Duke Energy®

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September 16, 2010

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

Subject: Duke Energy Carolinas, LLC (Duke)
Catawba Nuclear Station, Unit 1
Docket No. 50-413
Licensee Event Report 413/2010-004

Attached is Licensee Event Report 413/2010-004, Revision 0 entitled, "Technical Specification Violation Involving Notice of Enforcement Discretion Due to Failure of Diesel Generator Engine-Mounted Thermocouple".

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 L.J. Rudy at (803) 701-3084.

Sincerely,

James R. Morris

LJR/s

Attachment

IE22
NRR

xc (with attachment):

L.A. Reyes
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U.S. Nuclear Regulatory Commission - Region II
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U.S. Nuclear Regulatory Commission
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Catawba Nuclear Station

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ELL
Master File CN-801.01
LER File
RGC Date File
NCMPA-1
NCEMC
PMPA

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

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Technical Specification Violation Involving Notice of Enforcement Discretion Due to Failure of Diesel Generator Engine-Mounted Thermocouple

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
07	30	2010	2010	- 004 -	00	09	16	2010	FACILITY NAME	DOCKET NUMBER

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

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
L.J. Rudy, Regulatory Compliance	803-701-3084

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
				No					

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

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

On July 30, 2010 at 0200 hours, Technical Specification (TS) 3.8.1, "AC Sources - Operating" and three supported system TS were violated when the 72-hour Completion Time for Diesel Generator (DG) 1A expired. TS 3.8.1, Condition B had been previously entered following the failure of an engine-mounted exhaust thermocouple. The failed thermocouple was subsequently located in the stationary vane of the right bank turbocharger. On the afternoon of July 29, 2010, the NRC granted enforcement discretion concerning TS 3.8.1, Condition B and its supported system TS. The period of enforcement discretion began on July 30, 2010 at 0200 hours and was to be effective for 24 hours. DG 1A was subsequently returned to operable status and all applicable TS Conditions were exited by July 30, 2010 at 0308 hours. This was prior to the time that Unit 1 would have had to be placed in Mode 3 absent the granting of enforcement discretion (0800 hours on July 30, 2010).

The thermocouple failure was determined to be due to mechanical fatigue resulting from high-cycle, low-amplitude, cyclic stresses.

Planned corrective actions include replacing all exhaust thermocouples in both DGs on Units 1 and 2.

The failure of the thermocouple did not affect the ability of DG 1A to perform its safety related function following an event for which emergency AC power would have been required. Therefore, the health and safety of the public were not adversely affected by this event.

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

BACKGROUND

This event is being reported under the following criterion:

10 CFR 50.73(a)(2)(i)(B), any operation or condition which was prohibited by the plant's Technical Specifications (TS).

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

The onsite standby power source for each 4160 volt Engineered Safety Features (ESF) bus [EIIS: BU] at Catawba is a dedicated Diesel Generator (DG) [EIIS: EK]. For each unit, DGs A and B are dedicated to ESF buses ETA and ETB, respectively. A DG starts automatically on a Safety Injection (SI) signal (i.e., low pressurizer pressure or high containment pressure) or on an ESF bus degraded voltage or undervoltage signal. After the DG has started, it will automatically tie to its respective bus after offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with an SI signal. With no SI signal, there is a ten-minute delay between the degraded voltage signal and the DG start signal. The DGs will also start and operate in the standby mode without tying to the ESF bus on an SI signal alone. Following the trip of offsite power, a sequencer [EIIS: EK] strips loads from the ESF bus. When the DG is tied to the ESF bus, loads are then sequentially connected to its respective ESF bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the DG by automatic load application.

In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a Loss of Coolant Accident (LOCA).

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the DG in the process. Approximately one minute after the initiating signal is received, all loads needed to recover the unit or to maintain it in a safe condition are returned to service.

TS 3.8.1 governs the DGs. Limiting Condition for Operation (LCO) 3.8.1 requires two operable DGs for each unit that is in Modes 1, 2, 3, and 4. With one DG inoperable, the inoperable DG must be restored to operable status within 72 hours per Required Action B.4. If this is not accomplished, the unit must be placed in Mode 3 within 6 hours and in Mode 5 within 36 hours per Required Actions G.1 and G.2.

The Nuclear Service Water System (NSWS) [EIIS: BI] provides a heat sink for the removal of process and operating heat from safety related components during a DBA or transient. During normal operation, and a normal shutdown, the NSWS also provides this function for various safety related and non-safety related components.

The NSWS consists of two independent loops (A and B) of essential equipment, each of which is shared between the two Catawba units. Each loop contains two NSWS pumps [EIIS: P], each of which is supplied from a separate DG. Each set of two pumps supplies two trains (1A and 2A, or 1B and 2B) of essential equipment through common discharge piping [EIIS: None]. While the pumps are unit designated (i.e., 1A, 1B, 2A, 2B), all train-related pumps receive automatic start signals from a corresponding train-related SI or blackout signal from either unit. Therefore, a pump designated to one unit will supply post-accident cooling to equipment in that loop

on both units. For example, the 1A NSWS pump, whose emergency power is supplied by DG 1A, will supply post-accident cooling to NSWS trains 1A and 2A.

One NSWS loop containing two operable NSWS pumps has sufficient capacity to supply post-LOCA loads on one unit and shutdown and cooldown loads on the other unit. Thus, the operability of two NSWS loops assures that no single failure will keep the system from performing the required safety function. Additionally, one NSWS loop containing one operable NSWS pump has sufficient capacity to maintain one unit indefinitely in Mode 5 (commencing 36 hours following a trip from full power) while supplying the post-LOCA loads of the other unit. Thus, after a unit has been placed in Mode 5, only one NSWS pump and its associated DG are required to be operable on each loop, in order for the system to be capable of performing its required safety function, including single failure considerations.

TS 3.7.8 governs the NSWS. LCO 3.7.8 requires two operable NSWS trains for each unit that is in Modes 1, 2, 3, and 4. With one NSWS train inoperable, the inoperable NSWS train must be restored to operable status within 72 hours per Required Action A.1. If this is not accomplished, the unit must be placed in Mode 3 within 6 hours and in Mode 5 within 36 hours per Required Actions C.1 and C.2.

The NSWS also supports the Auxiliary Feedwater (AFW) [EIIS: BA] and Containment Spray [EIIS: BE] Systems since it serves as the assured water source for these systems. TS 3.7.5 governs the AFW System. LCO 3.7.5 requires three AFW trains to be operable in Modes 1, 2, and 3, and in Mode 4 when the steam generators are relied upon for heat removal. With one AFW train inoperable in Mode 1, 2, or 3 for reasons other than an inoperable steam supply to the turbine-driven AFW pump, the inoperable AFW train must be restored to operable status within 72 hours per Required Action B.1. If this is not accomplished, the unit must be placed in Mode 3 within 6 hours and in Mode 4 within 12 hours per Required Actions C.1 and C.2. TS 3.6.6 governs the Containment Spray System. LCO 3.6.6 requires two containment spray trains to be operable in Modes 1, 2, 3, and 4. With one containment spray train inoperable, the inoperable containment spray train must be restored to operable status within 72 hours per Required Action A.1. If this is not accomplished, the unit must be placed in Mode 3 within 6 hours and in Mode 5 within 84 hours per Required Actions B.1 and B.2.

On July 30, 2010, when this event occurred, Unit 1 was in Mode 1 at 100% power operation.

EVENT DESCRIPTION

In January 2010, it was observed that the exhaust cylinder temperature for the number six cylinder on the right bank (6R) of DG 1A was reading approximately 300 degrees F low. Administrative processes were initiated to investigate and resolve. Also, a review of the respective temperature data for the other 15 cylinders that had not exhibited changes showed this to be only an indication problem. On May 19, 2010, Problem Investigation Process (PIP) C-10-02963 was generated for Catawba. The purpose of this PIP was to ensure that the work request/order that had been previously initiated was performed in a timely manner to allow accurate trending of DG data, which is used to support engine reliability and operability.

DG cylinder exhaust temperature data is used as one input to help determine the functionality of the fuel injection system. Although the identified problem was determined to be an indication only concern, it was deemed prudent to resolve the problem.

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

The PIP noted that the respective work order needed to be scheduled sooner than the originally planned DG work day scheduled for the Fall of 2010. In response to this PIP, work order 01920283 was scheduled for the next planned DG work day on July 27, 2010.

DG 1A was removed from service and declared inoperable at 0200 hours on July 27, 2010 in support of the planned DG work day's activities. While performing work to replace the DG 1A number 6R cylinder exhaust thermocouple per work order 01920283, the end of the thermocouple was found to be broken off. The total probe length is approximately 4" and approximately 3/8" in diameter. The Operations Shift Manager was notified of the as-found condition and PIP C-10-04459 was generated.

Attempts to locate the thermocouple probe with a boroscope were not successful. Plant management convened a Unit Threat Team and plans were developed to remove the turbocharger to support locating the thermocouple probe. The broken piece was subsequently found in one piece (i.e., it had not broken into smaller pieces) in the stationary vane of the right bank turbocharger. There was no damage to the turbocharger.

To determine the cause of the thermocouple failure, the failed thermocouple and two other non-failed thermocouples from DG 1A were sent to Duke Energy's metallurgical laboratory for analysis. The analysis showed that the cause of the thermocouple failure was mechanical fatigue due to high-cycle, low-amplitude, cyclic stresses typical of vibration. The other two thermocouples showed no signs of degradation.

On the afternoon of July 29, 2010, Catawba engaged the NRC in a telephone conference call and requested enforcement discretion concerning the above TS requirements. The NRC granted enforcement discretion for a period of 24 hours commencing on July 30, 2010 at 0200 hours. DG 1A was subsequently returned to operable status and all applicable TS Conditions were exited by 0308 hours on July 30, 2010. On August 2, 2010, per commitment, Catawba submitted the formal written request for enforcement discretion. The NRC subsequently issued the formal written approval of the request on August 9, 2010 (NOED No. 10-2-003).

CAUSAL FACTORS

The DG 1A 6R exhaust thermocouple failed due to mechanical fatigue. Characteristics such as low-distortion fracture, small final fracture area, and the presence of fine, submicron-sized fatigue striations all indicated high-cycle, low-amplitude, cyclic stresses typical of vibration (e.g., mechanical and/or flow-induced).

The crack initiated on one side of the sheath at the end of the reducing hex bushing where the thermocouple was restrained. The outside diameter surface of the sheath had been lightly rubbed in this area, which may have aided crack initiation. From this point, the crack propagated in both directions around the circumference of the sheath, which was indicative of unidirectional bending.

The thin, uniform oxide film present on the fracture and the lack of any significant oxide scale formation suggested that the bulk of the service life for this component was consumed by incubation of the fatigue crack; the fatigue crack likely initiated during recent DG operations and propagated to failure very rapidly.

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Based on the results of the failure investigation, the thermocouple failed due to mechanical fatigue resulting from high-cycle, low-amplitude, cyclic stresses. The thermocouple is extended in the exhaust piping between the cylinder and manifold and is exposed to flow velocities of approximately 12,000 scfm.

Based on the most probable location of the crack to occur, the design of the turbocharger, and the actual as-found condition of the failed piece, Engineering concluded that it is unlikely that any future thermocouple failure would actually damage a turbocharger and fail a DG engine.

It should also be noted that DG 1A was operated numerous times throughout the six-month period with the faulted thermocouple and that this did not cause any problems with the DG.

CORRECTIVE ACTIONS

Immediate:

1. A Unit Threat Team was formed due to entry into the applicable TS Conditions. A maintenance plan was developed to locate and retrieve the failed thermocouple.

Subsequent:

1. Enforcement discretion was requested and obtained from the NRC to allow an additional 24 hours prior to having to place Unit 1 in Mode 3.

2. Following retrieval of the failed thermocouple and completion of maintenance, DG 1A was tested and returned to operable status. All applicable TS Conditions were subsequently exited.

Planned:

1. All exhaust thermocouples in both DGs on Units 1 and 2 will be replaced.

There are no NRC commitments contained in this LER.

SAFETY ANALYSIS

There was no safety significance to this event, as the failed thermocouple had no effect upon DG 1A's ability to operate as designed. Approximately six months of operating history with the failed thermocouple showed that the DG's performance was unaffected. The thermocouples are not safety related. They only provide indication that is used as an input to monitoring and trending for long-term reliability. The failed thermocouple was located in the stationary vane of the right bank turbocharger and would not have been transported anywhere else within the DG unit. During the time period that DG 1A was inoperable for troubleshooting and maintenance, the opposite train DG (DG 1B) was operable and would have functioned as designed in the event of a loss of normal power to its essential bus. Therefore, plant response to a DBA, had one occurred, would have been within analysis limits.

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Only one hour and eight minutes was eventually utilized out of the 24-hour period of enforcement discretion granted by the NRC. The probabilistic risk analysis and other technical information contained in the enforcement discretion request fully supported the 24-hour extension of the applicable TS Completion Times. The details of the enforcement discretion request can be found in the letter from Duke Energy to the NRC dated August 2, 2010 (ADAMS Accession Number ML102160562). The NRC letter granting the enforcement discretion request was issued on August 9, 2010 (ADAMS Accession Number ML102220252).

This event did not affect the health and safety of the public.

ADDITIONAL INFORMATION

Within the previous three years, there have been no LER events involving the failure of a DG thermocouple or involving a request for enforcement discretion. There have been other LER events involving TS violations; however, the specific circumstances surrounding those events and the corrective actions taken in response to those events could not have prevented this event from occurring. 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 affected the operability of DG 1A when the DG was taken out of service for troubleshooting and maintenance following the discovery of the failed thermocouple. DG 1B remained operable throughout this event. There was no release of radioactive material, radiation overexposure, or personnel injury associated with the event described in this LER.