

From: Kamal Manoly
Sent: Wednesday, May 27, 2009 1:44 PM
To: Kevin Harper
Subject: FW: Oyster Creek 3-D drywell analysis, inspection report

Please include in ADAMS.

From: Kamal Manoly
Sent: Wednesday, May 27, 2009 1:43 PM
To: 'Richard Webster'
Cc: Brian Harris
Subject: RE: Oyster Creek 3-D drywell analysis, inspection report

Mr. Webster:

I am writing in response to your email of May 20, 2009 (hereafter “May 20, 2009, Email”). Your email identifies a number of areas where you disagree with the NRC Staff’s assessment of Structural Integrity Associates (“SIA”) three dimensional finite element analysis (“3-D FEA”) of Oyster Creek Nuclear Generating Station’s (“Oyster Creek”) drywell shell, the implementation of the Memorandum and Order, CLI 09-07, April 1, 2009 (“Commission’s order”), and the regulatory oversight of Oyster Creek. However, your email contains a number of errors regarding the Commission’s order, the Atomic Safety and Licensing Board (“ASLB”) recommendations, our review of the 3-D FEA, and the regulatory oversight process.

In your email, you state that NRC Staff “failed to require Exelon to implement any of the [ASLB’s] recommendations.” (May 20, 2009, Email). The Commission’s order did not require the NRC Staff or Exelon to implement any of the ASLB’s recommendations. Instead, the Commission stated that “the results of the sensitivity study to which [Exelon] has committed would bound the results of a study that used the contour plots.” (Commission’s order at 66). In addition, the Commission directed the Staff to “use its expertise and engineering judgment to scrutinize carefully Exelon’s compliance as part of its oversight responsibilities.” (*Id.* at 68). The NRC Staff looked at the ASLB’s recommendations, at Citizens’ concerns, and applied its own significant experience to evaluate whether the 3-D FEA provided by Oyster Creek satisfied Judge Baratta’s objective as the Commission defined. Namely, Judge Baratta’s objective was to provide a better understanding of the drywell shell’s state. (*Id.* at 65).

In your April 17, 2009, letter and May 20, 2009, email, you stated that Commission directed the NRC Staff to “enhance enforcement.” Inexplicably this phrase never appears in the Commission’s decision. In regards to the 3-D FEA, the Commission “direct[ed] the Staff to ensure that Judge Baratta’s objective is in fact achieved by enhancing its review of Exelon’s compliance with proposed License Condition 7.” (*Id.* at 67). The Commission also directed “the Staff to enhance its review and enforcement of the license condition.” (*Id.* at 33). Since Exelon complied with its license condition and commitment regarding the 3-D FEA, no enforcement action is warranted. The NRC Staff will continue to monitor Exelon’s implementation of the Aging Management Program for the drywell shell and take additional action, if it is warranted.

In your email, you also state that Exelon failed to perform its commitment as set forth in the Safety Evaluation Report, Appendix A, Commitment 27, Subsection 18, at A-31. You believe that Exelon failed to satisfy this commitment because “Exelon did not *vary* the size of the thinned areas at *all*” (May 20, 2009, Email) (emphasis added). As already discussed, the Commission’s order clearly indicates that it was satisfied with the Oyster Creek’s planned 3-D FEA, which was provided to the Commission on January 22, 2009, and your notice to the Commission on January 26, 2009. Therefore, the Commission could have easily indicated any additional sensitivity studies it required to be done. Instead, it endorsed the planned sensitivity analyses as already reported to the Commission. Exelon’s commitment states that:

AmerGen will perform a 3-D finite element structural analysis of the primary containment drywell shell using modern methods and current drywell shell thickness data to better quantify the margin that exists above the Code required minimum for buckling. The analysis will include sensitivity studies to determine the degree to which uncertainties in the size of thinned areas affect Code margins. If the analysis determines that the drywell shell does not meet required thickness values, the NRC will be notified in accordance with 10 CFR 50 requirements.

This commitment only required Exelon to vary the thickness of the locally thinned areas. No requirement exists or existed for Exelon to vary both the thickness and surface area of the locally thinned areas. However, your January 26, 2009, letter to Chairman Klein repeated this misunderstanding of the commitment by Exelon. (Letter to Chairman Klein from R. Webster January 26, 2009, at 3). Therefore, we addressed this issue in our assessment by simply noting that besides Exelon’s variation of thickness, the additional studies of Oyster Creek’s drywell shell provide sufficient information for a qualified engineer to draw conclusions regarding the effect of variations in the area of locally thinned areas. Additionally, the sensitivity analyses were performed to determine the effect of unknown conditions (i.e. the thickness of the drywell shell between measured locations and measurement uncertainties). The extent of the surface area affected by the degradation is well known and conservatively modeled in the baseline analysis.

Since Commitment 27 only required a sensitivity analysis to determine the degree to which uncertainties in the size of thinned areas affect Code margins and the Commission implicitly endorsed Exelon’s proposed sensitivity analyses, Exelon has successfully completed its commitment to perform the sensitivity analysis in conjunction with the 3-D FEA.

You also indicated that the NRC Staff “failed to allow Sandia national laboratories (sic) to review the capacity reduction factor issue, betraying ... a lack of confidence in their findings” (May 20, 2009, Email). However, Sandia National Laboratories’ (“Sandia”) confirmatory analysis already demonstrated that the Oyster Creek’s drywell shell meets all applicable ASME code requirements without application of the modified capacity reduction factor (“CRF”). The Commission directed the NRC Staff to perform a review of the 3-D FEA. The NRC Staff performed a thorough review of Exelon’s use of the capacity reduction factor as directed by the Commission. The NRC Staff determined that Exelon made appropriate use of the modified CRF based on its engineering judgment as applied to the 3-D FEA.

You also suggest that SIA's 3-D FEA "muddies the water in a number of ways." (May 20, 2009, Email). This is simply not accurate as your stated objective for the 3-D FEA is incorrect. It appears that you do not fully understand Judge Baratta's additional statement. The Commission stated that the objective of the 3-D FEA was to "enhanc[e] the NRC's 'understanding of the drywell shell state' by performing 'a conservative best estimate analysis of the actual drywell shell.'" (Commission's order at 65).

The 3-D FEA was not intended to substitute for the analysis of record, GE's analysis, nor was it intended to replicate GE's analysis. The 3-D FEA was intended to provide an estimate of margins against buckling based on the actual condition of the drywell shell. Therefore, it was expected that the limiting case might change as a result of using more realistic buckling modes based on more realistic modeling than either the analysis of record or Sandia's confirmatory analysis. Since GE's analysis is significantly more conservative, its acceptance criteria are sufficient to bound the buckling modes in the 3-D FEA.

You also indicate that Commitment 27 has not been satisfied because "no effort was made to better quantify the existing margin." A careful review of our assessment and the 3-D FEA shows that safety factors were determined and show the margin to the ASME code requirements. Thus, the 3-D FEA accurately quantifies the existing margin to the ASME code requirements.

In your May 20, 2009, email, you stated that "the NRC Staff did not do this review [of the 3-D FEA] with an open mind and may be trying to justify past decisions." (May 20, 2009, Email). You also stated that "the Board and the Commission thought the [NRC] Staff should hire outside expertise to review [the capacity reduction factor]." (*Id.*). As previously discussed, the Commission never directed the NRC Staff to hire Sandia National Laboratories or any other outside expert. The Commission instead adopted Judge Abramson's separate opinion. Judge Abramson stated that:

The Staff has available, both *in-house* and through its extensive base of expert outside consultants, ample resources to examine the analyses once they have been completed, confirm their accuracy and boundaries, and make confirmatory computations. In my view, and it is my advice to the Commission in response to the referral, the Commission should apply its *customary license condition review practices* to the issue it wishes to have addressed, and the Agency can, and should, enforce AmerGen's commitment in the customary manner. I do recommend, as does the majority, that the Commission direct its technical staff to engage appropriate expertise to conduct a thorough examination of the analyses when submitted.

Separate Advisory Opinion of Judge Abramson at 3-4 (Oct. 29, 2008) (emphasis added) (internal citations omitted).

Judge Abramson continued his endorsement of the NRC Staff's review by stating that "the customary practice within the Agency would seem to me to be that the job of determining the adequacy of those computations resides with the Commission's technical staff." (*Id.* at 4 n. 3). If it had desired Sandia or another outside expert to conduct the review of the capacity reduction

factor, the Commission would have simply stated that requirement instead of leaving it to the discretion of the NRC Staff based on the staff's expertise and good engineering judgment.

Additionally, the Board did not express any opinion on whether the NRC Staff should perform the review with its in-house technical expertise or with outside contractors. The Board "recommend[ed] that the Commission require the Staff to perform, or have performed, a comprehensive and in-depth review of the work done by AmerGen to confirm that it provides, with reasonable assurance, an estimate of the amount of margin that exists, and to confirm that the analysis, as performed, is in fact a conservative best estimate analysis." Memorandum (Addressing The Issue Referred By The Commission Regarding The Adequacy Of AmerGen's Proposed 3-D Finite Element Structural Analysis Studies) at 18 (Oct. 29, 2008).

The NRC Staff, after consulting with its in-house technical experts on structural engineering, determined that the assessment regarding the capacity reduction factor could best be performed by in-house technical staff, especially in light of the current acceptance of ASME Code Case N-759, allowing for a modified capacity reduction to be employed for evaluation of spherical shells subjected to the refueling load conditions utilized by GE in its analysis and in SIA's 3-D FEA.

Even though independent review by a third party was not required by the Commission or the ASLB, the State of New Jersey contracted Becht Nuclear Services ("Becht") to conduct a review of the 3-D FEA. Becht reached the same conclusion made by the three previous analyses of the drywell shell including GE's analysis of record, Sandia's analysis, and the 3-D FEA. Becht concluded that Oyster Creek's drywell shell meets the applicable ASME code requirements.

You state that the NRC Staff "consistently attempted to minimize the concerns of Citizens." (May 20, 2009, Email). At every point, the NRC Staff has consistently listened to, reviewed, and analyzed Citizens' concerns in a responsible manner. Our disagreement regarding the effect of Citizens' concerns or the proper response to those concerns should not be construed as a failure to address those concerns. The NRC Staff will continue to monitor Exelon's implementation of the Aging Management Programs during the period of extended operations and take appropriate actions based on information, events, and operating experience.

We will be available to discuss any additional issues regarding our analysis of the 3-D FEA and Oyster Creek during the May 28, 2009, open house and annual assessment meeting.

Sincerely,

Kamal Manoly,
Senior Technical Advisor
Division of Engineering
Office of Nuclear Reactor Regulation

From: Richard Webster [mailto:rwebster@easternenvironmental.org]

Sent: Wednesday, May 20, 2009 1:43 PM

To: Kamal Manoly

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Subject: Fwd: Oyster Creek 3-D drywell analysis, inspection report

Please find below some comments on the 3D analysis report. I also called Mr. Manoly yesterday. I would greatly appreciate an oral or written response to these comments prior to the meeting on May 28th.

Thanks

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Here are some comments on the review of the 3D analyses:

i) Although the Commission instructed the Staff to do their review "suitably informed" by the Board's recommendations, the Staff failed to require Exelon to implement any of the recommendations. Indeed, the Staff only obliquely mentions one of the Board's recommendations and fails to state why it thought the Board's recommendations were not worth implementing. For example, the Board found that reducing thickness by 0.05 inches in one bay would not be enough to take account of uncertainties in the measurements. In contrast, the Staff found that this reduction was adequate for this purpose, but failed to note that this finding contradicted the Board.

ii) The commitment required Exelon to "determine the degree to which uncertainties in the size of thinned areas affect code margins" through sensitivity studies. Because Exelon did not vary the size of the thinned areas at all, this study fails to satisfy the commitment. On page 18 FN 27, the Staff attempt to address this point, but merely confirm that the study under review did not do what was required.

iii) The overall purpose of the study is to "better quantify the margin that exists above the code required minimum for buckling." However, instead of achieving this purpose, it muddies the waters in a number of ways. First, in contrast to the previous Sandia study AND the analysis of record, the new modeling finds that the limiting margin is based on post-accident flooding, not the refueling condition. There is no explanation of why this is so. The differences between the findings of the various analyses must be resolved to ensure we understand the limiting failure mode. Even more importantly, the current acceptance criteria are

based on the refueling condition. If this is incorrect, as the Staff and Exelon now suggest, the implication is that the acceptance criteria need to be adjusted and the margins may be lower than previously thought. Unfortunately, contrary to the explicit requirement of the commitment, no effort was made to better quantify the existing margin. Such quantification is essential to determine both method and frequency of inspection.

iv) The Staff conclude that the use of the enhanced capacity reduction factor is appropriate without consulting Sandia national labs or any other outside expert. Given the complexity of this issue and the history, the Board recommended that Sandia should do this work. The Commission adopted the recommendation that the "Staff engage appropriate expertise to conduct a thorough review." Thus, both the Board and the Commission thought that the Staff should hire outside expertise to review this issue. Despite this history, the Staff have failed to provide any reason for their refusal to engage outside expertise. This refusal to submit to outside review only fuels public concern that the NRC Staff did not do this review with an open mind and may be trying to justify past decisions.

v) Overall, the NRC Staff has failed to properly "enhance enforcement" as the Commission required. Inexplicably, Staff has approved an analysis that employed methods that the licensing board found wanting and that fails to resolve any of the key issues, such as the effect of the uncertainty in the size of the thin areas and what the existing margin actually is. Finally, the Staff has failed to allow Sandia national laboratories to review the capacity reduction factor issue, betraying either a lack of confidence in their findings or a lack of understanding that the public need to be assured by having this issue reviewed by an entity that has not consistently attempted to minimize the concerns of Citizens.

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