



Tom Simril
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RA-18-0117

August 13, 2018

10 CFR 50.73

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

Subject: Duke Energy Carolinas, LLC
Catawba Nuclear Station, Unit 2
Docket No. 50-414
Licensee Event Report (LER) 414/2018-002-00

Pursuant to 10 CFR 50.73(a)(1) and (d), attached is LER 414/2018-002-00, entitled "Condition Prohibited by Technical Specifications (TS) due to Failure of the 2A Diesel Generator (DG)."

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

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.

Please direct any questions or concerns to Carrie Wilson, Sr. Engineer, at (803) 701-3014.

Sincerely,

A handwritten signature in black ink that reads "Tom Simril". The signature is fluid and cursive, with the first name "Tom" and last name "Simril" clearly distinguishable.

Tom Simril
Vice President, Catawba Nuclear Station

Attachment

U.S. Nuclear Regulatory Commission
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Page 2

xc (with attachment):

C. Haney, Region II Administrator
U.S. Nuclear Regulatory Commission
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, GA 30303

M. Mahoney
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Mailstop O-8B1A
Rockville, MD 20852

J.D. Austin (without enclosure)
NRC Senior Resident Inspector

INPO Records Center
700 Galleria Parkway, SE
Suite 100
Atlanta, GA 30339-5943

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@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 Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

1. Facility Name Catawba Nuclear Station, Unit 2	2. Docket Number 05000 414	3. Page 1 OF 5
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4. Title Condition Prohibited by Technical Specifications (TS) due to Failure of the 2A Diesel Generator (DG).
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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
06	11	2018	2018	- 002 - 00		08	13	2018	Facility Name	Docket Number 05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. Power Level	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
100	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)		

12. Licensee Contact for this LER	
Licensee Contact Carrie Wilson, Senior Engineer, Regulatory Affairs	Telephone Number (Include Area Code) 8037013014

13. Complete One Line for each Component Failure Described in this Report									
Cause A	System EK	Component RG	Manufacturer P292	Reportable to ICES YES	Cause	System	Component	Manufacturer	Reportable to ICES

14. Supplemental Report Expected				15. Expected Submission Date		
<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No				Month	Day	Year

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On June 11, 2018, at 0408 hours Eastern Daylight Time (EDT) the 2A Diesel Generator (DG) was declared inoperable for planned maintenance. At 2111 EDT, during a scheduled surveillance test of the 2A DG, the output breaker 2ETA-18 tripped open, caused by the actuation of the Lockout Relay 86D. The failure of the surveillance test required additional troubleshooting and maintenance. During troubleshooting, two disconnected cables were identified in the Voltage Regulator circuitry. These two cables connect the current transformer to the linear reactor. The two cables were left disconnected from the linear reactor terminal during the current maintenance activities. The cause of the disconnected cables is a failure to properly reassemble the connection after maintenance. As a result of the disconnected cables, damage occurred during the subsequent post-maintenance run that required corrective work for a duration beyond the Technical Specification(TS) required Completion Time.

This event is being reported under 10 CFR 50.73(a)(2)(i)(B) as an operation or condition which was prohibited by the plant's Technical Specification due to 2A EDG repair and testing exceeding the 72-hour completion time as mandated by TS 3.8.1, TS 3.7.8, TS 3.7.5, and TS 3.6.6.

On June 14, 2018, Catawba Unit 2 requested a Notice of Enforcement Discretion (NOED) in anticipation of exceeding TS 3.8.1, TS 3.7.8, TS 3.7.5, and TS 3.6.6. The NOED was granted by the NRC on the same day.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@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.

1. FACILITY NAME		2. DOCKET NUMBER	3. LER NUMBER		
Catawba Nuclear Station, Unit 2		05000-	YEAR 2018	SEQUENTIAL NUMBER 002	REV NO. 00

NARRATIVE**BACKGROUND:**

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

The onsite standby power source for each 4160 volt Engineered Safety Features (ESF) bus at Catawba is a dedicated Diesel Generator [DG] (DG). For each unit, DGs A and B are dedicated to ESF buses ETA and ETB, respectively. Each 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 degraded voltage or undervoltage, 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 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) provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (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 loop contains two NSWS pumps, 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. 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 Safety Injection (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 1A DG, will supply post-accident cooling to NSWS trains 1A and 2A.

The NSWS system is shared between the two units. The shared portions of the system must be operable for each unit when that unit is in the mode of applicability. Additionally, both normal and emergency power for shared components

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Catawba Nuclear Station, Unit 2	05000-414	YEAR 2018	SEQUENTIAL NUMBER 002	REV NO. 00

NARRATIVE

must also be operable. If a shared NSWS component becomes inoperable, or normal or emergency power to shared components becomes inoperable, then the required actions of the NSWS LCO must be entered independently for each unit that is in the mode of applicability of the LCO. If both units are in the mode of applicability with the NSWS operating in the normal dual supply and discharge header alignment, one unit may exit the LCO provided that unit's NSWS pump is operable and one unit's flow path to the non-essential header, AFW pumps, and Containment Spray System heat exchangers are isolated (or equivalent flow restrictions). In this case, sufficient flow is available, however, this configuration results in inoperabilities within other required systems on one unit and the associated required actions must be entered.

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 D.1 and D.2. Thus, the LCO for TS 3.7.8 on Unit 1 can be met, while the Unit 2 LCO cannot be met, requiring an extension to the Completion Time.

The NSWS also supports the AFW and Containment Spray 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 one motor-driven AFW train to be operable 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.

At the time of the event, repair and testing of the 2A DG was not anticipated to be completed within the 72-hour completion time mandated by TS 3.8.1, TS 3.7.8, TS 3.7.5, and TS 3.6.6. Therefore, Duke Energy requested the Completion Time of Required Action be extended from the current 72 hours by an additional 48 hours, for a total of 120 hours, to allow Catawba Unit 2 to remain in Mode 1 (Power Operation) until repairs could be completed and testing to demonstrate operability of 2A DG was completed. The NOED was subsequently granted by the NRC on the same day for an additional 48 hours of unit operation. The 2A DG was restored to operable status approximately 17 hours into the 48-hour period allowed by the NOED.

This event is being reported under 10 CFR 50.73(a)(2)(i)(B) as an operation or condition which was prohibited by the plant's Technical Specifications. Throughout the duration of this event, Unit 1 operated in Mode 1 at 100% power. No significant structures, systems or components were out of service at the time of discovery such that they contributed to the event.

EVENT DESCRIPTION:

The 2A DG was declared inoperable on June 11, 2018, at 0408 hours. This inoperability was planned as part of scheduled maintenance activity. One of the major maintenance activities was Doble testing of the 2A DG Portec Voltage Regulator components. During the post maintenance test, the 2A DG and associated breaker 2ETA-18 tripped on an actuation of Lockout Relay 86D when trying to load in parallel and therefore failed the post maintenance test.

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During troubleshooting, two disconnected cables were identified in the Voltage Regulator circuitry. These two cables connect the current transformer to the linear reactor. The two cables were left disconnected from the linear reactor terminal during the current maintenance activities. The cause of the disconnected cables is a failure to properly reassemble the connection after maintenance. As a result of the disconnected cables, damage occurred during the subsequent post-maintenance run that required corrective work for a duration beyond the TS required Completion Time.

During extent of damage visual inspections of the voltage regulator cabinet, evidence of arcing between a heat sink mounting screw and the heat sink for Silicon Controlled Rectifier, SCR1, was discovered. Under normal operation the distance between the heat sink and mounting screw is sufficient to prevent arcing or conduction. However, when the two cables were not terminated, they were allowed to ground against the DG control cabinet and resulted in arcing between the heat sink and mounting screw. This resulted in the need to replace the SCRs and Diodes.

The current transformer was replaced and the associated linear reactor was tested and found to be operating satisfactorily with no damage. The cables were re-landed per design drawings. The SCRs and Diodes were replaced with new components. During the functional run, it was determined that the Voltage Regulator module was not operating correctly. Two of the three SCRs were not firing as required. These SCRs receive their firing signals from the Voltage Regulator module. Therefore, this indicates that the extent of damage from the two cables that were left disconnected also resulted in damage to the Voltage Regulator module.

On June 14, 2018, at 0234, Catawba requested a NOED for an additional 48 hours to TS 3.8.1, TS 3.7.8, TS 3.7.5, and TS 3.6.6, to allow for repair of the 2A DG. The NOED was subsequently granted by the NRC for an additional 48 hours of unit operation. The enforcement discretion period began on June 14 at 0408. On June 14, 2018, at 2106, the 2A DG was declared operable.

CAUSAL FACTORS:

The cause of this event is that two cables in the Voltage Regulator circuitry of the DG were not connected as required. These two cables connect the current transformer to the linear reactor. The two cables were left disconnected from the linear reactor terminal during the current maintenance activities. The cause of the disconnected cables is a failure to properly reassemble the connection after maintenance.

CORRECTIVE ACTIONS:

1. Replaced the Current Transformer, SCRs, Diodes, and Voltage Regulator Module
2. Completed all required post-maintenance testing
3. Communicated lessons learned with maintenance and QC
4. Remediated individuals involved

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NARRATIVE**SAFETY ANALYSIS:**

An assessment of the safety consequences and implication of the event was performed. The nuclear safety significance of this event was that the site operated for a period of time outside the Technical Specification limits with the 2A DG inoperable. The associated risk, including the Probabilistic Risk Assessment analysis, of this condition was evaluated as part of the NOED and was found to be acceptable. The redundant 2B DG was operable and available and could have performed its intended safety function at all times while the 2A DG was tagged out to support maintenance and testing.

The common mode failure review determined that the 1A, 1B, and 2B DGs were not susceptible to the same failure mode as 2A DG based on the fact that Doble testing has been successfully completed on the 1A, 1B, and 2B DGs per scheduled maintenance. Along with successful post maintenance testing and successful monthly surveillance testing, this proves there were no issues reconnecting the respective components.

ADDITIONAL INFORMATION:

A three-year search of the Catawba corrective action database revealed that no other DG Voltage Regulators have failed due to cable connection errors following maintenance.