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From: Peter Tam
Sent: Saturday, March 28, 2009 5:04 PM
To: 'Pointer, Kenneth'; 'Salamon, Gabor'
Cc: Karl Feintuch; Alexander Tsirigotis; Kerby Scales
Subject: Monticello - Second portion, draft RAI from Mechanical & Civil Engineering Branch re. proposed EPU amendment (TAC MD9990)

Ken:

Our review of your 11/5/09 application for an extended power uprate (EPU) amendment is ongoing. Our Mechanical & Civil Engineering Branch (EMCB) has previously provided draft RAI questions on the steam dryer, which I e-mailed to you on 3/20/09; following please find the balance of the draft RAI, not concerning the steam dryer, from EMCB. Please contact me to set up a conference call to discuss these questions. **If you desire to hold the conference call during 3/24 - 4/10 when I am on leave, please contact my backup Karl Feintuch to make arrangements (301-415-3079).**

- Enclosure 5 of the 11/5/09 application contains the Power Uprate Safety Analysis Report (PUSAR) NEDC-33333P, Rev 3. This draft RAI (below) is referring to the PUSAR, unless otherwise noted.
- Refer to PUSAR for all acronyms used in this draft RAI
- The CLTR is Reference 1 of the PUSAR
- The ELTR1 is Reference 2 of the PUSAR
- The ELTR2 is Reference 3 of the PUSAR

RAI 1
Provide a table which contains information on plant operating parameters similar to Table 1-2 and include a column for OLTP. Include design and maximum temperatures for reactor recirculation system (RRS) vessel outlet and inlet nozzles and feedwater (FW) nozzles.

RAI 2
Confirm whether the current licensing basis criteria for high energy line break (HELB) are the criteria contained in the Giambusso/Schwencer letters (1972-73).

RAI 3
PUSAR Section 2.2.1 states that corrective actions are underway to perform HELB analysis upgrades at Monticello due to changes in pipe break methodology.

a) Explain why corrective actions are in place to upgrade the Monticello pipe break methodology.

b) Verify whether the Monticello pipe break methodology upgrade is based on SRP Section 3.6.2, MEB 3-1 criteria. If not, provide supporting justification.

RAI 4

ELTR 1 and ELTR 2 both recommend that HELB evaluations for High Pressure Core Spray (HPCS) and Building Heating Line be performed on plant-specific power uprate submittals. Please indicate where in the proposed LAR submittal these evaluations have been performed or provide the HELB plant-specific evaluations for these systems at EPU conditions.

RAI 5
Page 3-23 states that:

> "During the 6.3 percent rerate in 1996, only one new case was reanalyzed at CLTP for the RWCU system - a break in the system suction piping at the outboard isolation valve. For this reason a detailed comparison of CLTP and EPU results for HELBs in the RWCU system is not possible."

The statement that, "For this reason a detailed comparison of CLTP and EPU results for HELBs in the RWCU system is not possible" is not clear. Please provide clarification.

RAI 6
The same paragraph on page 3-23, as above, in reference to the reactor water cleanup (RWCU), continues as follows:

> "For the break location that was analyzed during rerate, new mass and energy release calculations considered additional blowdown sources that had not been considered in the previous 1996 analysis. This resulted in an increase in integrated mass release of about 90% and an increase in integrated energy release of 63 percent."

a) Confirm that the 90% and 63% increases are referring to the proposed EPU.
b) Please explain how the effects of the increased mass and energy release have been evaluated, include evaluations of pipe whip restraints and jet targets.

RAI 7
Page 2-37 states that: "The combination of stresses was evaluated to meet the requirements of the pipe break criteria. Based on these criteria, no new postulated pipe break locations were identified." For systems affected by the EPU, specifically steam (all EPU affected steam lines) and FW lines (including condensate), provide a pipe break analysis summary table (that includes the main steam increased turbine stop valve (TSV) closure transient loads in the analysis) which compares values at EPU and CLTP conditions and shows code equation stresses and CUFs compared to break limit for stresses and CUFs. Include pipe break locations and types selected for CLTP and EPU. Include lines inside and outside containment.

RAI 8
Enclosure 5, PUSAR Section 2.2.1.2, Liquid Line Breaks, on page 2-23 states that:

> "The mass and energy releases for HELBs in the RWCU, FW, Condensate, CRD, Standby Liquid Control, and Zinc Injection System (GEZIP) systems and instrument and sample lines may be affected by EPU and were re-evaluated at EPU conditions. [[Plant specific]**]** evaluations of liquid line breaks have been performed at EPU conditions."

Provide similar summaries as in RAI 7 for the RWCU line breaks at EPU conditions.

RAI 9

Indicate whether the FW lines have been structurally analyzed for any flow instabilities and loads due to water hammer or other flow transients and whether reanalysis has considered the EPU higher flows for these transients in evaluating pipe stresses, pipe breaks and pipe supports.

RAI 10

Are there any new liquid or steam line pipe break locations that need to be postulated due to EPU conditions?

RAI 11

a) For main steam (MS) and FW piping, state the design basis (DB) code for Class I and Class II piping and pipe supports.

b) Verify that all structural evaluations of SSCs, required for EPU, were performed in accordance with the DB codes of record for piping and pipe supports. If a different code than the DB code of record was used, provide a justification.

RAI 12

Page 2-36 of the PUSAR states that, "The effects of the EPU conditions have been evaluated for the following piping [BOP] systems:" A list of piping systems follows this statement. On page 2-37 of the PUSAR, it is stated that, "These piping systems have been evaluated using the process defined in Appendix K of ELTR1 and found to meet the appropriate code criteria for the EPU conditions," when in fact evaluations of many of these systems, including RHR and MS, has not been completed, as shown by the submitted EPU LAR, see PUSAR Table 2.2-2d. In addition, Enclosure 8, Table 8-2 states that EPU planned modifications include, "Revise documentation to incorporate revised pressure and temperature ratings for specific piping systems affected by EPU. Modify supports as required by the analyses."

a) The above PUSAR statements are not consistent. Please clarify the apparent inconsistency.

b) The proposed EPU LAR indicates that some EPU evaluations have not been completed for the staff to review. The acceptability of the proposed EPU LAR will be determined based upon the results of the LAR evaluation reviews that are performed by the staff in accordance with the policies and procedures set forth in LIC-101, "License Amendment Review Procedures." Please provide a schedule of completion of these analyses and submittal of your evaluation results which shows that piping and pipe supports meet code allowables. Also, submit a schedule of completion for EPU required piping and pipe support modifications.

RAI 13

a) Provide a list of systems (inside and outside containment) for which temperature, pressure, flow and mechanical loads have been increased due to EPU. Please include OLTP and EPU values.

b) Provide a brief summary that shows the EPU maximum code equation stresses compared to CLTP for the affected systems. For MS, FW and condensate see RAI 14, below. Include fatigue evaluation CUFs, where applicable. It is noted, that although the tables in Section 2.2 of the PUSAR include, for some BOP systems, the percentage increases for pipe stresses and pipe support loads, varying from 9 to 72 percent increases, due to temperature or pressure increases, these percentages are not

indications that piping and pipe supports meet code equation allowable values, without providing maximum resulted values compared to code allowables.

RAI 14
Verify whether the increased flow rate due to EPU affects the structural analysis (pipe stress and support loads) of only the MS and FW piping.

RAI 15
The reactor coolant pressure boundary (RCPB) piping systems structural evaluation is contained in Section 2.2.2 of the PUSAR. Please provide structural evaluations for the residual heat removal (RHR) low pressure coolant injection (LPCI) and core spray systems and whether their piping and supports are structurally adequate for the EPU conditions.

RAI 16
The PUSAR indicates that "the MS piping pressures and temperatures are not affected by EPU." Please confirm that the main steam piping has no temperature and pressure increases due to the EPU and whether that includes main steam branch piping inside and outside containment including the main steam turbine bypass piping.

RAI 17
Steam flow and feedwater flow will increase as a result of the CPPU implementation. The load due to the TSV fast closure transient is used in the design of the MS piping system. Page 2-31 states that "Due to the magnitude of the TSVC transient load increase [at EPU], the transient event was reanalyzed. The main steam piping was then reanalyzed using this revised load definition."

a) Provide a quantitative summary of the MS and associated piping system evaluation (inside and outside containment), including pipe supports, that contains the increased loading associated with the TSV closure transient at EPU conditions, along with a comparison to the code allowable limits. For piping, include maximum stresses and data at critical locations (i.e. nozzles, penetrations, etc), including fatigue evaluation CUFs, where applicable. For pipe supports, state the method of evaluation for EPU conditions and confirm that the supports on affected piping systems have been evaluated and shown to remain structurally adequate to perform their intended design functions. For non-conforming piping and pipe supports, provide a summary of the modifications required to ensure that piping and pipe supports are structurally adequate to perform their intended design functions and the schedule for completion of these modifications.

b) For FW and condensate, please respond as in part (a) of this RAI.

RAI 18
In accordance with Section 2.2.2 of the PUSAR, the main steam and associated piping system structural evaluation was performed to justify the operation of these systems at EPU conditions. This evaluation showed that one small bore branch line did not meet the displacement criteria. PUSAR further states that, "Additional detailed analysis will be performed to qualify this line or the piping modified prior to operation at EPU conditions."

a) Provide identification of the small bore branch line (size, system, location, function).
b) Describe the required displacement limits and their bases.

c) Since this piping analysis, with potential piping and or support modifications, is required for EPU, please discuss the reasoning for not including this information in your application. Also, indicate when necessary modifications, as needed, will be completed.

RAI 19

Page 2-31 of the PUSAR states that, "SRV discharge loads are not affected by EPU."
Please clearly present your evaluation of the effects of the safety relief valve (SRV) discharge line and containment loads at EPU conditions, which demonstrates that the current design basis for containment dynamic load definitions for the SRVs are still valid and bound the EPU conditions.

RAI 20

Page 2-33 states that:

> "FW piping from the MOVs [downstream from the high pressure heaters] to the condensate pumps will be modified as a result of the replacement of the feedwater and condensate pumps, and will be qualified for full EPU operation as part of the modification. The current piping and associated components are adequate for operation within the capability of the existing feedwater and condensate pumps."

Page 2-61 indicates that:

> "BOP FW from the condensate pumps to the first isolation valves (IV) (outside containment) "will be analyzed and qualified with the FW and Condensate pump modifications prior to operation at EPU conditions."

a) In addition to the minimum flow line modifications for EPU FW and condensate pumps (identified in Enclosure 8, Planned Modifications), what other piping modifications are anticipated?

b) Indicate whether piping (including supports) analysis at the EPU conditions of the above mentioned FW and condensate piping modifications (including minimum flow lines) has been completed and discuss the analysis results.

c) Provide an explanation whether any transients are applicable in the sections of piping mentioned above (including pump min flow lines) and evaluate their affects with regard to structural integrity of the proposed modifications of piping, pipe components and pipe supports.

RAI 21

PUSAR, on page 2-33, to makes the following statement with regard to FW pipe stress evaluation:

> "A review of the small increases in pressure, temperature and flow associated with EPU indicates that the EPU temperature, pressure and flow conditions are bounded by the existing analyses. The original design analyses have sufficient design margin between calculated stresses and ANSI-B31.1-1977, including Winter 1978 Addenda Code allowable limits to justify operation at EPU conditions."

Explain the small increases in FW flow between OLTP and EPU and between CLTP and EPU that are bounded by the existing analyses, and whether the existing analyses contain flow induced loads at the OLTP or CLTP.

RAI 22

PUSAR, on page 2-33, makes the following statement with regards to the FW pipe support evaluation:

> "The FW system was evaluated for the effects of seismic, deadweight and thermal expansion displacements on the piping snubbers, hangers, and struts. A review of the increases in temperature and FW flow associated with EPU indicates that the EPU conditions are bounded by the existing analyses."

Provide a discussion which shows that the FW flow induced loads on pipe supports in the existing analysis bound the EPU flow induced loads.

RAI 23

a) Discuss whether there is any piping analysis, in the current design basis of the plant, that contains stratification or discuss whether there is any CLTP stratification monitoring currently in place.

b) If a stratification phenomenon currently exists, explain how these stratification locations have been evaluated at EPU conditions and provide a summary of their evaluation results.

RAI 24

Consider the two statements below:

LAR Enclosure 10, on page 3 of 16, states the following:

> "If the vibration level in the main piping in these systems [(FW and MS)] is greater than 50% of the acceptance criteria, then an engineering evaluation of the small bore piping will be performed to ensure that the steady state stresses are within the endurance limit."

In response to NRC staff RAI, CLTR for the EPU generic evaluation states that:

> "[T]ypically the measured piping vibration levels of the MS and FW piping are only a few percent of [the acceptance] criteria. Hence, the vibration levels of the large bore piping are small and therefore the vibration levels of components and branch piping attached to the large bore piping are not of concern. However, if during testing, the vibration levels of the large bore MS and FW piping are found to be significant, [[say 50% or higher of their acceptance criteria,{3}]] then the attached components and branch piping connections will have a higher probability of fatigue failure relative to operation at the original power level. Hence when the measured MSL or FW large bore piping vibration levels reach [[50% of{3}]] their acceptance criteria, the attached branch piping connections will be further evaluated."

a) Please revise the statement of Enclosure 10 of the LAR to be in accordance with the generic CLTR evaluation, in that if the vibration levels of the main piping reach 50% or higher, an engineering evaluation of all attached branch piping, not just for the small bore, will be performed to ensure that the steady state stresses are within the endurance limits. As this was the intention of the CLTR statement.

b) It appears that the 50% was based on the CLTR statement that, "measured piping vibration levels of the MS and FW piping are only a few percent of [the acceptance] criteria." However, in the

Monticello case, from readings taken at 100% CLTP, vibration resulted in levels well above just a few percent of the acceptance criteria. At CLTP, 10 locations came in at above 20% of the acceptance criteria for FW and MS. Inside containment, the maximums were 14% and 32% of the acceptance criteria for FW and MS, respectively. Outside containment, the maximums were 43% and 34% of the acceptance criteria for FW and MS, respectively. Using the EPU expected vibration increase of 32%, the CLTP values of 14, 20, 32, 34 and 43 percent of the acceptance criteria are projected for the EPU to be 18, 26, 42, 45 and 57 percent of the acceptance criteria, respectively.

1. Using the 50% or higher criterion, one location has been predicted to be 57% of the acceptance criterion. Please discuss whether evaluations have been performed for branch lines in the vicinity of this location? Provide a discussion of the evaluation results.

2. Provide a basis for justification that the 50% criterion, which the CLTR recommends for cases where piping vibration levels are only a few percent of the acceptance criteria, is applicable for Monticello, where the vibration levels even at CLTP have reached well above a few percent of the acceptance criteria, as shown above.

RAI 25

With regard to the reactor pressure vessel (RPV) evaluation for EPU, Page 2-45 of the PUSAR states that:

> "The Top Head and Cylindrical Shell and the Stabilizer Bracket were not evaluated for fatigue at the time that the OLTP evaluation was performed, and have not been evaluated for EPU."

Monticello USAR Rev 24, Section 4.2.1 states that:

> "[T]he reactor vessel was also designed for the transients which could occur during the design [ ] life. The reactor vessel was analyzed for the cycles listed in Table 4.2-1."

Provide an evaluation which shows that the RPV top head and cylindrical shell and the RPV supports will be structurally adequate at EPU conditions for the renewed plant life.

RAI 26

Table 2.2-4 of the PUSAR shows that the fatigue CUFs for the recirculation (RRS) inlet nozzle (Ri) and FW Nozzle significantly increased for EPU by 146% for Ri and 47% for FW nozzle, placing the FW nozzle within approx 8.6% of its limit. Provide an explanation for these significant EPU CUFs increases, confirm that these CUFs are to the end of renewal life and assure that all required transients at EPU conditions have been properly included for these fatigue evaluations.

RAI 27

In Table 2.2-9 of the PUSAR, some of the locations are shown with "--". Please explain what is meant by this designation.

RAI 28

In Section 2.2.2 of the PUSAR, it is stated that, "The effects of FIV induced stresses at EPU conditions on safety-related thermowells in the MS and FW system and the sample probe in the FW system were evaluated" and indicates that they remain acceptable under EPU conditions (see page 2-28 of the PUSAR). However, Enclosure 8, page 5 of 9 states, "Replace or remove the thermowells in main steam piping to insure appropriate margin for flow induced vibration." Provide a quantitative summary of the

evaluation that supports the acceptability of the thermowells and sample probes in the MS, FW and related piping systems. Identify nonconforming component(s) and provide description of their modification(s).

RAI 29
Page 2-59 of the PUSAR states that:

> "The temperatures, accident radiation level, and the normal radiation level increase due to EPU. These effects are not considered to have an adverse effect on the functional capability of nonmetallic components in the mechanical equipment both inside and outside containment."

Please provide a justification that the radiation due to the EPU is not higher than the radiation damage threshold of the non-metallic parts of the resilient seated check valves, hydraulic snubbers and flex joint bellows affected by the EPU.

RAI 30
Page 2-59 of the PUSAR states that:

> "The Monticello design and licensing bases do not require a formal mechanical EQ program like the EQ program applied to electrical equipment."

What program used at Monticello establishes the capability of active safety-related mechanical equipment and their components to perform their required safety function for the life of the plant during postulated normal and accident conditions?

This e-mail aims solely to prepare you and others for the requested conference call. **This e-mail does not convey a formal NRC staff position, and does not formally request for additional information**.

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