

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) McGuire Nuclear Station - Unit 1										DOCKET NUMBER (2) 0 5 0 0 0				PAGE (3) 1 OF 0 4								
TITLE (4) Personnel Exposure																						
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	6	0	5	8	5	8	5	0	2	1	0	1	0	8	0	2	8	5	0 5 0 0 0			
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)																				
6		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)				50.73(a)(2)(v)				73.71(c)								
		20.405(a)(1)(ii)				50.73(a)(2)(vi)				50.73(a)(2)(vii)				<input checked="" type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)								
		20.405(a)(1)(iii)				50.73(a)(2)(iii)				50.73(a)(2)(viii)(A)				Voluntary								
		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)(ix)												
LICENSEE CONTACT FOR THIS LER (12)																						
NAME Jerry Day - Licensing										TELEPHONE NUMBER												
										AREA CODE		7 0 4 3 7 3 - 7 0 3 3										
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																						
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC												
SUPPLEMENTAL REPORT EXPECTED (14)												EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR						
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)												<input checked="" type="checkbox"/> NO										

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

On June 5, 1985, a radioactive particle was discovered under the upper left arm of a technician involved in steam generator tube plugging who was exiting containment. The particle was removed and later analyzed. Initial dose calculations indicated a dose of 10.6 Rem to the skin and 0.030 Rem to the whole body, which represents an overexposure to the skin for the quarter pursuant to 10 CFR 20.101a. A review of methodology and assumptions of the initial dose calculation has resulted in revised dose calculations which yield lower values for the dose which do not represent an overexposure.

The control and disposal of all protective clothing has been revised to prevent this type of incident from reoccurring.

The original calculation was based upon conservative methodology and assumptions about the exposure. The revised calculation is based upon more realistic assumptions. The health of the technician and the safety of the plant were unaffected by this incident.

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## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

FACILITY NAME (1)  McGuire Nuclear Station -Unit 1	DOCKET NUMBER (2)  0 5 0 0 0 3 6 9	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

On June 5, 1985 at 2200, a radioactive particle was discovered under the upper left arm of a technician who had been assisting in the plugging of a steam generator tube and had partially entered (head and arms) the steam generator.

The particle was removed and analyzed. The particle was found to have 1.219 micro Curies of Cobalt-60. On June 10, 1985, the dose was calculated to be 10.6 Rem to the skin and 0.030 Rem to the whole body. This is the dose at 7 mg/cm(2) skin depth averaged over 1 cm(2) and assumes contact with the skin for the two full hours of use of the protective clothing.

Subsequently, the dose was recalculated for more realistic assumptions, and as being delivered averaged over the dermal layer, as well as at 7 mg/cm(2). Changing any single parameter to a more realistic value (time, exposure depth, or movement) yields a value that is not an overexposure.

Below are the results of several calculations using more realistic assumptions:

	Time (hrs)	Skin Area cm (2)	Skin Depth mg/cm(2)	Dose Rem
Literal worst case	2	1	at 7	10.6
4-125 mg/cm(2)	2	1	4-125	1.9
4-40 mg/cm(2)	2	1	4-40	5.3
Statistically likely	1	1	at 7	5.3
Most likely transfer	.5	1	at 7	2.65
1 cm movement of particle on skin	2	2	at 7	5.3
Proposed 10 CFR 20	2	10	at 7	1.06

Calculating the dose at 7 mg/cm(2) is at a thin slice location and represents a two dimensional calculation. It is more realistic to calculate dose over a volume (three dimensional).

The time of exposure is also in question. Two hours is the maximum possible time of exposure. This conservatively assumes the particle was in the protective clothing, transferred immediately when the technician put on the protective clothing, and did not move once transferred. Since no particle motion was assumed, the dose was calculated over one square centimeter; minimal particle motion (one centimeter) would have distributed the dose as not to involve an overexposure.

Based on the above results, Duke Power concludes that no overexposure occurred.

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Beginning in April, 1985 personnel contaminations occurred as a result of microscopic particles containing only Cobalt-60. At this time an investigation was started to determine the source of the Cobalt-60. The following possibilities were evaluated:

1. All pure Cobalt-60 sources on site were lead tested but no sources were found to be leaking.
2. All new steel on site used in construction was surveyed but no contaminated material was found.
3. Detailed grid surveys of the plant were performed. No activity was above background.
4. Surveys using maslin cloth (oil cloth) were performed. All activity was below background.

It is believed that the Cobalt-60 is coming from activated stellite in the Reactor Coolant System. Due to leakage or maintenance on primary system components the activated stellite (Cobalt 60) is picked up on the protective clothing. During laundering of protective clothing most contamination is removed. However, the Cobalt-60 particles are insoluble and can be suspended in the wash water and then redeposited on the protective clothing.

Corrective Action:

The following corrective actions were initiated after the original personnel contaminations:

Extensive frisking (80 man-hours per day) of all protective clothing.

Disposal of all cloth coveralls and hoods. New coveralls and hoods purchased. Prior to mass disposal only protective clothing used in high contamination jobs had been disposed of as radwaste.

Increased the number of personnel frisking stations within the plant.

Frisking the inside of protective clothing by purchasing special (yellow) coveralls to be worn in very high contamination and high temperature areas.

More use of plastic and disposable protective clothing where possible.

Requisition of an automatic laundry monitor to eliminate technician error.

The individual was removed from further activities involving radiation exposure for the remainder of the quarter. The incident has been reviewed with appropriate personnel at other Duke stations.

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Safety Analysis:

The exposure had no effect on any safety related system and the health and safety of the public were not affected.

The exposure of the technician was calculated with realistic assumptions and did not involve an overexposure. The health of the technician was not affected by this event.