

50-445/446



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20565-0001

February 3, 1997

Mr. C. Lance Terry
TU Electric
Group Vice President, Nuclear
Attn: Regulatory Affairs Department
P. O. Box 1002
Glen Rose, TX 76043

SUBJECT: 10 CFR 50.46 LARGE BREAK LOSS OF COOLANT EVALUATION MODEL FOR
COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2
(TAC NOS. M96355, M97131, AND M97132)

Dear Mr. Terry:

In our letter of October 11, 1996, we informed you about the problems that we had identified concerning changes in the large break loss-of-coolant accident (LBLOCA) evaluation model of Siemens Power Corporation (SPC) for pressurized water reactors (PWRs) to comply with 10 CFR 50.46. The changes to the 1986 approved LBLOCA evaluation model were to correct an error of non-physical behavior in the prediction of heat transfer coefficients during core reflood. The range of concern for core reflood rates following the LBLOCA is for rates of 1 "/sec to 1.77 "/sec in that the 1986 model predicted a peak in the heat transfer coefficients within this range and then the non-physical behavior of decreasing coefficients with increasing reflood rates. The SPC 1991 model which was also discussed in the October 11, 1996, letter is not an acceptable LBLOCA model.

We stated in the letter of October 11, 1996, that the 1986 model had an unacceptable error and we requested, in accordance with 10 CFR 50.46(a)(3)(ii), that you assess the impact of the model error and changes, and take whatever actions are required to assure compliance with 10 CFR 50.46 for Comanche Peak, Units 1 and 2. You were also requested to attend a public meeting on October 16, 1996, at the Nuclear Regulatory Commission (NRC) headquarters to present the results of the assessment of the peak cladding temperature (PCT) for the LBLOCA and the corrective actions and compensatory measures that have been undertaken, both short-term and long-term to demonstrate compliance with 10 CFR 50.46. An acceptable short-term measure would be to use a demonstrably conservative reflood heat transfer coefficient model; an acceptable long-term measure must be to eliminate the non-physical behavior from the model. In both cases, the model must comply with Appendix K to 10 CFR Part 50. The summary of the October 16, 1996, meeting was issued on November 5, 1996.

You submitted letters dated October 25, November 1 and 29, 1996 (TXX-96497, TXX-96501, and TXX-96517). The October 25, 1996, letter documented the assessment that you had presented at the October 16, 1996, meeting of the PCT for the LBLOCA and the corrective actions and compensatory measures that have been undertaken, both short-term and long-term for Comanche Peak, Units 1 and 2. In that letter, you stated that the minimum reflood rate prior to the time of PCT is 1.735 "/sec and that a heat transfer coefficient no greater than that for 1.77 "/sec was used through the time of PCT. With this conservatism,

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you stated that the values of the total peaking factor limit were reduced for both units to continue to meet the requirements of 10 CFR 50.46. You reported that the PCTs for Comanche Peak, Units 1 and 2 are 2112 °F and 2036 °F, respectively, which are below the acceptance criteria of 10 CFR 50.46.

In your letter, you also stated that, based on the information summarized in Enclosure 1 to the letter, the 1986 SPC LBLOCA model predicts heat transfer coefficients during the reflood which have ample conservatism to the measured data to justify its use to show compliance with 10 CFR 50.46. You stated that the values of the total peaking factor limit for the two units would be kept reduced pending the resolution of the conservatism of the 1986 model.

In the October 16th meeting, the discussion was on the use of a "modified" 1986 model which, for the reflood range of concern, capped the heat transfer coefficients at the coefficient value for 1.77 "/sec to correct the error. Based on the new data shown in the meeting by SPC about the significant conservatism in the modified 1986 model, the staff concluded in that meeting that the licensees involved had taken those actions required by 10 CFR 50.46 to allow continued plant operation. We requested, however, that the licensees at the meeting submit all the data that shows the modified 1986 model is conservative over the entire range of reflood rates of concern so that the staff could review the data in determining an acceptable correction to the error in the 1986 model.

In your letter of October 25, 1996, you stated that the Comanche Peak Units will operate with a reduced value of the total peaking factor pending the resolution of this issue and requested that we review data to justify the 1986 model before the model is applied to Comanche Peak, Units 1 and 2 to show compliance with 10 CFR 50.46. You stated that the 1986 model incorporates heat transfer coefficients during reflood which demonstrate ample conservatism with respect to measured data to justify the use of the model. You also stated that you compared analyses based on the 1986 model to that performed by Westinghouse based on their 1981 ECCS evaluation model and concluded that a similar degree of conservatism exists for the 1986 model relative to the Westinghouse analysis. In letter dated November 1, 1996, you provided plant-specific information from the hot rod heatup calculations regarding the calculated PCT for the reduced value of the total peaking factor.

In your letter of October 25, 1996, you did not refer to the conference call held on October 23, 1996, where SPC provided clarification about its discussion of conservatism in the 1986 model in the October 16, 1996, meeting. In that conference call, the staff and you were informed by SPC that the 1986 model was not as conservative with respect to the measured heat transfer coefficients as was presented in the October 16th meeting. Because of this information on reduced conservatism in the 1986 model, we can no longer accept the modified 1986 model, in accordance with 50.46(a)(1)(i), as a basis for concluding that an affected plant meets the acceptance criteria of 10 CFR 50.46 until we have reviewed the information to justify the model is conservative for the reflood range of concern and have approved the model. An

acceptable model to correct the non-physical behavior is to use a linear interpolation in the reflood range of concern for the 1986 model to determine the heat transfer coefficients.

In letter dated November 29, 1996, you discussed the conference calls between your staff and the NRC staff concerning the linear interpolation of the heat transfer coefficients in the reflood range of concern for the 1986 model with the upper limit of this range being between 1.74 "/sec and 1.77 "/sec. We agreed that the upper limit for the interpolation could be 1.74 "/sec. You stated that a new revised temporary assessment was made performed using a linear interpolation between 1 "/sec and 1.74 "/sec demonstrates compliance with 10 CFR 50.46 and Appendix K for both units pending the resolution of the issue with the 1986 model. Attached to the letter, you provided (1) PCT values which showed the units were within the 50.46 criteria and (2) plant-specific information regarding the PCT for both units for the reduced value of the total peaking factor. You concluded in the letter with the statement that both units continue to satisfy the requirements of 10 CFR 50.46 and Appendix K.

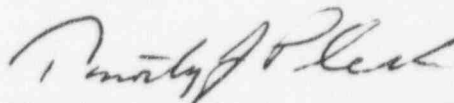
In reviewing the data provided in Attachment 2 to the letter dated November 29, 1996, we have compared the figures of (1) convective heat transfer coefficient versus time and (2) reflood rate versus time, for both units. The comparison shows that the heat transfer coefficients for both units would be increasing with decreasing reflood rate which appears to be the non-physical behavior of the 1986 model that we identified in 1986 model. This was discussed in a conference call on December 17, 1996, and your staff referred to Figure 3.7, page 3 of 11, which was attached to your October 25, 1996, letter. This figure showed that the heat transfer coefficient for a given reflood rate between 1.0 and 1.77 "/sec increased with time after the LBLOCA. Because the linear interpolation of heat transfer coefficients between 1.0 and 1.77 "/sec for the 1986 model would be for each time step, a comparison of separate figures of heat transfer coefficient versus time and reflood rate versus time could indicate that the heat transfer coefficients may be increasing with decreasing reflood rate because there are other phenomena, as raising quench level in the core, occurring with reflood which will affect the heat transfer coefficient. We agree with you that this is what Figure 3.7 is showing.

In a conference call on January 7, 1997, we further discussed your LBLOCA analysis for the Comanche Peak Units with regard to a correction of a "Z-equivalent" error in SPC's LBLOCA model. This information was documented in your letter dated January 13, 1997 (TXX-97013). You indicated that this correction could result in a reduction in PCT for both units. In the conference call, your staff stated that it had been decided not to correct the error at this time, and to accept the higher PCT value as a penalty for plant operation. We find that this course of action is within the requirements of 50.46 and Appendix K and, therefore, acceptable. When the error is corrected you should follow 50.46 and Appendix K concerning actions related to changes in the PCTs. Your staff further stated that the PCTs for Comanche Peak, Units 1 and 2 are 2013 °F and 2072 °F respectively, based on the linear

interpolation to 1.74 "/sec. These PCTs were reported in your letters dated November 29, 1996, and January 13, 1997. They are different from those values reported in your letter dated October 25, 1996, and acknowledged on page 1 of this letter.

We acknowledge that your letter dated November 29, 1996, included an attachment documenting your LBLOCA analyses for Comanche Peak, Units 1 and 2 using a linear interpolation for reflood heat transfer coefficient between reflood rates of 1.0 and 1.74 in/sec. We have reviewed these analyses and find them acceptable, pending final resolution of the issues pertaining to the TOODEE2 reflood heat transfer model with SPC. The staff confirms that the linear interpolation methodology appears to be conservative, and that TU Electric is in compliance with the applicable parts of 10 CFR 50.46 and Appendix K. The staff has also reviewed your letter dated January 13, 1997, and agrees with TU Electric's proposed course of action regarding the error in the Z-equivalent parameter in TOODEE2. The staff accepts the results reported in your January 13, 1997, letter as your analyses of record for the Comanche Peak Units; these will be used as the "baseline" for the purposes of determining "significant" changes in the PCTs for Comanche Peak, Units 1 and 2. Your previous request, in letter dated October 25, 1996, to review the data to justify SPC's 1986 model is considered to have been superseded by subsequent events (i.e., your subsequent letters and conference calls with the staff that are discussed in this letter) and is no longer relevant.

Sincerely,



Timothy J. Polich, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-445 and 50-446

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TU Electric Company

Comanche Peak, Units 1 and 2

cc:

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