

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

Form Rev. 2.0

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TEXT Energy Industry Identification System (EIS) codes are identified in the text as [XX]

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 MWT rated core thermal power

EVENT IDENTIFICATION: A postulated design basis fire could have caused multiple spurious operations of certain Reactor Water Cleanup System valves, potentially allowing a loss of reactor coolant inventory in excess of design basis limits, due to inadequate procedural guidance.

A. CONDITIONS PRIOR TO EVENT

Unit: One	Event Date: 022796	Event Time: 1730
Reactor Mode: 4	Mode Name: Refueling	Power Level: 000%
Unit: Two	Event Date: 022796	Event Time: 1730
Reactor Mode: 1	Mode Name: Power Operation	Power Level: 100%

This report was initiated by Licensee Event Report 254\97-006.

B. DESCRIPTION OF EVENT

On 032797, during a review of a problem identification form (PIF) written on 022796 regarding Appendix R safe shutdown procedures, station personnel concluded that the PIF had been incorrectly dispositioned as a non-reportable event. The PIF identified missing procedure steps as the problem. It was not recognized that the missing steps also constituted a nonconformance to the Safe Shutdown Analysis (SSA). An ENS call was made on 032797 to report the historical condition.

On 022796, while reviewing the Station's Appendix R Conformance Safe Shutdown Analysis (SSA), plant personnel discovered that the Reactor Water Cleanup (RWCU)[CE] system had been identified as a high/low pressure interface whereby reactor coolant inventory could have been lost. The SSA indicated that to prevent excessive reactor inventory loss, the normally-open RWCU outboard containment isolation valve MO1(2)-1201-5 should be manually closed during a postulated Appendix R fire. However, of the six procedures where RWCU isolation was required, none contained steps to isolate the RWCU system. The remaining 10 procedures did not require RWCU isolation.

A PIF was initiated on 022796 to identify the fact that the Appendix R safe shutdown procedures did not contain the steps to isolate a high/low pressure interface with the RWCU system as indicated in the SSA.

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As part of its SSA, Quad Cities was analyzed for the affects of multiple spurious actuation of system components in any one flow path that constitutes a high/low pressure interface. Each possible reactor blowdown path was resolved within the SSA in such a way that the ability to safely shutdown the reactor prior to water reaching the top of the core was not affected. The resolution for the potential RWCU blowdown path was to manually isolate the system during a design basis fire. However, no steps were included in the safe shutdown procedures to isolate the RWCU system.

All other high/low pressure interface valves identified in the Appendix R SSA were verified to be resolved correctly within the safe shutdown procedures.

While attempting to solve the RWCU issue, Station personnel discovered that in order to manually isolate the MO1(2)-1201-5 valve during a Unit 1 or Unit 2 reactor building fire, operations personnel would have been required to enter the fire area. In essence, the resolution for the RWCU high/low pressure interface valves as stated in the SSA would not have been possible to implement in two of the six safe shutdown procedures where RWCU isolation was required. It became necessary to use an alternate method to ensure excessive reactor inventory would not be lost through the RWCU system. The alternate method required a detailed calculation of reactor water level timelines.

On 052396, reactor level timeline calculations were completed. The calculations confirmed that the blowdown rate through the RWCU system could be successfully limited to below design basis levels by ensuring that the normally closed blowdown orifice bypass valve MO1(2)-1201-76 was not vulnerable to fire induced spurious actuation. This was accomplished by administratively controlling the power feed to MO1(2)-1201-76 in the off position. The controlling procedure became effective on 052896.

If the affected shutdown paths had been properly declared inoperable on 022796, per administrative requirements the Station would have been placed in a 67 day Limiting Condition of Operation (LCO) and would have required fire watch duty for compensatory measures. Nonetheless, fire watch duty was fully in place from 022796 to 052896. If, at the end of the 67 day period, on 050496, the RWCU issue was not resolved, a shutdown of Unit 2 would have been administratively required. The 67 day LCO was not entered, and corrective actions were taken in a time frame commensurate with the significance assigned to the PIF. Unit 2 continued to operate with three of its eight required shutdown paths inoperable until a forced shutdown on 051096 (storm related). Since Unit 1 was in cold shutdown between 022796 and 052896, no Unit 1 shutdown paths were required to be operable during that time.

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C. CAUSE OF EVENT

The root cause of this event was a cognitive personnel error on the part of the safe shutdown procedure writer and reviewer. An incorrect reportability determination was caused by an incomplete understanding of the Quad Cities Appendix R Safe Shutdown Analysis.

D. SAFETY ANALYSIS

This event had the potential to pose a safety concern in the unlikely event of a design basis fire.

The probability of the design basis fire to occur is small. The Station also reduces the probability of a design basis fire from occurring by the use of defense-in-depth as described in Appendix R. The first defense is to prevent a fire from occurring. Administrative controls such as procedures to control hot work and the use of ignition sources are implemented to reduce the number of ignition sources. Administrative controls are in place to keep the amount of combustible materials in the plant low. This is accomplished through transient fire load procedures and modification reviews.

The second defense is to provide rapid detection and suppression if a fire were to occur. This is accomplished by using early detection systems and automatic suppression systems. These automatic systems are augmented through the use of manual fire fighting through the fire brigade. Administrative requirements for compensatory fire watch duty when safe shutdown paths are inoperable are intended to fortify this defense. Since fire watch duty was fully in place between 022796 and 052896, the incorrect operability determination of this event posed an insignificant safety concern.

The final step of defense-in-depth is to contain a fire within a single fire area to protect safe shutdown systems and components. Although not directly used to attain safe shutdown, the RWCU system constituted a potential flow path whereby reactor inventory could have been lost. During a design basis fire, the RWCU system would be required to be sufficiently isolated to prevent a loss of reactor inventory greater than the design basis inventory loss.

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The RWCU system was configured such that if two Motor Operated Valves (MOVs) were to have unexpectedly remained in the open position following an auto-close signal and two additional MOVs were to have spuriously opened from their normally closed position and one additional Air Operated Valve was to have spuriously opened from its normally closed position, then an excessive reactor blowdown rate could have been experienced. The probability of this series of five specific fire induced valve failures was low. However, if such a series of valve maloperations were to have occurred as a result of a design basis fire, a greater than expected reactor inventory loss could have prevented station operators from attaining safe shutdown prior to reactor level reaching the top of active fuel. Without submergence of the reactor core, damage could have resulted, although other barriers to prevent a radioactivity release to the public would have been unaffected by this event.

E. CORRECTIVE ACTIONS

Corrective Actions Completed:

1. Operations Procedure QCOP 1200-07, "RWCU System Coolant Rejection" was revised to administratively control the power feed breaker to MO1(2)-1201-76 in the OFF position (completed on 052896).
2. Appendix R safe shutdown procedures were reviewed to ensure that all high/low pressure interface paths were adequately resolved as stated in the Appendix R SSA (completed on 052896).
3. Station Fire Protection Engineering personnel have received much more in-depth knowledge and understanding of the Station Appendix R design basis through recent completion of the fire Individual Plant Examination of External Events (IPEEE) and various fire protection program improvements.
4. The current procedure revision process requires a cross discipline review of all Appendix R safe shutdown procedure revisions by the Station Appendix R Coordinator.

Corrective Actions to be Completed:

1. The Appendix R Conformance Safe Shutdown Report will be revised by 092897 to define the MO1(2)-1201-76 valve as the RWCU isolation valve. (NTS # 2541809700601; Engineering)
2. All Shift Engineers and Engineering Representatives for the Event Screening Committee will receive training by 101597 on an overview of the Quad Cities Safe Shutdown Analysis and the Appendix R safe shutdown design basis. (NTS # 2541809700602; Training)

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F. PREVIOUS EVENTS:

- PIF 96-2053 6/07/96 Level III - LER 1-96-008 - Testing performed on the CAM check valves does not meet Tech Spec requirements due to an inadequate procedure.
- PIF 96-2897 10/9/96 Level III - LER 2-96-002 and PIR 2-96-057 - HPCI declared inoperable when flow could be obtained through FG 2-2301-10 due to inadequate procedures.

G. COMPONENT FAILURE DATA:

There were no component failures associated with this event.