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October 11, 1984
EF2-72272

Director of Nuclear Reactor Regulation
Attention: Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Youngblood:

Reference: (1) Fermi 2
NRC Docket No. 50-341
(2) NUREG-0798, Supplement 3, "Safety Evaluation Report Related to the Operation of Enrico Fermi Atomic Power Plant, Unit 2", dated January, 1983

Subject: Purge Valve Operability

Chapter 22, Section II.E.4.2 of Supplement 3 to the Fermi 2 Safety Evaluation Report (Reference 2) provided the NRC evaluation of the Fermi 2 purge valves. The discussion identified several items that required additional information from Detroit Edison to support NRC resolution of the issue. Attachment 1 identifies the items pending from SSER 3 and provides the Edison discussion responding to these items.

This submittal should allow closure of this issue. If you have any questions or require supplemental information, please contact Mr. O. K. Earle at 313-586-4513.

Sincerely,

Wayne H. Jens

cc: Mr. P. M. Byron
Mr. M. D. Lynch
Mr. R. Wright*
USNRC Document Control Desk
Washington, D.C. 20555

*With attachment

B001
1/40

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Attachment 1 - SSER 3 Purge Valve Open Items

The following discussion presents additional information to support NRC re-review of the purge valve issues identified in Chapter 22 of the Fermi 2 SSER 3 (page 22-8). Relevant information is provided for each of the results documented in SSER 3 as indicated below.

1. "Torque loads calculated for the 6- inch valves using the drywell peak containment pressure and maximum torque coefficients from the Jamesbury curves for 6-inch valves (with 50% margin) indicate the torque loads used in the stress analysis are more conservative. Closure time for these valves is therefore limited only by the 5- second requirement."

   Response: Edison concurs with this position.

2. "Torque loads calculated in this manner for the 10-inch valve would exceed the loads used in the stress analysis. A closure time of less than 2 seconds would be required for these valves."

   Response: This comment was provided to the NRC via a Brookhaven National Laboratory (BNL) evaluation report (Reference 1) of the Fermi 2 purge valves. The BNL evaluation had used a breaking torque (the torque required to either seat or unseat the valve) of 730 ft-lbs for the 10- inch valve to develop a P valve capability of 34.3 psi.

   As reflected in Attachment 2 (Reference 2), the original stress report (in which Edison had transmitted the 730 ft-lb value) did not include the dynamic torque exerted on the valve by the compressible flow of drywell gases during a LOCA. The reanalysis, provided in Attachment 2, includes this dynamic torque, and concludes that the differential pressure capability of the 10- inch valves is not exceeded during a DBA. (The valve is shown to be operable against a differential pressure of 56 psi - the maximum containment pressure in a LOCA environment.) Therefore, the current Technical Specification closure limit of 5- seconds is adequate to ensure valve operability and, further, no additional limitations beyond the requirements of ASME, Section XI, Article IWV-3417 need to be imposed for measuring closure times.

3. "The 20- inch valves are connected to the wetwell with a maximum potential pressure of 25 psig. The torque used in the stress analysis for these valves corresponds to a pressure of 23 psig. As it would take

more than 20 seconds to reach a wetwell pressure of 23 psig, the 5- second closure time requirement is more conservative."

Response: Edison concurs with this position.

4. "The calculated torque at peak drywell pressure for the 24- inch valve would be considerably higher than the torque used in the stress analysis. In that the differential pressure capability of the valve is less than the peak drywell pressure, a limitation is required on the valve closure time consistent with the stress analysis limitations and the 5- second closure time requirement."

   Response: Similar to Item 2 above, this comment was provided in the BNL report and was based on a breaking torque of 3200 ft-lbs which, again, does not reflect the dynamic torque exerted on the valve by the drywell atmosphere during a LOCA. Attachment 2 provides the reanalysis of this valve, incorporating the dynamic torque, and concludes that the differential pressure capability of the 24 inch valve is not exceeded during the required 5- second closure time. Therefore, as with the 10 inch valve, the current Technical Specification closure limit of 5- seconds is adequate to ensure valve operability, and that no additional limitations, beyond the requirements of ASME, Section XI, Article IWV-3417, need to be imposed for measuring closure times.

5. "In addition, valves experiencing a pressure load may close slower than valves in a no-load condition. As inservice inspection tests are performed in the no-load condition, stroke time acceptance times should provide a margin to account for the extended closure times under load."

   Response: Due to the analysis discussed in Items 2 and 4 above, and in previous Edison correspondence which have been reviewed by BNL and/or NRC, more restrictive stroke time requirements are not deemed necessary. The analysis proves that the valves are capable of closing against the containment pressures arising from LOCAs. In addition, these valves are governed by ASME, Section XI, Article IWV-3417 which requires:

   > "If, for power operated valves an increase in stroke time... from the previous test... of 50% or more for valves with full stroke times less than or equal to 10 seconds is observed, test frequency shall be increased to once each month until corrective action is taken..."

This requires that if, for example, a valve which normally closed in 2 seconds is found to take 3 seconds to close, its test frequency will be increased to monthly. This increased surveillance will continue until the cycling time returns (via maintenance or cycling exercise) to the expected 2 second range. This will further ensure that any valve degradation that occurs during operation will be identified and monitored until corrected.

6. "As the purge valves do include handwheels, provisions should be made by administrative procedures or automatic reengagement to ensure that valves are not inadvertently left in the handwheel mode.

   Response: As reflected in Detroit Edison to NRC letter EF2-57430 (dated May 12, 1982), the valve will operate automatically even in the manual handwheel mode. The handwheel clutch is disengaged when this occurs.

In addition to those items discussed above, one other issue was identified in SSER 3 under the heading "Evaluation Summary" (page 22-9) which requested the following:

> "Valve and valve disc orientations are to be modified so that valve shafts are "in plane" with upstream elbows or bends, and valve discs are to be installed with the shaft side downstream."

Via Detroit Edison to NRC letter EF2-55980, dated January 4, 1982, Edison previously committed to "reorient and maintain all of the purge valves with an in-plane orientation with shaft relative to an upstream elbow" and the valves have been installed accordingly. The valve discs are oriented with the shaft side downstream, with the exception of valves VR3-3013 and VR3-3015. Valves VR3-3013 and -3015 are the inboard isolation valves on each of the two torus purge lines. Edison has located both the inboard and outboard torus purge line isolation valves outside the torus to maximize valve accessibility and remove the valves from the torus environment. Both inservice inspection requirements and maintenance considerations dictated that the inboard valves (i.e., VR3-3013 and -3015) be oriented with the valve shaft upstream. This is contrary to our commitment in EF2-55980, but, as indicated below, does not adversely impact the operability of these valves under accident conditions.

Reference 3 provided stress and closure analyses for these two valves and reflected loads that are comparable to the maximum dynamic torque values identified in the BNL report (Reference 1). Based upon Reference 3, BNL had concluded

that the valves had a structural capability of 23 psig [using worst case valve torque coefficients (Ct)]. The DBA torus pressure is 25 psig (108% of valve structural capability). If the analysis methodology (i.e., ratioing of stress loads) utilized in Attachment 2 were applied to these two valves an eight percent (8%) increase would result. Reference 3 indicates that the stress capability for these valves ranges from 122 percent to 150 percent of allowable. Therefore, the valves will be capable of operating against a pressure differential of 25 psig.

Further the structural capability limit of 23 psig identified by BNL is based on a 150 percent factor for the valve torque coefficient. This is conservative due to the 50% margin and the combination of maximum torque coefficient coincident with maximum torus pressure.

Lastly, VR3-3013 and VR3-3015 are installed with the valve shafts in-plane with upstream elbows. As noted in Reference 1, the magnitude of the dynamic torque is likely to be equivalent for the "in-plane, shaft upstream elbow" configuration and the straight piping upstream configuration. Therefore, no additional loads are applied for this aspect of the valve's configuration.

Therefore, based upon the need to orient the valves as described, to support inservice inspection and maintenance activities, and the fact that the valve capability envelops the loads to be encountered in a DBA environment, Edison concludes the valves are acceptable.

References:

1. Letter from T. J. Restivo (Brookhaven National Laboratory) to M. Haughey (NRC-EQB), dated January 20, 1982.

2. Report No. DECo-04-2468, "Assessment of Purge Valve Pressure Differential Capabilities", dated September 1984.

3. Detroit Edison to NRC letter, "Purge Valve Operability", EF2-55980, dated January 4, 1982.