DUKE ENERGY®

Carrie T. Dunton
Director, Nuclear Site Support
Oconee Nuclear Station

Duke Energy
ON01VP | 7800 Rochester Hwy
Seneca, SC 29672

o. 864.873.3477
f: 864.873.4208
carrie.dunton@duke-energy.com

RA-18-0038

June 7, 2018 10 CFR 50.73

Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2746

Duke Energy Carolinas, LLC
Oconee Nuclear Station, Unit 1
Docket Numbers: 50-269
Renewed Operating Licenses: DPR-38

Subject: Licensee Event Report 269/2018-001, Revision 0 – Unit 1 Manual Reactor Trip Due to Main Feedwater Flow Control Valve E/P Converter Failures

Licensee Event Report 269/2018-001, Revision 0, is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

There are no regulatory commitments associated with this LER.

If there are questions, or further information is needed, contact Sam Adams, Regulatory Affairs, at (864) 873-4388.

Sincerely,

Carrie T. Dunton
Director, Nuclear Site Support
Oconee Nuclear Station

Enclosure

IE22
NRR

cc (w/Enclosure):

Ms. Catherine Haney, Administrator, Region II
U.S. Nuclear Regulatory Commission
Marquis One Tower
245 Peachtree Center Ave., NE, Suite 1200
Atlanta, GA 30303-1257

Ms. Audrey L. Klett, Project Manager
(by electronic mail only)
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Mail Stop O-08B1A
Rockville, MD 20852-2738

Mr. Eddy Crowe
NRC Senior Resident Inspector
Oconee Nuclear Station

NRC FORM 366 (04-2018)

U.S. NUCLEAR REGULATORY COMMISSION

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.

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	2. Docket Number	3. Page
Oconee Nuclear Station Unit 1	05000269	1 OF 4

4. Title

Unit 1 Manual Reactor Trip Due to Main Feedwater Flow Control Valve E/P Converter Failures

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
									NA	05000
04	13	2018	2018	001	0	06	07	2018	Facility Name	Docket Number
									NA	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)
24%	☐ 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)(ii)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(iii)
		☐ 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)
Sam Adams, Oconee Regulatory Affairs	(864) 873-3348

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
B	SJ	1FDWEP0007 CNV	M422	Yes	B	SJ	1FDWEP0008 CNV	M422	Yes

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 April 13, 2018 at 0227 hours, Oconee Unit 1 was manually tripped from 24% power. At the time of the trip, Unit 1 was in the process of a planned shutdown to repair a rod control cable connector and recover a dropped rod. The turbine was offline. While reducing power, problems were encountered such that power would no longer decrease. The main feedwater control valves (MFCVs) would not respond to automatic or manual control to close the MFCVs. An investigation revealed that the MFCVs would not go fully closed with a full closed demand signal from the Integrated Control System (ICS). The valves were subsequently tested and their electric to pneumatic (E/P) converters were found to be failed on the low end of calibration. The E/P converters failing in this manner caused the MFCVs to not go full closed despite the full closed demand signal from ICS.

This event was reported as a 4-hour notification to the NRC on April 13, 2018, in Event Notification (EN) number 53329 under 10 CFR 50.72(b)(2)(iv)(B) - Reactor Protection System (RPS) Actuation - Critical. The event is also reportable under 10 CFR 50.73(a)(2)(iv)(A) as an actuation of the RPS.

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		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Oconee Nuclear Station Unit 1	05000269	2018	001	0

NARRATIVE

EVALUATION:

BACKGROUND

Main Feedwater Control Valves (MFCVs) [EIIS: FCV] 1FDW-32 & 41 are pneumatically operated valves, that regulate feedwater flow to the 1A & 1B steam generator, respectively, when reactor power is between approximately 15% and 100%. The analog control signal for this valve is generated by the Integrated Control System (ICS) [EIIS: JA] and transformed to a pneumatic signal via an electric to pneumatic converter (E/P) [EIIS: CNV]. Each E/P contains an electric potential to current converter (E/I) and a current to pneumatic converter (I/P). Each I/P consists of an electronic subsystem and a pneumatic subsystem. Independent of the Main Feedwater control function, an Automatic Feedwater Isolation System (AFIS) circuit will automatically close the Feedwater control valves when a Main Steam Line Break (MSLB) is detected on the associated header.

Technical Specification (TS) 3.7.3 "Main Feedwater Control Valves (MFCVs), and Startup Feedwater Control Valves (SFCVs)" Limiting Condition for Operation (LCO) 3.7.3 requires "Two MFCVs and two SFCVs shall be OPERABLE," while in MODES 1, 2 and 3, except when all MFCVs and SFCVs are closed and deactivated or isolated by a closed manual valve. The safety function associated with this TS is to isolate main feedwater to the steam generators upon a steam line break inside containment.

The event did not challenge the AFIS function of the MFCVs.

When the manual reactor trip was initiated, Oconee Nuclear Station (ONS) Unit 1 was in the process of a planned, normal shutdown with power at approximately 24%. ONS Units 2 and 3 were operating in MODE 1 with Unit 2 at approximately 100% power and Unit 3 at approximately 89% power (Note: Unit 3 was in an end-of-cycle power coastdown in preparation for a refueling outage). No significant structures, systems or components were out of service such that they contributed to this event.

This event was reported as a 4-hour notification to the NRC on April 13, 2018, in Event Notification (EN) number 53329 under 10 CFR 50.72(b)(2)(iv)(B) - Reactor Protection System (RPS) Actuation - Critical. The event is also reportable under 10 CFR 50.73(a)(2)(iv)(A) as an actuation of the RPS.

EVENT DESCRIPTION

On April 12, 2018 at 1322 hours, an Oconee Unit 1 (ONS-1) control rod dropped to 0% withdrawn causing an automatic ICS runback that reduced ONS-1 power to 55%. The Operational Decision Making process was utilized and ultimately a conservative decision was made to shutdown ONS-1 to repair a rod control cable connector and recover the dropped rod. A controlled shutdown of ONS-1 was commenced and the turbine was taken offline. During the down power to shutdown ONS-1, problems were encountered such that the plant would no longer respond to the command/demand to decrease power as power remained at 24%. Operations troubleshot this issue until it became clear that efforts to lower power (both automatically and manually) could not cause power to further reduce. A decision was then made to manually trip the reactor. Post-trip conditions and system performance indications were normal.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Oconee Nuclear Station Unit 1	05000269	2018	001	0

NARRATIVE

CAUSAL FACTORS:

Troubleshooting of the event determined that the cause of the MFCVs not going fully closed despite a full closed demand signal was a failure in the pneumatic subsystem of the current to pneumatic converters (I/P) [a subcomponent of the electric to pneumatic converter (E/P)] to properly provide demand signals for MFCVs 1FDW-32 and 1FDW-41. Each E/P (1FDWEP0007 and 1FDWEP0008) contains an electric potential to current converter (E/I) and a current to pneumatic converter (I/P). Each I/P consists of an electronic subsystem and a pneumatic subsystem. A Root Cause Evaluation (RCE) is currently investigating the cause(s) for the I/P failures.

The I/P failure to properly provide demand signals for the Unit 1 MFCVs was determined to potentially apply to the MFCVs, SFCVs and other components on Oconee Units 1, 2 and 3 that use the same model I/P. The extent of condition is being reviewed and evaluated further in the on-going RCE.

Root Cause:

The cause of the MFCVs not going fully closed despite a full closed demand signal was identified to be a failure in the pneumatic subsystem of the associated I/P for each MFCV.

A RCE is in progress to determine the cause(s) for the I/P pneumatic subsystem failures, the extent of condition and required corrective actions.

CORRECTIVE ACTIONS:

Immediate:

1. Prior to restarting Unit 1, the I/P converters were replaced in each Unit 1 MFCV E/P (1FDWEP0007 & 1FDWEP0008), and successful checks and calibrations were performed on the associated MFCVs, 1FDW-32 and 1FDW-41.

Planned:

1. Complete the on-going RCE and implement required corrective actions.

SAFETY ANALYSIS

The ONS-1 manual trip on April 13, 2018 was uncomplicated and had no impact on public health and safety. The problems with the signals to the feedwater control valves that led to the manual trip did not affect the post-trip response of the feedwater and condensate systems. Feedwater flow to the steam generators was maintained throughout the event and no equipment problems were experienced that required unusual operator actions. No Emergency Core Cooling System (ECCS) or other safety system actuations occurred in response to this event, and no issues were identified with operator response or procedures. Thus, it is concluded that the impact of this event on overall plant risk is insignificant and had no impact on public health and safety.

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		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Oconee Nuclear Station Unit 1	05000269	2018	001	0

NARRATIVE

ADDITIONAL INFORMATION

A search of the Oconee Corrective Action Program (CAP) database was conducted for the preceding five (5) year period. Similarly, a review of industry Operating Experience (OE) databases was conducted using applicable keyword searches, i.e., "feedwater valve control issues," etc., to ascertain other reported events. This review revealed two similar Duke Energy events that occurred at ONS-3 on January 31, 2015 and October 24, 2013, when the unit was manually tripped due to feedwater oscillations. These previous events were reported in LER 287/2015-01 (ML15098A472) and LER 287/2013-01 (ML13358A336). Although the cause evaluation of the 2013 event identified a failed o-ring in the valve actuator, that cause was refuted in Revision 1 (ML16161A458) to the 2013 report as it was determined that the 2013 cause was an electric to pneumatic converter (E/P) failure similar to the one identified to be the cause of the 2015 event. Each E/P contains an electric potential to current converter (E/I) and a current to pneumatic converter (I/P). Each I/P consists of an electronic subsystem and a pneumatic subsystem. In both the 2013 and 2015 events, the E/P failure was determined to be due to intermittent failures of the circuit boards in the electronic subsystem of the I/P converter.

While the apparent cause of this event is an E/P converter failure as it was in the 2013 and 2015 events, it must be noted that, after the 2015 reported event, existing E/P converter components on each unit were replaced with upgraded components made by a different manufacturer. Specifically, the new manufacturer was chosen as they included IPC-A-610 Class 2 circuit boards that are manufactured to a higher standard than the IPC-A-610 Class 1 circuit boards used by the previous manufacturer. The IPC-A-610 standard provides target conditions for assemblies as well as examples of acceptable and defect conditions for each class of circuit board. Additionally, as previously described, the 2013 and 2015 failures were in the electronic subsystem of the I/P converters whereas the most recent failure occurred in the pneumatic subsystem of the I/P converters. The 2015 report also identified a planned corrective action to modify the MFCV controls with a more fault tolerant design; the first modification was installed on Unit 3 during its recently completed refueling outage.

The components of the E/P are not safety related; therefore, Part 21 reportability does not apply.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX]. This event is considered INPO Consolidated Events System (ICES) Reportable. There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.