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February 14, 1985

Director of Nuclear Reactor Regulation
Attention: Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
DOCKET NOS. 50-445 AND 50-446
MAIN STEAM LINE BREAKS OUTSIDE
CONTAINMENT

REF: B. J. Youngblood to M. D. Spence
letter of December 21, 1984,
concerning Main Steam Line Breaks
Outside Containment

Dear Sir:

The referenced letter is a request for additional information on the adequacy of the equipment necessary for mitigation of main steam line breaks outside the reactor building containment. The response to this request is enclosed and will be included in a future amendment to the FSAR.

Respectfully,

John W. Beck

John W. Beck

DRW/grr
Attachment

Distribution: Original plus 40 copies

B001
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140 EQUIPMENT QUALIFICATION BRANCH ENVIRONMENTAL QUALIFICATION

Q0140.1 Impact of MSLB on qualified equipment outside containment:

1. TUGCO discusses the effects of the main steam line break (MSLB) event due to a break area of 1 sq. ft. Needed are:

   a. A technical justification which supports that a break area of 1 sq. ft. is the worst break, from an operational standpoint, for equipment necessary for break mitigation, and what the worst initial power level is for the 1 sq. ft. break.

   b. The time sequence of events of the worst break.

   c. The assumption used in the analysis of the MSLB with superheat.

   d. Verification that the analysis included the effects of jet impingement.

   e. Identification of the safety-related equipment located in the area affected by a steam line break with superheat. This should include:

      (1) The Class 1E cables located in areas affected by MSLB, the separation between redundant Class 1E cables or Class 1E and non-Class 1E cables which are routed in the MSLB area.

(2) List of all equipment affected by the MSLB superheat condition with the required operability time. The required operability time should account for functional operability as well as any subsequent failure which could affect any other safety function, or mislead the operator.

(3) Qualification test profiles for all equipment affected including the demonstrated operability time for the MSLB with superheat.

(4) The time margin between the safety equipment performing its safety function and the critical component of this equipment exceeding its qualification temperature.

(5) If the time margin is less than 1 hour, provide the necessary justification in accordance with Regulatory Guide 1.89, Rev. 1.

2. TUGCO has analyzed the compartment temperature response following onset of a postulated MSLB using blow down data that includes superheat effect. The results show that in the break compartment, the temperature profile, which peaks at 350^{o}F, exceeds the original qualification envelope for about 40 seconds. The analysis also shows that safety functions occur before the superheat effect appears. In

order to complete its review, the staff requires that TUGCO provide a copy of the blow down analysis, including the mass and energy release data, and discuss and justify the time following onset of the accident at which safety functions would be completed.

R140.1 1.a For all rooms except the break room, 1.0 ft^2 is definitely the most severe case, for more energy is released to these rooms more rapidly than any of the smaller breaks. Since these rooms do not exceed the qualification temperatures for a 1.0 ft^2 break, they will not exceed their temperature for any smaller break.

The only equipment that could be required to operate and that could be in the room where the break occurs are the ventilation dampers. These dampers close on pressure differential. Pressure helps keep these dampers closed. The new temperature spike will not degrade the ability of these dampers to close and remain closed.

Since none of the remaining equipment in the area where the break is located is required to operate, the operability of this equipment will not contribute to determining the most severe break from the standpoint of equipment operability. Therefore, based on the impact to equipment in rooms outside the break area, the most severe break is the break that releases the most energy and generates the highest peak. That break is the 1.0 ft^2 break.

The previous environmental analyses for the break areas clearly showed that without superheat, full power provided the worst environmental results. For the superheat studies, typical mass and energy data are only available for the full power cases. However, it is fully reasonable to expect that, for the superheat cases, full power will still provide the worst environmental results. Since equipment operability is not required in the room with the break, minor deviations in the peak temperature will not impact mitigation of the event. The validity of this expectation will be confirmed when the mass and energy release data are received from Westinghouse.

b. The time sequence based on a 1.0 ft^2 break and an initial power level of 100% is as follows:

Reactor Trip (due to overpower N-16)	- 9 seconds
Feedwater Isolation (due to reactor trip and low Tavg)	- 11 seconds
Safety Injection Signal (due to low pressurizer signal)	- 47 seconds
Steamline Isolation (due to low steamline pressure)	- 130 seconds
Steam Generator Tube Uncovery	- 180 seconds

The time sequence for these events will be later for smaller breaks. At some point as the breaks

get smaller, steam generator tube uncovery will occur before Steamline Isolation because the break is so small that the tubes uncover before pressure falls below the low steamline pressure setpoint. At lower power levels and break sizes, other events such as low steam generator level will initiate reactor trip. Such slight deviations in the sequence are not expected to result in a more severe event. The most important action to mitigate the event, steamline isolation for the unaffected steam generators, will always be possible.

c. The mass/energy releases were calculated by Westinghouse using a modified version of the LOFTRAN code. The LOFTRAN code is a digital computer code which simulates the behavior of a multi-loop pressurized water reactor. LOFTRAN simulates the neutron kinetics, thermal-hydraulic conditions, pressurizer, steam generators, reactor coolant pumps, and control and protection system operation. LOFTRAN has been modified to model the heat transfer which may occur in the uncovered portion of the tube bundle of a steam generator and to calculate the resulting superheated steam mass and energy release.

The mass/energy releases are based on a four-loop plant. Conservative assumptions were made in order to result in early tube bundle uncovery and, therefore, the earliest superheat initiation time. Although these sample mass/energy releases are neither generic nor

necessarily conservative for a given plant, they are representative of the superheated steam phenomenon and will provide a valid estimate of the effects on compartment temperature analyses.

The environmental analysis used to determine the temperature transient due to this break is described in FSAR Section 3.6B.1.2.3. Additional specific information is provided in the FSAR in the response to question 010.20.

d. The NRC staff provided that for CPSES, in piping tunnels that contain break exclusion regions of main steam lines, the safety related equipment in these tunnels be designed to withstand the environmental effects of a non-mechanistic crack with a flow area of one square foot. (See NRC staff question 010.20 in the CPSES FSAR). Therefore, it was assumed that jets are not generated and hence jet loads are not considered. This criterion was reviewed and accepted in the CPSES SER (NUREG-0797) and SSER 6 (NUREG-0797 Supplement No. 6) in Section 3.6.2.

e. Items (2) through (5) are covered in Table 140.1-1.

The Class 1E cables located in the areas affected by the crack are those cables required to support the class 1E equipment in the same areas. All of these cables are qualified for the LOCA/MSLB inside containment for CPSES. As such, these cables are expected to remain fully

operational throughout this event. The cable separation in these areas meets the requirements of Regulatory Guide 1.75.

2. The blow down analysis and the mass and energy release data are based on an analysis performed by Westinghouse and are representative of a four loop plant. (See the response to item 1.c above.) Since reasonable margins exist in both time and temperature at CPSES for this event, the representative data are adequate for acceptance of the CPSES design. A plant specific blow down analysis will be prepared for CPSES and is expected to be available by about August of 1985.

   The time following onset at which safety function would occur does not vary from the previous CPSES analysis of this event. The assumption that the equipment in the break area fails in its most adverse mode is no more severe than the assumptions made for the previous CPSES analysis of this event. Therefore, the safety analysis and the crack mitigation/shutdown analysis remain the same.

TABLE 140.1-1
(Sheet 1 of 5)

EQUIPMENT	REQUIRED OPERABILITY TIME	POSTULATED TEMPERATURE PEAK	DEMONSTRATED TEMPERATURE PEAK	DEMONSTRATED OPERABILITY TIME	TIME MARGIN (3)	NOTES
MSIV	Not required (in room with break)	N/A	N/A	N/A	N/A	(1)
	12 minutes (not in room with break)	<336°F	358°F	30 days	29 days	(2)
MSIV Bypass (MSIVBP)	Not required (in room with break)	N/A	N/A	N/A	N/A	(1)
	12 minutes (not in room with break)	<336°F	365°F	30 days	29 days	(2)
Main Steam Drain Pot Isolation Valves (MSDPIV)	Not required (in room with break)	N/A	N/A	N/A	N/A	(1)
	12 minutes (not in room with break)	<336°F	346°F	3 hours	168 minutes	(4)
Feedwater Isolation Valves (FIVs)	10 minutes	<336°F	340°F	2 hours	110 minutes	(4)
Feedwater Bypass Valves (FWBPVs)	10 minutes	<336°F	346°F	3 hours	170 minutes	(4)
Feedwater Sample Isolation Valves (FW Sample IV)	10 minutes	<336°F	346°F	3 hours	170 minutes	(4)

TABLE 140.1-1
(Sheet 2)

EQUIPMENT	REQUIRED OPERABILITY TIME	POSTULATED TEMPERATURE PEAK	DEMONSTRATED TEMPERATURE PEAK	DEMONSTRATED OPERABILITY TIME	TIME MARGIN (3)	NOTES
Turbine Driven Auxiliary Feedwater Pump Steam Supply Valve (TDAFPSUP)	Not required	N/A	N/A	N/A	N/A	(1)
Main Steam Power Operated Relief Valves (MSPORVs)	Not required (in room with break)	N/A	N/A	N/A	N/A	(1)
	72 hours (5) (not in room with break)	<336°F	358°F	30 days	27 days	
Barton Steam Line Pressure Transmitters	12 minutes (6) (in room with break)	<351°F	420°F	2800 hours	2799 hours	Provide steam line isolation signal
	72 hours (5) (not in room with break)	<336°F	420°F	2800 hours	2700 hours	
Rosemount Steam Line Pressure Transmitters	Not required(7) (in room with break)	N/A	N/A	N/A	N/A	Provide control signal for MSPORVs
	72 hours (5) (not in room with break)	<336°F	350°F	30 days	27 days	
Watertight Doors	Not required	N/A	N/A	N/A	N/A	(8)

TABLE 140.1-1
(Sheet 3)

EQUIPMENT	REQUIRED OPERABILITY TIME	POSTULATED TEMPERATURE PEAK	DEMONSTRATED TEMPERATURE PEAK	DEMONSTRATED OPERABILITY TIME	TIME MARGIN (3)	NOTES
HVAC Isolation Dampers	<12 minutes	N/A	N/A	Continuous	N/A	(9)
Mechanical Safety Valve	Not required	N/A	N/A	N/A	N/A	
Accessory Limit Switches for MSIV, MSIVBP, MSPORV, FIV and FWBPV	72 hours	<336^{o}F	340^{o}F	30 days	27 days	(3)
Accessory Limit Switches for MSDPIV, TDAFPSUP, and FW Sample IV	Not required	N/A	N/A	N/A	N/A	(10)
Auxiliary Feedwater Flow Transmitters	Not required	N/A	N/A	N/A	N/A	(10)

TABLE 140.1-1

(Sheet 4)

NOTES:

(1) These valves may fail in either the open or closed position without increasing the severity of the event beyond the present analysis or decreasing the ability to mitigate the event and safely shutdown the unit.

(2) These valves will operate to close within the first 12 minutes (the exact time depends on the break size). Beyond 12 minutes (for up to 72 hours while proceeding to cold shutdown) these valves must remain closed. The qualification testing performed on these valves includes sufficient margin beyond the postulated peak (336°F for 5 minutes) to justify the operability of the valves for well beyond 72 hours.

(3) For no equipment where operability is required does the postulated accident profile exceed the demonstrated qualification profile.

(4) These valves operate within the first 12 minutes (the exact time depends on the break size). Operability is not required beyond then for the valves will fail (remain) in a safe position.

(5) 72 hour operability time is based on shutdown and cooldown within 72 hours such that the operability of these items would no longer be required.

(6) Once the low steamline pressure signal or high negative pressure rate signal is provided, the operability of these transmitters is no longer required.

(7) This transmitter provides an analog signal for the operation of the Main Steam PORV associated with the break. Since the

TABLE 140.1-1

(Sheet 5)

operability of this valve is not required, the operability of this transmitter is not required.

(8) These are mechanical devices that do not have an active function. The materials have been analyzed to show that the doors will not lose their leak tightness.

(9) The dampers are mechanical devices. They are mechanically closed by the pressure buildup from the break and are latched in the closed position (as well as being held closed by compartment pressure). Failure of the environmentally sensitive components due to this event will not prevent closure of the damper nor cause the damper to reopen. Therefore, the required operability is early in the event (much less than 12 minutes), but the dampers remain continuously operable in spite of the postulated environment. The materials have also been analyzed to show that the dampers will not lose their leak tightness.

(10) This equipment is not required to operate to either mitigate the accident or safely shutdown the plant. Output provides status information only to be utilized at times much later than during this HELB high temperature periods. Analyses have been made to verify that the non-metallic parts of this equipment will withstand the postulated temperature extremes although specific qualification tests have not been performed that envelope this scenario.