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SCHWENCER,A. Licensing Branch 2

SUBJECT: Responds to supplemental SER Item 3.10.1(3) re fatigue effects on NSSS equipment due to safety relief valve loads. Electrical & mechanical NSSS equipment analyzed for fatigue cycing.All NSSS equipment will perform satisfactorily.

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July 29, 1982

Mr. A. Schwencer, Chief
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Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
FATIGUE EVALUATION - NSSS EQUIPMENT
SER ITEM 3.10.1(3)
ER 100450 FILE 841-2
PLA-1222

Dear Mr. Schwencer:

This letter is provided in response to your concerns regarding the fatigue effects on NSSS equipment due to SRV loads, SSER 3 Item 3.10.1(3).

The SSES approach to fatigue cycling is to choose representative equipment for selected plant areas, analyze or test this equipment for fatigue cycling, and extend the results for this equipment to other NSSS equipment so that assurance is provided that all NSSS equipment can withstand SRV discharge cycling.

For equipment presently qualified, fatigue cycling has been considered as follows:

1. ANALYSIS - For the selected equipments, the stresses due to SRV discharge loads imposed upon NSSS equipment qualified by analysis were found to be small in comparison to the allowable stresses. (ASME Sect. III)

   Specifically the cyclic loading nature of the upset case (OBE + SRV) was qualitatively considered. The number of stress cycles of the plant life results in an ASME Code alternating stress allowable (S_A) that is higher than the calculated stresses for the following representative equipment:

B001

RHR Heat Exch.	E11-B001
RHR Pump/Motor	E11-C002
Core Spray Pump/Motor	E21-C001
HPCI Pump	E41-C001
RCIC Pump	E51-C001

2. TESTING - For NSSS equipment qualified by testing, the fatigue effects were considered by repetition of the tests and by extended duration testing for selected pieces of equipment. The test results show that the equipment performed its intended function during and after the tests.

Specifically, extended duration testing was performed on the MSIV-LCS Blower (E32-C001/C002). SQRT forms show that the overall test time was 40 minutes (far in excess of normal dynamic test duration). Four Upset Cases (OBE + SRV) were run at 2g's for 5 minutes each. Four Faulted Cases (SSE + SRV + LOCA) were run at 3g's for 5 minutes each. This extended duration testing was performed at acceleration levels far in excess of the .11g SRV load.

Fatigue testing done on BOP equipment included the M-87 H_2 Recombiners (located in drywell and wetwell), E-109 4kv Switchgear (located in R.B.), and the Limitorque Valve Actuators (P - Purchase order valves located throughout containment and reactor building). The recirculation discharge valve limitorque actuator test results for fatigue provide confidence that the NSSS valves will perform satisfactorily, due to the similarity of the equipment types.

The worst case NSSS g value for fatigue is the MSIV (highest piping response). The MSIV actuator dynamic qualification test incorporated extra testing beyond that required for seismic and dynamic qualification. For example, at least two extra 50 percent level upset and faulted condition tests were performed on the test specimen. In addition, several 40 percent level tests were run for TRS verification. This is aside from the fact that the g-level imposed on the upper actuator mass during qualification testing, which controls the maximum bending stress in the actuator yoke rods, was approximately double that calculated in the piping stress analysis. Since the vertical input motion to the inclined test specimen was approximately an order of magnitude greater than the horizontal components, repeating this input after horizontal rotation of the test specimen for each upset and faulted condition test results in twice as many yoke rod stress cycles than will occur on the SSES MSIV actuator for the design condition of five upset and one faulted-condition load events.

The results of the E-109 switchgear fatigue testing demonstrate assurance that the NSSS control panels will survive fatigue cycling because of the similar nature of equipment construction and components. The NSSS control room panels experience the same maximum SRV floor g-levels as the E-109 switchgear, and at most a 24 percent higher response g-level which results from comparing the isolated peaks of the floor spectra at the corresponding equipment locations.

For NSSS Equip. Qualified in the Future

1. Both the CRD vent and drain valves and the HPCI turbine are planned to undergo extended duration testing for SRV discharge loads in the near future.

The above description demonstrates that representative types of both electrical and mechanical NSSS equipment have been analyzed or tested for fatigue cycling. The MSIV, which experiences the worst case fatigue cycling has documented evidence provided through testing which assures that it will function properly after fatigue cycling loads.

In conclusion, the evidence from existing evaluations provide assurance that all NSSS equipment will perform satisfactorily under SRV fatigue cycling loads.

R J Shorlen for

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cc: R. Perch
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