UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ATTACHMENT 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATING TO THE TEXAS UTILITIES ELECTRIC COMPANY SMALL BREAK LOCA ANALYSIS METHODOLOGY FOR APPLICATION TO COMANCHE PEAK UNITS 1 AND 2 TEXAS UTILITIES ELECTRIC COMPANY COMANCHE PEAK STEAM ELECTRIC STATION UNITS 1 AND 2 DOCKET NOS. 50-445 AND 50-446

1 INTRODUCTION

In a submittal of December 19, 1995, the Texas Utilities Electric Company (TUEC) provided its topical report RXE-95-001-P, "Small Break Loss of Coolant Accident Analysis Methodology," December 1995. This report describes the TUEC Small break (SB) loss of coolant accident (LOCA) analysis methodology for application to its Comanche Peak Units. The TUE SBLOCA analysis methodology is a direct adaptation of the Siemens SBLOCA Evaluation Model (EM) which was approved for generic use in a NRC Safety Evaluation Report (SER) of October 3, 1994.

2 STAFF EVALUATION

In its review of the TUEC SBLOCA methodology, the staff covered areas related to technical adaptation of the approved model, provisions for its use in Comanche Peak licensing applications (including core operating limits report [COLR] operational determinations), and provisions for maintenance of the methodology. As part of its review, the staff conducted a meeting (open to the public) with TUEC on June 11, 1996 to discuss items in the review areas and provide documented basis for review findings. The meeting is documented in a meeting summary dated July 16, 1996.

2.1 Technical Adaptation

Because the technical model being implemented at TUEC has already received NRC approval for licensing applications, the NRC review of technical aspects of the TUEC SBLOCA model concentrated only on the faithfulness of the TUEC adaptation to the Siemens approved source SBLOCA EM and on any identified deviations from the source EM. In its initial technical screening the staff identified technical considerations to be discussed at the June 1996 meeting. Most of the considerations were informational in character and the technical issues involved had already been considered in the approval of the Siemens source EM. A synopsis of the technical discussion for each item is provided in attachments to the meeting summary and is not presented here. The licensee responses reflect a faithful adaptation of the approved source EM and are acceptable.

One significant deviation in the TUEC version of the model was proposed. Though demonstration calculations presented in RXE-95-001-P to justify technical adaptation of the model were performed using a nodalization scheme which explicitly represents all four Comanche Peak reactor coolant system loops (4-loop

explicitly represents all four Comanche Peak reactor coolant system loops (4-loop model) as in the source model, RXE-95-001-P also proposed the use of a 2-loop model. The 2-loop model was outside the scope of this review, and only the 4-loop model was considered at this time.

Because the source methodology was found to be in compliance with applicable requirements as specified in 10 CFR 50, Appendix K, and because we have found that TUEC has faithfully adapted the source EM, we find that the TUEC SBLOCA methodology meets the requirements of 10 CFR 50, Appendix K and is acceptable.

2.2 Input Assumptions

In RXE-95-001-P, TUEC discussed and justified various plant and analysis specific input assumptions for use of the methodology in performing Comanche Peak SBLOCA analyses. We find the justifications acceptable.

2.3 Applicability to Comanche Peak

2.3.1 Applicability of the TUEC Methodology to Comanche Peak

At the June 1996 meeting, TUEC discussed the applicability of its SBLOCA analysis methodology to the Comanche Peak design. In its discussion, TUEC identified other pressurized water reactors (PWRs), including various Westinghouse and Combustion Engineering design plants, whose LOCA analyses had been performed with the source SBLOCA EM. These designs sufficiently resemble the Comanche Peak design that their analyses may be referenced to justify applicability to Comanche Peak. In an investigation of the history of application of the source EM in analyses for other PWRs, TUEC found no instances of calculational complications requiring application-specific model changes. TUEC reported that it found no differences between Comanche Peak and the other designs that would affect application of the source EM (or its derived methodology) to the Comanche Peak design. From its investigation TUEC concluded that the source EM (and the TUEC methodology) is applicable to Comanche Peak without modification.

We conclude that the TUEC methodology is applicable to the Comanche Peak design.

2.3.2 Applicability of the Computer Codes to Comanche Peak Using the TUEC Computer

TUEC stated that test cases were run for both the source EM on its computer and the TUEC SBLOCA model on its computer to show that the conversion introduced no differences. TUEC performed a line-by-line comparison between the source and its derived codes, and between input and output values for the sample cases, and found an exact correspondence. We conclude that the TUEC SBLOCA methodology is applicable to the Comanche Peak design when run on the TUEC computer.

2.4 Limitations on Use of the Models

TUEC stated that all limitations placed upon use of the source EM in past NRC SERs either had been addressed by modification of source model by the supplier or will continue to be implemented in applications of the model. Specifically, TUEC addressed the limitations and requirements stated in the conclusions of the

NRC SER of October 1994, regarding the Siemens Small Break Evaluation Model (source EM), committing to comply with those requirements. We find the commitments appropriate and acceptable.

To address mixed core situations, TUEC will perform SBLOCA analyses for each fuel type. In using the analysis results to determine the limiting small break peak cladding temperature, and operational limits or surveillance, the licensee will apply the limits for the bounding case and fuel type to all fuel types resident in the core when similar limits are appropriate. If operating limits appropriate to the fuel types differ significantly, then the respective operating limits for each fuel type will be separately defined in the core operating limits report based on the bounding analysis for each fuel type.

We conclude that the TUEC process for treating mixed cores in SBLOCA analyses is acceptable.

2.5 Evaluation Model Modifications and Configuration Control

At the June 1996 meeting TUEC described its provisions for evaluation model modifications, including internal processes, interfaces with the supplier of the source EM, and interfaces with other technical groups.

TUEC identified company procedure ERX 5.07-01 as the process for identifying, approving, implementing, and reporting evaluation model modifications. This procedure provides a software development/modification plan, guidance for implementation of software developments/modifications, a process for software validation and installation of test cases, a user manual, and a software verification package.

TUEC indicated that its interfaces with the source EM supplier are supported by contractual requirements and by implementation of supplier interface processes in company procedure ERX 5.07-01. TUEC presented a list of industry and technical groups, including Yankee Atomic Electric Company, Westinghouse Owners Group, the Institute of Nuclear Power Operations (INPO), and the RELAP5 User Community, with whom it also has informational exchange interfaces to augment company procedure ERX 5.07-01.

TUEC also discussed processes for configuration control of its evaluation model associated with the above provisions for code corrections and modifications. TUEC indicated that corrections and changes in the model configuration originate in its design modification process, which provides a modification checklist and determines interdiscipline review needs. In this process hardware modifications are coordinated with changes in analyses. Records are maintained of all changes for future reference.

The above provisions are the same as those which were approved in the staff SER of October 3, 1994, and are equally applicable to the TUEC SBLOCA methodology.

From the TUEC presentation we conclude that the TUEC provisions for evaluation model corrections and modifications and configuration control are adequate.

2.6 Quality Assurance and Security

At the June 1996 meeting TUEC described its quality assurance program covering its SBLOCA analysis codes, engineering calculations, transmittals of design information, computer input decks, development and modification of software, handling of error reporting and evaluation, and installation of software. The program provides a process for cross-checking determinations and implementations in these areas by at least 2 responsible engineers.

TUEC also discussed its security provisions covering access, codes, and input decks. Access is protected by use of individual and group passwords. Code security is maintained by execution using binary code versions.

The TUEC discussions of quality assurance and security are documented in the meeting summary.

The above provisions are the same as those which were approved in the staff SER of October 3, 1994, and are equally applicable to the TUEC SBLOCA methodology.

We conclude that the TUEC quality assurance and security provisions will assure the continued integrity of the TUEC SBLOCA methodology and are therefore acceptable.

2.7 Licensee Competence and Provisions for Maintenance of Competence

At the June 1996 meeting TUEC discussed the qualifications of its senior staff which had adapted its SBLOCA model from the source EM and which was performing analyses using the model. Credentials for individuals reflect a requisite level of competence. TUEC also described its program for maintaining its competence, including reactor engineering orientation, on-the-job training, and more structured training in 10 CFR 50.46 and 10 CFR 50 Appendix K, and in its controlled LOCA analysis procedures and processes. These programs are the same as those which were approved in the staff SER of October 3, 1994, and are equally applicable to the TUEC SBLOCA methodology.

We conclude that TUEC has demonstrated an acceptable level of competence and has described an acceptable program to maintain its competence.

2.8 Interfaces Between the EM and Calculations with Plant Operational Controls

In RXE-95-001-P, the licensee identified plant parameters, for example, amount of steam generator tube plugging, ECCS pump flows and response times, peaking factors (F_q and $F_{delta-h}$), K(z) curve, main and auxiliary feedwater pump flows and response times, steam generator safety valve specifications, reactor trip specifications, and reactor coolant pump trip assumptions, which are input to EM calculations consistent with designations given provided in plant technical specifications and the plant core operating limits report. The licensee stated that the LOCA analysis group uses controlled copies of such plant data.

We conclude from the licensee's discussion the licensee has provided adequate interfaces between the EM and its calculations and plant operational controls.

3 CONCLUSIONS

Based on our review, as summarized in Section 2, we concluded that the licensee's EM, as described in the report RXE-95-001-P and the June 1996 meeting, is based on an acceptable source model, has been acceptably adapted, has been shown to be suitably applicable to the Comanche Peak design, and is properly supported with acceptable programs covering user qualification, methodology maintenance and control, and interfaces with plant operation. We therefore find that the TUEC Small Break LOCA EM described in RXE-95-001-P is acceptable for performing Comanche Peak SBLOCA analyses, for reference in Comanche Peak licensing applications, and for incorporation into or reference by the Comanche Peak core operating limits report. Our conclusions are limited to licensing use of the 4-loop version of the TUEC SBLOCA model only, since review of the 2-loop version is outside the scope of this review, as identified in Section 2.1.