



Exelon Generation®

Oyster Creek  
Route 9 South  
P.O. Box 388  
Forked River, NJ 08731

10 CFR 50.73

RA-17-083

January 3, 2018

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk or O-8B1  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852

Oyster Creek Nuclear Generating Station  
Renewed Facility Operating License No. DPR-16  
NRC Docket No. 50-219

Subject: Licensee Event Report (LER) 2017-005-00, "Failure of the #2 Emergency Diesel Generator During Surveillance Testing due to a Broken Electrical Connector"

Enclosed is LER 2017-005-00 reporting the electrical connector failure on a current differential relay for #2 Emergency Diesel Generator during the performance of surveillance testing.

This event did not affect the health and safety of the public or plant personnel. This event did result in a safety system functional failure. There are no regulatory commitments made in this LER submittal.

Should you have any questions concerning this report, please contact Gary Flesher, Regulatory Assurance Manager, at (609) 971-4232.

Respectfully,

Michael F. Gillin  
Plant Manager  
Oyster Creek Nuclear Generating Station

1E22  
NRR

Enclosure: NRC Form 366, LER 2017-005-00

cc: Administrator, NRC Region I  
NRC Senior Resident Inspector - Oyster Creek Nuclear Generating Station  
NRC Project Manager - Oyster Creek Nuclear Generating Station



**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/>)

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 e-mail to [Infocollects.Resource@nrc.gov](mailto: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.

<b>1. FACILITY NAME</b> Oyster Creek Nuclear Generating Station	<b>2. DOCKET NUMBER</b> 05000219	<b>3. PAGE</b> 1 OF 3
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**4. TITLE**  
Failure of the Emergency Diesel Generator #2 During Surveillance Testing due to a Broken Electrical Connector

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
10	09	2017	2017	- 005	- 00	01	03	2018	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000

<b>9. OPERATING MODE</b>	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>			
N	<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)
	<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 Gary Flesher, Regulatory Assurance Manager	TELEPHONE NUMBER (Include Area Code) (609) 971-4232
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
E	EK	DG	E147	Y	N/A	N/A	N/A	N/A	N/A

<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
		N/A	N/A	N/A

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

On 10/09/17, during the bi-weekly Emergency Diesel Generator (EDG) #2 Load Test, a Generator Lockout signal (86G) was received which tripped the EDG output breaker. This failure resulted in EDG #2 being declared inoperable, and entry into an unplanned 7-day Limiting Condition for Operation (LCO) at 0312.

Troubleshooting identified a broken electrical ring lug connector on a current transformer that provides an input to the protective relay logic. The investigation determined the connector failure was due to fatigue cracking that was initiated by stresses caused by bending and twisting of the electrical lug beyond limits specified in industry guidelines. The ring lug was most likely distressed during initial installation in the 1990's. The condition that led to the EDG #2 trip existed for greater than the allowed outage time in the plant's Technical Specification (TS) and is reportable under 10 CFR 50.73(a)(2)(i)(B).



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

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		YEAR	SEQUENTIAL NUMBER	REV NO.
Oyster Creek Nuclear Generating Station	05000219	2017	- 005	- 00

**NARRATIVE**

**Plant Conditions Prior To Event**

Event Date: October 09, 2017      Event Time: 03:12 hours ET  
Unit 1 Mode: Run      Power Level: 100%

**Description of Event**

On 10/09/17, during the bi-weekly EDG #2 Load Test (station procedure 636.4.013), a Generator Lockout (86G) signal was received which tripped the EDG output breaker. The diesel had run for 4 minutes loaded in the procedurally prescribed band of 2600-2800 KW prior to receiving the 86G lockout signal. The EDG #2 trip is documented under Issue Report (IR) 04060815. This failure resulted in EDG #2 being declared inoperable, and entry into an unplanned 7-day LCO (TS Section 3.7.D) at 0312.

Troubleshooting identified a broken electrical ring lug connector on one current transformer (CT5) that provides an input to a differential current relay (87G). When the ring lug connector became detached from the terminal point, the relay sensed a current imbalance and the protective relay logic actuated. The differential current relay (87G) provided an input to the Generator Lockout circuit, causing the lockout relay (86G) to trip the EDG#2 output breaker. Repairs were completed on 10/10/17 at 0557. EDG #2 was satisfactorily tested and declared operable at 0805, and the 7-day LCO was exited.

**Cause of Event**

The investigation determined the electrical ring lug connector failure was due to fatigue cracking that was initiated by stresses caused by bending and twisting of the electrical lug beyond limits specified in industry guidelines.

**Analysis of the Event**

The ring lug that failed was sent to a metallurgical lab for failure analysis. The metallurgical analysis determined the ring lug had failed due to fatigue cracking. The investigation performed for the EDG#2 trip concluded the fatigue cracking was initiated by historical stresses caused by bending and twisting of the electrical lug beyond limits specified in industry guidelines. Based on a review of recent maintenance records for EDG#2 and a review of plant procedures and work practices, the investigation concluded the ring lug was most likely distressed during initial installation in the 1990's.

**Assessment of Safety Consequences**

Two EDG units serve as the Standby Power Supply for Oyster Creek Nuclear Generating Station (OCNGS) by providing an emergency source of power to the 4.16 kV buses 1C and 1D in the event of a loss of normal power. The EDG units are designed to start and load automatically, if required. Non-essential loads are automatically shed by under-voltage sensing devices on loss of offsite power to ensure that the EDG units are not overloaded. The capacity of the EDG units is sufficient to sequentially energize for starting all safety-related pumps and auxiliaries required for a safe shutdown of the reactor in the event of a Design Basis Accident. The EDG units are independent of each other, except for a common bulk fuel storage supply, and are provided with auxiliary systems to ensure reliable starting and continuous operation with no Operator attention. Power to start the EDG units is self-contained and is not dependent on the availability of any other source of normal plant power at the moment of initiation.



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**NARRATIVE**

The Generator Lockout relay (86G) is an auxiliary relay that is operated upon the occurrence of abnormal conditions to maintain associated equipment out of service until it is reset. The lockout (86G) relay is sealed-in when the Differential Current Relay (87G) is initiated. The failure of the wire lug would not have prevented EDG #2 from being able to start. However, in the as found condition EDG#2 was unable to start and load to supply power to the safety buses for the required mission time of 72 hours. Because EDG #1 was operable and available to supply power to its associated loads in the event of a loss of offsite power, there was no loss of safety function.

**Corrective Actions**

1. The broken ring lug connector for the current transformer (CT5) was replaced. EDG#2 was tested and restored to operable status on 10/10/17 at 0805 hours.
2. All ring lug connectors were inspected in the current transformer and potential transformer cabinet for EDG#2. Four other bent and/or twisted ring lug connectors were identified and replaced on 10/10/17.
3. Extent of condition inspections were performed on all ring lug connectors in the current transformer and potential transformer cabinet for EDG#1.
4. Two bent and/or twisted ring lug connectors were replaced on EDG#1 on 12/28/17.
5. Revise electrical ring lug installation and EDG inspection procedures to include inspection for bent and/or twisted lugs.

**Previous Occurrences**

There have been no similar, previous events resulting from a failure of a wire lug on an EDG at Oyster Creek.

**Component Data**

Component	IEEE 805 System ID	IEEE 803A Component
Emergency Diesel Generator	EK	DG