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ONS-2016-038

10 CFR 50.73

May 5, 2016

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

Duke Energy Carolinas, LLC (Duke Energy)  
Oconee Nuclear Station Unit 1  
Docket No. 50-269  
Renewed License Number DPR-38

Subject: Licensee Event Report 269/2016-001, Revision 0 - Reactor Trip - System Actuation

The enclosed Licensee Event Report (LER) describes the March 6, 2016, reactor trip at Oconee Nuclear Station (ONS), Unit 1. A Turbine Trip/Reactor Trip was initiated by an electrical failure on the high side bushing of Unit 1 Main Step-up Transformer. The actuation of the Reactor Protection System (RPS) for the reactor trip requires an LER to be submitted per 10 CFR 50.73(a)(2)(iv)(A).

There are no regulatory commitments associated with this LER.

If there are questions, or further information is needed, contact David Haile in ONS Regulatory Affairs at (864) 873-4742.

Sincerely,

Scott L. Batson  
Vice President  
Oconee Nuclear Site

Enclosure

LER: RPS Actuation - Unit 1 Reactor Trip initiated by a Generator Lockout/Turbine Trip

IE22  
NRR

cc :


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INPO (Word File via E-mail)

<b>NRC FORM 366</b> <b>U.S. NUCLEAR REGULATORY COMMISSION</b> (11-2015)					<b>APPROVED BY OMB: NO. 3150-0104</b> <b>EXPIRES: 10/31/2018</b> <small>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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet 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.</small>					
 <b>LICENSEE EVENT REPORT (LER)</b>										
(See Page 2 of form 366 for required number of digits/characters for each block)										
<b>1. FACILITY NAME</b> Oconee Nuclear Station, Unit 1					<b>2. DOCKET NUMBER</b> 05000269		<b>3. PAGE</b> 1 of 3			
<b>4. TITLE</b> RPS Actuation - Unit 1 Reactor Trip Initiated by a Generator Lockout/Turbine Trip										
<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>			<b>8. OTHER FACILITIES INVOLVED</b>	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV. NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	06	2016	2016	001	00	05	05	2016	NA	5000
<b>9. OPERATING MODE</b> <b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>										
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"/> 20.2201(d)			<input type="checkbox"/> 20.2203(a)(3)(ii)			<input type="checkbox"/> 50.73(a)(2)(ii)(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"/> 20.2203(a)(2)(i)			<input type="checkbox"/> 50.36(c)(1)(i)(A)			<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	
100			<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"/> 20.2203(a)(2)(iii)			<input type="checkbox"/> 50.36(c)(2)			<input type="checkbox"/> 50.73(a)(2)(v)(B)	
			<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"/> 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"/> 20.2203(a)(2)(vi)			<input type="checkbox"/> 50.73(a)(2)(i)(B)			<input type="checkbox"/> 50.73(a)(2)(vii)	
						<input type="checkbox"/> 50.73(a)(2)(i)(C)			<input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A	
<b>12. LICENSEE CONTACT FOR THIS LER</b>										
<b>LICENSEE CONTACT</b> David Haile, Regulatory Affairs Lead Engineer								<b>TELEPHONE NUMBER (Include Area Code)</b> (864) 873-4742		
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO ICES	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO ICES	
X	EA	XFMR	W121	Yes						
<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> NO								<b>15. EXPECTED SUBMISSION DATE</b>		
								MONTH	DAY	YEAR
<b>ABSTRACT</b> (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)										
<p>At 1512 on March 6, 2016, Oconee Nuclear Station (ONS) Unit 1 experienced a Reactor Trip, initiated by an electrical bushing failure on the Unit 1 Main Step-up Transformer that resulted in a transformer fire. The plant response to the trip was evaluated, and was found to be acceptable. The reactor trip is a RPS actuation and requires an LER per 10 CFR 50.73(a)(2)(iv)(A).</p> <p>Due to the transformer fire a "Notification Of Unusual Event" was declared at 1520. The fire eventually led to a transformer overhead line failure that caused a switchyard bus lockout and the loss of one emergency power path for the site. The second emergency power path and multiple offsite sources remained operable during the event. The emergency classification was upgraded to an "Alert" condition at 1658, upon determining that the fire had an impact on safety related equipment.</p> <p>The 4-hour notification related to this reactor trip was bounded by the notifications made for the Emergency Classifications described above (See Event Notification 51770).</p> <p>Post trip conditions and Emergency event conditions were controlled and maintained within the allowances of Technical Specifications with no personnel injuries or challenges to other safety system actuations. The transformer deluge system activation along with the response of onsite and offsite fire teams promptly contained the fire.</p>										

LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE		
		YEAR	SEQUENTIAL NUMBER	REV NO.			
Oconee Nuclear Station, Unit 1	05000269	2016	- 001	- 00	2	OF	3

**Narrative**Background

This event is reportable per 10 CFR 50.73(a)(2)(iv)(A) as an actuation of the Reactor Protection System (RPS) [JC]. When the reactor trip occurred, Oconee Nuclear Station (ONS) Units 1, 2 and 3, were operating in MODE 1 at approximately 100% power. No significant structures, systems or components were out of service such that they contributed to this event.

The 19KV output of the unit 1 generator is fed to a Main Step-Up (MSU) transformer where voltage is increased to 230KV. The MSU Transformer is located beside the Turbine Building and feeds the generator's power output to the switchyard.

The ONS electrical power system design credits two Keowee Hydroelectric Units (KHUs) [EK] within the owner controlled area of the station as its emergency power sources. Upon a loss of power, emergency power is supplied from both KHU units through two separate and independent routes, an overhead and underground emergency power path.

The ONS Limiting Condition for Operation (LCO) for Technical Specification (TS) 3.8.1 "AC Power Sources" contains the following:

The following AC electrical power sources shall be OPERABLE:

1. Two offsite sources on separate towers connected to the 230 KV switchyard to a unit startup transformer and capable of automatically supplying power to one main feeder bus; and
2. Two Keowee Hydro Units (KHUs) with one capable of automatically providing power through the underground emergency power path to both main feeder buses and the other capable of automatically providing power through the overhead emergency power path to both main feeder buses.

EVENT DESCRIPTION

At approximately 1512 on March 6, 2016, a fault occurred on one of the bushings for the Unit 1 - Main Step-Up (MSU) transformer [EL], which resulted in a Generator [TB] Lockout/Turbine Trip which in turn prompted a reactor trip. At the time of these occurrences a security officer stationed in proximity of the MSU transformer heard a loud noise and observed smoke and flames coming from the MSU transformer and reported it to the Control Room.

This reactor trip is an anticipatory design feature of RPS which trips the reactor based on an "at power turbine trip," prior to Reactor Coolant System (RCS) [RC] parameters (pressure, temperature, level, flow, or reactor power) reaching their reactor trip setpoints.

Reactor trip breaker operation and control rod insertion all occurred as expected and within acceptable time responses. RCS and Secondary plant parameters were maintained such that no safety system actuation occurred.

With regard to nuclear safety systems, operational and plant system response to the Reactor Trip was evaluated as being normal/acceptable.

The reactor trip (RPS actuation) is the reportable attribute of this LER per 10 CFR 50.73(a)(2)(iv)(A).

A "Notification of Unusual Event" (NOUE) was declared at 1520 due to a transformer fire that was started by an electrical fault of one of its bushings. The transformer deluge system activation along with the response of onsite and offsite fire teams promptly contained the fire. The fire eventually caused a transformer overhead conductor to fail and fall to the ground, which triggered a switchyard bus lockout. Due to the ONS electrical distribution design, the lockout also constitutes a loss of one emergency power path to the site. At 1658, the discovery that the fire had affected a safety system, led the

LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Oconee Nuclear Station, Unit 1	05000269	YEAR	SEQUENTIAL NUMBER	REV NO.	3 OF 3
		2016	- 001	- 00	

***Narrative***

emergency classification to be upgraded to an "Alert" condition. The fire was declared to be completely extinguished at 1708 and the plant exited all Emergency declarations at 2016.

Other than entry into the Technical Specifications associated with the fire's impact on one emergency power path, there was no impact to systems required for safe operation and shutdown of the plant during the NOUE and Alert. The second emergency power path and multiple offsite sources remained operable and had no impact on the operational response to the reactor trip or recovery for the emergency declarations. Units 2 and 3 continued to operate at 100% power throughout the event.

**CAUSAL FACTORS**

The cause of this Reactor Trip was determined to be an electrical failure of a transformer bushing (the transformer connection point for a conductor going to the 230KV switchyard). The electrical fault initiated a generator lockout and turbine trip which prompted a reactor trip.

**CORRECTIVE ACTIONS**

1. The 230KV bus was restored.
2. A replacement step-up transformer was tested and installed on Unit 1.

**SAFETY ANALYSIS**

The Unit 1 Main Step-up transformer's bushing failure caused a generator lockout/turbine trip, that initiated a RPS anticipatory reactor trip. The unit's system response was in line with a loss of electrical load reactor trip. Steam generator pressure control responded as expected and Main Steam Relief Valves (MSRVs) lifted and reseated within specifications. Steam generator level was controlled to appropriate post trip levels without an Emergency Feedwater actuation. RCS pressure, temperature and inventory (i.e., pressurizer level) was also controlled appropriately. All reactor coolant pumps operated throughout the event and no Emergency Core Cooling System (ECCS) or Engineering Safeguards (ES) actuation conditions were met. Thus, the controlled nature of the plant response to the reactor trip did not result in a significant risk to the public.

The transformer fire was contained and controlled without injury, and did not present any radiological safety challenges. The fire affected one out of two emergency power paths during post trip recovery. No other nuclear related plant systems were impacted. The loss of the emergency power path was within the safety allowances provided by Technical Specification actions.

**ADDITIONAL INFORMATION**

Energy Industry Identification System (EIIIS) codes are identified in the text as [XX].

There were no releases of radioactive materials or radiation exposures in excess of limits associated with this event.

**SIMILAR EVENTS**

A search of the Oconee Corrective Action Program (CAP) database was conducted for the preceding three year period. No other LERs were found related to reactor trips caused by secondary electrical load issues.