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RA-19-0405

10 CFR 50.73

October 17, 2019

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) 414/2019-004-00

Pursuant to 10 CFR 50.73(a)(1) and (d), attached is LER 414/2019-004-00, entitled "Condition Prohibited by Technical Specification and Loss of Safety Function due to Refueling Water Storage Tank Volume Below the Minimum Requirement."

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(v)(A), (B), and (D).

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 questions arise regarding this LER, please contact Sherry E. Andrews of Regulatory Affairs at (803) 701-3424.

Sincerely,

Tom Simril
Vice President, Catawba Nuclear Station

Attachment

xc (with attachment):

L. Dudes
Regional Administrator
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J. Austin
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NRC FORM 366
(04-2018)

U.S. NUCLEAR REGULATORY COMMISSION

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/)

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

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. Page
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4. Title

Condition Prohibited by Technical Specification and Loss of Safety Function due to Refueling Water Storage Tank Volume Below the Minimum Requirement

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
									None	05000
8	18	2019	2019	- 004 -	0	10	17	2019	Facility Name: None	Docket Number: 05000

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

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
Mandy Hare, Manager Nuclear Support Services, Regulatory Affairs	(803) 701-2218

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to ICES		Cause	System	Component	Manufacturer	Reportable to ICES

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☐ Yes (If yes, complete 15. Expected Submission Date) ☑ No				

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

On August 18, 2019, at 1700 hours, while aligned for purification of the Unit 2 Refueling Water Storage Tank (RWST), Catawba entered an unplanned action statement per Technical Specification (TS) Limiting Condition for Operation (LCO) 3.5.4 "RWST," Condition B. The Unit 2 RWST wide range (WR) level was discovered at a volume below the minimum TS required value when accounting for uncertainty. The Unit 2 RWST was removed from purification and makeup was immediately started. Unit 2 exited TS LCO 3.5.4 Condition B at 1744 on August 18, 2019.

At the time of the event, the Unit 2 RWST level narrow range (NR) channels were unavailable for completion of the TS Surveillance Requirement (SR) due to a previously known issue. Operators at the time failed to recognize that using WR level indication required accounting for additional instrument uncertainty. While actual level in the U2 RWST was later confirmed greater than the amount required for accident mitigation, the surveillance could not be met.

The cause of this event is overconfidence and a lack of validating assumptions regarding equipment deficiencies associated with the event, as well as a formal evaluation process was not used to fully evaluate risk when the NR indications were lost. The health and safety of the public was not affected by this event.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(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	2. DOCKET NUMBER	3. LER NUMBER		
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NARRATIVE

BACKGROUND

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

This event is being reported under 10 CFR 50.73(a)(2)(i)(B) for condition prohibited by Technical Specifications (TS) and 10 CFR 50.73(a)(2)(v)(A), (B), and (D) for an event or condition that could have prevented the fulfillment of a Safety Function due to the Unit 2 refueling water storage tank (RWST) level being below the minimum TS required value.

The refueling water storage tank provides a source of borated water for use during refueling and a loss-of-coolant accident. The tank Technical Specification minimum contained capacity of 377,537 gallons provides an amount of borated water to assure items 1 through 4 below. The RWST in addition provides sufficient volume to fill the refueling cavity for refueling operations.

1. The volume of borated refueling water needed to increase the boron concentration of initially spilled water to a point that assures no return to criticality with the reactor at cold shutdown and all control rods, except the most reactive rod cluster control assembly, inserted in the core.
2. A volume sufficient to refill the reactor vessel above the nozzles after a loss-of-coolant accident.
3. A sufficient volume of water in the Containment sump to permit the initiation of recirculation.
4. Sufficient volume to allow the station operator adequate time to complete manual valve alignment required to complete switchover from the injection mode following a loss of cooling accident (LOCA) to the containment sump recirculation mode.

Four water level wide range indicator channels and two narrow range instrument loops are provided for the refueling water storage tank. Any one narrow range instrument loop provides a high level alarm and make up level alarm. Any one wide range channel provides a pre lo level alarm, lo level alarm, or lo-lo level alarm. All of the RWST wide range level channels are connected so that 2/4 channels produce an additional alarm indicating low level, which is used to initiate automatic switchover of the residual heat removal pumps at low level for containment recirculation.

The high level alarm is provided to protect against possible overflow of the refueling water storage tank. The tank level at makeup alarm is provided to assure that a sufficient volume of water is always available in the refueling water storage tank in conformance with the Technical Specifications. The lo level alarm alerts the operator to initiate switchover of the suction of the residual heat removal (RHR) pumps. The low-low level alarm alerts the operator to initiate switchover of the suction of the NI and NV pumps. These are the last manual actions required to switchover the suction of the Emergency Core Cooling System (ECCS) pumps to the containment recirculation sump.

In addition to the containment recirculation, the RWST Lo Level setpoint also de-energizes the RWST heaters. During outages, Mode 5, 6 and No Mode, it is desirable to maintain heating of the RWST even below the normal Lo Level setpoint. Therefore, during these modes the RWST Lo Level setpoint is reduced to 11% RWST level.

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Technical Specification 3.5.4 governs the RWST system. Technical Specification Limiting Condition for Operation (LCO) 3.5.4 requires the RWST shall be OPERABLE in MODE 1, 2, 3, and 4. Condition B states that if the RWST is inoperable for reasons other than Condition A, then restore the RWST to OPERABLE status within one hour. LCO 3.5.4 Required Action C states if the Required Action and associated Completion Time of Condition B is not met, the plant must be in Mode 3 within 6 hours and Mode 5 within 36 hours. Technical Specification Surveillance Requirement (SR) 3.5.4.2 requires verification the RWST borated water volume is greater than or equal to 377,537 gallons.

No other inoperable structures, systems, or components contributed to the event.

EVENT DESCRIPTION

On August 18, 2019, at 1700, Catawba Unit 2 entered TS LCO 3.5.4 Condition B “RWST inoperable for reasons other than Condition A”. This was an unplanned entry into a one-hour shutdown LCO action statement. The Unit 2 RWST is a single train system, and the wide range (WR) level average was 97.14% which equates to a volume that is below the minimum Unit 2 RWST volume per TS SR 3.5.4.2, when accounting for instrument uncertainty. At the time the Unit 2 RWST narrow range (NR) level channels Operator Aid Computer (OAC) computer points were unavailable for completion of TS SR 3.5.4.2 due to a previously identified issue. Additionally, level in the Unit 2 RWST had been trending down since placing the tank in purification on the previous day. Transfer of water between the Unit 2 RWST and the Unit 2 spent fuel pool system [DA] (KF) was anticipated and occurred due to known seat leakage on a Unit 2 KF purification loop outlet throttle valve.

Unit 2 RWST WR level reached 97.35% at approximately 2045 on August 17, 2019, which exceeded the threshold for operability of the Unit 2 RWST. The crew on-duty at the time failed to recognize the condition. On day shift August 18, 2019, the Unit 2 control room operator completed the mode surveillance performance test, including the weekly surveillance for Unit 2 RWST level/volume. The operator added the NR instrument uncertainty value when reading the WR value leading to SR 3.5.4.2 being incorrectly signed off as being met. Later in the day, the crew investigated further and identified that the Unit 2 RWST WR level was below the required volume when accounting for the correct instrument uncertainty. The Unit 2 RWST was removed from purification and a manual makeup was immediately started. Unit 2 exited LCO 3.5.4 Condition B at 1744 on August 18, 2019.

While it was later confirmed the actual level in the Unit 2 RWST was greater than the amount required for accident mitigation, TS SR 3.5.4.2 could not be met by using the approved WR level method and thus LCO 3.5.4 Condition B was entered.

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NARRATIVE

Timeline of Events:

August 17, 2019, 1058 – Unit 2 Spent fuel pool demineralizer placed in service, purifying the Unit 2 RWST.

August 17, 2019, 1930 – Operator logs note Unit 2 RWST levels have been trending down since the Unit 2 RWST was placed into purification (due to valve seat leakage). A plan is devised to mitigate the leakage.

August 17, 2019, 2045 – The Unit 2 RWST WR level is now less than TS minimum volume when using Unit 2 RWST WR level instruments and accounting for WR uncertainty.

August 18, 2019, 0800 – Mode surveillance for SR 3.5.4.2 completed incorrectly when NR uncertainty values are used instead of WR uncertainty values.

August 18, 2019, 1700 – Operators determine Unit 2 RWST is below the TS minimum volume and Unit 2 enters TS LCO 3.5.4 Condition B. Unit 2 average RWST WR level is 381,946 gallons (lowest indication of Unit 2 RWST level).

August 18, 2019, 1744 – Unit 2 RWST makeup completed and Unit 2 exits TS LCO 3.5.4 Condition B.

CAUSAL FACTORS

A causal evaluation was completed. Two unrelated and unresolved equipment deficiencies contributed to this event. A KF purification loop outlet throttle valve had previously been identified as having seat leakage. This leakage allowed there to be a transfer of water between the Unit 2 RWST and the Unit 2 spent fuel pool. The second equipment deficiency was related to the Unit 2 RWST NR level indications. An issue had existed in which both Unit 2 RWST NR level channels provided no indication on the OAC. Adequate consideration had not been given as to the impact that these equipment issues had on alarm set points which are designed to alert operators prior to challenging the Unit 2 RWST TS minimum volume.

The cause of this event was determined to be overconfidence and lack of validating assumptions regarding equipment deficiencies associated with the event. Additionally, a formal evaluation process was not used to fully evaluate risk and contingencies when the Unit 2 NR level indications on the OAC had previously been lost.

CORRECTIVE ACTIONS:

Immediate

Unit 2 RWST level was restored to satisfy TS SR 3.5.4.2. – Complete

Unit 1 and Unit 2 temporary OAC alarms were set at appropriate average RWST WR level - Complete

Extent of Condition was performed and the mode surveillance performance tests were reviewed against outstanding equipment deficiencies that could potentially impact a TS surveillance requirement - Complete

Issue a crew learning to all licensed operators regarding lessons learned from this event – Complete

Revise the mode surveillance test procedure for RWST level/volume to remove the complexity of calculating the TS minimum volume by using the instrument uncertainty - Complete

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Complete a Performance Analysis regarding operator knowledge of the RWST NR and WR level instrumentation, their outputs, the relationship between each indication, and the RWST at makeup annunciator – Complete

Planned

Operations identify equipment deficiencies related to TS equipment/indications on turnover sheets through the formal evaluation process to ensure impacts are understood, including any lost margin; the correct monitoring and contingency actions are in place; the priority for repairs are appropriate, and the issue is effectively communicated within the department and to the site.

SAFETY ANALYSIS:

After the event occurred, a functional test was performed that verified both Unit 2 RWST NR transmitter instrument loops and annunciators were functional. The RWST Makeup Level annunciator is set at a value which is sufficient to ensure timely makeup can be provided such that volume can be maintained above the TS minimum volume. The Unit 2 RWST Makeup Level annunciator was not received during this event.

As-found channel calibration performance was also analyzed during the recent Unit 2 outage. Based on the functional testing performed coupled with the as-found channel calibration performance, and the fact that a Makeup Level annunciator was not received during the event, it is concluded that the Unit 2 RWST contained more than the minimum required volume. Therefore, the Unit 2 RWST could have still performed its intended safety function with the level in the tank.

In conclusion, this event is considered to be of low safety significance. There was no impact to the health and safety of the public.

ADDITIONAL INFORMATION:

Previous Similar Occurrences:

A review of License Event Reports from the past 5 years did not identify any similar occurrences.