TOLEDO EDISON

Docket No. 50-346

License No. NPF-3

Serial No. 1171

July 19, 1985

Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stolz
Operating Reactor Branch No. 4
Division of Operating Reactors
United States Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Stolz:

This is in response to your letter of June 7, 1985 (Log No. 1764) concerning NUREG-0737 Item II.D.1 - Request for Additional Information (RAI). The questions related to three areas: 1) selection of transients and valve inlet conditions, 2) valve operability, and 3) thermal hydraulic and structural analysis of the inlet and discharge piping. Toledo Edison has reviewed the questions and will provide a partial response at this time for Davis-Besse Nuclear Power Station Unit 1.

In 1982 Toledo Edison evaluated the results of the Relief Valve Testing Program administered by the Electric Power Research Institute. As a result of that evaluation the two pressurizer safety relief valves were removed and relocated to the pressurizer. The PORV, block valve and associated piping were not altered as a result of the EPRI program.

Since our February 1, 1983 (Serial No. 905) submittal of Item II.D.1 of NUREG-0737, it has been determined that the heat tracing on the PORV inlet loop seal cannot be maintained at or higher than 500°F. The analysis performed by Teledyne and reported in Teledyne report TR-5639-2 utilized a loop seal maintained at a minimum of 500°F. Due to this determination, Toledo Edison has been in the process of reevaluating the consequences of the loop seal temperatures below 500°F. Upon completion of this effort Toledo Edison will report the results to the NRC.

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Toledo Edison will provide the remaining responses to your letter of June 7, 1985 by October 1, 1985.

Very truly yours,

Joe Williams Jr /tsm

Joe Williams, Jr.
Senior Vice President, Nuclear

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Attachments

cc: DB-1 Resident Inspector

Question 1 — The Crosby 4M$_1$6 safety valve was not tested by EPRI. A spare Davis-Besse safety valve was tested by Crosby to gain additional test data to demonstrate operability. The Teledyne Engineering Services (TES) report (TR-5639-2) stated that the inlet conditions used by Crosby (Reference 5 of Appendix A TES report) in testing the 4M$_1$6 were not identical to the Davis-Besse inlet fluid conditions. Full pressure, full flow testing was not performed by Crosby on the 4M$_1$6 safety valve. The TES report further stated that the inlet conditions used by Crosby could be justified by parametric studies. Crosby concluded that the as supplied ring settings were adequate for the Davis-Besse inlet fluid conditions and inlet piping configuration. The Crosby test report results (Reference 5 of TR-5639-2 Appendix A) were not available to EG&G Idaho for review. No other discussion or detailed results were provided on the Crosby test. Provide a copy of Reference 5 of TR-5639-2 Appendix A, and additional discussion justifying the applicability of the Crosby test results to the Davis-Besse plant.

Response — The Crosby tests on the 4M$_1$6 safety valves were performed to determine the ring setting to achieve a blowdown which would provide stable operation for the valves with the long inlet piping which originally existed at the Davis-Besse plant. The tests were successful and a satisfactory ring setting was established. The results became academic when the valves were mounted directly on the pressurizer nozzles and the long inlet piping was eliminated in 1982.

A copy of the Crosby (3992) report is attached.

Question 2 — Results from the EPRI tests on the Crosby 3K6 and 6M6 safety valves indicated that test blowdowns exceeded the 5% value given in the valve specifications. If the plant-specific expected blowdowns also exceed 5%, the pressure might be sufficiently decreased such that adequate core cooling might not be achieved for decay heat removal. Expected blowdowns for the Davis-Besse plant at their current ring settings were not provided. Discuss the consequences of potentially higher blowdowns. Discuss the adequacy of decay heat core cooling at the expected reduced pressures.

Response — Toledo Edison will provide the response by October 1, 1985.

Question 3 — The B&W Inlet Fluid Conditions Report analyzes the generic 177-FA plant for a feedline break accident. In their analysis the PORV was assumed not to operate. The

transient data tables and plots were presented in the report for times of less than 40 seconds. Liquid discharge was not predicted during these time spans.

The Davis-Besse submittal states that the safety valves will pass only steam with the exception of the feedwater line break event where transition to liquid could occur. Provide additional information discussing the potential case of safety valve liquid discharge, and discuss the effects on safety valve operability.

Response

During the transition of steam to liquid flow there could be a small water hammer in the inlet and outlet piping of the safety valves. This occurs because of the change in mass flow rate as the water goes through the valve. The inlet and outlet piping to the safety valves is minimal because since 1982 the valves have been mounted on the pressurizer nozzles and there is an open tee for the discharge. Because of the minimal piping, the water hammer loads should be negligible. A conservative estimate of the bending moments produced by these water hammer loads on the safety valves is being generated. The moments shall then be compared to the allowable bending moments on similar safety valves tested by EPRI. These bending moments and their comparison to allowables will be provided by October 1, 1985.

Question 4

EPRI testing of the Crosby 3K6 and 6M6 safety valves was performed at various ring settings. The submittal did not provide the present Davis-Besse safety valve ring settings. If the plant current ring settings were not used in the EPRI tests, the results may not be directly applicable to the Davis-Besse safety valves. The submittal did state that Crosby conducted testing on a spare Davis-Besse 4M$_1$6 safety valve and concluded the ring settings were adequate (see related Question 1). No documentation of the Crosby tests were provided. Identify the Davis-Besse safety valve ring settings. Explain how the expected values for flow capacity, blowdown, and stability corresponding to the plant-specific ring settings were extrapolated or calculated from the EPRI test data. Identify these values to determined and evaluate the effects of these values on the behavior of the safety valves.

Response

The present safety valve ring settings are as follows:

RC13-1: (-275, -18) RC13-2: (-300, -18)

The concern addressed in question four is that these ring settings will provide stable operation. The main barrier to stable operation was the long inlet piping. The long inlet piping, plus the loop seal, were removed in 1982.

Question 5 EPRI testing of the Crosby PORV during pre-evaluation tests at Marshall failed to open on demand for several actuations and failed to seat properly. The Crosby PORV was disassembled and inspected, revealing a fractured weld on the bellows and an improperly machined surface on the bellows flange. A second Crosby PORV was used for the Wyle Phase II and III tests. Prior to testing the PORV was disassembled and again an improperly machined bellows was found. What measures have been taken by Davis-Besse to assure reliable PORV operability and that the plant PORV meets vendor specifications.

Response The following chronology summarizes the maintenance and surveillance/test history of the PORV:

12-14-76 The PORV was disassembled, inspected and the seating surfaces lapped.

08-01-77 The PORV failed to open. Replaced power fuses.

09-06-77 The PORV was disassembled, inspected and seating surfaces lapped.

09-24-77 The PORV failed open during a loss of feedwater accident. The valve was disassembled and the pilot valve was found stuck open. The pilot valve steam was replaced and the nozzle guide was cleaned. When the valve was reassembled and tested, the valve again failed open on the sixth cycle. The valve was again disassembled and inspected. The pilot valve stem was machined to correct the pilot stem-nozzle guide clearance, and the stroke of the pilot valve was adjusted. The valve was cycled 12 times at reduced pressure and once at 2200 psig with no problems.

01-18-79 Because the PORV was leaking, it was disassembled and inspected. The disc, seat and pilot valve were found to have minor cutting. They were lapped and the valve was reassembled.

04-19-79 The PORV actuating linkage was checked for proper operation and proper supply voltage to the solenoid coil was verified. No problems found.

05-17-79 The setpoints for the PORV were changed to open at 2400 psig and close at 2350 psig.

10-29-79 Because the PORV was leaking, it was disassembled and inspected. The valve disc and pilot disc were lapped and the valve was reassembled.

03-24-82 Because the PORV was leaking, the valve was disassembled and repaired.

09-01-82 The PORV was stroked. No problems found.

09-06-83 The setpoints for the PORV were changed to open at 2425 psig and close at 2375 psig.

09-14-83 The bistable setpoints were checked and found to be okay.

12-28-84 The bistable setpoints were checked and found to be okay.

06-09-85 The PORV lifted three times and failed to reseat on the third lift. Toledo Edison and the NRC are investigating the incident and the evaluation is not complete at this time.

Maintenance and Test Summary

The majority of the maintenance was to correct for minor leakage. The routine testing has not found any problems with the PORV. The valve failed open one time, was repaired and has operated properly up to the June 9, 1985 incident.

Question 6 The TES report (TR-5639-2) stated that the Davis-Besse block valve was a 2½ in. Velan B9-354B-13MS gate valve with a Limitorque SMB-00-10 actuator. The EPRI Block Valve Information Report stated that the Davis-Besse block valve was a 2½ in. Velan F9-454-B-13MS gate valve with a Limitorque SMB-00-10 actuator. Neither of the above block valves nor the actuators were tested by the EPRI block valve test program. Clarify which model block valve is used at Davis-Besse. Provide additional information discussing the extrapolation of EPRI test data and its application.

Response The Davis-Besse block valve is a 2½ in. Velan F9-454-B-13MS with a Limitorque SMB-00-10 actuator. EPRI tested a similar valve by the same manufacturer. The tested valve was a Velan 3 in. B10-3054B-13MS with a Limitorque SMB-00-15 actuator. EPRI Test Report NP-2514-LD shows the valve opened and closed on demand for all tests.

Question 7 The B&W Valve Inlet Fluid Conditions Report stated that liquid flows could exist through the PORV for the FSAR feedline break and the extended high pressure injection

events. These same flow conditions will also exist for the block valve. The EPRI/Marshall block valve test program only tested the block valves with steam flow. Since it is conceivable that the PORV block valve could be expected to operate with liquid flow, provide a justification as to how the results of the Marshall tests or other tests can be used to demonstrate operability of the block valves for liquid conditions. Also, evaluate applicability of the test results to the Davis-Besse block valve since the plant valve has a Limitorque SMB-00-10 actuator while a SMB-000-10 and SB-00-15 were tested.

Response

The motor operation of all Limitorque valve controls is the same, basically; however, there is some variation in the manual operation.

The SMB-000 and SMB-00 vary in that with the SMB-000 the handwheel is mounted directly on the drive sleeve, whereas the SMB-00 could have the handwheel directly on the drive sleeve or mounted on the side using a set of bevel gears to improve the mechanical advantage.

Toledo Edison will provide a response on liquid flow operation by October 1, 1985.

Question 8

NUREG-0737 Item II.D.1 requires that the plant-specific PORV control circuitry be qualified for design-basis transients and accidents. Please provide information which demonstrates that this requirement has been fulfilled.

Response

The block valve is environmentally qualified in accordance with 10CFR50.49 (E.Q. Rule). The block valve is located upstream of the PORV and is powered from a Class 1 AC source. The PORV is powered from a 125 volt DC bus supplied by a safety grade battery system. The PORV is not required for accident mitigation of a design basis LOCA in containment.

Question 9

Bending moments are induced on the relief valves during the time they are required to operate because of discharge loads and thermal expansion of the pressurizer vessel and inlet piping. The TES report TR-5639-2 did not provide bending moments applied to the PORV. Make a comparison of the predicted Davis-Besse PORV valve bending moments to the tested valve bending moments to demonstrate that operability of the valve is not impaired.

Response

Toledo Edison will provide the response by October 1, 1985.

Question 10 The submittal provides a list of loads that were considered in the structural analysis and states that the analysis was performed to criteria of ASME Code Section III, Subsections NB, ND and NF. It does not, however, identify the load combinations considered in the analysis or the stress limits used for each combination. A list of recommended load combinations and stress limits is contained in the EPRI PWR Safety and Relief Valve Test Program Guide (by MPR Associates, Inc.). Provide a list of load combinations and respective stress limits used in the analysis of the inlet piping, discharge piping and supports so as to show how these compare with the recommended combinations and limits of the EPRI Guide.

Response Analysis was performed mostly in accordance with ASME Code Section III, Subsections NC and ND. A list of load combinations and stress limits will be provided.

Toledo Edison will provide the additional information by October 1, 1985.

Question 11 The submittal on structural analysis states that the nozzle-to-flange weld of the safety valve and the flange below the safety valve have acceptable stress values. Provide results from the analysis that support this statement.

Response Page 109 of TR-5639-2 (Serial 905, 2/1/83) discusses acceptable stress levels for the nozzle-to-flange welds of the SRVs. Further analysis and interpretation of this information will be necessary to complete the answer.

Toledo Edison will provide the additional information by October 1, 1985.

Question 12 The submittal identified three supports which were overloaded and stated that considerations were being made concerning modifications to these supports to meet the higher loads. Provide final assessment and/or modifications performed concerning the three overstressed piping supports.

Response In 1983 Toledo Edison determined that interim operation was acceptable. During the 1983 refueling outage the supports were modified.

These support modifications were needed to assure that all ASME Code rules and regulatory commitments were met for long term operation of the PORV discharge piping system.

The specific changes are as follows:

1. 30-GCC-8-H2 is an east-west direction snubber that was attached to 4"-GCC-8 at the end of the 180° return (double elbow) downstream of the PORV. The attachment point was moved to a point on the discharge piping immediately adjacent to the PORV outlet. Snubber size and wall attachment were adequate as is.

2. 30-GCC-8-H17 is a double vertical strut assembly attached to 8"-GCC-8. The concrete anchor bolts in this assembly were increased in size so that a conservative factor of safety would be achieved.

3. 30-C^C-8-H5 is a vertical snubber attached to 8"-GCC-8 at approximately the 633' elevation. This snubber was replaced by a sway strut and the supporting steel was reinforced by the addition of a bracing member (kicker).

4. After the submittal of February 1, 1983 further analysis showed the desirability of modifying 30-GCC-8-H3. 30-GCC-8-H3 is a north-south direction snubber attached to 4"-GCC-8 in the PORV valve room. The existing ½ inch anchor bolts were changed to 5/8 inch nominal size with a minimum of three inches embedment and stiffeners were added to the baseplate.

Question 13

The submittal stated that the safety valves are directly mounted to the Pressurizer nozzles. No piping supports are used on the safety valves or inlet piping. The safety valves discharged directly into tees with their ends closed by rupture discs. The blowdown loads due to a safety valve lift do not appear to be included with the other considered piping loads. Provide additional information addressing the dynamic effects of the blowdown discharge (torsional moment on nozzle if rupture disc burst pressures not equal) and the effects of valve discharge impingement on the tee wall (inducing of a bending moment on the nozzle) to verify nozzle structural integrity.

Response

Toledo Edison will provide the response by October 1, 1985.

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