BRUCE H HAMILTON
Vice President
McGuire Nuclear Station

Duke Energy Corporation
MG01VP / 12700 Hagers Ferry Road
Huntersville, NC 28078

704-875-5333
704-875-4809 fax
bhhamilton@duke-energy.com

June 24, 2009

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

Subject: Duke Energy Carolinas, LLC
McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369, 50-370
Licensee Event Report 369/2009-01, Revision 0
Problem Investigation Process (PIP) M-09-02216

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report 369/2009-01, Revision 0, regarding the past inoperability of the Nuclear Service Water System "A" Trains due to potential for strainer fouling.

This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (i) (B), an Operation Prohibited by Technical Specifications, and 10 CFR 50.73 (a) (2) (v) (B), any Event or Condition That Could Have Prevented Fulfillment of the Safety Function.

This event is considered to be of no significance with respect to the health and safety of the public. There are no regulatory commitments contained in this LER.

If questions arise regarding this LER, contact Rick Abbott at 980-875-4685.

Very truly yours,

Bruce Hamilton

Bruce H. Hamilton

Attachment

IE22
NRR

cc: L. A. Reyes, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303

J. H. Thompson, Jr. (Addressee Only)
Senior Project Manager (McGuire)
U.S. Nuclear Regulatory Commission
Mail Stop O-8G9A
Washington, DC 20555

J. B. Brady
Senior Resident Inspector
U.S. Nuclear Regulatory Commission
McGuire Nuclear Station

B. O. Hall, Section Chief
Radiation Protection Section
1645 Mail Service Center
Raleigh, NC 27699

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE
Nuclear Service Water System (NSWS) "A" Trains Past Inoperable when aligned to the Standby Nuclear Service Water Pond (SNSWP) due to corrosion.

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									MNS Unit 2	05000 370
04	27	2009	2009	001	0	06	24	2009	FACILITY NAME: None	DOCKET NUMBER: 05000

9. OPERATING MODE: 1

10. POWER LEVEL: 100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

	20.2201(b)		20.2203(a)(3)(i)		50.73(a)(2)(i)(C)		50.73(a)(2)(vii)
	20.2201(d)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(A)
	20.2203(a)(1)		20.2203(a)(4)		50.73(a)(2)(ii)(B)		50.73(a)(2)(viii)(B)
	20.2203(a)(2)(i)		50.36(c)(1)(i)(A)		50.73(a)(2)(iii)		50.73(a)(2)(ix)(A)
	20.2203(a)(2)(ii)		50.36(c)(1)(ii)(A)		50.73(a)(2)(iv)(A)		50.73(a)(2)(x)
	20.2203(a)(2)(iii)		50.36(c)(2)		50.73(a)(2)(v)(A)		73.71(a)(4)
	20.2203(a)(2)(iv)		50.46(a)(3)(ii)	X	50.73(a)(2)(v)(B)		73.71(a)(5)
	20.2203(a)(2)(v)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(C)		OTHER
	20.2203(a)(2)(vi)	X	50.73(a)(2)(i)(B)		50.73(a)(2)(v)(D)		Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Richard Abbott, Regulatory Compliance	980-875-4685

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	BI	PSP		YES					

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

Unit Status: Unit 1 and Unit 2 were in Mode 1 at 100% power.

Event Description: On April 27, 2009, the Unit 1 "A" (1A) and Unit 2 "A" (2A) NSWS Trains suctions were realigned to the SNSWP, the automatic backwash function of the strainers upstream of the pumps was disabled and the pumps were declared inoperable as prerequisites to perform testing. During the test, unexpected fouling of the 2A NSWS Strainer was caused by corrosion products which collected on the strainer and resulted in reduced 2A RN train flow rate. A subsequent evaluation of this condition determined operator actions specified for strainer fouling were not considered time critical and would not have assured previous "A" Train NSWS pump operability for loss of Instrument Air events and "A" Trains pump suction are also manually realigned to the SNSWP.

Event Cause: Corrosion products accumulated on the surface of the "A" Trains SNSWP pump suction header piping due to an inadequate frequency, duration and flow rate specified in the periodic flush procedure.

Corrective Actions: Immediate action was taken to assure "A" Trains NSWS operability if "A" Train is required to be manually aligned to the SNSWP. Actions will be taken to revise the flush procedure.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

BACKGROUND:

Applicable Energy Industry Identification (EIIS) system and component codes are enclosed within brackets. McGuire unique system and component identifiers are contained within parentheses.

The principal safety related function of the Nuclear Service Water System (RN) [BI] is the removal of decay heat from the reactor via the Closed Cooling Water System (KC) [CC].

The Nuclear Service Water System (RN) [BI] provides assured cooling water for various Auxiliary Building and Reactor Building heat exchangers during all phases of station operation. Each unit has two redundant "essential headers" serving two trains of equipment necessary for safe station shutdown, and a "nonessential header" serving equipment not required for safe shutdown.

The system is further designed to tolerate a single failure following a Loss of Coolant Accident (LOCA) on one unit with a controlled shutdown on the alternate unit concurrent with a loss-of-offsite power on both units, or a seismic event causing loss of Lake Norman resulting in controlled shutdown on both units concurrent with a loss-of-offsite power on both units.

Strainers [STR] are installed immediately upstream of the RN pumps. The related support function of the RN strainer is to ensure adequate suction pressure and flow rate are maintained during normal and accident conditions. Each strainer can be backwashed either automatically or manually.

The strainers [STR] are of the automatic back flush type, and normally each will back flush with Nuclear Service Water from the RN pump discharge when the pressure drop across the strainer reaches a predetermined value.

A safety injection signal will fail closed the backwash return valve and a loss of instrument air will fail closed the backwash supply and return valve. In the event instrument air is not available, backwash will be controlled manually based on strainer differential pressure. In addition, the manual control of the return valve prevents unnecessary loss of water from the system when aligned to the SNSWP. On loss of instrument air, operating procedures manually align "B" Train of the nuclear service water system to the SNSWP. This suction source diversification provides additional protection against strainer fouling when automatic backwash is not available.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

The normal source of water to the RN [BI] system is from Lake Norman. A single line from the Low Level Intake Cooling Water system provides raw water to both "A" and "B" RN System Trains. Engineered Safety Feature actuation causes the low-level intake supply to automatically align to feed the "A" Train RN [BI] from Lake Norman while the "B" Train RN [BI] supply is automatically aligned to the Standby Nuclear Service Water Pond (SNSWP). In the event of a seismic event or Loss of Lake Norman, the RN System "A" Trains will be manually aligned to the SNSWP.

The RN [BI] System supports the operability of other Systems including the Diesel Generator (DG)[DG], Control Room Area Chilled Water (YC)[KM], Auxiliary Building Filtered Ventilation Exhaust System (VA) [VF], Auxiliary Feedwater (CA)[BA], Component Cooling Water (KC)[CC], Residual Heat Removal (ND)[BP], Safety Injection System (NI) [BQ], Containment Spray System (NS)[BE], and the Chemical and Volume Control System (NV)[CB].

EVENT DESCRIPTION:

On April 27, 2009, the Unit 1 "A" (1A) and Unit 2 "A" (2A) NSWS Trains suctions were realigned to the Standby Nuclear Service Water Pond (SNSWP), the automatic backwash function of the strainers upstream of the pumps was disabled and both "A" Train NSWS pumps were declared inoperable as prerequisites to perform testing.

The purpose of the test was to collect RN pump suction and discharge pressure data at various flows while aligned to the Standby Nuclear Service Water Pond (SNSWP). The RN pump strainer automatic backwash function was disabled to improve the accuracy of the test data collected during testing. At increased flow test conditions Operators observed increased strainer differential pressure and reduced system flow. The RN 2A Train pump was removed from service to avoid possible pump damage.

A subsequent evaluation of this condition determined operator actions specified for strainer fouling were not considered time critical and would not have assured previous "A" Train NSWS pump operability for loss of Instrument Air events and "A" Trains pump suction are also manually realigned to the SNSWP.

It was determined there were two periods during the past three years (4/27/06 - 8/16/07 and 11/25/08 - 4/29/09) when fouling could have impacted

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

1A and 2A NSWS pump operability. These durations exceeded the 72 hour completion time allowed by Technical Specifications (TS) 3.7.7 and is reported as a condition prohibited by plant TS in accordance with 10 CFR 50.73(a) (2) (i) (B). In addition, scheduled maintenance or testing performed during these periods rendered "B" Train NSWS inoperable resulting in two trains being simultaneous inoperable for brief periods and is reportable as an event or condition that could have prevented the fulfillment of a safety function in accordance with 10 CFR 50.73(a)(2)(v)(B).

From 8/16/07 until 11/25/08 McGuire had an operator dedicated to immediately perform a manual backwash of the NSWS strainers for any event where the automatic backwash function was disabled. Therefore, reasonable assurance of operability existed for all normal or accident conditions during this period.

The relevant sequence of events related to the testing is as follows (all times approximate):

- 4/27/09; 1159 Hours: McGuire Nuclear Station (MNS) initiated testing, "Data Collection for A Train RN Aligned to SNSWP."
- 4/27/09; 1242 Hours: 1A and 2A Trains of RN were aligned to the SNSWP.
- 4/27/09; 1258 Hours: 1A and 2A RN Trains declared inoperable.
- 4/27/09; 1334 Hours: 1A RN Pump started per test procedure.
- 4/27/09; 1547 Hours: 2A RN pump started per test procedure.
- 4/27/09; 1634 Hours: 1A & 2A RN Pump flows of approximately 10,000 GPM each were obtained.
- 4/27/09; 1650 Hours: 2A RN pump strainer differential pressure (D/P) was greater than 10 Pounds Per Square Inch.
- 4/27/09; 1654 Hours: Unit 2 received alarms for low cooling water flow to the containment lower compartment vent systems. Operators began reducing 1A and 2A RN system flows in response to the alarms and indications.

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- 4/27/09; 1705 Hours: 2A RN Pump Strainer D/P was in an alarm condition and steps were initiated to perform manual backwash of the RN strainer.
- 4/27/09; 1712 Hours: The 2A RN Pump was removed from service.
- 4/27/09; 1725 Hours: Testing was suspended and post event actions taken.

The immediate determination of operability conservatively extended the fouling condition to all RN Strainers [STR] and action was taken to assure RN [BI] operability under all normal and accident conditions. Specifically, an operator dedicated to perform manual backwash was stationed such that strainers could be backwashed within required times.

Subsequent analysis of the event determined that the reduced flow was caused by RN strainer fouling due to corrosion products. The SNSWP supply piping to RN is carbon steel. Carbon Steel base metal in a raw water environment typically contains a corrosion layer. Once the corrosion layer breaks away from the pipe surface the "chip scale" is carried to downstream components in varying amounts based on pipe geometry and local velocities.

Lab analysis of a sampling of material collected from the 2A RN strainer following the test concluded, in part, "The 2A RN strainer debris is consistent with steel corrosion product, consisting mostly of iron and oxygen." Therefore, the material responsible for the fouling in the 2A RN strainer was corrosion products from the SNSWP supply piping.

The "A" train SNSWP supply piping is flushed through performance of periodic testing, "Train A SNSWP Supply and Return Header Flush." This periodic test (PT) is performed annually with the flush duration lasting about an hour. The typical flow rate achieved in the "A" train SNSWP supply header during this PT is 16,500 gallons per minute (GPM). This flow rate was inadequate to provide a successful flush of the corrosion products in the "A" Train header and did not meet the GL 89-13, "Service Water System Problems Affecting Safety Related Requirements", recommendation of flushing at the "*maximum design flow.*" The frequency and duration of the flush was insufficient to flush out transportable corrosion products in the header.

The "B" train supply header from the SNSWP flush was accomplished by the performance of the "B" train flow balance procedure. "B" Train flow balance is performed more frequently, at higher flow rate and for longer durations

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

than the "A" Train flush procedure. The increased frequency, flow and test duration provided assurance of "B" Train operability. Subsequent testing confirmed Unit 1 and Unit 2 RN [BI] System "B" Train operability were not impacted by the same fouling mechanism experienced with the "A" Train RN [BI] and remained operable prior to, during and following the event. Therefore, actions to dedicate an operator to manually backwash the "B" Trains was an enhancement and was not an action necessary to restore "B" Train operability while aligned to the SNSWP.

CAUSAL FACTORS:

The cause of this event was inadequate flushing of the "A" train SNSWP supply piping. Periodic flushing of the "A" train RN supply headers at less than design flow rates, at less than optimum frequency, and for insufficient duration led to ineffective flushes and the accumulation of corrosion products which challenge the design function of the RN system.

Contributing to the cause was limited supply piping inspections and incorrect design assumptions. Specifically, visual inspections were limited to the first few hundred feet of the approximate 2,000 feet of piping of the "A" train SNSWP supply header based on the capabilities of commercial scuba divers. Consequently, portions of "A" train SNSWP supply piping have not been inspected.

Engineering inputs used during the development of testing procedure, "Data Collection for A Train RN Aligned to SNSWP", were based on an assumption that no strainer backwash is expected due to fouling when aligned to the SNSWP. RN macro-fouling calculation and associated RN Design Bases Documents stated that the SNSWP is clean and therefore strainer backwashes are not expected when aligned to the SNSWP. This was a contributor to the test procedure development that isolated automatic backwash during the performance of the testing which aligned "A" train to the SNSWP.

CORRECTIVE ACTIONS:

Immediate:

1. An operator, dedicated to perform manual backwashes, was stationed such that RN strainers could be backwashed within required times.

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Subsequent:

1. "B" Trains RN [BI] were flow tested at increased flow rates and duration and it was determined that the "B" train of the RN [BI] was not affected by the fouling mechanism discovered on the "A" Train due to adequate flushing.

Planned:

1. Ensure periodic "A" train and "B" train system flush procedures to reflect the frequency, duration, flow rates and acceptance criteria required to assure the adequacy of the flush to prevent adverse accumulations of corrosion products.

2. Perform a detailed review of all other RN system flush procedures to ensure quantifiable acceptance criteria exists or develop a means to visually inspect the piping following the flush to ensure it is free of transportable corrosion products and other debris.

SAFETY ANALYSIS:

NSWS "A" Train fouling requires the an event where the "A" Train is required to be aligned to the SNSWP and high system flow conditions are possible. This can occur following either Cowans Ford Dam failure(Loss of Lake Norman), low level intake piping failure, or seismic event (Operating Basis Earthquake exceeded alarm)along with loss of instrument air which causes valves to fail open placing increased demands on NSWS flows.

This condition has been evaluated both from a probability of occurrence and from a core damage probability perspective considering the condition to have existed for the entire year. As expected, probability or likelihood of strainer impairment due to a seismic event which fails instrument air is low. When consideration is given to the remaining NSWS "B" Train, the core damage probability (CDP) is very small. Therefore, this condition had no impact on the health and safety of the public.

ADDITIONAL INFORMATION:

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In 2007, a similar event occurred as documented in Problem Identification M-07-04313, "Inability to manually backwash RN strainers during post-accident conditions." This event was caused by macro fouling due to alewife fish intrusion and questioned the ability to manually backwash the NSWS Strainers in the event of an accident. Fouling from corrosion products was not evaluated in this report; however, the site did evaluate fouling from macro-fouling sources in the SNSWP.