

LICENSEE EVENT REPORT (LER)

Form Rev. 2.0

|   |  |                            |
|---|--|----------------------------|
| Facility Name (1)<br>Quad Cities Unit One | Docket Number (2)<br>0   5   0   0   0   2   5   4 | Page (3)<br>1   of   0   5 |
|---|--|----------------------------|

Due to Design Related Cognitive Personnel Error, it is physically possible for the Unit 1 & 2 Refuel Bridge Monorail Auxiliary Hoists to perform core alterations without a Refuel Bridge Position Interlock actuation.

| Event Date (5)          |       |       | LER Number (6)   |                   |                 | Report Date (7) |       |       | Other Facilities Involved (8) |                               |
|-------------------------|-------|-------|--|-------------------|-----------------|-----------------|-------|-------|-------------------------------|-------------------------------|
| Month                   | Day   | Year  | Year   | Sequential Number | Revision Number | Month           | Day   | Year  | Facility Names                | Docket Number(s)              |
| 0   4                   | 1   0 | 9   7 | 9   7  | -- 0   1   2      | -- 0   0        | 0   5           | 0   9 | 9   7 | Quad Cities Unit 2            | 0   5   0   0   0   2   6   5 |
| OPERATING MODE (9)<br>4 |       |       | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11) |                   |                 |                 |       |       |                               |                               |

|                       |                   |                   |                      |   |
|-----------------------|-------------------|-------------------|----------------------|---|
| POWER LEVEL (10)<br>0 | 20.402(b)         | 20.405(c)         | 50.73(a)(2)(iv)      | 73.71(b)                                      |
|                       | 20.405(a)(1)(i)   | 50.36(c)(1)       | 50.73(a)(2)(v)       | 73.71(c)                                      |
|                       | 20.405(a)(1)(ii)  | 50.36(c)(2)       | 50.73(a)(2)(vii)     | Other (Specify in Abstract below and in Text) |
|                       | 20.405(a)(1)(iii) | 50.73(a)(2)(i)    | 50.73(a)(2)(viii)(A) |   |
|                       | 20.405(a)(1)(iv)  | X 50.73(a)(2)(ii) | 50.73(a)(2)(viii)(B) |   |
|                       | 20.405(a)(1)(v)   | 50.73(a)(2)(iii)  | 50.73(a)(2)(x)       |   |

LICENSEE CONTACT FOR THIS LED (12)

|   |  |
|---|--|
| NAME<br>Charles Peterson, Regulatory Affairs Manager, ext. 3609 | TELEPHONE NUMBER<br>AREA CODE<br>3   0   9   6   5   4   -   2   2   4   1 |
|---|--|

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NERDS | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NERDS |
|-------|--------|-----------|--------------|---------------------|-------|--------|-----------|--------------|---------------------|
|       |        |           |              |                     |       |        |           |              |                     |
|       |        |           |              |                     |       |        |           |              |                     |

SUPPLEMENTAL REPORT EXPECTED (14)

|   |      |                               |       |     |      |
|---|------|-------------------------------|-------|-----|------|
| YES (If yes, complete EXPECTED SUBMISSION DATE) | X NO | Expected Submission Date (15) | Month | Day | Year |
|---|------|-------------------------------|-------|-----|------|

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

**ABSTRACT:**  
On 041097 at 1500 hours, during an evaluation, Design Engineering determined that it is physically possible for the Unit 1 & 2 Refuel Bridge Monorail Hoists to be over a portion of the core without the Refuel Bridge Position Interlock being actuated (contrary to design requirements). This was caused by a design program deficiency in which engineering personnel did not apply a sufficient degree of attention to re-positioning the Refuel Interlock Trip Plates and/or Interlock Limit Switches when the wider Refuel bridges were installed in 1986.

Procedures were in-place to prevent fuel movement with the Monorail Hoist. This provided the same protective function as the intended interlocks.

A potential inadvertent reactor criticality was still significantly limited by the procedures, work practices, and the nuclear characteristics of the core. The net effect of the event is that a slight increase in the probability of an inadvertent criticality existed which could have resulted in increased exposure to personnel on the Refuel floor.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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| FACILITY NAME (1)<br><br>Cities Unit One  | DOCKET NUMBER (2)<br><br>0   5   0   0   0   2   5   4 | LED NUMBER (6) |                   |                 | PAGE (3)<br><br>2   OF   0   5 |
|   |  | Year           | Sequential Number | Revision Number |                                |
|   |  | 9   7          | -   0   1   2     | -   0   0       |                                |
| TEXT Energy Industry Identification System (ACE) 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: Due to Design Related Cognitive Personnel Error, it is physically possible for the Unit 1 & 2 Refuel Bridge Monorail Auxiliary Hoists to perform core alterations without a Refuel Bridge Position Interlock actuation.

A. CONDITIONS PRIOR TO EVENT:

Unit: One                      Event Date: 041097                      Event Time: 1500  
Reactor Mode: 4              Mode Name: Cold Shutdown              Power Level: 0%

Unit: Two                      Event Date: 041097                      Event Time: 1500  
Reactor Mode: 0              Mode Name: \*                      Power Level: 0%

This report was initiated by Licensee Event Report 254\97-012.

Cold Shutdown (4) - Mode switch in Shutdown position with average reactor coolant temperature  $\leq 212$  degrees F.

\*Refueling - Mode switch in the Shutdown or Refueling position with average reactor coolant temperature  $\leq 140$  degrees F and fuel in the reactor vessel with one or more vessel head closure bolts less than fully tensioned or with the head removed.

\*NOTE: Per Tech Specs, Table 1-2 (Definitions 1.0), when there is no fuel in the reactor vessel, the reactor is considered not to be in any OPERATIONAL MODE.

B. DESCRIPTION OF EVENT:

On 041097, during an evaluation of the Refuel Interlocks design, concerning the Refuel Platform position, Design Engineering discovered that it is physically possible for the Refuel Bridge Monorail Hoist [DF] to be over a portion of the core without the rod motion block interlock or the Refuel Bridge reverse motion block interlock being actuated.

The design basis, per UFSAR Section 9.1.4.3, states that the refueling interlocks, in combination with core nuclear design and refueling procedures, limit the probability of an inadvertent reactor criticality. The pre-TSUP Technical Specifications also required this interlock to be operable. As this interlock was not operable, the plant was outside of the design basis and in violation of TS 3.10.A.1.b. Pre-TSUP Technical Specifications required interlocks to be operable for all hoists. The Station chose to use administrative controls to prohibit the use of the Refuel Bridge Monorail hoist and Frame Mounted hoist during fuel bundle movement. As a result, these Tech. Spec. required surveillances were not performed.

Current Technical Specification (TSUP) only require the subject interlocks to be operable if the associated hoists are to be used for core alterations.

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|                                      |  | Year<br>9   7  | Sequential Number<br>-   0   1   2 | Revision Number<br>-   0   0 |                            |

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

C. CAUSE OF EVENT:

This was caused by a design program deficiency in which engineering personnel did not apply sufficient degree of attention to re-positioning the Refuel Interlock Trip Plates and/or Interlock Limit Switches when the wider Refuel bridges were installed in 1986. During Refueling Platform Assembly (Modification Number M4-1(2)-84-13), in 1986, two new, wider Refuel Bridges were installed. The Refuel Position Interlock Trip Plates and/or Interlock Limit Switches were not repositioned for proper operation of the Refuel Bridge Position Interlock for the Monorail Hoist. The rest of the subject modification was reviewed for adequacy and no additional problems were found.

D. SAFETY ANALYSIS:

The Refuel Platform "Position Interlock" was not installed per the design requirements during the 1986 modification. This allowed portions of the core to be susceptible to core alterations with the monorail hoist which is outside of the design basis that requires the rod block Refuel Interlock to actuate. The design function of the Refuel Interlocks as stated in UFSAR section 9.1.4.3, is to limit the probability of an inadvertent reactor criticality if procedure violations should occur.

The design deficiency allowed two conditions to go unprotected with the Monorail Hoist loaded:

1. With a control rod withdrawn, a Refuel Bridge reverse motion block would not have been received when required.
2. With the Refuel Bridge over the core, a rod block would not have been generated over a small section of the core.

The above interlocks and procedural controls are in place to prevent inadvertent criticality.

The Station had further administrative controls in place which prohibited use of the Monorail Hoist during fuel bundle movement. Interviews with Fuel Handlers and Operations personnel, and a records search, revealed that there were no procedures written or evolutions performed which allowed the Monorail Hoist to be used to move fuel. Therefore, the administrative control of not allowing fuel movement with the Monorail Hoist provided the same protective function as the intended interlocks.

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|   |  | 9   7   -      | 0   1   2   -     | 0   0           |                                |
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Were the administrative controls ever bypassed, the following are the assumptions for a worst case discussion:

1. Plant in the Refuel mode.
2. Monorail Hoist is physically positioned over the portion of the core not protected by the interlock.
3. Strongest worth control rod withdrawn in the area of the core not protected by the interlock.
4. Fuel in the vessel.
5. Core alteration to be performed with Monorail Hoist which adds positive reactivity.

The nuclear characteristics of the core assures that the reactor remains subcritical when the highest worth control rod is withdrawn. With this rod withdrawn in the refuel mode and a substantial reactivity addition is made using the monorail hoist, an inadvertent criticality is possible. Once critical, some local heating and increased radiation levels may occur and expose personnel to higher doses. Assuming normal Refuel Cavity water level exists, dose would be limited. Power ascension in these conditions is limited by the Reactor Protection System trips which use the neutron monitoring system to limit power in this mode by scrambling the reactor.

It can be concluded that a potential inadvertent reactor criticality was still significantly limited by the procedures, work practices, and the nuclear characteristics of the core. The net effect on the plant operations is that a slight increase in the probability of an inadvertent criticality existed which could have resulted in increased exposure to personnel on the Refuel floor.

**E. CORRECTIVE ACTIONS:**

Corrective Actions Completed:

1. Quad Cities has an improved modification process today in comparison to 1986. ComEd has sought and achieved higher standards in the design process by expecting design walkdowns to be completed and design criteria to be clearly established.  
  
This LER resulted from a preliminary design walkdown for a future modification to the Refuel Platforms. This demonstrates the design process improvements are achieving results.
2. Operations and Fuel Handling have taken steps to place the Monorail Hoist "Out of Service for current refueling operation".

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Corrective Actions to be Completed:

The following are the actions to use to correct the Refuel Bridge Interlock for the Monorail Hoist:

1. Take steps to ensure that Operations/Fuel Handling perform a programmatic change to 'Out Of Service' the Monorail Hoist while conducting core alterations in the near future. This will be completed by 060797 (NTS# 2541809701201, Engineering).
2. Several different solutions are being evaluated for long term corrective actions. (NTS# 2541809701202, Engineering). Final resolution will be determined by 093097.

F. PREVIOUS OCCURRENCES:

The following similar Licensee Event Reports (LERs) have occurred since 1995 regarding cognitive personnel error:

- 1-95-003 Design deficiency in the Tack In Place (TIP) system response to a PCIS signal due to an incomplete review of the system circuitry.
- 1-96-011 NRC information notice 92-18 describes a condition where motor operated valves can be damaged due to hot shorts occurring during a fire in the Control Room due to an inadequate design and managerial methods.

G. COMPONENT FAILURE DATA:

None.