



Commonwealth Edison
 One First National Plaza, Chicago, Illinois
 Address Reply to: Post Office Box 767
 Chicago, Illinois 60690 - 0767

February 27, 1989

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, 50-254/265

Reference: (a) NRC Bulletin No. 88-04, dated May 5, 1988.
 (b) W.E. Morgan letter to U.S. NRC, dated
 July 11, 1988.
 (c) T. Ross letter to H. Bliss, dated
 November 10, 1988.

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.

In Reference (b), when addressing the adequacy of the minimum flow bypass lines for safety-related centrifugal pumps at Dresden and Quad Cities Stations, Commonwealth Edison indicated that further vendor input and engineering evaluation would be necessary to verify that current miniflow rates are sufficient to ensure that there will be no pump damage from low flow operation.

Attachment A presents the evaluation on the low pressure safety-related system pumps (LPCI/RHR and Core Spray) which are supplied by Sulzer Bingham, and Attachment B presents the evaluation on the high pressure safety-related system pumps (HPCI) which are supplied by Byron Jackson.

To the best of my knowledge and belief, the statements contained above are true and correct. In some respect these statements are not based on my personal knowledge, but obtained information furnished by other Commonwealth Edison employees, contractor employees, and consultants. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

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

Respectfully,



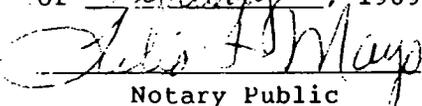
M. H. Richter
Nuclear Licensing Administrator

/lb

Enclosure

cc: A.B. Davis
Resident Inspector - D/QC

Subscribed and Sworn to
before me this 27th day
of February, 1989



Notary Public

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Attachment A

LPCI/RHR and Core Spray System Pumps at Dresden and Quad Cities Stations

In order to address the concern of possible safety-related pump damage resulting from operation in the minimum flow mode, Dresden and Quad Cities Stations collected special minimum flow data on one pump in each safety-related low pressure system (LPCI/RHR and Core Spray). The selected pumps were governed by the piping configuration which created the greatest flow resistance. The special test data collected during minimum flow operation included pump bearing housing vibration, motor bearing housing temperature, fluid temperature across the pump, and sound levels. From a review of the special test data, the pump which experienced the highest vibration at each station are shown below.

<u>Station</u>	<u>System Pump</u>	<u>Manufacturer</u>
Dresden	Core Spray Pump 2B	Sulzer Bingham
Quad Cities	Residual Heat Removal (RHR) Pump 2D	Sulzer Bingham

The special test pump data for these two pumps was transmitted to the manufacturer (Sulzer Bingham) for evaluation.

In general, the vibration levels of the pumps during minimum flow operation were approximately 2-3 times higher than during full flow operation. Sulzer Bingham Pumps Inc., responding in a letter dated January 31, 1989, indicated that the increased vibration levels "...are in accordance with the expected levels for pumps operating at extremely low flow conditions." From the results of the vibration testing, it appears that the pumps are performing as expected and that no apparent deterioration is evident.

Sulzer Bingham also indicated that 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." In the shorter term, these minimum flow vibration levels will cause bearing and seal problems. Based on their manufacturing specification, which includes operating times that far exceed the pump applications at Dresden and Quad Cities Stations, Sulzer Bingham recommended new minimum flow rates for the pumps to prevent any short term damage caused by increased vibration levels at low flows. The new minimum flow rates, shown below, reflect a substantial increase from their (Sulzer Bingham) original values, and consequently the present minimum flow lines will not meet the new recommendations.

Dresden Core Spray Pumps

The short term minimum flow (2 hours or less in 24 hours) is recommended to be no less than 1,100 gpm. Continuous minimum flow rate (in excess of 2 hours) should be no less than 1,550 gpm.

Quad Cities RHR Pumps

The short term minimum flow (2 hours in 24 hours) is recommended to be no less than 1,000 gpm. Continuous minimum flow rate (in excess of 2 hours) should be no less than 1,400 gpm.

Minimum flow operation typically occurs during surveillance testing and during postulated small break LOCA events. The BWR owner's group has evaluated Bulletin 88-04 concerns, and utilizing pump vendor minimum flow guidelines for intermittent operation has determined that the total expected hours of minimum flow operation for the low pressure systems during the life of the plant is a very small percentage (approximately 1 percent) of the time estimated by the pump vendor. Additionally, the maximum expected continuous duration in the minimum flow mode is 30 minutes for only a limited spectrum of postulated small break LOCAs. Typically, less than 5 minutes of minimum flow operation occurs during normal surveillance or ECCS operation.

Currently, the quarterly surveillances are performed on all the safety-related low pressure systems to verify system, and pump, performance. Vibrational data is obtained on the pumps to detect any degradation which may occur. If damage has occurred during minimum flow operations, an increased vibration level will appear during these surveillances. The surveillance program requires actions for increased vibration levels above an acceptable range. If vibration levels are unacceptable and located in an "alert" range, increased surveillances are performed (every 45 days) until the pump is repaired, replaced, or an evaluation on the pump's performance is conducted. If the pump is operating above the "alert" range, the pump is declared inoperable, the appropriate Technical Specification action is taken and corrective actions are immediately initiated. A review of the results of recent Dresden and Quad Cities surveillances for the low pressure system pumps revealed no adverse trends, and the pumps have been operating as expected. To ensure that pump damage is not occurring in the minimum flow mode, Edison will perform vibrational testing on the pumps following any extended periods of minimum flow operation (10 minutes or longer) excluding quarterly surveillances. At this time, the administrative controls to implement this additional vibration testing should be complete by the end of the second quarter of 1989.

Based on the minimal amount of time that the low pressure system pumps operate in minimum flow, and the past performance of these pumps at Dresden and Quad Cities Stations, Edison believes that operation of the pumps at low flow conditions will not cause pump damage or prevent the pumps from performing their design function during a LOCA event. Additionally, the current quarterly surveillance which monitors pump vibration, coupled with the additional vibration testing following extended minimum flow operations, will ensure that any pump degradation will be detected.

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Attachment B

High Pressure Coolant Injection Pumps at Dresden and Quad Cities Stations

In order to address the concern of possible safety-related pump damage resulting from operation in the minimum flow mode, Commonwealth Edison (Edison) contacted Byron Jackson, the manufacturer of the HPCI pumps at Dresden and Quad Cities Stations. Byron Jackson, responding in a letter dated January 31, 1989, indicated the following minimum flow guidelines to avoid damage to the pumps due to operation at reduced flows.

- "A minimum flow rate of 4,675 gpm for continuous operation in excess of 1,500 hours annually."
- "A minimum flow rate of 3,275 gpm for intermittent operation for an annual accumulation of 60 to 1,500 hours."
- "A minimum flow rate of 1,020 gpm for an accumulation of 60 hours annually."

The HPCI System operates at a minimum flow of approximately 1,200 gpm, for considerably less than 60 hours annually. This condition is within the manufacturer's guidelines. Additionally, a review of the results from past quarterly surveillance testing on the system have shown no adverse trends on pump performance. Therefore, Edison believes that operation at low flow conditions will not cause pump damage.

Quarterly surveillances will continue to trend pump performance, providing assurance of early detection of any adverse trends.