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GGC-94-113

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U.S. Nuclear Regulatory Commission
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Washington, DC 20555

Reference: Quad Cities Nuclear Power Station
Docket Number 50-254, DPR-29, Unit One

Enclosed is Licensee Event Report (LER) 94-006, Revision 00, for Quad Cities Nuclear Power Plant Station.

This report is submitted as a voluntary report only.

The following commitments are being made by this letter:

An evaluation of radiological hazards will be completed and presented to senior site management for approval.

The Training Department will modify general employee training as necessary to ensure hazards associated with radiological sources are properly communicated.

The Radiation Protection Department will revise QCRP 5720-4, Personnel Decontamination, to provide specific guidance for responding to contamination indications including an IPM-8 alarm.

If there are any questions or comments concerning this letter, please refer them to Nick Chrissotimos, Regulatory Assurance Administrator at 309-654-2241, ext. 3100.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION

G. G. Campbell
Station Manager

GGC/TB/jcs
Enclosure

cc: J. Schrage
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INPO Records Center
NRC Region III

Hr Encl
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LICENSEE EVENT REPORT (LER) Form Rev. 2.0

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Title (4)

Uncontrolled Personnel Exposure From A Sr-90 Radioactive Source

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 8	0 8	9 4	9 4	-- 0 0 6	-- 0 0			9 4		0 5 0 0 0
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OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)				
01		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)	
POWER LEVEL (10)	0 0 0	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)	X 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)	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
Mike Melton, Regulatory Assurance, Ext. 3299	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)

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

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

ABSTRACT:

On August 8, 1994 a contract laborer received an estimated radiation dose of 17 to 34 rem Shallow Dose Equivalent (SDE) to the skin from a Sr-90 check source. The source was discovered in the laborer's back pocket during routine exit monitoring through a personnel contamination monitor. The source was determined to be detached from a plexiglass instrument check source in the turbine building. The initial investigation was unable to determine how the source was detached and placed in the pocket of the laborer. An ongoing security investigation is in progress. Causes of this event include personnel error (vandalism), incomplete failure mode analysis concerning the potential for vandalism, and incomplete worker awareness of the hazard. Corrective actions include restricting access to check sources, evaluating the exposure potential of vandalism with other radiological hazards, revising a procedure, and expanding the discussion of radiological hazards in General Employee Training to include potential consequences of vandalism. This event is being reported due to the significant dose to the worker, and the associated potential for exceeding the SDE limit of 10CFR20.1201.

PLANT AND SYSTEM IDENTIFICATION:

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

EVENT IDENTIFICATION: Uncontrolled personnel exposure from a Sr-90 check radioactive source.

A. CONDITIONS PRIOR TO EVENT:

Unit: One Event Date: August 08, 1994 Event Time: 1600
Reactor Mode: 01 Mode Name: Shutdown Power Level: 00

This report was initiated by Licensee Event Report 254\94-006.

SHUTDOWN (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 August 8, 1994 a contract laborer was assisting contract carpenters with erecting scaffolding in the turbine building. At 1144 the worker left the turbine building for lunch dressed in personal clothing including the blue jeans which were later found to contain the Sr-90 radiation source. The worker exited the radiological posted area (RPA) on the north end of the turbine building passing through the IPM-8 personnel contamination monitors at trackway two (TW-2) without an alarm, indicating the source was not in the worker's pocket at that time.

At 1242 the worker re-entered the building at TW-2 and walked to a change area at the south end of the turbine building and changed into blue work coveralls. The worker left the personal clothing including the blue jeans at the change area on the ground floor of the turbine building.

At 1454 the worker re-entered the turbine building at TW-2 after a break, proceeded to the change area, donned personal clothing, and returned to TW-2 to exit the turbine building. The worker alarmed the IPM-8 personnel contamination monitor required to leave the RPA. The worker immediately contacted the contract radiation protection technician (CRPT) stationed at TW-2. The CRPT observed the worker repeat the IPM-8 monitoring and checked the worker with a hand held Geiger Müeller detector (GM), in an effort to isolate and remove the contamination. The CRPT confirmed the indication was consistent with the presence of contamination reading above background over a large area, but did not identify the source in the back pocket. The worker was sent to Trackway One (TW-1) at the south end of the turbine building where personnel decontamination is normally handled and documented.

At 1534 the worker contacted the ComEd RPT stationed at TW-1 and informed the RPT of the alarms at TW-2. The RPT took the worker to an IPM-8 monitor at TW-1 which alarmed. The RPT made another attempt with a different TW-1 IPM-8 monitor which also indicated an alarm. The RPT then used a GM to check the suspected area and the GM pegged off-scale over the back pocket. The RPT made two attempts to remove a suspected hot particle from the back pocket with masking tape and then escorted the worker to the personnel decontamination room where the worker removed personal clothing and donned a paper suit ending the worker's exposure to the source.

Another ComEd RPT arrived and escorted the paper suited worker to an IPM-8 monitor at TW-1 and the worker passed with no alarm. The RPTs called for a Radiation Protection Supervisor and Health Physicist (HP) and then began to check the clothing with a GM, finding elevated readings on the blue jeans. One RPT was checking the blue jeans when the Health Physicist arrived. The RPT turned the jeans upside down and a dime shaped object fell out of the right rear pocket which the HP identified as a Sr-90 calibration source from a plexiglass fan source. These fan sources are located in various locations throughout the plant to response check dose rate instruments. The HP directed another RPT to check these fan sources to locate the origin of the detached source. Within 10 minutes the RPT determined that the source originated from a source holder attached to a supply cabinet on the main turbine floor.

Initially, the Radiation Protection Department re-enacted the chain of events with the exposed worker over three trial runs and determined an estimated exposure time of 12 minutes. Using a video of the Trackway Two survey, security card reader times and re-enactment data, the initial time estimate was refined to 12 minutes and 23 seconds from the time the pants were donned to when the pants were removed. Using TLDs, specialized dosimetry, and computer modeling along with the exposure time estimate, the estimated dose to the skin of the worker ranges from 17 to 34 rem SDE. This range in dose assumes that the active side (worst case) of the source was against the worker's skin. If we assumed the non-active side was directed towards the worker's skin, the SDE would be reduced by a factor of eight. The licensee will continue efforts at refining their dose estimate. This LER is submitted due to the significant dose to the worker, and the associated potential for exceeding the SDE limit in 10CFR20.1201.

C. APPARENT CAUSE OF EVENT:

1. Root Cause: External Human Factor, Vandalism by Individual

The source was deliberately removed from the holder and placed in the worker's pants pocket. The as yet unidentified individual(s) could have committed these actions for reasons ranging from simple mischievousness (if they had an incomplete understanding of the significant dose consequences of their actions), to malevolent behavior (if they were aware of the dose consequences of their action).

2. Contributing Causes: These causes may have reduced the possibility of occurrence or mitigated the consequences of the event.

a. Design Configuration and Analysis, Failure Modes and Effects Analysis

The placement and design of the plexiglass instrument check sources did not minimize risk from vandalism. The source holder design allows a narrow tool such as a screwdriver to be inserted into the top hole to snap the source loose to fall out through the top hole or out the bottom. In addition, the source holder in question was in an area which currently had limited work activity and personnel access which made it easier for the vandalism to occur undetected. The possibility of such vandalism and the potential for high exposures resulting from contact with these sources was not considered when designing the source holder, or when determining the location of the source holders.

b. Work Practices, Error Detection Practices, Self-checking not applied to ensure intended action is correct before it is performed. Written Communication, Content, information too generic (not equipment specific).

The CRPT at TW-2 did not identify the source in the worker's pocket in response to the IPM-8 alarm. If the source had been discovered at this time, the dose to the worker would have been reduced. After noting that several arrays on the IPM-8 alarmed at both the front and back of the body, the CRPT only surveyed the front of the worker and found readings above background over a large area. The CRPT assumed the blue work coveralls had caused a low level contamination to the worker. Previous experience had shown the blue coverals capable of causing low level contamination resulting in multiple alarms on an IPM-8 as in this instance.

QCRP 5720-4, Personnel Decontamination, directs the RPT to "Perform a survey of the effected area using a whole body contamination monitor or GM count rate instrument." This has previously been adequate guidance for responding to typical contamination events, but in this instance, because all areas were not surveyed with a hand-held probe during initial monitoring, discovery of the source was delayed.

c. Training/Qualification. Content did not address potential consequences of inappropriate actions.

The general employee training program does discuss the concerns associated with high localized skin exposures, but only in relation to hot particles. The general employee training does not specifically discuss the potential consequences of deliberately misusing radioactive material.

D. SAFETY ANALYSIS OF EVENT:

This event did not impact on Plant safety.

E. CORRECTIVE ACTIONS:

IMMEDIATE ACTIONS

1. In June of 1994 Site management initiated a Radiation Work Improvement Program. This program has clearly communicated and reinforced management's expectation that all site personnel will be held accountable for completing work in a manner consistent with proper radiological controls. This program was initiated as a result of previous examples of unacceptable performance typically involving "short-cuts" or errors as a result of incomplete understanding of radiation protection requirements. Given that this event is more serious in both consequences and intent, management has initiated an extensive investigation involving site and corporate security personnel working in conjunction with federal authorities to determine the personnel involved in this event. Once these personnel are identified they will be held accountable for their actions, and an estimate of their dose received from handling the source will be completed.

2. Site management also recognizes that they are responsible for evaluating potential hazards and establishing conditions which minimize the risks associated with these hazards. As such the following corrective actions have been completed:

   a. All Sr-90 fan sources were removed from unrestricted use on 8-9-94, and stored in a secured locker under Radiation Protection control.

   b. An inventory of all site sources was initiated on 8-9-94. This inventory was completed with all sources accounted for.

c. On 8-9-94 an evaluation of other general plant use sources was initiated and the site identified that Cs-137 button sources are used in GM friskers throughout the plant. A dose rate was calculated for these GM check sources (non licensed material) to quantify the potential hazard. An estimated skin dose rate of 200 mrem/hr was calculated, and using this dose rate with an assumed "worst case" time scenario of 8 hours of exposure prior to detection resulted in a potential SDE of 1.6 rem. Given that this exposure is well below the 50 rem annual SDE limit, and access to these sources requires disassembly of the instrument, it was decided that corrective actions for these sources were not required at this time.

d. On 8-26-94 a briefing was conducted for all RPTs on the revised expectations for responding to an IPM-8 alarm or other contamination indications.

e. An article was placed in the station newspaper reinforcing managements' expectations in regards to "Pranks" and that they will not be tolerated.

LONG-TERM ACTIONS:

1. The site will conduct an evaluation of similar radiological hazards using the following methodology:

   a. Specify the Hazard - A description of the potential dose rates and the various physical, procedural, and other barriers provided to protect individuals from unplanned exposures.

   b. Evaluate Effectiveness - Review barriers in regards to potential failure modes including deliberate tampering, probabilities for failure, and potential consequences.

   c. Propose Enhancements - Review potential changes to enhance existing barriers specifying positive and negative aspects of these enhancements.

   d. Corrective Actions - Select enhancements which provide a significant reduction of risk when compared to the associated negative impacts. Assign Departmental responsibility and due dates for completion of actions.

   This evaluation will be completed and presented to senior site management for approval (Radiation Protection, NTS 2541809400601).

2. The Training Department will modify general employee training as necessary to ensure hazards associated with radiological sources are properly communicated. (Training, NTS 2541809400602).

3. The Radiation Protection Department will revise QCRP 5720-4, Personnel Decontamination, to provide specific guidance for responding to contamination indications including an IPM-8 alarm. This revision will be incorporated into future RPT and CRPT training. (Radiation Protection, NTS 2541809400603)

F. PREVIOUS EVENTS:

A search conducted for previous events involving high personnel exposures from instrument calibration sources over the last ten years found no similar events.

G. COMPONENT FAILURE DATA:

There were no component failures related to this event.