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September 16, 1983

W3P83-3047  
3-A1.01.04  
3-A20.17

Director of Nuclear Reactor Regulation  
Attention: Mr. G. W. Knighton, Chief  
Licensing Branch No. 3  
Division of Licensing  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

SUBJECT: Waterford SES Unit No. 3  
Docket No. 50-382  
Containment Purge Valve Operability  
Response to EQB Questions

REFERENCES: (1) LP&L Letter W3P81-1835 to R. L. Tedesco from  
D. L. Aswell, dated August 19, 1981  
(2) LP&L Letter W3P81-2324 to R. L. Tedesco from  
L. V. Maurin, dated October 16, 1981  
(3) LP&L Letter W3P82-1749 to R. L. Tedesco from  
L. V. Maurin, dated June 25, 1982  
(4) NRC Letter to LP&L from J. D. Kerrigan, dated  
September 23, 1982

Dear Sir:

In accordance with TMI Action Item II.E.4.2, Reference (1) transmitted the Waterford 3 containment purge and vent valve operability study. Reference (2) and (3) provided additional information on the operability of the Waterford 3 containment purge valves in response to the request of the Equipment Qualification Branch (EQB). In Reference (4) the EQB identified four additional questions on this subject.

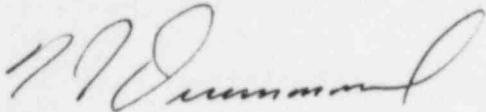
As discussed in our attached response, the additional EQB questions required reanalyzing purge valve operability under the combined loading of a simultaneous DBA-LOCA and SSE event. In conformance with the results of this revised operability analysis, LP&L will limit the Waterford 3 containment purge valves to a maximum opening angle of 52°.

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As noted in the Waterford SER (section 6.2.4) the containment atmosphere purge system conforms to the provisions of BTP CSB 6-4 subject to the acceptability of the valve operability study. We believe that the enclosed responses adequately address the remaining EQB concerns on the operability of the Waterford 3 containment purge supply and exhaust valves. We therefore request your determination as to the acceptability of our operability study in the next supplement to the Waterford SER.

Should you have any further questions on this subject, please contact Mike Meisner at (504) 363-8938.

Yours very truly,

A handwritten signature in dark ink, appearing to read 'F.J. Drummond', with a stylized, flowing script.

F.J. Drummond  
Nuclear Services Manager

FJD/MJM/ch  
Attachments

cc: W.M. Stevenson, E.L. Blake, J. Wilson (NRC), G.L. Constable (NRC,  
Resident Inspector)

## CONTAINMENT PURGE AND VENT VALVE OPERABILITY

### WATERFORD-3

#### Open Item No. 1

Seismic Loads are to be considered in combination with the Design Basis Accident (DBA) - LOCA loads for the Waterford-3 plant safety-related equipment. The applicant's response to the request for an evaluation of the operability of these valves under combined SSE and LOCA loads was that pipe break loads were not imposed since the valves are located in a moderate energy system. The aerodynamic loads in a LOCA event however are likely to be a significant load in a DBA-LOCA and SSE event. The valves were analyzed for LOCA and seismic testing was performed on the valve actuator separately. No seismic testing was indicated for the valve assembly.

The applicant should provide operability assurance of the valve assembly's ability to operate under a combined DBA-LOCA plus SSE event.

#### Response

To provide operability assurance, the valve's most highly stressed component, i.e. shaft, was reanalyzed considering concurrent DBA and SSE loads. Also considered in the reanalysis was the containment pressure vs valve position relationship throughout the closing mode. The pressure rise was based on the pipe break yielding the steepest pressure gradient in containment during the period of valve closure (i.e. Double-ended Hot Leg Break). The valve position was based on actual valve stroke testing. This was not previously considered (i.e. the differential pressure was assumed to be a constant 44 psi). The resulting stresses in the shaft permit a maximum valve open position of 52 degrees.

Open Item No. 2

The valve operability analysis under LOCA conditions is noted as using  $1.5 "S"$  (" $S$ " is the allowable stress figure found in Section VIII of the ASME Boiler and Pressure Vessel Code), or for shear strength  $.75 "S"$ , as allowable stresses. These values are effectively the minimum yield strength of the material and may indicate no margin is available beyond the design loads. A more conservative allowable (such as the Section III recommended  $.6S$  for shear stress) should be used. Margins should be used in the allowable stresses to account for deviations in manufacturing or design.

Response

Use of the premium strength 17-4PH material for the shaft justifies  $0.75S$  as the shear stress allowable, since the highest torsional stresses experienced occur only in the outermost layer of the shaft material. Paragraph NR-3227.2 of Section III of the ASME Boiler and Pressure Vessel Code recognizes this distinction, stating that  $0.8S_m$  is suitable as the allowable for shafts in torsion. When applied to the stress value " $S$ " found in Section VIII, the allowable is less than yield.

Table I.7.1, Appendix I of Section III, lists  $S$  of 35,000 psi for shafts manufactured from 17-4PH hardened to H1100, so  $0.75S = 26,250$  psi. Minimum tensile yield is given as 115,000 psi, so minimum yield in shear would be at least 57,500 psi, providing a substantial margin.

Open Item No. 3

The applicant should verify, through the valve actuator vendor (Bettis), or through torque curves for the valve actuator model used, that the end-of-stroke torque availability is the minimum torque availability for the actuators used.

Response

The manufacturer has indicated that the actuator's torque output drops from 100% of the end of stroke torque (at 0 degrees open) to 73% of this value when the valve is 35 degrees to 40 degrees open. The manufacturer has calculated that for valve positions 20 degrees open and greater the dynamic torque due to flow exceeds the friction torque. At these angles, the resultant torque from dynamic and friction forces assists the actuator in closing the valve. For angles below 20 degrees open, the sum of the friction and dynamic torques is substantially smaller than the minimum actuator output torque (i.e 75% of the end of stroke value). Therefore, the actuator output torque at all valve positions is greater than what is required to close the valve.

Open Item No. 4

The applicant should confirm the installation of valve travel stops to limit the opening of the valves to a maximum opening of 40°.

Response

As discussed in response to Open Item No. 1, the valves were reanalyzed under a combined DBA-LOCA and SSE event. The maximum valve open position will be limited to 52° by mechanical stops. Confirmation of the installation of the mechanical stops will be verified in accordance with plant Technical Specification 3/4.6.1.7. The Surveillance Requirement for the stops is expected to be as follows:

4.6.1.7.3 at least once per 18 months and/or following any adjustment of the mechanical position stops by verifying that the valves open to less than or equal to 52°.