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Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Clarifications Concerning Containment
Parameter Limits and Pressurizer Pressure
Proposed Technical Specification Change Requests
TAC Nos. M84029 AND M84098

Gentlemen:

By letters dated July 9, 1992 (2CAN079201) and July 22, 1992 (2CAN079202), Entergy Operations proposed Technical Specification (TS) Change Requests revising containment parameter limits and pressurizer pressure, respectively for Arkansas Nuclear One - Unit 2 (ANO-2). During a telephone conversation on September 3, 1992 with the ANO-2 NRR Project Manager and other NRC Staff, Entergy Operations provided clarifications to these submittals. This letter documents the responses which were requested to be provided in writing.

The questions asked during the September 3, 1992 conversation and our responses are provided in Attachment 1. Should you have any further questions, please do not hesitate to contact me or my staff.

Very truly yours,

James J. Fisicaro
James J. Fisicaro
Director, Licensing

JJF/NBM/sjf
Attachment

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ATTACHMENT 1

Question on 2CAN079201

At the bottom of the next to last paragraph on page 1, you state that - "Initial conditions of containment temperature and humidity do not have a significant impact on PCTs." Please explain your reasons for this.

Response

The relative effects that the initial containment conditions have on peak clad temperatures (PCT) are dominated by the initial pressure changes. Initial containment temperature and humidity also affects the PCT; but not with as great a magnitude. These effects have been derived based on two calculations. The first calculation (Bechtel Calculation A-120) documented the relative effects of initial containment pressure, temperature and humidity on the design basis accident (DBA) peak pressure. From this calculation, the following relationships were determined:

1 psi increase in initial pressure results in a 1.3 psi increase in peak pressure

1°F increase in initial temperature results in a 0.05 psi increase in peak pressure

Decreasing the initial humidity from 100% to 0% results in 0.4 psi increase in peak pressure

From these relationships, it can be seen that small changes in the initial containment pressure will have significant effects on the peak containment pressures.

Post loss of coolant accident (LOCA) containment pressures are credited in the ABB-CE emergency core cooling system (ECCS) evaluation model to reduce blowdown and subsequently, increase reflood rates. Any change in the initial pressure, temperature, or humidity which changes the post LOCA containment pressure will affect the PCT in relative amounts. One of the calculations ABB-CE performed for the ANO-2 large break LOCA (LBLOCA) analysis indicates a 95°F increase in the PCT when the initial containment pressure was decreased from 14.7 psia to 12.8 psia and initial temperature was decreased from 90°F to 60°F. From this, a relationship can be developed to correlate initial containment conditions to effects on PCT. Conservatively assuming the total increase in PCT was due to the pressure change (assumed to be the dominant change), the following is derived: a 1.9 psi decrease in the initial pressure results in a 2.5 psi decrease in the final pressure which, in turn, results in a 95°F increase in PCT. Using this correlation, the above relationships can be conservatively altered to reflect changes in PCT.

1 psi decrease in initial pressure results in a 50°F PCT increase

1°F decrease in initial temperature results in a 2°F PCT increase

Increasing the initial humidity from 0% to 100% results in a 15°F PCT increase

These relationships indicate the relative change in PCT due to a change in initial containment pressure, temperature, and humidity.

Questions on 2CAN079202

In the second paragraph from the top of page 6, you state that - "This clarification is consistent with other CE plant interpretation of the Technical Specification." Please provide the names of other plants where this is so.

Response

The ANO-2 and CE Standard Technical Specifications define the fuel centerline melt specified acceptable fuel design limit (SAFDL) in terms of a peak linear heat rate (PLHR) safety limit.

Maine Yankee, an analog ABB-CE plant, has recently received a favorable SER allowing them to change the PLHR safety limit to a fuel centerline melt temperature. (Amendment No. 126, Docket No. 50-301, November 18, 1991). ANO-2 is a digital plant where CPCs monitor LHR; hence, a PLHR safety limit can be considered appropriate. However, the Technical Specification bases should define the underlying acceptance criteria as fuel centerline melting temperature which the PLHR safety limit is protecting.

This position is further substantiated with the SER for Cycle 2 (January 16, 1987) at Waterford 3. Waterford 3 is a digital plant similar to ANO-2 with a PLHR safety limit of 21 kw/ft. In their Cycle 2 Reload Report, Waterford 3 indicated that they exceeded 21 kw/ft under the same conditions as ANO-2 (Uncontrolled CEA Withdrawal from Subcritical Conditions) for a short duration, but still were within the fuel centerline melt temperature.

Question

In the last paragraph on page 6 you state that - "plus 25 psi which bounds pressure measurement uncertainties." How was the 25 psi uncertainty value arrived at?

Response

The 25 psi error is based on an analysis of the instrument error for the narrow range (1500-2500 psia) pressurizer pressure indicators in the control room. The analysis calculated an overall loop error of +/- 24.4 psi which was conservatively rounded up to +/- 25 psi. This error is based on normal (non-accident) errors including reference accuracy, calibration error, drift, environmental influences (temperature, power supply variations), and indicator readability (resolution). The error methodology of Square-Root-Sum-of-Squares (SRSS) was used to combine random errors. Bias errors were added linearly to the resultant SRSS combination of random errors to establish total error. This methodology is the same as used to develop the setpoint/error analysis for the plant protection system low pressurizer pressure trip setpoint.

Question

In the middle paragraph on page 7 you state that - "In the new instrument error calculation, several non-realistic assumptions are removed with regard to the containment conditions; specifically, the conditions at which the low pressurizer pressure instruments reach the trip setpoint. The original instrument error calculation conservatively assumed worst case long-term harsh environment inside containment based on a large break loss of coolant accident (LOCA)." Please provide more information on this relaxation of conditions.

Response

In the 9/3/92 conference call with the NRC reviewers, the reduction in errors due to seismic, temperature, and radiation effects was discussed. Seismic and radiation errors were adequately addressed to the NRC reviewer's satisfaction. Additional information was requested concerning temperature. This is provided below.

The low pressurizer pressure trip function provides protection for small break LOCA (SBLOCA) events at an analytical limit of 1625 psia and for LBLOCA/steam line break (SLB) events at an analytical limit of 1578 psia. Previously, the setpoint analysis had calculated worst case errors associated with the LBLOCA event and added them to the 1625 psia (highest) analytical limit for SBLOCA events to derive the current 1766 psia setpoint. Therefore, using the higher analytical limit for the SBLOCA and the worst case LBLOCA error, a setpoint was determined that bounded each of the events. This approach has been determined to be overly conservative since no credit was taken for smaller errors associated with the SBLOCA analytical limit.

A new analysis was performed that showed that 200°F was a bounding containment temperature for LOCA (i.e., SBLOCA and LBLOCA) events at the time of trip actuation. This temperature falls within the normal operating temperature limits for the Rosemount 1154 transmitter and allowed the use of the smaller Rosemount normal temperature error specification in lieu of the larger accident specification. For the SLB event, the maximum temperature at the time of trip actuation was analyzed to be no greater than 250°F. This places the Rosemount transmitter outside its normal operating range and, therefore, accident errors were used for those events. The revised setpoint calculation tabulated errors separately for the LOCA and SLB events. The errors were applied to the corresponding analytical limits to determine the new setpoint. The smaller errors of the LOCA case combined with the higher analytical limit of 1625 psia for the SBLOCA event, yielded the requested 1717.4 psia setpoint. This setpoint was conservative with respect to the setpoint that was derived with the larger SLB error combined with its respective lower analytical limit.