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1901 Gratiot Street, St. Louis

Donald F. Schnell
Vice President

February 28, 1986

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Denton: ULNRC- 1266

DOCKET NUMBER 50-483
CALLAWAY PLANT
RELOAD LICENSE AMENDMENT REQUEST
ADDITIONAL INFORMATION

References: 1) ULNRC-1207 dated 11/15/85
2) ULNRC-1227 dated 12/13/85
3) ULNRC-1247 dated 1/28/86
4) ULNRC-1258 dated 2/18/86
5) ULNRC-1263 dated 2/24/86

The referenced letters transmitted the reload license amendment request for Callaway Cycle 2 along with additional information to support this request. The attachment to this letter documents additional information provided in a phone call on February 24, 1986, involving NRC, Westinghouse and Union Electric.

Item 1 from the attachment was identified as an item which needed to be addressed to support issuance of the Cycle 2 Amendment. It is our understanding the information provided on the phone satisfies the NRC reviewers concern and this letter provides documentation of the response.

Items 2 and 3 of the attachment address initial draft questions raised by the NRC reviewer concerning the eventual request for a power uprating for Callaway. These are documented herein because of the lengthy nature of the responses, but are not considered necessary for close-out prior to issuance of the Cycle 2 Amendment. The Callaway uprating amendment request is not anticipated to be submitted until the second quarter of 1987.

If there are additional questions, please contact us.

Very truly yours,

for Donald F. Schnell

DS/bjk
Attachments

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STATE OF MISSOURI)
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CITY OF ST. LOUIS)

Robert J. Schukai, of lawful age, being first duly sworn upon oath says that he is General Manager-Engineering (Nuclear) for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Robert J. Schukai
Robert J. Schukai
General Manager-Engineering
Nuclear

SUBSCRIBED and sworn to before me this 28th day of February, 1986

Barbara J. Pfaff
BARBARA J. PFAFF
NOTARY PUBLIC, STATE OF MISSOURI
MY COMMISSION EXPIRES APRIL 22, 1989
ST. LOUIS COUNTY

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Attachment to
ULNRC- 1266

Additional Information for Cycle 2
Reload License Amendment Request

1. Large break LOCA analyses were performed using the BART computer code. The staff SER describing review and approval of this code is dated December 21, 1983 and is contained in WCAP-9561-P-A. The staff approval is dependent on selection of proper nodal length and prohibits use of the grid spacer model. Following staff review of WCAP-10484 use of the grid spacer model was permitted provided that the droplet breakup model was not included. Justify that the BART evaluation for Callaway utilized options and assumptions approved by the staff.

   Response

   In the BART Evaluation Model (BART EM) used to analyze large break LOCAs for Callaway, the proper nodal lengths were utilized as required by the NRC SER. One-half foot spacings were chosen for all nodes in the BART model, except around the peak power location, where the nodes were spaced 1/4 foot apart.

   It has been verified and confirmed that the grid spacer model (grid rewet model) was used and the droplet breakup model was not utilized, as required by the NRC SER.

   The above confirms that the options and assumptions utilized in the BART EM for Callaway were those approved by the NRC.

2. The Commission's Regulation 10CFR50.46 (a)(1) requires that ECCS cooling performance be calculated for loss-of-coolant accidents of different sizes sufficient to provide assurance that the entire spectrum of postulated loss-of-coolant accidents are covered. In the reanalysis of loss-of-coolant accidents using BART and NOTRUMP models the peak cladding temperature was determined to be 2153°F for a 40% large break size and 1299°F for a 3 inch small break size. Break sizes smaller than these sizes were not examined. Demonstrate that an adequate break spectrum has been evaluated or perform additional analyses. Include split breaks as well as double ended ruptures.

   Response

   The limiting case break identified for Callaway loss-of-coolant-accidents is the CD=0.4 DECLG break, at a calculated peak clad temperature (PCT) of 2153°F. In the LOCA analyses the 0.4 discharge coefficient is the lower bound of the cold leg guillotine break spectrum which is consistent with the use of the Moody critical flow correlations required by 10CFR50 Appendix K. This lower bound limit was established based on experimental data as described in Appendix D of WCAP-8340, "Westinghouse Emergency Core Cooling System, Plant Sensitivity Studies," and has been observed since the institution of 10CFR50 Appendix K.

Sensitivity studies using Westinghouse large break LOCA evaluation models have universally demonstrated that the limiting (cold leg) guillotine break exhibits a higher calculated PCT than the limiting (cold leg) split break. WCAP-8565-P, "Westinghouse ECCS 4-Loop Plant (17x17) Sensitivity Studies," provides 4-loop plant results that may be referenced for Callaway which demonstrate this behavior. In the BART Evaluation Model (BART EM), SATAN and WREFLOOD still provide system and core thermal-hydraulic boundary conditions to the rod heatup PCT computation, just as in previous Westinghouse evaluation models. Note in particular that core flooding rates are higher in WCAP-8565-P for split breaks than for the corresponding discharge coefficient guillotine breaks. Since the WREFLOOD model has changed very little in the BART EM, this behavior will be retained, providing a relative benefit for the split breaks. In conclusion, the use of BART does not necessitate that split breaks be analyzed, so the spectrum provided for Callaway is adequate as in the past.

WCAP 10,054-P-A, "Westinghouse Small Break ECCS Evaluation Model using the NOTRUMP Code," which was provided by reference in the submitted text on page 15.6-16, indicates a 2 inch break need not be analyzed. This is based on the fact that a 2 inch break does not lead to core uncovery and there is therefore no impact on PCT. Given this and the fact that 900° F in PCT , margin exists to the regulatory limit of 2200° F, the small break spectrum provided is clearly adequate.

3. Discuss how the increase in steam generator tube plugging was considered in the analysis of loss-of-coolant accidents, in particular the effect due to increased steam binding during the reflooding period.

Response

Steam Generator Tube Plugging (SGTP) is a large break LOCA ECCS performance penalty, because of the flow restriction it produces within the steam generators. This restriction inhibits mass flow through the coolant loops (i.e., increases steam bending) and hinders the reflooding of the reactor core following a large break LOCA. This consequently results in higher calculated Peak Clad Temperatures (PCTs), as SGTP increases, as noted in WCAP-8986, "Westinghouse Pertubation Technique for Calculating ECCS Cooling Performance."

SGTP levels affect the performance of calculated small break LOCA in three important aspects namely, the reduced heat transfer area, the increased initial temperature difference between the primary and the secondary side, and countercurrent flow limit (CCFL).

During a small break LOCA only a small portion of the steam generator heat transfer area is required to provide an effective heat sink. Thus the availability of adequate steam generator heat transfer area is unaffected because of tube plugging. In an Appendix K small break LOCA analysis, the increasing temperature difference between the primary and the secondary side will disappear right after the break, because the secondary side pressure reaches the steam generator safety valve set point immediately after the break. SGTP may affect the CCFL characteristics depending on the severity of the plugging. At a lower plugging percentage (up to about 20%), the limiting CCFL discussed in Reference 1 is still at the inclined pipe connecting the steam generator inlet plenum and hot leg. Therefore, at low plugging rates (20%), small break LOCA transients would not be affected by the tube plugging and remain non-limiting.

In the LOCA analysis for Callaway, a uniform SGTP level of 10% was assumed, in order to accommodate a plugging level in any steam generator up to 10%. This was achieved via input to the Callaway large break BART EM analysis and the small break NOTRUMP EM analysis, including the following:

1. The steam generator tube net free volume was reduced by 10%.

2. All heat transfer areas and flow areas associated with the steam generator tubes were reduced by 10%.

3. All pressure drops and enthalpy distributions were revised to accommodate 10% SGTP.

Therefore 10% SGTP was properly implemented in the Callaway LOCA analysis. The calculated LOCA PCT value is valid for SGTP levels of 10% in any steam generator and conservative for any tube plugging level below 10%.

REFERENCE

1. Lee, N., "Limiting Countercurrent Flow Phenomenon in Small Break LOCA Transients", Proceedings of the Specialists Meeting on Small Break LOCA Analyses in LWRs, Pisa, Italy, June (1985).