Duke Energy®

JAMES R. MORRIS
Vice President

Duke Energy Corporation
Catawba Nuclear Station
4800 Concord Road
York, SC 29745

803-701-4251
803-701-3221 fax

June 22, 2011

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

Subject: Duke Energy Carolinas, LLC (Duke Energy)
Catawba Nuclear Station, Unit 1
Docket No. 50-413
Licensee Event Report 413/2011-002

Pursuant to 10 CFR 50.73(a)(1) and (d), attached is Licensee Event Report 413/2011-002, Revision 0 entitled, "Safety System Actuation of Auxiliary Feedwater due to Feedwater Isolation during Unit Shutdown."

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A).

There are no regulatory commitments contained in this letter or its attachment.

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

If there are any questions on this report, please contact M.J. Sawicki at (803) 701-5191.

Sincerely,

James R. Morris

Attachment

IE22
NRR

xc (with attachment):

V.M. McCree
Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, GA 30303-1257

J.H. Thompson (addressee only)
NRC Project Manager
U.S. Nuclear Regulatory Commission
Mail Stop 8-G9A
11555 Rockville Pike
Rockville, MD 20852-2738

G.A. Hutto, III
NRC Senior Resident Inspector
Catawba Nuclear Station

INPO Records Center
700 Galleria Place
Atlanta, GA 30339-5957

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(10-2010)

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Catawba Nuclear Station, Unit 1	05000413	1 OF 6

4. TITLE

Safety System Actuation of Auxiliary Feedwater due to Feedwater Isolation during Unit Shutdown

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	
04	23	2011	2011	– 002	– 0	06	22	2011	FACILITY NAME: N/A	DOCKET NUMBER

9. OPERATING MODE
4

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)	☒ 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

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
M.J. Sawicki, Regulatory Compliance	(803) 701-5191

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

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete EXPECTED SUBMISSION DATE) ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On April 23, 2011 at 0921 hours, the Auxiliary Feedwater (CA) System was automatically actuated. This resulted from Main Feedwater (CF) being inappropriately isolated with the Unit in Mode 4 during the shutdown for a refueling outage. The Loss of Steam Generator (SG) Feedwater procedure was entered, and through the addition of CA, SG level was stabilized to normal levels. At 1026 hours CF was restored to service.

This event was caused by the placement of a tagout prior to its scheduled execution time without fully recognizing its effect on plant operation. The tagout closed two CF valves which isolated all CF flow to the SGs. A root cause evaluation was performed and two root causes were determined to have resulted in this event. These root causes and the resultant corrective actions are described fully in the body of this LER.

Throughout this event, the 1A Motor Driven Pump Train of the CA System was operable and performed its required safety related function. The CF system was subsequently restored, CA was secured, and the Unit was cooled down to Mode 5 where the CA System was no longer required. Therefore, the health and safety of the public were not adversely affected by this event.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO	
Catawba Nuclear Station, Unit 1	05000413	2011	- 002	0	2 of 6

NARRATIVE

BACKGROUND

This event is being reported under the following criterion:

10 CFR 50.73(a)(2)(iv)(A), for any event or condition that resulted in manual or automatic actuation of the PWR auxiliary or emergency feedwater system.

Catawba Nuclear Station Unit 1 is a Westinghouse four-loop Pressurized Water Reactor (PWR) [EIIS: RCT].

The Auxiliary Feedwater (CA) System [EIIS: BA] automatically supplies feedwater to the Steam Generators (SGs) to remove decay heat from the Reactor Coolant (NC) System [EIIS: AB] upon the loss of Main Feedwater [EIIS:SJ] (CF) System supply. The CA pumps [EIIS: P] take suction from the Condensate Storage (CS) System [EIIS: KA] and pump to the SG secondary side.

The CA System consists of two motor driven CA pumps and one steam turbine driven pump configured into three trains. Each of the motor driven pumps (MDPs) supplies 100% of the flow requirements to two of the four SGs, although each pump has the capability to be realigned to feed the other SGs. The turbine driven pump provides 200% of the flow requirements and supplies water to all four SGs. Each motor driven CA pump is powered from an independent Class 1E power supply. The steam turbine driven CA pump receives steam from two Main Steam (SM) System [EIIS: SB] lines upstream of the Main Steam isolation valves [EIIS:SA]. Each of the steam feed lines will supply 100% of the requirements of the turbine driven CA pump. The SGs function as a heat sink for core decay heat, and the CA System is designed to supply sufficient water to the SGs to remove decay heat. The CA System is capable of supplying feedwater to the SGs during normal unit startup, shutdown, and hot standby conditions. The motor driven CA pumps actuate automatically on SG water level Lo-Lo in 1 out of 4 SGs by the Engineered Safety Features Actuation System (ESFAS) [EIIS:JE]. The MDPs also actuate on loss of offsite power, safety injection, ATWS (Anticipated Transients Without Scram) Mitigation System Actuation Circuitry (AMSAC) and trip of all CF pumps. The turbine driven CA pump actuates automatically on SG water level Lo-Lo in 2 out of 4 SGs and on loss of offsite power.

Technical Specification 3.7.5 governs the CA System. Limiting Condition of Operation 3.7.5 requires three CA trains to be operable in Modes 1, 2, and 3. In Mode 4 when the SGs are relied upon for heat removal, one motor-driven CA train is required to be operable. On April 23, 2011, when the event occurred, Unit 1 was in Mode 4 at 0% power operation. The 1B SG initiated a Lo-Lo water level signal at 0921 hours, meeting the criteria for the actuation of the CA system MDPs to provide adequate decay heat removal. As a result, the 1A MDP promptly auto-started and provided flow in excess of what was needed to satisfy the decay heat removal for the SGs. The 1B MDP was removed from standby readiness and therefore did not automatically start, but remained available as it could have been manually started if required. The turbine driven pump was also removed from standby readiness but would not have been capable of performing its design function due to the lack of steam pressure at the time of the event. The CF system was subsequently restored, CA was secured, and the Unit was cooled down to Mode 5 where the CA System was no longer required.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO	
Catawba Nuclear Station, Unit 1	05000413	2011	- 002	0	3 of 6

NARRATIVE

EVENT DESCRIPTION

The isolation of the CF system occurred when valves [EIIS: V] 1CF-19 (1B1 High Pressure (HP) Heater Inlet Isolation) and 1CF-23 (1B2 HP Heater Inlet Isolation) were prematurely isolated through Removal and Restoration (R&R) 10-2709, which is a tagout package. The R&R is performed by the Nuclear Equipment Operator (NEO) once the Senior Reactor Operator (SRO) approves the tagout package and it has been released to the NEO for execution. The tagout must also be acknowledged by the Control Room Supervisor (CRS) prior to being executed.

(Some event times are approximate.)

Date/Time		Event
04/22/11	0225	Nightshift SRO approved R&R 10-2709.
04/22/11	~1915	Nightshift SRO provided R&R 10-2709 to the nightshift NEOs for walk down and preparation for the Pre-Job Brief (PJB). It was determined the tagout would require re-sequencing before being executed.
04/22/11	~2030	Nightshift NEOs took the R&R package to the CRS. The CRS acknowledged the R&R with the understanding that it would be re-sequenced prior to placement.
04/22/11	2100	Nightshift SRO decided not to complete R&R 10-2709 because it would require significant revision to be coordinated with a procedure which would isolate the 1A CF pump turbine. The approved R&R was left uncontrolled on the SRO's desk.
04/23/11	0045	1A CF pump turbine secured per station procedure.
04/23/11	~0600	Shift Turnover occurred. The R&R was not included in the written turnover but was verbally discussed among the SROs.
04/23/11	0811	Dayshift SRO did not conduct a formal PJB, but had a verbal discussion with the dayshift NEOs regarding R&R 10-2709, who then proceeded with the tagout.
04/23/11	0904	Turbine driven CA pump removed from service, entered in Technical Specification Action Item Log (TSAIL).
04/23/11	0906	1B MDP removed from standby readiness, entered in TSAIL.
04/23/11	0908	Valve 1CF-19 indicated closed.
04/23/11	0911	Valve 1CF-23 indicated closed.
04/23/11	0915	The NC System cooldown rate decreased due to loss of feedwater to the 1B SG. Control room recognized loss of feedwater and determined that both CF heater inlet valves were closed.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO	
Catawba Nuclear Station, Unit 1	05000413	2011	- 002	0	4 of 6

NARRATIVE

04/23/11 0916 SG 1B level deviation alarm received. Control room entered the procedure for loss of SG feedwater.

04/23/11 0921 The 1A CA pump auto-started on 1B SG Lo-Lo level.

04/23/11 1009 Valves 1CF-19 and 1CF-23 are opened.

04/23/11 1026 Control room returned the feedwater control system to automatic.

04/23/11 1038 The 1A CA pump was secured.

04/23/11 1334 Unit 1 entered Mode 5 Operation.

CAUSAL FACTORS

The following Root Causes were determined in conjunction with this event:

Root Cause 1: Inadequate Operations organization work control and release process guidance resulted in Operations executing a work activity prematurely that isolated feedwater and subsequently caused the auto-start of the 1A CA pump.

Basis: Current Operations procedures do not provide sufficient guidance for the control of tagouts that have been approved for execution. Detail was not included which specified how deferred tagouts were to be managed. As a result, R&R 10-2709 remained in the approved state and in the work flow process even though plant conditions did not support placing the R&R.

Root Cause 2: Incomplete Operations supervisory review of the R&R and failure to conduct an adequate PJB led to the R&R being placed prior to proper plant conditions being established.

Basis: The dayshift SRO took the approved R&R and set in motion its placement by assigning the task to NEOs with only informal instructions. The SRO made the assumption that the plant conditions were appropriate for placing the R&R. A cursory review of the R&R by the SRO would have indicated that 1B feedwater valves were in the tagout and would isolate all feedwater. Inadequate oversight occurred in the SRO not performing a detailed review of the tagout and also not performing a PJB in accordance with Station protocol. A dayshift PJB was required because the R&R extended beyond a shift change and new personnel were assigned. Had a detailed R&R review been performed, the SRO would have realized that the R&R could not be placed as written and the event would not have occurred. Had a formal PJB or Task Preview been performed, the 1B feedwater isolation on a 1A tagout would very likely have been discovered which would also have prevented the loss of feedwater event.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO	
Catawba Nuclear Station, Unit 1	05000413	2011	- 002	0	5 of 6

NARRATIVE

CORRECTIVE ACTIONS

Immediate:

1. Isolated valves 1CF-19 and 1CF-23 were opened and the CF System restored. The CA System was secured.

2. In progress activities were reviewed to determine if they were being performed per the schedule. No other issues were identified.

Interim:

1. Station and Operations management performed observations of Operations' PJBs.

2. More stringent approval requirements were established in order to perform an R&R package that deviated from the outage schedule.

3. Interim Operations guidance was established to notify the work execution SRO if a R&R package cannot be performed and is to be delayed due to problems encountered.

Planned:

1. Revise appropriate Operations procedures to include that the work execution SRO is to be informed if the R&R package cannot be performed and is to be delayed due to problems that were encountered. Also the procedure will specify that if the plant cannot be configured to allow work based upon current plant condition, then the work must be deferred. It will direct the individual to return the R&R to "reviewed" status until plant conditions can support the R&R, or to discard the R&R package completely. Also, the more rigorous approval requirements for R&R packages will be proceduralized.

2. Incorporate lessons learned from this event into operator training.

There are no NRC commitments contained in this LER.

SAFETY ANALYSIS

Catawba Nuclear Station Unit 1 has a total of four SGs. The CA System is composed of three diverse trains, two MDPs with different power sources and a turbine driven pump. The CA System provides decay heat removal in the event that CF is unavailable. The CA MDPs actuate on SG water level Lo-Lo on 1 out of 4 SGs, while the turbine driven pump will actuate on SG water level Lo-Lo in 2 out of 4 SGs.

The 1B SG initiated a Lo-Lo water level signal on 4/23/11 at 0921, meeting the criteria for the actuation of the CA system MDPs to provide adequate decay heat removal for the conditions of Unit 1 at that time. In Mode 4, Technical Specifications only require 1 train of CA to be operable. As required, the 1A MDP promptly auto-started and provided flow in excess of what was needed to satisfy the decay heat removal for the SGs. Further, the 1B MDP, although not started, was also available. The CF system was subsequently restored, CA was secured, and the Unit was cooled down to Mode 5 where the CA System was no longer required.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO	
Catawba Nuclear Station, Unit 1	05000413	2011	- 002	0	6 of 6

NARRATIVE

In conclusion, this event is considered to be of low safety significance. The 1B SG had a Lo-Lo water level, and the 1A MDP actuated as required to provide adequate flow. There was additional defense in depth available had the 1A CA pump not been able to perform as required. Further, normal feedwater was subsequently restored, and the Unit continued cooldown to Mode 5.

This event was of no significance with respect to the health and safety of the public.

ADDITIONAL INFORMATION

Within the previous three years, there have been no Station Licensee Event Report (LER) events involving the actuation of the CA System. Further, the tagging process has not led to an inappropriate isolation and safety system actuation in the past three years. This event is therefore considered to be non-recurring.

Energy Industry Identification System (EIIS) codes are identified in the text as [EIIS: XX]. This event is not considered reportable to the Equipment Performance and Information Exchange (EPIX) program. This event is not considered to constitute a Safety System Functional Failure. This event only involved the actuation of the CA System. It was determined through the extent of condition review that the condition described in this LER did not extend to the other trains of CA or the other Unit of operation. There was no release of radioactive material, radiation overexposure, or personnel injury associated with the event described in this LER.