NRR-PMDAPEm Resource

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Subject: Diablo Canyon, Units 1 and 2 - RAIs for LAR Associated with Pressurizer Filling Concerns due to MFW Pipe Rupture accident (TAC Nos. MF5785 and MF5786)

Please note the following **official** requests for additional information (RAIs) for the subject license amendment request (LAR), and provide your responses within 60 days from the date of this e-mail.

By letter dated February 25, 2015 (ADAMS Accession Number ML15056A773), Pacific Gas & Electric Co. (PG&E), the licensee for Diablo Canyon, Units 1 & 2, submitted a license amendment request (LAR) to revise Updated Final Safety Analysis Report (UFSAR) Section 15.4.2.2. to incorporate the results of a pressurizer filling analysis for major rupture of a main feedwater (MFW) pipe accident. The Nuclear Regulatory Commission (NRC) staff has done a preliminary review of the LAR and finds that the following additional information is required to complete the review:

Reactor Systems Branch (SRXB)

SRXB-RAI-1

Section 3.4.2 of the LAR dated February 25, 2015, states that "The transient response following a FLB [feedwater line break] accident was calculated with a detailed simulation of the plant in accordance with the NRC approved methodology for a 4-loop plant using the Westinghouse version of the RETRAN-02 computer code (RETRAN-02W). The NRC's generic approval of the Westinghouse methodology is documented in the safety evaluation report (SER) dated February 11, 1999, which is included in WCAP-14882-P-A (Reference 9)." When discussing relief valve flow in the SER to WCAP-14882-P-A, it states "The calculation of critical flow for subcooled or saturated conditions is not a significant consideration for the non-LOCA [non-loss-of-coolant accident] transients and accidents to be analyzed by Westinghouse using RETRAN." However, in the case of the current pressurizer filling analysis, the flow through the power operated relief valve (PORV) is a significant consideration as it has an effect on the number of PORV cycles. Given that the number of PORV cycles was not a concern in the generic approval of RETRAN-02, justify the applicability of Westinghouse's existing NRC-approved non-LOCA safety analysis methodology in computing the PORV mass flow rate and number of PORV cycles.

SRXB-RAI-2

Section 3.4.2 of the LAR states "The pressurizer PORV relief flow is controlled by the choking velocity. As discussed in Section 3.5.2 of WCAP-14882-P-A (Reference 9), the valve flow area is based on the extended Henry-Fauske critical flow correlation for subcooled choking and isoenthalpic expansion model for saturated and superheated conditions." Is the flow rate and associated critical flow model conservative for both operator action time(s) and number of pressurizer PORV cycles? Were other critical flow models considered? How does the modelled pressurizer PORV flow rate compare to the design flow rate?

SRXB-RAI-3

Section 3.4.2 of the LAR states “A valve flow area multiplier is included in the PORV model to account for the change in mass flow rate that occurs when water is relieved through the valves.” Describe the valve flow area multiplier in more detail and state what value is used in the analysis.

SRXB-RAI-4

Section 3.4.3 of the LAR states “However, relief through the PORVs that are actuated on the indicated (measured) pressurizer pressure signal (i.e., the PG&E Design Class I PORVs) has been modeled with the assumptions that maximize the number of PORV opening cycles experienced.” Describe the assumptions used to model the PORV to maximize the number of PORV cycles.

SRXB-RAI-5

Section 3.4.3 of the LAR states “Therefore, transient mitigation must be demonstrated to occur before 300 PORV cycles is reached.” For this criterion to be met, the number of pressurizer PORV cycles would have to be 299 or less. Section 3.4.4 of the LAR states “The system response showing that the maximum number of PORV cycles is not reached is presented in new UFSAR Figures 15.4.2-24 through 15.4.2-27.” In Figure 15.4.2-26 of the UFSAR markup the red curve, indicating calculated PORV cycles, appears to slightly exceed the dotted grid line at 300 cycles. Confirm that the actual number of pressurizer PORV cycles in the analysis is below 300.

SRXB-RAI-6

For a given opening setpoint pressure, an increase in the closing setpoint pressure will result in additional pressurizer PORV cycles and may result in depleting the backup nitrogen supply. What pressurizer PORV opening/closing setpoint pressures were used in the analysis and how do these compare to the current plant setpoints? What is the uncertainty in the physical PORVs opening/closing pressures, including any setpoint drift effects? Were these uncertainties taken into consideration in the analysis?

SRXB-RAI-7

Section 3.4.3 of the LAR discussed the auxiliary feedwater (AFW) assumptions. In the current pressurizer filling analysis, some AFW flow begins one minute after trip, however, in the UFSAR Section 15.4.2.2 FLB analysis, AFW does not begin for 10 minutes. Explain the difference in AFW modelling assumptions between the UFSAR FLB and current FLB analyses and describe how the current analysis is conservative.

SRXB-RAI-8

In UFSAR Section 15.2.15.2 Spurious Safety Injection (SSI) Pressurizer Overfill Analysis, the operators are credited with making a pressurizer PORV available within 11 minutes of the initiation of the event. This event is considered a condition II fault of moderate frequency. For this case, the 11 minute time frame is consistent with times in the ANSI/ANS [American National Standards Institute/American Nuclear Society]-58.8-1994 standard (5 minute diagnosis and 1+ minute for each action). However, in the current FLB pressurizer overfill analysis, the event is a condition IV limiting fault (much lower frequency of occurrence) and credits operator action within 8.6 minutes. This value is significantly lower than the ANSI/ANS-58.8-1994 standard (20 minute diagnosis and 5+ minutes for each operator action) for this type of event. Address the discrepancy between the proposed operator action time and the ANSI/ANS standard.

SRXB-RAI-9

The current analyses show different runs for the different time critical operator actions. Was an analysis performed using all four of the proposed time critical operator actions in a single run to assure that all the acceptance criteria are met at the same time?

SRXB-RAI-10

Is there any single failure (common cause) that would cause loss of backup nitrogen to both safety grade pressurizer PORVs?

Probabilistic Risk Assessment Operations & Human Factors Branch (APHB)

RAI-APHB-1: Are the four operator actions that are proposed to be added completely new actions or have operators had previous training and experience with each of the four actions?

RAI-APHB-2: Which procedures will require revision to support this LAR (plant-specific number, title, and revision)?

RAI-APHB-3: Please provide the NRC with any operating experience that was used in this proposed change. This may include but is not limited to plant-specific condition reports, Licensee Event Reports, Institute of Nuclear Power Operations (INPO) reports, prior implementations of the design, and other relevant sources.

RAI-APHB-4: Will any changes to the Safety Parameter Display System be required? If yes, describe.

RAI-APHB-5: Other than the modification to the nitrogen supply, will any modifications to the Control Room, controls, displays, or alarms be required to support this LAR?

RAI-APHB-6: Discuss the sample of operators used for validation and how it was representative of the population of operators expected to perform the four actions. If all of the potential operators/crews who could be involved were used, a statement to that fact would be enough.

RAI-APHB-7: Provide the results of the validation. Show each operator's response time for each action, and the total time for each operator to perform all four actions. If validated by crew, show response times and totals by crew. Identify and discuss any operator errors that were observed. Do not identify operators by name or other personally identifiable information.

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