Commonwealth Edison
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January 8, 1990

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: Dresden Station Units 2 and 3
Quad Cities Station Units 1 and 2
Supplemental Response to NRC Bulletin 88-04
Docket Nos. 50-237/249 and 50-254/265

References (a): NRC Bulletin 88-04, dated May 5, 1988.

(b): W.E. Morgan letter to U.S. NRC, dated July 11, 1988.

(c): M.H. Richter letter to U.S. NRC, dated February 27, 1989.

Dear Sir:

Reference (a) requested that licensees investigate and correct as applicable two miniflow design concerns. The first concern involves the potential for the dead-heading of one or more pumps in safety-related systems that have a miniflow line common to two or more pumps or other piping configurations that do not preclude pump-to-pump interaction during miniflow operation. A second concern is whether or not the installed miniflow capacity is adequate for even a single pump in operation.

Reference (b) provided Commonwealth Edison's (Edison's) initial response for Dresden and Quad Cities Stations to Reference (a). Reference (c) provided additional vendor information and the results of further engineering review concerning the adequacy of the minimum flow bypass lines for safety-related centrifugal pumps at Dresden and Quad Cities Stations. Upon review of Reference (c), the NRC verbally requested additional information concerning the response for the low pressure safety-related pumps (LPCI/RHR and Core Spray) which are supplied by Sulzer Bingham. This letter presents Edison's response to that request.

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As reported in Reference (c), Dresden and Quad Cities Stations performed special tests on selected low pressure safety-related pumps at minimum flow conditions (for approximately 15 to 25 minutes) to obtain pertinent data (pump and motor bearing housing vibration, fluid temperature rise, and sound levels). From this testing it was determined that, in general, the vibration levels of the pumps during minimum flow operation were approximately two-to-three times higher than during full flow operation. Sulzer Bingham reviewed the data (for the pump with the highest vibration at each station) and indicated in a letter to Edison (dated January 31, 1989) that the increased vibration levels "...are in accordance with the expected levels for pumps operating at extremely low flow conditions." Additionally, Sulzer Bingham indicated that vibration levels at minimum flow conditions, "...if allowed to continue for extended operating periods (hundreds to thousands of hours), would result in severe damage to the impeller vanes and volute lips", and in the shorter term would cause bearing and seal problems. Sulzer Bingham recommended minimum flow values, presented on the attachment to this letter, which reflect a substantial increase from the present minimum flow values. Following a review of the pump vendor information, a review of pump performance from quarterly surveillances, and consideration of the minimal amount of time these pumps operate at minimum flow conditions, Edison determined at that time that implementation of a vibration analysis on the pumps following any extended periods of minimum flow operation (10 minutes or longer) was an appropriate action.

As recommended by the NRC, Edison's approach to addressing the current minimum flow situation was discussed with Sulzer Bingham, and further information was requested from the vendor. Sulzer Bingham declined to make any commitment on Edison's approach, but provided further recommendations concerning testing and inspection frequencies of the pumps for the present minimum flows. Sulzer Bingham provided the following recommendations to Edison in a letter dated June 28, 1989.

- Vibration readings (horizontal and vertical velocity measurements on the motor, driver stand, pump casing) should be obtained on a regular basis, and the data should be trended. An inspection should be made if any significant change occurs in the vibrations.

- Record noise at 1,000 hertz plus to detect bearing damage, crack propagation, and internal rubbing.

- Visual inspection every 500 hours of minimum flow operation. This time duration is "somewhat arbitrary" since no historical data exists for the Edison pumps.

Edison already satisfies the Sulzer Bingham vibration monitoring recommendations since Dresden and Quad Cities Stations routinely perform vibration monitoring on the low pressure safety-related pumps (as part of the Inservice Testing (IST) Program) during the quarterly Technical Specification surveillances. The vibration monitoring consists of taking velocity frequency spectrum analysis data on the pump and motor bearings in the directions indicated by Sulzer Bingham. The vibration monitoring meets or exceeds the ASME Section XI requirements of the IST program and Sulzer Bingham recommendations. The vibrational data is trended, and as indicated in Reference (c), any increase in vibration level requires additional actions depending on the severity.

Regarding Sulzer Bingham's second recommendation, Edison believes a primary parameter for detection of machinery, or pump, degradation is vibration monitoring. The vibration frequency spectrum analysis routinely performed at Dresden and Quad Cities Stations during vibration monitoring essentially provides the same function as the noise measurements recommended by Sulzer Bingham (since all sound originates as vibration). Additionally, the vibration monitoring provides the stations with a more reliable means of detecting pump degradation and trending the condition of the pump. Therefore, Dresden and Quad Cities Stations will not implement the Sulzer Bingham noise measurement recommendation.

Concerning Sulzer Bingham's third recommendation, Dresden and Quad Cities Stations do not perform visual inspections of the safety-related pumps on the basis of operational hours at minimum flow, but rather, on degradation detected by the surveillance program (and IST Program) established at the stations. Although records on the amount of operational time in the minimum flow condition have not been maintained, Edison believes the existing operational practices will assure that 500 hours of minimum flow operation will not be achieved during the lifetime of the plant. This belief is based on the fact that operation of the low pressure safety-related pumps in the minimum flow mode is limited to pump startup during surveillance testing, plant support (i.e., RHR in Shutdown Cooling or Suppression Pool Cooling), and automatic starts generated by ECCS initiation signals. Regarding surveillance testing or plant support, procedural controls provide assurance the pumps will not operate in minimum flow conditions during startup for an extended period of time (typically 5 minutes or less). In the event of an ECCS initiation signal, the maximum expected duration in the minimum flow mode (as evaluated by the BWR owners group) is 30 minutes for only a limited spectrum of postulated small break LOCAs. In addition, plant emergency procedures allow the low pressure pumps to be secured if plant conditions warrant, or if they are not immediately needed. In conclusion, Edison believes the current operating practices (procedures) assure that 500 hours of minimum flow operation, for a low pressure pump, will not be achieved during the lifetime of the plant. Therefore, the Sulzer Bingham visual inspection recommendation does not pertain to the low pressure pumps at Dresden and Quad Cities Stations.

In consideration of the latest information from the pump vendor (Sulzer Bingham), Edison believes the necessary testing is in place to detect pump degradation, and the current operational practices minimize the amount of time the pumps would be operated in the minimum flow condition. Additionally, as indicated in Reference (c), a review of the results of recent Dresden and Quad Cities surveillances for the low pressure system pumps have revealed no adverse trends, and the pumps have been operating as expected. At this time, Edison still believes an appropriate action is the performance of a vibration analysis on the low pressure pumps following any extended period of minimum flow operation (10 minutes or longer).

It should be noted that in Reference (c) it was indicated that the minimum flow rates recommended by Sulzer Bingham reflected a substantial increase in their (Sulzer Bingham) original values. Further review has revealed that Sulzer Bingham did not specify an original minimum flow value for the Dresden and Quad Cities pumps.

Please address any questions that you may have concerning this response to this office.

Respectfully,

Milton H. Richter

M.H. Richter
Generic Issues Administrator

Attachment

cc: A.B. Davis - Regional Administrator, Region III
Resident Inspector - D/QC
T. Ross - NRR, Quad Cities Station Project Manager
B. Siegel - NRR, Dresden Station Project Manager

SUBSCRIBED AND SWORN to before me this 8th day of January, 1990

Lelia F. Mayo
Notary Public

"OFFICIAL SEAL"
LELIA F. MAYO
Notary Public, State of Illinois
My Commission Expires 4/25/93

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ATTACHMENT

System Pump	Sulzer Bingham Recommended minimum flow (duration)	Calculated minimum flow (gpm)
Core Spray	1,100 gpm *(short term)	Dresden 185 gpm
	1,550 gpm *(continuous)	Quad Cities 185 gpm
LPCI (Dresden) RHR (Quad Cities)	1,000 gpm *(short term)	Dresden 450 gpm Quad Cities 400 gpm
	1,400 gpm *(continuous)	

*short term: 2 hours or less in a 24 hour period
continuous: in excess of 2 hours in a 24 hour period

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