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Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Illinois Power's (IP) Response to Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs"

Dear Sir:

The purpose of this letter is to provide IP's response to the Nuclear Regulatory Commission's (NRC) Bulletin 93-03. The bulletin required that a report be submitted to the NRC describing the short term compensatory measures taken at Clinton Power Station (CPS) to ensure that potential level errors caused by reference leg de-gassing do not cause improper system response or improper operator actions during transients and accident scenarios initiated from reduced pressure conditions. The bulletin also requested that a description be provided of the hardware modifications to be implemented to ensure the level instrumentation system design provides a high functional reliability for long-term operation.

Short Term Compensatory Measures

As a result of Bulletin 93-03, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," IP implemented the following short term compensatory measures:

a) Actions Completed Within 15 Days:

1) To enhance the monitoring of all Reactor Pressure Vessel (RPV) level instruments, IP conducted three training seminars intended to inform the operators of the possibility of level anomalies associated with de-gassing from the reference legs. The seminars also discussed industry experiences involving reactor water level instrumentation concerns. In addition, Operations procedures were revised to alert Operations personnel to monitor for notching during depressurization.

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2) Cautions were added to enhance various operating procedures. These cautions alert operators of the de-gassing phenomenon that occurs while depressurizing the RPV.

3) Upon receipt of Bulletin 93-03, IP held additional briefings for all operators alerting them that confusing or misleading level indication may occur during operations while the unit is in hot shutdown (Mode 3).

b) IP completed augmented operator training associated with the loss of RPV inventory scenarios during Mode 3. Training was conducted in training cycle 93.4 and completed prior to July 30, 1993.

Hardware Modifications

A keep-fill modification will be installed in the Divisions I and II water level instrumentation using the control rod drive system as the source of water. The fuel zone water level transmitters, which are connected to the Divisions III and IV water level instrumentation condensing chambers, will be modified by connecting their reference legs to the narrow range level instrumentation. The modifications will provide a full range of redundant water level indications from the bottom of fuel to the top of wide range level indication. These modifications are further described in Attachment 1.

IP recognizes the priority that the NRC has placed on implementing hardware modifications. IP has placed appropriate priorities on the design and procurement of parts to facilitate these changes, however, we request that consideration be given to deferring hardware installations until the next refueling outage, commencing on or about September 26, 1993. We have carefully evaluated the industry plans toward actual plant installation, and based on our discussion with Mr. J. Dyer et. al., on July 28, 1993, IP believes this request is justified for the following reasons. 1) Parts have been ordered on an urgent priority requisition, but IP is competing with other Boiling Water Reactor plants for similar parts. Our estimated delivery date for parts ordered is early September. Based on parts availability, the earliest implementation date of this modification will be the middle of September, therefore, the refueling implementation time frame is still appropriate. 2) This summer's floods in the Midwest and the United Mine Workers strike have impacted coal delivery to IP coal-fired plants, causing an increased need for the generation from CPS, therefore, the availability of CPS needs to be maximized to meet the energy demands of IP customers. 3) The CPS-specific Probabilistic Risk Assessment has shown that there is no change in core damage frequency as a result of the noncondensable gas phenomenon even without the modification installed, therefore, with the exception of improved water level indication available to the operator in responding to an unlikely rapid depressurization

event, the cost of implementing these modifications prior to the refueling outage is not justified by the improvement to reactor safety. In addition, we intend to keep apprised of other plants' modifications and testing associated with this NRC Bulletin which may identify problems previously unanticipated. This may eliminate the risk of similar problems occurring at CPS.

I hereby affirm that the information provided in this letter and attachment is correct to the best of my knowledge.

Sincerely yours,

R E Wyatt

for J. S. Perry
Senior Vice President

Attachment

WTD/nls

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

NRC Bulletin 93-03 addressed a concern where a high concentration of non-condensable gases in the Reactor Pressure Vessel (RPV) water level reference leg could cause erratic level indication during depressurization. This not only causes an indication concern, but has the potential of impacting protective trips during RPV drain down events.

The modification at Clinton Power Station (CPS), to address the NRC Bulletin, consists of a keep-fill modification on Divisions I and II and a core range monitor modification on Divisions III and IV. The two divisions of keep-fill will be installed to provide diversity and minimize the potential of common mode failure due to the check valves used as isolation between the safety-related RPV reference leg and non-safety-related portions of the Control Rod Drive (CRD) system.

The keep-fill design will use CRD charging water as the source of water. This source has a relatively low concentration of dissolved gases. Flow into the reference leg will be at a very low rate (approximately 4 lb/hr). The flow is sufficient to overcome non-detectable leakage but small enough to minimize any effect on the static pressure from the reference leg with maximum operating differential pressure for the CRD system.

The use of diverse check valves will provide isolation between the reference legs and the CRD system. The check valves will be a disc check valve and a lift check valve. These check valves will be oriented in favorable positions. A needle valve provides the flow control as well as dampening to minimize CRD pressure transients affecting RPV level indication.

Divisions III and IV will not be modified by a keep-fill modification. However, we will change the Divisions III and IV fuel zone transmitters. The two fuel zone transmitters associated with Divisions III and IV will be modified to change the reference leg from the steam condensing chamber to the narrow range variable leg of their respective divisions. This is to assure the fuel zone reference legs are also filled with water that has a low concentration of dissolved gasses.

By installing a modification as described above, two redundant divisions of reliable indication will be available from the bottom of the fuel zone to the top of the wide range indication, even at low pressure when the de-gassing condition occurs. By not modifying Divisions III and IV, a small potential does exist that a Level 3 isolation of Residual Heat Removal (RHR) may not occur since a Level 3 RHR isolation requires either Division III or IV input, in addition to Division I or II input, to fulfill the one-out-of-two-twice logic. This condition would occur if both Divisions III and IV had a sustained high level indication due to de-gassing of greater than 20 inches, and a RPV drain down was occurring. This condition has been evaluated acceptable, should it occur, since all available ECCS systems would inject water, keeping the core covered.

The initial design intent was to modify all four water level divisions with a keep-fill system. That design had two identified weaknesses. First, the check valves used to isolate the RPV reference leg from the non-safety CRD piping have a possibility of leaking. This could cause leak paths from the reference leg upon CRD system depressurization. The potential for a common mode failure of leaking check valves would therefore exist. The second weakness is associated with the Rosemont 1153 transmitters. The transmitters are susceptible to pressure surges in the sensing lines which could lead to inadvertent initiation of the High Pressure Core Spray (HPCS) system.

To address the check valve leakage issue, Illinois Power (IP) prepared a CPS-specific Probabilistic Risk Assessment (PRA) analysis. It showed an increase in core damage frequency due to loss of all water level divisions, if all four divisions were modified with the keep-fill modification. The PRA found no increase in core damage frequency if only two divisions were modified. IP chose not to modify all divisions with the keep-fill modification; instead only Divisions I and II will be modified. These divisions were chosen since they provide initiating signals to the Low Pressure Core Spray (LPCS) and Low Pressure Coolant Injection (LPCI) systems which are the systems needed when the plant is at lower pressures. By modifying the core range monitors on Divisions III and IV, neither de-gassing nor check valve leakage will impact reliable fuel zone level indication. Additionally, by not modifying all four divisions with a keep-fill modification, the sensitive transmitter problem is less likely to cause inadvertent initiation signals on Divisions III and IV for HPCS.

In conclusion, by implementing a modification with two divisions of keep-fill and two divisions of core range monitoring, the following advantages are realized: There is no change in core damage frequency, there is a diversity in the water level instrumentation, HPCS is not subjected to increased inadvertent initiation probability, and automatic actions protect the core under all credible conditions either during normal operation or during conditions of de-gassing at low pressure.