May 16, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-445 and
TEXAS UTILITIES ELECTRIC	)	50-446
COMPANY, ET AL.	)	
	)	(Application for
(Comanche Peak Steam Electric	)	Operating Licenses)
Station, Units 1 and 2)	)	

AFFIDAVIT OF ROBERT C. IOTTI REGARDING
ALLEGED ERRORS MADE IN DETERMINING DAMPING
FACTORS FOR OBE AND SSE LOADING CONDITIONS

I, Robert C. Iotti, having first been duly sworn hereby depose and state, as follows: I am Chief Engineer of Applied Physics for Ebasco Services, Inc. In this position I am responsible for directing analytical work in diverse technical areas, including analyses of the response of piping and support systems to dynamic events, including earthquakes. I have been retained by Texas Utilities Electric Company to coordinate and oversee the technical activities performed to respond to the Board's Memorandum and Order (Quality Assurance for Design) of December 28, 1983. A statement of my educational and professional qualifications accompanies Applicants' letter of May 16, 1984, to the Licensing Board transmitting this affidavit

Q1. What is the purpose of your affidavit?

A1. This affidavit addresses the allegation by CASE that Applicants employed erroneous seismic damping factors in their pipe stress analyses for OBE and SSE conditions. This allegation is the subject of Item 16 in Applicants' Plan.[1] The substance of CASE's allegation is set forth in Section XXII of its August 22, 1983, Proposed Findings of Fact and Conclusions of Law. Specifically, referring to a discussion in the SIT Report[2] concerning the seismic analysis of a particular support addressed by Mr. Doyle, CASE alleged, as follows:

> This is a Class 1 (active) pipe system of 3" diameter; therefore, the damping factor which must be used is 1 percent for both OBE and SSE, not 2 percent OBE and 4 percent SSE (see Reg. Guide 1.61). Even if this were a non-active system, the allowable damping is only 1 percent for OBE and 2 percent for SSE. The Applicants and SIT are wrong regardless, according to the NRC's own Regulatory Guide. [CASE Proposed Findings at XXII-3.]

Q2. Are CASE's assertions correct?

A2. No. There are three allegations made in this statement that are incorrect. They are, as follows:

1. Class 1 piping systems are active;
2. Incorrect seismic damping values were used to evaluate the piping system response to OBE and SSE conditions; and

---

1 Applicants' Plan to Respond to Memorandum and Order (Quality Assurance For Design), February 3, 1984.

2 NRC Inspection Report 50-445/82-26, 50-446/82-14, February 15, 1983 (NRC Staff Exhibit 207), at 48-49.

3. The Applicants' and SIT's positions are not consistent with applicable Regulatory Guides.

Q3. What is your response to CASE's allegation that piping systems are active systems?

A3. Piping systems are not active systems. They are passive. As defined in Regulatory Guide 1.48, an active component is one

> "that must perform a mechanical motion during the course of accomplishing a system safety function".

Therefore, footnote 2 in Regulatory Guide 1.61, which refers to OBE damping values and which provides, as follows:

> "in the dynamic analysis of active components as defined in Regulatory Guide 1.48, these values should also be used for SSE,"

does not apply to the seismic analysis associated with piping. Accordingly, CASE is incorrect in asserting that piping systems are active systems and damping values for piping analyses should be the same for both OBE and SSE conditions.

Q4. Did Applicants employ damping factors in their pipe stress analyses which are consistent with NRC Regulatory Guide 1.61?

A4. Yes. Applicants use 1 and 2 percent critical damping response spectra for the OBE and SSE evaluations, respectively, for small diameter (12" and under) piping systems, as provided in Regulatory Guide 1.61. See FSAR § 1A(B), p. 1A(B)-25. The piping seismic analysis for the

stress problem (in this instance stress problem 1-41) which includes support CS-1-235-067-C41K (CASE Exhibit 69B, 8T-8U) used those values.

Apparently, CASE was misled by the statement made in the SIT report at p. 48. That statement is, as follows:

> "The Special Inspection Team concluded that these response spectra characteristics, together with the fact that the SSE damping value of 4 percent is twice the OBE damping value of 2 percent led to the condition expressed in Mr. Doyle's concern."

The SIT was not clear that the use of 2 and 4 percent damping factors in the analysis of OBE and SSE conditions to which it refers was with respect to that aspect of the analysis in which closely spaced modal responses are combined using a coupling factor. The coupling factor is a function of damping, as is evident in equations 3.7N-29 and 3.7N-30 set forth in the FSAR. In calculating the coupling factor in stress problem 1-41, 2 and 4 percent critical damping were used. This is a conservative assumption for this calculation because the higher the damping the larger the coupling factor, and therefore, the larger the total response. However, as already noted, Applicants employed values of 1 and 2 percent for the OBE and SSE conditions, respectively, as well as the conservatively calculated coupling factor, in the actual small-diameter piping

analyses. In sum, the analysis performed for stress problem 1-41 used the correct seismic damping factors and follows the guidance in NRC Regulatory Guide 1.61.

Q5. Has CASE made any other incorrect allegations regarding the use of damping factors in their seismic analyses?

A5. Yes. CASE states, on page 1 of Section XXII of its Findings:

> "But the SIT found it suitable to accept the Applicants' procedure of assigning two different spectra(s) dependent on damping factors."

Contrary to CASE's assertion, Applicants' use of the different seismic spectra is appropriate. Applicants use OBE spectra for OBE events and SSE spectra for the SSE event. The use of these spectra has nothing whatever to do with damping factors. When using OBE spectra, the choice of the damping factor employed will depend on the analysis being performed. In this instance, consistent with Regulatory Guide 1.61, a damping value of 1 percent is used for piping analyses if the piping diameter is 12 inches or less. Similarly, when using SSE spectra, an appropriate damping value is employed for the SSE condition. In this case, again consistent with Regulatory Guide 1.61, the damping factor employed is two percent for 12 inch or under piping.

Q6. Is there any other assertion by CASE on this topic you would like to comment on?

A6. Yes. On pages XXII-3 and XXII-4 of its Findings, CASE suggests that Applicants employed a document (a Westinghouse Topical Report) applicable to larger piping systems and friction as a basis for employing damping factors different than those allowed by Regulatory Guide 1.61. This document was employed by Applicants only with respect to the damping for the Westinghouse reactor loop configuration, for which a different damping factor was justified by testing, as described in the FSAR. FSAR § 1A(N)-34. Thus, CASE's assertions in this regard are incorrect.

Robert C. Iotti

Subscribed and sworn to before me this 16th day of May, 1984.

Notary Public

My Commission Expires January 31, 1985