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FACIL:50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co. 05000335
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UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
CLARK,R.A. Operating Reactors Branch 3

SUBJECT: Forwards final response to NRC 830216 ltr re purge valve operability. Revised purge valve rept addresses remaining NRC concerns re operability of 48-inch containment purge valves for facility. "All repts"

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FLORIDA POWER & LIGHT COMPANY

July 15, 1983
L-83-399

Office of Nuclear Reactor Regulation
Attention: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Clark:

Re: St. Lucie Unit 1
Docket No. 50-335
Containment Purge Valve Operability

This letter contains Florida Power & Light Company's final response to your letter of February 16, 1983 concerning St. Lucie Unit 1 purge valve operability. The Henry Pratt Company has completed the revised purge valve report for St. Lucie Unit 1. Enclosure 1 summarizes the results of the report and Enclosure 2 contains the full report. The enclosures adequately address the remaining NRC concerns regarding the operability of the 48" containment purge valves for St. Lucie Unit 1. We trust that the information contained in this letter will allow the NRC staff to complete their review.

Very truly yours,

Robert E. Uhrig

Robert E. Uhrig
Vice President
Advanced Systems and Technology

REU/PKG/cab

cc: Mr. James P. O'Reilly, Region II
Harold F. Reis, Esquire

Enclosures

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Re: St. Lucie Unit 1
Docket No. 50-335
Containment Purge Valve Operability

ENCLOSURE 1

In accordance with the commitment made in our letter L-83-203 dated March 31, 1983, Henry Pratt has now completed the revised Containment Purge Valve Aerodynamic Torque Calculation and Stress Analysis for the St. Lucie Unit No. 1, 48" Containment Purge Valves. This analysis has been prepared utilizing Henry Pratt's most current methodology and test data available, which are summarized below:

A. 1. Purge valve closure time during a LOCA was less than or equal to the no-flow time demonstrated during shop tests, since fluid dynamic effects tend to close a butterfly valve. Valve closure rate vs. time was based on a sinusoidal function.

2. Flow towards the hub side of an offset asymmetric disc was assumed in the calculations as it contributed to the highest torques.

3. Upstream pressures acting on the valve were determined from the containment pressure vs. LOCA time curve for a 19.2 $ft.^2$ slot break (FSAR Fig. 6.2-7A) assuming maximum delay times and maximum valve closure time. Minimum downstream pressures vs. LOCA time were assumed.

4. A single valve closure of the inside containment valve, with the outside containment valve fixed at the fully open position was determined to be worst case.

5. Containment back pressure had no effect on cylinder operation since the same back pressure would also be present at the inlet side of the cylinder and differential pressure would be the same during operation.

6. This analysis also assumed that the first incidence of sonic flow coincided with the critical valve disc angle as a worst case condition.

7. In this report worst case conditions were considered; i.e. a 90° elbow (upstream) oriented 90° out-of-plane with respect to the valve shaft and the leading edge of the disc closing toward the outer wall of elbow. Effects of downstream piping on system back pressure are covered in A. 3. above.

The Pratt purge valve analysis program was developed for indicated LOCA conditions using existing Pratt model test data. During 1982, Pratt undertook additional model testing to consider alternate valve/piping configurations, such as the elbows immediately as well as two diameters upstream of the valve with the valve shaft "out-of-plane" with respect to the elbows, flow from the flat and arch side of the disc, clockwise and counterclockwise disc closure, and various disc diameter to thickness ratios. The dynamic torques determined by the model tests were in all cases lower than those calculated by the Pratt purge valve analysis program.

B. This analysis consisted of a static analysis of the valve components to determine whether the stress levels under combined seismic and LOCA conditions were less than allowable stresses and/or 0.40 x yield strength for shear (non-Code components) as indicated in Table 1 for the materials utilized.

A valve operator evaluation was presented based on the operator manufacturer's rating versus the calculated LOCA-induced fluid dynamic torques.

C. With regard to sealing integrity, decontamination chemicals have very little effect on EPT and stainless steel seats. Molded EPT seats are generically known to have a cumulative radiation resistance of 1×10^8 rads at a maximum incidence temperature of 350°F. FPL intends to visually inspect the seats every 18 months and replace them as required in accordance with Henry Pratt's recommendations.

Valves at outside ambient temperatures below 0°F, if not properly adjusted, may have leakage due to thermal contraction of the elastomer; however, during a LOCA, the valve internal temperature would be expected to be higher than ambient which tends to increase sealing capability after valve closure. Please note that the lowest ambient temperature recorded onsite is 28.4°F.

D. Valve operator capability was evaluated as follows:

Model: Bettis T520-SR2

Rating: 200,000 in-lbs at full open and closed positions only.
143,774 in-lbs at 68°.
125,000 in-lbs at 45° (minimum rating)

Maximum calculated valve torque: 98,358 in-lbs (valve blocked at 40°).

The maximum torque generated during a LOCA induced reactive forces in the load carrying components of the actuator. Since the LOCA induced torque calculated in this analysis for valve disc opening of 40° was lower than the absorption rating of the operator, it was concluded that the Bettis model furnished was structurally suitable to withstand combined LOCA and seismic loads as defined in this analysis when blocked to a maximum opening angle of 40° from the closed position.

Please note that the design for the modification to block the purge valves at 40° open has been completed. This modification is presently scheduled to be implemented during the present outage prior to mode 4 operation.

Based on the above considerations the analysis demonstrated that the calculated stresses of the valve components (for valve blocked at 40°) for combined seismic and LOCA conditions were less than allowable stresses and/or 0.40 x yield strength for shear (non-code components) as indicated in Table 1 of the report.

Please note that the valve component which had the smallest margin between the calculated and allowable stress was the adjusting screw threads. As per Table 1 of the report, the calculated shear stress is 9527 psi vs. ASME allowable stress level of 9960 psi. However, this calculated value for shear stress has a much higher margin of safety when compared to 0.4 x yield strength of the material (12000 psi).

Three (3) copies of the Henry Pratt analysis for "48"-R1A Butterfly Valve Blocked at 40°" dated April 27, 1983, are enclosed for your review.

We believe this analysis adequately addresses the remaining concerns regarding the operability of the 48" Containment Purge Valves for St. Lucie 1.

ENCLOSURE 2

Re: St. Lucie Unit 1
Docket No. 50-335
Containment Purge Valve Operability

Henry Pratt Company Containment/Isolation Purge Valve Analysis - St. Lucie Unit 1, April 27, 1983