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YOUNGBLOOD,B.J. Licensing Branch 1

SUBJECT: Forwards info re SER Outstanding Issue 67,use of nonsafety grade equipment in shaft seizure accident.

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NORMAN W. CURTIS
Vice President-Engineering & Construction
821-5381

May 15, 1981

Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket Nos. 50-387
50-388

SUSQUEHANNA STEAM ELECTRIC STATION
SER OUTSTANDING ISSUE 67
ER 100450 FILE 841-2
PLA-783

Dear Mr. Youngblood:

Attached is a discussion on the use of nonsafety-grade equipment in the shaft seizure accident.

This discussion completes our action on SER Outstanding Issue 67.

Very truly yours,

N W Curtis

N. W. Curtis
Vice President-Engineering and Construction-Nuclear

CTC/mks

Attachment

cc: R. M. Stark - NRC

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SUSQUEHANNA RESPONSE TO SER OPEN ITEM 67

USE OF NONSAFETY-GRADE EQUIPMENT IN THE SHAFT SEIZURE ACCIDENT

The recirculation pump seizure event is considered to be an extremely unlikely event and as such falls into the category generally classified as an accident. The event is evaluated as a limiting fault. The potential effects of the hypothetical pump seizure "accident" are very conservatively bounded by the effects of the DBA-LOCA.

This is easily verified by comparison of the two events. In both accidents, the recirculation driving-loop flow decreases extremely rapidly. In the case of seizure, stoppage of the pump occurs; for the DBA-LOCA, the severance of the line has a similar, but more rapid and severe influence. Following a pump seizure event, water level is maintained, the core remains submerged, and this provides a continuous core cooling mechansim. However, for the DBA-LOCA complete flow stoppage occurs and water level decreases due to loss of coolant, thus resulting in uncovery of the reactor core and subsequent overheating of the fuel-rod cladding. Also, complete depressurization occurs with the DBA-LOCA, while reactor pressure does not significantly decrease for the pump seizure event. Clearly, the increased temperature of the fuel cladding and the reduced reactor pressure for the DBA-LOCA both combine to yield a much more severe stress and potential for cladding perforation for the DBA-LOCA than for the pump seizure. Therefore, it is concluded that the potential effects of the hypothetical pump seizure accident are very conservatively bounded by the effects of the DBA-LOCA and a specific core performance analysis or radiological evaluation is not considered necessary. However, to be completely responsive to the NRC question, the following narrative is provided to show the impact of not taking credit for non-safety grade equipment to terminate this event.

1) Level 8 Turbine Trip

The FSAR analysis of the pump seizure event assumes that the vessel water level swell due to pump seizure will cause high water level (Level 8) trips of the main turbine and the feedwater pumps, and indirectly initiates a reactor scram as a result of the turbine trip. The FSAR (Subsection 15.3.1.2.3.2 referenced by Subsection 15.3.3.2.3) discusses the Level 8 trip function and shows that a turbine trip will eventually occur even in the event of failure of the non-single-failure proof turbine-trip-signal circuitry. In the case of the pump seizure without an L8 trip, the event is less severe than the analysis in the FSAR with the L8 trip for the following reason: A pump seizure, should it occur, would result in core flow reduction which reduces the core power and surface heat flux due to the effect of the negative void reactivity coefficient. Hence, the surface heat flux existing when the turbine trip occurs is lower because the turbine trip occurs later. Therefore, a loss of Level 8 trip would result in a less severe event consequence from a fuel standpoint than that depicted in Subsection 15.3.1.2.

2) Main Turbine Bypass System

As a result of the NRC's concern respecting reactivity effects of pressure transients, GE and the NRC met on November 20 and 21, 1978 for a comprehensive review of turbine trip and load reject transients without bypass. The principal conclusion of that meeting was that the most limiting BWR transient event which takes credit for nonsafety grade equipment is the feedwater controller failure. Analysis indicates that a ΔCPR increase of approximately 0.08 applies to this transient without a functioning main turbine bypass system.

For recirculation pump seizure with a failure of turbine bypass system, the increase of ΔCPR would be less than that for the feedwater controller failure for the following reason. As this event occurs, the reactor power drops significantly within the first 2 seconds due to decreased core flow. Therefore, by the time of turbine trip, the reactor power is at a low level. The core power is the main parameter which relates to the fuel thermal limit. The effect of failure of the main turbine bypass system to stop the steam flow retains pressure on the core but contributes only a small positive reactivity feedback. This is a secondary effect of much less significance than the reactivity decrease due to fluid flow decreasing through the core. This increase of core power is more severe for feedwater controller failure (increasing) event than for a recirculation pump failure because it occurs at a higher power level.

3) Relief Function of Safety/Relief Valves

The contribution of MCPR from taking credit for the relief function rather than the safety function of safety/relief valves is not significant because the MCPR always reaches its lowest value before opening of the relief valves.

Analyses of recirculation pump seizure where coolant flow rate drops rapidly have shown that MCPR does not increase significantly before fuel surface heat flux begins dropping enough to restore greater thermal margins as the plant intrinsically responds to the reduced flow rate. The effect of not taking credit for non-safety grade equipment is a ΔCPR increase of 0.08.