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RLB-89-233

October 19, 1989

U. S. Nuclear Regulatory Commission
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Reference: Quad Cities Nuclear Power Station
Docket Number 50-254, DPR-29, Unit One

Enclosed is Licensee Event Report (LER) 89-016, Revision 00, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 20.405(a)(1)(iv), which requires the licensee to make a report in writing within 30 days of the occurrence of any incident for which notification is required by 10 CFR 20.403.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION

for RLB

R. L. Bax
Station Manager

RLB/MJB/ad

Enclosure

cc: R. Stols
R. Higgins
INPO Records Center
NRC Region III

IE22

2355H

RIDS CODE CHANGED
PER T. ROSS 11/13/89

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1)	Docket Number (2)	Page (3)
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Title (4) New Fuel Assembly Dropped in Fuel Pool When Refuel Bridge Fuel Grapple Released Due to Personnel Error and Lack of Procedural Guidance

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 9	2 1	8 9	8 9	0 1 6	0 0	1 0	1 8	8 9		0 5 0 0 0
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OPERATING MODE (9): 1

POWER LEVEL (10): 0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

___ 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)	
X 20.405(a)(1)(iv)	___ 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 LER (12)

Name	TELEPHONE NUMBER (AREA CODE)
John Lechmaier, Technical Staff Engineer, Ext. 2174	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 NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

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)

On September 21, 1989, Unit One was in the SHUTDOWN mode with all fuel removed from the reactor vessel.

At 1410 hours, during the transfer of new fuel from the new fuel storage vault to the fuel pool, fuel assembly LYT191 was released from the refueling grapple and fell upon spent fuel racks.

The grapple control switch was inadvertently left in the "release" position after attempting to unlatch. The unlatching failure was due to the adjacent assembly not being fully seated. The cause of fuel assembly drop was a combination of personnel error and procedural deficiency.

Corrective action included a refuel bridge hoist circuitry modification to prevent raising a fuel assembly with the grapple control switch in "release." The fuel handling procedures were revised to assure proper fuel assembly seating and proper positioning of the grapple control switch.

This report is submitted to comply with the requirements of 10CFR20.405(a)(1)(iv).

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 MWt rated core thermal power.

EVENT IDENTIFICATION: New Fuel Assembly Dropped in Fuel Pool When Refuel Bridge Fuel Grapple Released Due to Personnel Error and Lack of Procedural Guidance

A. CONDITIONS PRIOR TO EVENT:

Unit: One Event Date: September 21, 1989 Event Time: 1410
Reactor Mode: 1 Mode Name: SHUTDOWN Power Level: 00%

This report was initiated by Deviation Report D-4-1-89-080.

Shutdown Mode (1) - In this position, a reactor scram is initiated, power to the control rod drives is removed, and the reactor protection trip systems have been deenergized for 10 seconds prior to permissive for manual reset.

B. DESCRIPTION OF EVENT:

On September 21, 1989, Unit One was in the SHUTDOWN mode with all fuel removed from the reactor [RCT] vessel [VSL]. Operations were in progress to move new fuel from the new fuel storage vaults [RK] into the Unit One fuel storage pool racks [RK]. This consisted of moving the new fuel from the new fuel storage vaults to the Unit One fuel prep machines [FHM] (in the fuel pool) with the overhead crane [CRN], and then transferring the fuel to the fuel racks with the Unit One refuel bridge [DF][FMB]. This was being performed per QFP 200-3, Transfer of New Fuel from Either the New Fuel Storage Vault or the New Fuel Inspection Stand [FHM] to the Fuel Pool, and per QFP 150-2, Refueling Platform Operation.

At approximately 1400 hours, new fuel assembly LYT191 was being moved from the Unit One #1 fuel prep machine [FHM] to location 03N-35W in the fuel rack. The fuel handler (FH) moved the fuel assembly over the target location and lowered it into the rack until the slack cable [CBL] light [IL] came on. The slack cable light indicates there is <50 lbs. of weight on the cable. The FH also visually verified that the fuel assembly appeared to be fully seated. The FH then put the grapple [HOI] control [HC] switch [HS] to the "Release" position to release the fuel assembly. However, the grapple engaged light remained lit which indicated that the grapple's opposing J hooks had not opened and the fuel assembly was still latched. The FH operated the grapple control switch a few more times, then lifted the fuel assembly slightly, rotated the mast [FMH] back and forth slightly, and lowered the assembly again. These are actions normally taken when seating a fuel assembly. Further operation of the grapple control switch failed to cause the fuel grapple engaged light to go out.

At this point, the FH informed the Fuel Handling Foreman (FHF) of the problem. The FHF suspected that there may be an obstruction from the adjacent assembly which could be avoided if the assembly was rotated. The FHF instructed the FH to raise the fuel assembly out of the fuel rack, rotate it 90 degrees, and lower it back into the fuel rack. The FH raised the assembly just clear of the fuel rack, rotated it 90 degrees, and started to lower it. The bottom of the fuel assembly contacted the top of the fuel rack and the fuel grapple opposing J hooks opened unexpectedly, releasing the fuel assembly. The fuel assembly tipped away from the mast and was observed by the FHF and another FH to fall slowly across irradiated fuel and stay in the position it first landed. Immediately thereafter, at 1410 hours, the three FH present and the FHF moved to the southwest corner (near Unit One exit) of the refuel floor as a precaution, although no radiation alarms were annunciating. At this time, the FHF notified the Shift Engineer (SE), the Radiation Protection Department, and the Lead Nuclear Engineer (LNE). The LNE assigned a Nuclear Engineer (NE) to notify an Operating Engineer (OE), and proceeded to the refuel floor.

The Radiation Protection Department dispatched a Radiation Technician (RT) and a Radiation Protection Foreman (RPF) to the refuel floor. They also notified a Health Physicist (HP) who called the refuel floor and questioned the FHF concerning his location and any Area Radiation Monitor (ARM) alarms [RA] or personal dosimetry [MON] indications of abnormal dose rates. After being informed of the FHF's location on the refuel floor and of the absence of ARM alarms and dosimetry indications of abnormal dose levels, the HP instructed the FHF to remain where he was and to wait for the RT. A RPF also initiated a search of the GSEP manual for possible classifications and determined that none were appropriate.

The SE notified the Shift Control Room Engineer (SCRE) and instructed him to start both trains of Standby Gas Treatment (SBGT) [BH] as a precaution. QAP 1290-1, Reporting Requirements Procedure, QOA 800-1, Irradiated Fuel Damage While Refueling, and the GSEP manual were all checked for applicability by the SE. It was determined that the conditions were such that it was not necessary to classify the event as a GSEP, no immediate off-site notifications were necessary, and further verification of no change on refuel floor radiation levels was sufficient immediate corrective action. All ARMs, as well as the radiation monitors specific to the refuel floor and the Reactor Building Ventilation System [VA], were checked and no abnormal activity was noted.

At approximately 1415 hours, the RT, RPF, LNE and OE arrived on the refuel floor. The RT verified that radiation levels on the refuel floor were normal and no Continuous Air Monitor (CAM) alarms [RA] were annunciating, and thus, it was safe to approach the fuel pool. The dropped fuel assembly and the irradiated fuel it fell on were visually examined in place from the bridge and the floor for signs of fuel damage. No damage was observed. The FHF, OE, and LNE then engaged in a ten-minute discussion of their concerns about the situation. This discussion included the abnormality of the situation, the concern that although the pool was not critical now, they could not assure this configuration would not result in criticality at some time in the future, and the concern with having the weight of the assembly on irradiated fuel. Based on these concerns, the OE determined that the situation warranted immediate action. The decision was made to rely on the expertise available on the floor (the LNE and OE have Senior Reactor Operator [SRO] Licenses, and the FHF has a Limited SRO License) and proceed with righting the fallen assembly.

The FH previously assigned to the fuel prep machine was dispatched to the refuel bridge and instructed to pick up the dropped assembly with the J hook on the auxiliary hoist and put it in the empty fuel prep machine per the previous discussion. The assembly was righted with the appropriate bridge movement to assure that there was no sliding or swinging as it came up. As the FH was transporting the assembly to the prep machine, it was realized that it could not be put in the fuel prep machine with the auxiliary hoist [HOI] due to the position of the auxiliary hoist [HOI] in relation to the main hoist. Therefore, it was necessary to put the assembly in a nearby open fuel rack space.

When the Station Manager was notified of the situation, a meeting was held between the Assistant Superintendent of Operations (ASO) and the Station Manager to discuss the situation. The decision was made to cease fuel movement until identification of root cause could be made. The ASO made a call to the refuel bridge and instructed the OE to cease all fuel movement. The OE informed him of the current status of the dropped fuel assembly, and with the agreement of the ASO, the assembly was put in the nearest open fuel rack.

The FH, after placing the dropped assembly in the fuel rack, proceeded to test the fuel grapple interlocks [IEL] on the dummy fuel bundle, at the FHF's direction, to verify operability of the grapple. After successfully completing the test, he moved a fuel assembly that had been previously placed in the fuel prep machine to its assigned location in the fuel rack, at the FHF's direction. The FHF believed that only the dropped assembly was not to be moved again. After this move, all fuel movement was ceased.

At 1605 hours, a 24-hour Emergency Notification System (ENS) phone call to the NRC per 10CFR20.403 (greater than $2,000 damage to licensed material) was made. This notification was based on the assumption that the new fuel assembly would have to be replaced, regardless of actual damage. At about 1500 hours, the event was declared a Potentially Significant Event, and, at 1635 hours, Nuclear Operations was notified. At 1900 hours, the Control Room started recording refuel floor ARMs and refuel floor radiation monitor readings every two hours.

Further immediate responses included:

- Radiation Protection performed a refuel floor air sample for noble gases, particulates, and halogens, refuel pool samples for nuclide concentrations, noble gases, and gross activity, and dose surveys of other areas of the Reactor Building, and placed an ARM near the unit one fuel pool heat exchangers [HX]. All results were normal.

- The bridge interlocks were verified and documented again later on September 21, 1989.

- A 24-hour notification to Illinois Department of Nuclear Safety (IDNS) was made on September 22, 1989. IDNS indicated a follow-up telegram would not be necessary.

- A visual inspection of a portion of the affected area of the fuel pool was performed on the morning of September 22, 1989, with a television camera [TVC] to verify no immediately detectable failure. This did verify that the assembly adjacent to the target position for the dropped assembly was sitting up about six inches for no perceivable reason.

- The original High Density Fuel Rack Analysis was reviewed and one fuel assembly laying horizontally on top of the fuel rack with fuel in the rack was determined to have been analyzed for sufficient margin to criticality.

- As of the afternoon of September 22, 1989, all use of the refuel grapple was restricted, as well as prohibiting fuel movement.

There were no other structures, systems or components inoperable or degraded at the start of this event which could have contributed to the event.

C. APPARENT CAUSE OF EVENT:

This event is being reported in accordance with 10CFR20.405(a)(1)(iv), which requires the licensee to make a report in writing within 30 days of the occurrence of any incident for which notification is required by 10CFR20.403.

The normal procedure for fuel movement as described in QFP 150-2, Refueling Platform Operations, is to lower the fuel grapple onto the fuel assembly, put the grapple control switch to "engage," verify the engaged light is lit, rotate the hoist slightly back and forth, raise the assembly out of the rack, transport the fuel assembly, lower the assembly into the rack until the slack cable light is lit, put the grapple control switch to "release," see the engaged light go off, and raise the hoist.

This time, at the point where the engaged light should have gone out, the grapple remained engaged and the light stayed on. Investigation showed that the bundle next to it was not fully seated. As a result, the grapple came in contact with the adjacent fuel assembly and could not be lowered far enough to allow the grapple's opposing J hooks to clear the assembly handle. After repeated attempts to release the assembly, the FH raised the assembly to rotate it. The grapple control switch was inadvertently left in "release" as he raised the assembly. As it was lowered after it was rotated, the bottom of the assembly (lower tie plate) contacted the top of the rack. This is not an unusual occurrence due to the small difference in size between the fuel assembly and the high density fuel rack opening. With the lower tie plate of the assembly resting on top of the rack, the weight of the assembly came off of the grapple, such that the grapple's opposing J hooks cleared the assembly handle. Since the grapple control switch was still in the "release" position, the grapple released the assembly.

The root cause for this event is a combination of personnel error and lack of procedural guidance. It appears that during the attempts to get the fuel grapple to release, the FH lost track of the position of the grapple control switch, and did not verify that it was in the "engage" position prior to lifting the fuel assembly to rotate it. Also, the FH appeared to place a large amount of emphasis on the green light which indicates the position of the grapple's opposing J hooks. As a result, the FH felt that he was okay as long as the green light was lit. This green light indicates the position of the grapple's opposing J hooks (released or engaged), and not the position of the engage switch. The fact that there was no procedural guidance for attempting to release a fuel assembly that cannot be released is a contributing cause for this event.

On September 29, 1989, the adjacent fuel assembly was removed from its location in order to determine why it had not fully seated. A piece from a previously cut up Local Power Range Monitor (LPRM) [IG][MON] was found lodged in the bottom of the rack. The piece was removed from the location, the fuel assembly was returned, and was then found to seat properly. The piece of LPRM was approximately nine inches in length. A total of 330 LPRM strings were cut up for disposal between January and June of 1989. However, it cannot be determined how this one piece fell into the bottom of the rack.

It is not uncommon for irradiated fuel at higher exposures to not fully seat due to channel bowing. However, this problem does not exist with new fuel, so a new fuel assembly should always seat properly. Observance of the digital readout of the mast height can be used to determine if a fuel assembly is properly seated. However, no procedural requirement existed to direct the FH to observe the digital readout to verify proper seating of the fuel assembly prior to releasing it. It would have been difficult for the FH standing on the refuel bridge to recognize visually that the fuel assembly was not fully seated, but the digital readout would have indicated that the mast was not at the proper height for a fully seated fuel assembly.

Two other concerns were identified in this event, neither being factors which resulted in the dropping of the fuel assembly. The first concern regards the retrieval of the dropped fuel assembly. Although the decision to pick up the dropped fuel assembly and restore it to a normal configuration was made with a full understanding of the situation by fully qualified people, communications should have been established with readily available upper station management immediately. In addition, there is no procedure which specifically addresses this situation. The other concern regards the single fuel assembly moved from the fuel prep machine after upper station management made the decision to cease fuel movement. This was caused by missed communication. It appears that the decision was communicated to the OE on the refuel floor, but the FHF understood only that the dropped fuel assembly was not to be moved. The FHF did not realize that all fuel movements were to cease. It wasn't until after the fuel assembly had been moved from the fuel prep machine to the fuel rack that he was again informed to cease all fuel moves.

D. SAFETY ANALYSIS OF EVENT:

The weight of the fuel assembly was being supported by its lower tie plate resting on the rack in the fuel pool when it fell. Thus, it fell slowly and did not bounce or roll. All initial observations (visual, air samples, dose rates, fuel pool samples, ARM indications, CAM indications) indicated there was no irradiated fuel damage. Subsequent examination of the dropped fuel assembly, after removal from the fuel pool, revealed minor indentations to the fuel channel; however, no damage was observed to the fuel rods. Fuel sipping of the 32 fuel assemblies which encompassed the region where the dropped assembly fell revealed no damage. For this particular event to occur, the weight of the fuel assembly must have come off the opposing grapple J hooks, therefore, the assembly was being supported by the fuel rack. Consequently, the length of the fall was limited to the length of the fuel assembly. Both trains of SBGT were available throughout the event. The configuration of one fuel assembly lying horizontally on the fuel in the fuel racks has been analyzed for sufficient margin to criticality and a fuel assembly drop while loading the core has been analyzed. Thus, the safety consequences of this event were minimal.

E. CORRECTIVE ACTIONS:

Several corrective actions have been taken as a result of this event. Modification M-4-1-89-152 was completed on September 27, 1989, to the Unit One refuel bridge. This modification installed an interlock which prevents raising the main grapple hoist with the grapple control switch in the release position unless the hoist is unloaded. Fuel movement with the Unit Two refuel bridge is prohibited until modification M-4-2-89-152 (which installs the same interlock to the Unit Two refuel bridge) is completed (NTS 2542008908003). Also, the fuel handling procedures have been updated with additional notes and steps to verify that the grapple control switch is in the engaged position at all times while fuel (or a blade guide) is loaded, unless releasing the fuel assembly (or blade guide) at its fully seated position in the core or in the fuel storage pool. The updated procedures also now require using the main grapple hoist position indication to verify proper seating of a fuel assembly prior to attempting to release it. If proper indication is not observed, the FH is to notify the FHF. Additional revisions will be made to the Fuel Handling procedures to provide tolerances to the FHF on the digital height read out for a fully seated bundle (NTS 2542008908001). In addition, a new procedure, QFP 110-1, Refuel Bridge Grapple Fails to Release, has been implemented. This procedure details the steps to be taken when the refuel bridge grapple does not release a fuel assembly or a blade guide.

This event was discussed with all the FHs. The FHs were trained on using the digital readout of mast height to verify that a bundle is properly seated. The training also included operation of the grapple control switch and the indication of the engaged light for grapple position.

The individuals involved in the missed communication have had the importance of conscientious communications emphasized to them.

On September 29, 1989, the dropped fuel bundle was pulled from the pool and dechanneled for inspection. Inspection of the channel revealed several indentations from the bail handles on which the fuel assembly fell. The deepest indentation was 37 mils in depth. Examination of the fuel rods revealed no damage.

Four bundles were visually examined by a General Electric representative. The bundles selected for examination included the three bundles impacted the hardest by the fallen fuel assembly based upon the indentation depth obtained from the fallen fuel assembly. These three bundles were impacted near the lower end of the fallen fuel assembly. One additional bundle was selected to include the bundle impacted the hardest by the upper end of the fallen fuel assembly. These four selected fuel bundles (LYD444, LYD453, LYD383, LYD429) were dechanneled and their fuel rods were examined for evidence of bowing or damage by impact forces. Examination of the rods and other bundle parts (upper tie plates, channel fasteners, spacers, etc.) revealed no damage.

The two rows of 16 fuel bundles (32 total) which encompassed the region where the fuel assembly fell were sipped for indication of fuel damage. The sipping of these fuel assemblies was completed on October 2, 1989. The results revealed no indication of leakage of any fuel assemblies.

Although no apparent damage has resulted to any of the irradiated fuel, 12 of the 32 potentially impacted fuel assemblies will be discharged instead of reloaded for use in the upcoming fuel cycle. Two of these fuel assemblies have four cycles of exposure and seven have three cycles of exposure. These nine fuel assemblies will be discharged since they may be replaced with other fuel assemblies (which were to be discharged) with no effect on the upcoming cycle length. Three remaining fuel assemblies with two cycles of exposure will be discharged since they were the hardest impacted by the fallen fuel assembly. One remaining fuel assembly (not one of the 32 potentially impacted) with two cycles of exposure will be discharged due to symmetry concerns with the reload. Replacing these four fuel assemblies will result in a small decrease in the upcoming cycle length.

The dropped fuel bundle will be returned to General Electric. General Electric has provided a new fuel bundle for use for the upcoming cycle.

Since a piece of an LPRM was found in the fuel rack and it could not be determined how it came to rest there, an inspection of the Unit One fuel rack will be performed with a camera. This inspection will check for the possibility of other obstructions and will cover any open locations and locations where an assembly is not fully seated (NTS 2542008908002). Also, a review of LPRM disposal (cutting and transfers) will be completed to determine any actions that could be taken to prevent this situation from occurring again (NTS 2542008908004).

F. PREVIOUS EVENTS:

A review of past Licensee Event Reports and Deviation Reports revealed one instance of a dropped fuel assembly. This event is documented in D-4-1-80-52 and concerns a new fuel assembly which was dropped while being lowered into the fuel pool using the overhead crane to place it in a fuel rack. The assembly fell on an empty portion of the fuel rack. Corrective action for the event included requiring that new fuel movements within the fuel pools be performed with the refuel bridge.

G. COMPONENT FAILURE DATA:

There was no component failure identified in this event.