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October 9, 1984
84056.032

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Mr. J. B. George
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Subject: Reactor Coolant Thermal Barrier Rupture
Comanche Peak Steam Electric Station
Independent Assessment Program
Texas Utilities Generating Company
Job No. 84056

- References:
- (a) N. H. Williams (Cygna) letter to J. B. George (TUGCO), 84056.010, "Mechanical and Electrical/I&C Review Questions," July 30, 1984.
 - (b) L. M. Popplewell (TUGCO) letter to N. H. Williams (Cygna), "Cygna Review Questions," August 24, 1984.
 - (c) D. H. Wade (TUGCO) letter to N. H. Williams (Cygna), CPPA-40961, "Follow-up Response to Cygna Questions," September 18, 1984.

Gentlemen:

As part of the CPSES Independent Assessment Program, Cygna reviewed the mechanical systems design of a portion of the Component Cooling Water System (CCW). During the course of this review Cygna raised a question concerning the capability of the CCW system to isolate a ruptured reactor coolant pump thermal barrier with a single temperature controlled shut off valve. The Architect/Engineer, Gibbs & Hill (G&H), questioned whether this rupture was considered a loss of coolant accident and whether single failure criteria or isolation at the containment boundary need apply. After additional review and study, Cygna restated the question in a letter to TUGCO (reference a).

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TUGCO responded to Cygna's question in their letter of August 24, 1984 by noting that Westinghouse had filed a 10 CFR Part 21 on a similar concern (reference b). This was expanded upon in a letter from D. Wade of TUGCO to Cygna (reference c). TUGCO further advised Cygna of their intent to file a potential 50.55(e) report with the NRC on this issue.

The following discussion summarizes Cygna's understanding of the Westinghouse 10 CFR Part 21 report and describes the Cygna concern and the potential differences between the Westinghouse corrective action and the Cygna concern.

(1) Westinghouse 10CFR21 Description

Westinghouse discusses an overpressurization of the CCW system caused by the surge tank vent valve closing on a high radiation signal and a concurrent volume increase in CCW water inventory. The overpressure that is described in their letter to TUGCO is in both the surge tank and piping downstream of the CCW pumps, with the main area of concern being the piping. Westinghouse also assumes that the tank vent discharges to the same receiver as the tank relief valve. The stated Westinghouse objective is "... to ensure that the maximum pump discharge pressure does not exceed 110% of design, assuming a water solid surge tank coincident with the maximum anticipated in-leakage through a ruptured tube in one of the system heat exchangers." The proposed fix is to remove the vent and relief valves from the surge tank and replace them with vent/overflow pipes. This solution does not address single failure requirements, surge tank rupture, or the vent size and flow capacity effects on the situation. Westinghouse also states that thermal barrier leak rate is 260 gpm "cold" rather than what it would be at operating temperature.

(2) Cygna Concern

The Cygna concern focuses on a single failure causing a LOCA outside containment and possible common mode failure of the CCW system. The Cygna scenario is initiated by a rupture in a reactor coolant pump thermal barrier followed by failure of the temperature control isolation valve in the CCW system to close. Reactor coolant at 650°F and 2250 psia would then flow into the low pressure section of the CCW system at the rate of 275 gpm. No other automatic functions exist to isolate this leakage in the high pressure portions of the CCW system. The CCW piping outside containment will be overpressurized by this high flow rate and pressure. In addition, the water level in the surge tank will begin to rise at the rate of 275 gpm. Assuming that the tank is at high level at the time of the incident, it would only take approximately four minutes for the surge tank to be filled solid with water. Since the surge tank is designed for 10 psig and is only protected by a 1 gpm relief valve and a 1 inch vent valve, it will quickly become overpressurized and possibly rupture. If the tank does rupture, both safeguards trains of the CCW system would be disabled and a LOCA outside containment would result. Alternatively, if the CCW piping outside containment failed prior to surge tank rupture, a LOCA outside containment would still occur even though both trains of CCW may



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not be disabled. It should also be noted that even if the tank and piping remain intact, the surge tank vent will allow the leakage to discharge into the room containing the surge tank. This is due to the vent not being piped to the same receiver as the relief valve in accordance with the Westinghouse stated normal practice.

Based on the above, it is not clear that the Westinghouse Part 21 is directly related to the Cygna question. Westinghouse does not specifically address single failure of the thermal barrier isolation valve or a LOCA outside containment. In their design documents they do list thermal barrier leakage into the surge tank as the typical limiting in-leakage to the tank. Westinghouse is only concerned with overpressurization of components on the discharge side of the CCW pump while Cygna is concerned with the rupture of the surge tank and/or CCW return piping resulting in a possible common mode failure of the CCW system.

Cygna has not been provided with any specific information on the content or corrective action contained in TUGCO's 50.55(e) report, however, TUGCO has assured Cygna that they are addressing the single failure, LOCA, common mode failure and generic concerns raised by Cygna in their 50.55(e) submittal to the NRC.

Should you have any questions or require any additional information on this subject please do not hesitate to call.

Very truly yours,

A handwritten signature in cursive script, appearing to read "N. H. Williams".

N. H. Williams
Project Manager

dmm

cc: Mr. D. Wade (TUGCO)
Mr. D. Pigott (Orrick, Herrington & Sutcliffe)
Ms. J. Ellis (CASE)
Mr. S. Treby (US NRC)
Ms. J. VanAmerongen (EBASCO/TUGCO)
Mr. R. Ballard (G&H)

To: DOCUMENT CONTROL

FROM: S. B. Burwell x 27563

SUBJECT: Cygna Review (Phase 4) Comanche Peak

Attached is the following document:

October 9, 1984 - 84055.032

Reactor coolant pump thermal barrier rupture.

Cygna (Williams) to NRC (Burwell) and TUGCU (George)

Please distribute as follows:

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