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

July 17, 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
Zion Station Units 1 and 2
LaSalle County Station Units 1 and 2
Byron Station Units 1 and 2
Braidwood Station Units 1 and 2
Response to NRC Bulletin 88-08, Supplement 3
NRC Docket Nos. 50-237/249, 50-254/265, 50-295/304, 50-373/374, 50-454/455 and 50-456/457

Reference: (a) NRC Bulletin 88-08, Supplement 3, dated April 11, 1989.

Dear Sir:

Reference (a) requested that licensees (1) review the reactor coolant system (RCS) to identify any connected, unisolable piping that could be subjected to unacceptable thermal stratification, and (2) take action, where such piping is identified, to ensure that the piping will not be subjected to unacceptable thermal stresses.

Commonwealth Edison has completed its review pursuant to Action 1 of Reference (a) for Dresden, Quad Cities, Zion, LaSalle County, Byron, and Braidwood Stations. The results of that review are presented in Attachment A for Byron, Braidwood, and Zion Stations, and Attachment B for Dresden, Quad Cities, and LaSalle County Stations. For Byron and Braidwood Stations, Commonwealth Edison will submit a schedule for Action 3 following completion of an evaluation on susceptible piping (as detailed in Attachment A of this response).

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

Respectfully,

Melton H. Richter

M. H. Richter
Generic Issues Administrator

Attachments: A - Response for Byron, Braidwood, and Zion Stations.
B - Response for Dresden, Quad Cities, and LaSalle County Stations.

cc: A.B. Davis
Resident Inspectors D/QC/LSC/Z/BY/BW

Subscribed and Sworn to before me this 17th day of July, 1989

Lelia F. Mayo
Notary Public

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

9001k-48/49

Attachment A

Response to NRC Bulletin 88-08, Supplement 3,
for Byron, Braidwood, and Zion Stations

As documented in Supplement 3 of NRC Bulletin 88-08 (Supplement), a recent event at a foreign reactor facility raised new concerns on thermal stratification in unisolable piping connected to the Reactor Coolant System (RCS). At this facility, cracks were found in piping connected to the RCS. The cracks resulted from thermal fatigue caused by hot water, which was drawn periodically from the RCS hot leg, leaking through the packing gland of a Residual Heat Removal (RHR) valve. The hot fluid flowed on top of the cool fluid in the pipe and produced a temperature difference between the top and bottom of the pipe resulting in thermal stresses on the pipe. The valve leakage, and resultant thermal stresses, were cyclic due to the thermal expansion and contraction of the RHR valve disc.

The Supplement requested that the Actions in NRC Bulletin 88-08 be addressed.

Action 1:

Review systems connected to the RCS to determine whether unisolable sections of piping connected to the RCS can be subjected to stresses from temperature stratification or temperature oscillations that could be induced by leaking valves and that were not evaluated in the design analysis of the piping. For those addressees who determine that there are no unisolable sections of piping that can be subjected to such stresses, no additional actions are requested.

Response:

Commonwealth Edison (Edison) has completed a review of piping connected to the RCS to identify locations which may be susceptible to the phenomenon identified in the Supplement for Byron, Braidwood, and Zion Stations.

The review indicated that the lines from the RCS hot legs to the suction of the RHR pumps at Byron and Braidwood Stations have the same configuration as that identified in the Supplement, and therefore, may be susceptible to unacceptable thermal stresses. Zion Station has no lines with a configuration which may be susceptible to the phenomenon identified in the Supplement.

Edison's review included locations at Byron, Braidwood, and Zion Stations where motor-operated wedge-type gate valves are used for isolation of lines connected to the RCS. Globe and check valves were also evaluated and it was determined that these valves are not susceptible to the cyclic leakage identified in the Supplement.

For each Byron and Braidwood unit, RHR valves RH8701B and RH8702B provide isolation of the lines (2 lines) connecting the RCS hot legs to the suction of RHR pumps. The valves are motor-operated wedge-type gate valves furnished with packing leak-off lines, which utilize a pre-selected limit switch position to terminate valve closure. These valves are the same design as the valve discussed in the Supplement, and may be susceptible to the same cyclic leakage. Additionally, the piping configuration is very similar to that identified in the Supplement.

At Zion Station, the isolation valve (RH8702) for the suction line to the RHR pumps from the RCS hot leg is a double disc design. The valve has a line connected between the RCS and the cavity between the discs, which assures that the area between the discs is constantly pressurized to RCS pressure. If there is a packing leak, the pressure equalization line will supply a constant flow through the packing leak-off line. The constant leakage will assure that cyclic thermal stresses, as identified in the Supplement, will not occur.

In summary, two lines per unit at Byron and Braidwood Stations may be susceptible to cyclic thermal stresses, as identified in the Supplement, and Actions 2 and 3 of Bulletin 88-08 will be addressed. For Zion Station, there are no lines which are susceptible to cyclic thermal stresses, as identified in the Supplement, and no further action is required.

To address Actions 2 and 3 for Byron and Braidwood Stations, Edison is performing an evaluation of the potentially susceptible piping. This evaluation will supply a list of the critical locations on the piping that may be subjected to cyclic thermal stresses, and the frequencies for future inspections to ensure piping integrity.

The scope of the evaluation will include: identifying the hydrodynamic models and the thermal transients that bound the thermal stratification and cyclic loading on the susceptible piping in the event cyclic valve leakage were to occur; and the performance of stress and fatigue analyses evaluating the structural integrity of the susceptible piping, which will determine the frequency and location for future inspections. It is expected that the evaluation will be completed by September 30, 1989, which will support the next refueling outage for each Byron and Braidwood Unit.

Action 2:

For any unisolable sections of piping connected to the RCS that may have been subjected to excessive thermal stresses, examine non-destructively the welds, heat-affected zones and high stress locations, including geometric discontinuities, in that piping to provide assurance that there are no existing flaws.

Response:

Byron and Braidwood Stations will perform non-destructive examinations on the susceptible piping at the locations determined by the evaluation discussed in the response to Action 1. In accordance with Action 4 of Bulletin 88-08, these examinations will be performed during the next refueling outage for each unit. The present schedule for the next refueling outage for each unit is:

- Byron Unit 1 - January 1990,
- Byron Unit 2 - September 1990,
- Braidwood Unit 1 - September 1989,
- Braidwood Unit 2 - March 1990.

As requested by Reporting Requirement 2 of Bulletin 88-08, Edison will submit a response upon the completion of Action 2 for each Byron and Braidwood Unit.

Action 3:

Plan and implement a program to provide continuing assurance that unisolable sections of all piping connected to the RCS will not be subjected to combined cyclic and static thermal and other stresses that could cause fatigue failure during the remaining life of the unit.

Response:

The evaluation being performed for the susceptible piping, reported in the response to Action 1, will determine the location and frequency of future inspections to ensure the integrity of the piping. Upon completion of the evaluation, the results will be reviewed and Edison will determine an inspection schedule, and any other necessary corrective/preventative actions, for the susceptible piping at Byron and Braidwood Stations. The evaluation being performed is expected to be completed by September 30, 1989.

Edison will submit a response within 60 days of completion of the evaluation for Byron and Braidwood Stations.

Attachment B
Response to NRC Bulletin 88-08, Supplement 3,
for Dresden, Quad Cities, and LaSalle County Stations

As documented in Supplement 3 of NRC Bulletin 88-08 (Supplement), a recent event at a foreign reactor facility raised new concerns on thermal stratification in unisolable piping connected to the Reactor Coolant System (RCS). At this facility, cracks were found in piping connected to the RCS. The cracks resulted from thermal fatigue caused by hot water, which was drawn periodically from the RCS hot leg, leaking through the packing gland of a Residual Heat Removal (RHR) valve. The hot fluid flowed on top of the cool fluid in the pipe and produced a temperature difference between the top and bottom of the pipe resulting in thermal stresses on the pipe. The valve leakage, and resultant thermal stresses, were cyclic due to the thermal expansion and contraction of the RHR valve disc.

The Supplement requested that the Actions in NRC Bulletin 88-08 be addressed.

Action 1:

Review systems connected to the RCS to determine whether unisolable sections of piping connected to the RCS can be subjected to stresses from temperature stratification or temperature oscillations that could be induced by leaking valves and that were not evaluated in the design analysis of the piping. For those addressees who determine that there are no unisolable sections of piping that can be subjected to such stresses, no additional actions are requested.

Response:

Commonwealth Edison (Edison) has completed a review of piping connected to the RCS to identify locations which may be susceptible to the phenomenon identified in the Supplement for Dresden, Quad Cities, and LaSalle County Stations.

The review indicated that Dresden, Quad Cities, and LaSalle County Stations have no lines with a configuration which may be susceptible to the phenomenon identified in the Supplement.

The review included all systems connected directly to the reactor coolant pressure boundary with pipe sizes larger than two inches in diameter. Piping systems meeting the following criteria were evaluated further:

- Hot/cold interface at a valve with hot side of the valve unisolable.
- Hot side higher pressure with respect to cold side.
- Wedge type gate valve at interface.

Piping systems adjacent to valve numbers MO-1(2)-1001-50 of the Residual Heat Removal System at Quad Cities Station and valve numbers M-2(3)-1001-1A and M-2(3)-1001-1B of the Shutdown Cooling System at Dresden Station met the above criteria. No piping at LaSalle County Station met the criteria.

The potential for thermal fatigue cracking is significantly reduced by a number of factors. Attachment 1 of the Supplement indicates that the potential for this type of thermal fatigue may be eliminated by utilizing a torque switch setting to terminate valve closure. The foreign reactor event was caused in part by the subject RHR valve closing to a pre-selected limit switch position. This may have provided for a gap between the seat and disc, thus initiating packing gland leakage. All of these valves utilize torque switches, which ensures that adequate disk to seat contact is achieved. The MO-1(2)-1001-50 valves at Quad Cities Station are located in a straight horizontal section of piping which is connected to the high pressure recirculation system piping, and therefore, would not be subject to as high a thermal differential in the event of a packing gland leak. The MO-2(3)-1001-1A valves at Dresden Station are located less than 3.5 feet from the reactor recirculation piping connection. These valves are installed horizontally, and the piping connecting these valves to the recirculation piping is horizontal. This would significantly reduce the maximum temperature differential in the event of a packing gland leak due to the close proximity of these valves to the turbulent reactor recirculation flow. The MO-3-1001-1B valve at Dresden Station is located over 21 feet from the reactor recirculation piping connection. As indicated in Attachment 1 of the Supplement, locating the valve sufficiently far away from the high temperature water source may dissipate the thermal differential and minimize the effects of thermal stratification. The MO-2-1001-1B valve at Dresden Station is located above the reactor recirculation piping connection. This will tend to reduce the maximum temperature differential and associated thermal stratification, thereby reducing the potential for thermal fatigue cracking.

In addition, all welds on the high pressure/high temperature side of the Dresden and Quad Cities valves are inspected in accordance with the IGSCC augmented inspection program for stainless steel piping. The most recent inspection results were reviewed for the potentially affected welds. No indications attributable to the thermal fatigue phenomenon were identified.

In summary, the review required by Action 1 indicates there are no lines with a configuration which may be susceptible to the phenomenon idenitified in the Supplement at Dresden, Quad Cities and LaSalle County Stations. Therefore, Actions 2 and 3 are not required to be addressed for these stations.