PMSTPCOL PEmails

From: Foster, Rocky
Sent: Monday, October 03, 2011 8:17 AM
To: Chappell, Coley; Elton, Loree; wemookhoek@stpegs.com; jaagles@stpegs.com
Cc: STPCOL; Morante, Richard J; Wei, Xing; Chakrabarti, Samir
Subject: Draft RAIs 6070 for Chapter 09.01.02
Attachments: draft RAI 6070.doc

Good Morning,

Attached are draft RAIs 6070 associated with Chapter 09.01.02. We can discuss them during our telecom scheduled for Wednesday, October 5, 2011 if you have a need for clarification.

Thanks,

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From: Foster, Rocky

Created By: Rocky.Foster@nrc.gov

Recipients:
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Tracking Status: None
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Request for Additional Information No. 6070 Revision 6

South Texas Project Units 3 and 4
South Texas Project Nuclear Operating Co
Docket No. 52-012 and 52-013
SRP Section: 09.01.02 - New and Spent Fuel Storage
Application Section: FSAR 9.1.2

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

09.01.02-***

As follow-up to the applicant's response to RAI 09.01.02-2, part (a) and part (h), the staff requests that the applicant provide the following information, to assist the staff in completing its technical review:

a. The RAI response indicated that the spent fuel storage pool has been reconfigured; one single rack size will be utilized for all racks; descriptive information is provided in sketches included with the RAI response.

- Sketch 3 shows the spent fuel storage boundary. Clarify what the spent fuel storage boundary represents.

- Sketch 4 shows two groups of racks and a 11.77" gap between the two groups. Explain whether all adjacent racks are tied together. If yes, provide the linkage design details for two racks with an 11.77" gap. If not, what is the maximum horizontal differential movement between the two rack groups during a seismic event?

- Sketch 6 shows that the overall height of the rack is now 180.1", which was 198.1" according to the Technical Report, Rev.1. Explain whether the size and weight of fuel assembly also have been changed. If yes, provide the updated values.

- Sketch 13 shows conceptual rack-to-rack linkage at the top of racks. During conference calls, the applicant stated that the 1/2" plates will be welded to the rack on each cell. The 0.1” thick cover plates are welded to cell wall faces with an overlap, creating a 0.1” mismatch between the cell wall external surface and the cover plate external surface. The staff requests that the applicant explain how the 1/2" plates will be welded to both the cover plates and the cell walls.

h. The RAI response states that neutron absorbing material is not required on the fourth side if it will be located on the adjacent cell in the next rack. For racks located on the perimeter, the outside facing side of all exterior cells will be covered by neutron absorbing material.

- One of the follow-up questions for part (a) requests that the applicant address whether all the adjacent racks are tied together, specifically those that are separated by an 11.77” gap. The staff also requests that the applicant identify whether the racks on both sides of this gap are considered perimeter racks, requiring neutron absorbing material on the outside facing side of all exterior cells.
- The staff requests a clarification whether integrity of the neutron absorbing materials is also evaluated for seismic loading. If yes, explain how this evaluation is performed. If no, explain why it is not necessary.

09.01.02-***

As follow-up to the applicant's response to RAI 09.01.02-3, part (c), the staff requests that the applicant provide the following information, to assist the staff in completing its technical review:

c. The RAI response provided a design check of spent fuel storage rack for the stuck fuel assembly load case.

- Normally welds are checked for both weld material and base metal, as was done for Level A in Section 8.2.3 of the Technical Report, Rev 1. Page 3 of the RAI response develops the allowable maximum weld stress for the weld material. Explain why an allowable maximum weld stress based on the base metal is not developed.

- Explain whether any design check has been performed for the local region of the rack cell wall, at the location where the 1 kip horizontal load is applied.

- Explain whether the potential for buckling of the cell wall in compression has been considered.

09.01.02-***

As follow-up to the applicant's response to RAI 09.01.02-4, part (a), the staff requests that the applicant provide the following information, to assist the staff in completing its technical review:

The RAI response provides details of design checks on baseplate and support plate for the fuel drop load case.

- 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. During a conference call, the applicant explained that the assumption of dropping through the air is no longer valid. Buoyancy and water drag effect on the dropped fuel assembly were considered. Considering that the impact energy would be reduced because of the water drag effect and buoyancy, the staff requests that the applicant explain why the maximum vertical deformation for the shallow drop increases from 6.05" reported in Rev. 1 of the Technical Report to 7.30" reported in this RAI response.

- SRP 3.8.4 Appendix D specifies the load combination for drop analysis: D + L + F_d. During a conference call, the applicant explained that, for deep drop analysis, the weight of rack was considered, but not the weight of fuel assemblies, because the weight of a fuel assembly is only 600 lb, which is much smaller than the impact force, which is around 100 kips. Also, the impact is localized. However, the staff noted that the weight of 100 fuel assemblies for a 10 x 10 rack is 600 lb x 100 = 60 kips, which is the same order of magnitude as the impact force. Therefore, the staff requests that the applicant provide additional technical basis for not considering the weight of fuel assemblies in deep drop analyses, or analyze a case with the fuel weight included.

- In Figure 4 of the RAI response, holes are shown penetrating the large support plates. However, no holes are shown for the small support plates. During a conference call, the applicant explains that the flow holes are not modeled because NINA thinks that the modeling of the holes will not affect the structure integrity. However, the staff notes that 50% of the small support plate area is removed by the holes and the edge distance for the 4 drain holes is less that 0.25”. Therefore, the staff requests that the applicant provide further explanation for not modeling the flow holes. Also, 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.

09.01.02-***

As follow-up to the applicant's response to RAI 09.01.02-5, parts (d) and (e), the staff requests that the applicant provide the following information, to assist the staff in completing its technical review:

d. The RAI response indicated that the pipe elements that were used in the modeling of the fuel-to-cell wall connection are rigid and mass-less; they connect the spring elements and the grid outer walls normal to the face of the wall; this system of connection distributes the fuel lateral loads throughout the grid structure, but does not over stiffen the rack; additional information is given in Figures 1 and 2 included

with the RAI response. The RAI response addressed most of the staff's concerns; however, regarding Figure 1, the staff requests that the applicant explain whether the spring elements shown include gap elements, and whether all pipe elements are shown.

e. The RAI response indicated that the fluid-structure interaction methodology uses the theory from Fritz. Also, additional modeling details are provided in the RAI response for the hydrodynamic coupling of fuel assembly-to-cell wall, rack-to-rack and rack-to-pool wall.

- For the rack-to-rack and rack-to-pool wall cases, explain why the hydrodynamic mass matrix terms are calculated for each rack for three different sections and what the basis for the use of the 25%, 50% and 25 % ratio; also explain the 16:70:14 ratio;

- For the rack-to-pool wall case, what gaps are assumed? For the rack-to-rack case, what gaps are assumed? Is the 11.77" gap shown in Sketch 4 of the RAI response to RAI 09.01.02-2 considered?

- Explain how the hydrodynamic mass matrix is input to the rack structural model. For the rack-to-rack case, are the hydrodynamic masses added to the cell walls along the rack periphery? For the rack to rack case, are the hydrodynamic masses added to the cell walls along the periphery of the single continuous rack volume? For the fuel-to-cell wall case, are the hydrodynamic masses added to all the cell walls?

- In Figure 5, what do the darker horizontal and vertical lines stand for?

09.01.02-***

As follow-up to the applicant's response to RAI 09.01.02-6, part (a), the staff requests that the applicant provide the following information, to assist the staff in completing its technical review:

The RAI response provided more information on design checks of cell-to-cell weld, coverplate weld, cell-to-baseplate weld and baseplate-to-support plate weld.

During a conference call, the applicant explained that the finer element mesh shown in Technical Report Revision 1 for cell-to-cell weld, will not be used for the cell-to cell-weld in the re-analysis. The staff requests that the applicant explain why there is no longer a need to use a finer element mesh for the cell-to-cell weld.

For the baseplate-to-support plate welds, the RAI response only discusses compression force. Have horizontal forces and bending moments been considered in the evaluation of these welds? If not, provide the technical basis for excluding them.

09.01.02-***

As follow-up to the applicant's response to RAI 09.01.02-7, the staff requests that the applicant provide the following information, to assist the staff in completing its technical review:

(1) The RAI response indicates that the quality assurance requirements applied to the spent fuel racks are established by DCD Table 3.2-1 and the NINA QAPD, Part III, "Non-Safety-Related SSC Quality Control". Regarding quality assurance requirements, as noted in FSAR Section 9.1.2.1.3, the spent fuel racks are Seismic Category I, in accordance with RG 1.29. As such, all of the QA provisions of 10 CFR 50 Appendix B would appear to be applicable. The staff's review of NINA QAPD Rev.6 Part III, referenced by the RAI response, found that it contains relatively few requirements, compared to 10 CFR 50 Appendix B.

The first sentence of the NINA QAPD Rev.6 Part III states "Specific program controls are applied to nonsafety-related SCCs, for which 10 CFR 50, Appendix B is not applicable, ..." This statement is inconsistent with DCD Table 3.2-1 (which is also referenced by the RAI response). Note e of DCD Table 3.2-1 states "Elements of 10CFR50, Appendix B are generally applied,..." The statement in Note e of DCD Table 3.2-1 is accepted by the staff, according to the ABWR FSER. Therefore, the staff requests that the applicant explain what aspects of Appendix B are deemed to be not applicable to spent fuel storages racks, and the basis for this determination.

(2) The RAI response indicates that SRP 3.8.4 ISI requirements refer to 10 CFR50.65 and RG 1.160 (Maintenance Rule), and that the performance and monitoring of the racks will be evaluated at least every refueling cycle. With respect to ISI, only the condition of the neutron absorbing material is monitored.

Regarding ISI, the staff concurs that the regulatory requirements for periodic ISI of spent fuel storage racks originates from 10 CFR 50.65 “Maintenance Rule”. RG 1.160 clarifies acceptable procedures for implementation of the Maintenance Rule, and includes special guidance for condition monitoring of structures. The staff requests that the applicant explain whether the guidance provided in RG 1.160 for structures will be implemented for spent fuel storage racks, and update the report as necessary.