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DUKE POWER

August 10, 1994

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Subject: McGuire Nuclear Station Unit 1  
Docket No. 50-369  
Voluntary Licensee Event Report 369/94-05  
Problem Investigation Process No.: 1-M94-0801

Gentlemen:

Attached is a voluntary Licensee Event Report 369/94-05 concerning the Boron dilution of the Unit 1 Spent Fuel Pool during drain down and decontamination of the Transfer Canal. This report is being submitted voluntarily and is not required per 10 CFR 50.73. This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

A handwritten signature in cursive script, appearing to read 'T.C. McMeekin'.

T.C. McMeekin

RJD/bcb

Attachment

xc: Mr. S.D. Ebnetter  
Administrator, Region II  
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U.S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Washington, D.C. 20555

Mr. George Maxwell  
NRC Resident Inspector  
McGuire Nuclear Station

160110  
9408180023 940810  
PDR ADOCK 05000369  
S PDR

Handwritten initials, possibly 'IEPP', with a vertical line drawn through them.

bxc: B.L. Walsh (EC11C)  
P.R. Herran (MG01VP)  
R.C. Norcutt (MG01WC)  
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NSRB Support Staff (EC 12-A)

## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS  
INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD  
COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION  
AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR  
REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO  
THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF  
MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME(1)

McGuire Nuclear Station, Unit 1

DOCKET  
NUMBER(2)

05000 369

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TITLE(4) Boron Dilution of the Unit 1 Spent Fuel Pool During Drain Down and Decontamination of the Transfer Canal.

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)
07	11	94	94	05	0	08	10	94		05000
										05000

OPERATING

1

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

MODE(9)

20.402(b)

20.405(c)

50.73(a)(2)(iv)

73.71(b)

POWER

100%

20.405(a)(i)(i)

50.36(c)(1)

50.73(a)(2)(v)

73.71(c)

LEVEL(10)

20.405(a)(1)(ii)

50.36(c)(2)

50.73(a)(2)(vii)

X

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)

OTHER  
(Specify in  
Abstract below  
and in Text  
NRC Form 366A)

LICENSEE CONTACT FOR THIS LER(12)

NAME

Ricky J. Deese, Manager, McGuire Safety Review Group

TELEPHONE NUMBER

AREA CODE

704

875-4065

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

MONTH

DAY

YEAR

SUBMISSION

DATE(15)

YES (If yes, complete EXPECTED SUBMISSION DATE)

X

NO

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

This report is being submitted voluntarily to provide information and lessons learned regarding a Reactivity Management Event. On July 10, 1994, with Unit 1 operating in Mode 1 (Power Operation) at 100 percent power, Mechanical Maintenance personnel began the drain down of the Unit 1 Spent Fuel Pool Transfer Canal. During the drain down, a demineralized water misting system was used to keep the pool walls wet to minimize potential airborne contamination. Approximately 28,000 gallons of demineralized water was added to the pool during the decontamination process. The addition of the demineralized water lowered the Boron concentration from 2105 parts per million (ppm) to 1957ppm. The Technical Specification requires a Boron concentration  $\geq 2000$ ppm. The Action Statement to suspend fuel movement while the Boron concentration is less than 2000ppm was not violated. Boric Acid was added to the pool to bring the Boron concentration above 2000ppm. This event has been assigned a cause of improper Managerial Methods. Corrective actions include heightening the awareness of site personnel to Reactivity Management concerns, evaluation of work processes/controls, rewrite of the procedure used, incorporation of work involving complex evolutions and multiple interfaces into the Risk Assessment Process.

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This is a voluntary LER.

## EVALUATION:

## Background

Valve [EIIS:ISV] 1KF-122, Fuel Transfer Tube Isolation, is located in the Spent Fuel Pool (SFP) Transfer Canal and is used to isolate the SFP from the Refueling Cavity in the Reactor Building. During normal operation, a blank flange is installed on the Reactor Building side of the Fuel Transfer Tube and valve 1KF-122 is open. This allows SFP water to enter the Fuel Transfer Tube supplying a source of borated water to the Standby Makeup Pump. This pump is part of the Standby Shutdown System (SSS) and provides water to the Reactor Coolant (NC) system [EIIS:AB] and the NC pump [EIIS:P] seals if normal sources are lost. The SSS is required to be operable during Modes 1 (Power Operation), 2 (Startup), and 3 (Hot Standby). Technical Specification 3.9.12a requires the Boron concentration in the SFP to be maintained at  $\geq 2000$  parts per million (ppm). The associated action statement requires that all fuel movement be suspended if the Boron concentration is found to be below 2000ppm.

## Description of Event

This report is being submitted voluntarily to provide information and lessons learned regarding a Reactivity Management Event. On July 5, 1994, with Unit 1 operating in Mode 1 (Power Operation) at 100 percent power, Mechanical Maintenance personnel performed preliminary work in preparation for the drain down of the Fuel Transfer Canal (FTC). The work included the installation of approximately 26 feet of 3/4 inch PVC pipe along both sides of the FTC. Approximately 1/16 inch holes had been drilled in the pipe at 3 to 5 inch intervals. The pipe was capped at one end and connected to a standard 3/4 inch hose on the other end. The hose was connected to a demineralized water line, but not charged. The purpose of the PVC pipe was to provide a mist of water to the walls of the FTC while the canal was being drained. This would ensure that the walls stayed wet to minimize potential airborne contamination.

On July 10, 1994, at approximately 0030, Mechanical Maintenance personnel prepared to drain down the FTC to allow the Fuel Transfer Tube Isolation valve, 1KF-122 to be replaced. Prior to beginning work, the team held a pre-job briefing and contacted Operations personnel to obtain approval to begin work.

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The Mechanical Maintenance Team installed the Weir Gate and inflated the seals per Operations Procedure OP/O/A/6550/14, Draining and Filling of Spent Fuel Pool Transfer Canal and Cask Area. Operations personnel tagged the valve supplying the air to the seals in the open position. The Maintenance Team then lowered a submersible pump into the FTC and contacted the supervisor of a multi-skilled shift work team (SPOC) responsible for draining the FTC. A SPOC Team member was assigned to monitor the drain down process and secure the pump when the canal was empty. The Maintenance Team started the pump and turned on the mister system to keep the FTC walls wet.

The Maintenance Team instructed the SPOC Team member to monitor SFP level, Weir Gate seal pressure, and pump operation. The SPOC Team member was also asked to check the Weir Gate seals for leaks and ensure that the FTC walls stayed wet to minimize potential airborne contamination. During the day shift on July 10, 1994, Operations Control Room personnel went to the SFP Building and observed the drain down/mister operation. The Control Room Staff discussed the effects of the mister system on Boron concentration in the SFP. They referred to the SFP makeup procedure and decided that the system would not add more demineralized water to the pool than was allowed by the makeup procedure.

At approximately 2045, the drain down was complete and the pump was secured. To ensure that the FTC walls stayed wet, the mister system was allowed to continue to run. No specific instructions had been given to the SPOC team about turning it off.

On July 11, 1994, the Maintenance Team pumped the water that was added to the FTC by the mister system out of the FTC so the Mechanical Maintenance team could begin work on valve 1KF-122. They also throttled the mister system back to reduce the amount of water being added to the FTC. Radiation Protection personnel had taken radiation level readings and believed the risk of airborne contamination had been reduced.

On July 12, 1994, Radiation Protection personnel contacted Chemistry personnel and informed them about the demineralized water that had been added to the pool. There was a concern about the amount of water that had been added by the mister system and its effect on the Boron concentration in the pool. Chemistry personnel completed sampling of the pool at 1100 and determined the Boron concentration to be 1957ppm. Enough Boric Acid was added to the pool, to raise the concentration above the Technical Specification requirement of  $\geq 2000$ ppm.

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Conclusion

This event is assigned a cause of improper Managerial Methods. The following is a list of examples/contributing factors.

- 1) The personnel responsible for execution support for the Maintenance Team allowed the misting system that had been used in the past to be altered without reviewing impact on demineralized water flow and thus Boron concentration.
- 2) The turnover of the job between the Maintenance Team and the SPOC Team was not adequate. The Maintenance Team was familiar with the procedure and was aware of the note in the procedure that stated, "The continuous use of misting hoses will add a substantial amount of water which when pumped over can cause pool dilution". They did not inform the SPOC of the note and the need to be concerned about how much water was added.
- 3) Operations personnel questioned the addition of demineralized water to the pool, but did not verify Boron concentration of the pool or ensure that adequate controls were in place to prevent over dilution.
- 4) The part of the job associated with drain down of the FTC was not discussed or planned out in detail. Since the drain down was being performed by an existing procedure and had been performed before without incident, no one saw a need to review the process. The plan for the modification should have included all aspects of the job, including drain down and decontamination of the FTC.
- 5) Personnel involved with the actual drain down did not see the note in the procedure concerning the potential for diluting the pool and did not recognize that the mister system could significantly affect the Boron concentration of the pool. Personnel interviewed did not have a good understanding of their responsibilities associated with Reactivity Management (Nuclear System Directive 304).
- 6) The incorrect tags were hung on the air supply valves for the Weir Seals. OP/O/A/6550/14 specifies red tags (Employee Safety) to be hung on the valves. Operations personnel hung white tags (Equipment Safety) on the valves. The procedure was not followed as required.



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7) The SPOC team was not qualified to the procedure and had not run the procedure previously. This situation requires that the Supervisor or qualified individual give close direction to the employees involved to ensure adequate completion of the task assigned.

8) The decision, on July 11, to pump the additional water out of the FTC, without determining the full impact was in error. Emphasis was on the work schedule and desire to return the SSS to operation as soon as possible. The Job Sponsor, Radiation Protection Technician, Mechanical Maintenance Valve Supervisor, Work Window Manager, Maintenance Team Members, and the Maintenance Team Support Technician, reviewed the situation; however, the amount of demineralized water in the FTC was unknown. The possibility that this amount of water could lower the Boron concentration of the SFP below 2000ppm was not considered.

Corrective actions to prevent recurrence include heightening the awareness of site personnel to Reactivity Management concerns, evaluation of work processes/controls, rewrite of procedure OP/0/A/6550/14 to better clarify the concern for ensuring the misting system does not add enough water to effect SFP Boron concentration, and incorporation of work involving complex evolutions and multiple interfaces into the Risk Assessment Process.

A review of the Problem Investigation Process data bases for the past 24 months revealed no event related to Reactivity Management. Therefore, this event is not considered to be recurring.

This event is not Nuclear Plant Reliability Program (NPRDS) reportable.

There were no radiation overexposures, or uncontrolled releases of radioactive material resulting from this event.

## CORRECTIVE ACTIONS:

- Immediate: 1) Chemistry personnel added approximately 1000Kg of Boric Acid to the pool.
- 2) Mechanical Maintenance personnel isolated the Mister system and only used it intermittently to wet the walls.

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**Subsequent:** Site Management has clarified that the Nuclear Engineering Group is responsible for work associated with the Spent Fuel Pool until improved processes/controls are in place.

- Planned:**
- 1) Nuclear Engineering personnel will identify and implement a method to heighten the awareness by appropriate site personnel to Reactivity Management concerns.
  - 2) Nuclear Engineering will evaluate work associated with the Spent Fuel Pool and recommend improved processes/controls to ensure concerns such as Foreign Material Exclusion, Dilution, Fuel integrity etc. are properly addressed.
  - 3) Maintenance Procedure Group will coordinate with Operations and Nuclear Engineering to rewrite OP/O/A/6550/14 to specifically address the decontamination activities.
  - 4) Superintendent of Mechanical Maintenance will ensure that the Risk Assessment process includes a review of work involving complex evolutions and multiple interfaces, not covered by existing processes, to determine if Project Managers are needed.
  - 5) Safety Assurance personnel will lead a review of the Work Control process using the problems identified in this event as examples of specific areas to address.

**SAFETY ANALYSIS:**

This event had no safety significance and is being provided voluntarily to provide information and lessons learned regarding a Reactivity Management event. The Spent Fuel Pool is designed to contain borated water at  $\geq 2000$ ppm Boron. However, the Licensing Basis for the plant does not take any credit for dissolved Boron in the pool for normal operation. The borated water in the pool serves two purposes. One purpose is to provide an additional margin of reactivity control above that which is required by the Final



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Safety Analysis Report. It also serves as a source of borated water for the Standby Makeup pump.

The Standby Makeup pump was removed from service to allow draining of the FTC. Therefore, the possibility of the diluted water being pumped into the NC System was eliminated. Also, the effect on reactivity control within the pool was minimal. Boron concentration was only two and one half percent below the Technical Specification limit. The Licensing Basis for the plant takes no credit for dissolved Boron in the pool under normal conditions. The fuel storage racks provide all of the negative reactivity required to keep K(eff) below .95.

The Technical Specification Action Statement requires that all fuel movement be suspended, if the Boron concentration in the pool drops below 2000ppm. No nuclear fuel was moved; therefore, at no time during this event was the Technical Specification Action Statement violated.

At no time were the health and safety of the public or plant personnel affected by this event.