Duke Energy®

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

December 30, 2008

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

Subject: Duke Energy Carolinas, LLC
McGuire Nuclear Station, Unit 1
Docket No. 50-369
Licensee Event Report 369/2008-03, Revision 0
Problem Investigation Process No.: M-08-07057

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 369/2008-03, Revision 0, regarding the Unit 1 Manual Reactor trip completed on October 31, 2008 due to K-2 Control Rod drop condition caused by shorted control rod drive mechanism (CRDM) cable connector.

This report is being submitted in accordance with 10 CFR 50.73 (a) (2) (iv) (A). 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 E. Abbott at 704-875-4685.

Very truly yours,

BH Copps for
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. F. Stang, 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
McGuire Nuclear Station, Unit 1	05000- 0369	1 OF 5

4. TITLE
Unit 1 Manual Reactor Trip taken to mitigate control rod drop caused by shorted control rod drive mechanism (CRDM) cable connector.

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
									None	
10	31	2008	2008	- 003	- 00	12	30	2008	FACILITY NAME: None	DOCKET NUMBER

9. OPERATING MODE
2

10. POWER LEVEL
0

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)	X 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)	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)	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)
Rick Abbott, Regulatory Compliance	704-875-4685

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
B	JD	CON	W121	Y					

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

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

Event Description:
On October 31, 2008, Unit 1 was in Mode 2 and performing Zero Power Physics Testing when operators received a "Rod Control Urgent Failure" annunciator. Abnormal procedure 14 was entered and subsequently re-entered when control rod K-2 dropped to the fully inserted position. The condition was terminated when the operators manually opened the Unit 1 Reactor Trip Breakers per operating procedure and completed subsequent emergency response procedure actions. This event is considered to be of no significance with respect to the health and safety of the public.

Event Cause:
A root cause was completed following the event and it was determined a CRDM power cable head connector failed causing the K-2 control rod to drop to the fully inserted position. It was concluded the CRDM power cable head connector design was inadequate for the application.

Corrective Actions:
The Unit 1 CRDM connectors were removed and the cables were spliced and tested prior to returning Unit 1 to service.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
McGuire Nuclear Station, Unit 1	05000369	2008	- 003 -	00	2 OF 5

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

BACKGROUND

The following information is provided to assist readers in understanding the event described in this LER. Applicable Energy Industry Identification [EIIS] system and component codes are enclosed within brackets. McGuire unique system and component identifiers are contained within parentheses.

Rod Control System [JD](IRE):

The Rod Control System provides for reactor power modulation by manual or automatic control of full length control rod banks in a pre-selected sequence and for manual operation of individual banks. Alarms are provided to alert the operator in the event of a control rod deviation exceeding a preset limit.

Reactor Protection System [JC](IPE):

The Reactor Protection System automatically keeps the reactor operating within a safe region by shutting down the reactor whenever the limits of the region are approached. The safe operating region is defined by several considerations such as mechanical/hydraulic limitations on equipment, and heat transfer phenomena. Therefore, the Reactor Protection System monitors process variables which are directly related to equipment mechanical limitations, such as pressure, pressurizer water level and also on variables which directly affect the heat transfer capability of the reactor. Still other parameters utilized in the Reactor Protection System are calculated from various process variables. Whenever a direct process or calculated variable exceeds a setpoint the reactor is shut down in order to protect against either gross damage to fuel cladding or loss of system integrity which could lead to release of radioactive fission products into the Containment.

The various reactor trip circuits automatically open the reactor trip breakers whenever a condition monitored by the Reactor Protection System reaches a preset or calculated level.

Station operators may elect to manually actuate the reactor trip switchgear (manual reactor trip) using either of two control board switches. One switch actuates the train A trip breaker; the other switch actuates the train B trip breaker. Operating either manual trip switch

removes the voltage from the under-voltage trip coil, energizes the shunt trip coil, and trips the reactor.

EVENT DESCRIPTION

On October 31, 2008, Unit 1 was in Mode 2 (Startup). Control Rods were being inserted while performing Zero Power Physics Testing when Control Bank B Group 2 stopped moving and the operators received the "Rod Control Urgent Failure" annunciator alarm. The operators entered into and executed the control room annunciator response procedure which then directed the operators to enter the abnormal procedure for "Rod Control Malfunction" (AP-14). The purpose of AP-14 is to provide operators with the proper response in the event of a rod control malfunction. The AP provides guidance for operators to assess plant conditions and identify appropriate steps for Dropped or Misaligned Control Rods, Failure to Move Control Rods on Demand or Continuous Control Rod Movement. Subsequently, control rod K-2 dropped to the fully inserted position, operators re-entered AP-14 and rods could not be moved using the rod control system.

Enclosure 1 "Response to Dropped or Misaligned Rod" of AP-14 directed operators to shutdown to Mode 3 per the normal operating procedure. The operators manually opened the Unit 1 Reactor Trip Breakers in accordance with the normal operating procedure steps. At the time the reactor protection system was manually activated the reactor core was sub-critical. Manual actuation of the Reactor Protection System to mitigate a condition when the reactor is subcritical is 8 hour reportable per 10 CFR50.72 (b) (3) (iv) (A) followed up with a written report within 60 days per 10 CFR50.73 (a) (2) (iv) (A).

CAUSAL FACTORS

A root cause was completed following the event and it was determined the Control Rod Drive Mechanism (CRDM) power cable head connector failed causing the K-2 control rod to drop to the fully inserted position. It was determined the CRDM power cable head connector design was inadequate for the application.

Connector causal factors supported by metallurgical analysis are:

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
McGuire Nuclear Station, Unit 1	05000369	2008	- 003 -	00	4 OF 5

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

- Aging due to radiation, temperature, and vibration causing particle migration.
- Conductive material on Rubber Grommet internal to the CRDM connector.
- Faulty barrier internal to connector.

The Root Cause investigation revealed conductive material was on the upper surface of the rubber grommet (an insulator within the CRDM connector assembly). The non-routine act of disconnecting and reconnecting the CRDM cable from the CRDM head connection can generate conductive material from within the CRDM head connector. The design and orientation of the CRDM head connector allowed for collection of conductive material around the base of the pins at the grommet interface. Degradation of the grommet material caused a loss of compression over time, allowing a horizontal pathway for collected conductive material to migrate across the grommet face, providing conditions for arcing and eventually providing a pin-to-pin conductive path. This condition is also applicable to Unit 2 (when the CRDM cable is disconnected/reconnected to the CRDM head connection) and a planned corrective action will address the condition.

CORRECTIVE ACTIONS

Immediate:

1. Operations personnel responded to the K-2 rod drop in accordance with normal and abnormal station procedures. Following the manual opening of the reactor trip breakers operators entered and executed the emergency procedure for reactor trip.

Subsequent:

1. Following troubleshooting, all Unit 1 CRDM head connectors (53) were removed and spliced.

2. A Nuclear Network message was issued December 11, 2008 to inform the industry of the failure mechanism associated with PYLE STAR-LINE Connectors.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
McGuire Nuclear Station, Unit 1	05000369	2008	- 003 -	00	5 OF 5

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

Planned:

1. Eliminate or replace the Unit 2 CRDM Pyle National connectors at the reactor head.

The Planned corrective action is voluntary and does not constitute a commitment. It may be modified as operating experience, judgment and evaluations dictate and will be documented in Duke's corrective action process.

SAFETY ANALYSIS

Duke Energy used a risk-informed approach to determine the risk significance associated with the reactor trip of October 31, 2008.

The Conditional Core Damage Probability (CCDP) and the Conditional Large Early Release Probability of this event was evaluated by considering the following:

- A reactor trip initiating event
- Actual plant configuration and maintenance activities at the time of the trip

The CCDP associated with this event was evaluated to be less than 1.0E-7. The Conditional Large Early Release Probability (CLERP) associated with this event was evaluated to be less than 1.0E-8.

This event is considered to be of no significance to the health and safety of the public.

ADDITIONAL INFORMATION

A review of McGuire's corrective action database was performed and it was determined that this is NOT a recurring or similar event.