permanently deform the rack. Figure 6 in the response to part (d) shows the stored internal energy at about 0.125 E06, no units specified. Please provide the energy units used in Figure 6, and reconcile the stored internal energy with the initial potential energy of the dropped weight.

Question: In the Spent Fuel Storage Racks Technical Report, Rev 1, Figure 8-4 appears to show seven (7) locations where drops on top of the rack were postulated. Of these 7, 1 is a corner location. In the response to part (e), Figure 7 shows deformation of the rack for the corner drop location; the response simply states this is the worst location, without further explanation. Confirm that in the re-analysis for the 10x10 rack, all 7 locations were analyzed. Provide a description of the results at the other locations. Since WEC also performed accidental drop analyses for the HOLTEC AP1000 spent fuel storage racks, provide a discussion of the similarities and differences between these 2 analyses, including the magnitude and location of the maximum crushing deformation.