



Callaway Plant

November 7, 2019

ULNRC-06538

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

10 CFR 50.73(a)(2)(iv)

Ladies and Gentlemen:

**DOCKET NUMBER 50-483  
CALLAWAY PLANT UNIT 1  
UNION ELECTRIC CO.  
RENEWED FACILITY OPERATING LICENSE NPF-30  
LICENSEE EVENT REPORT 2019-001-01  
EMERGENCY AC ELECTRICAL POWER ACTUATION**

On June 6, 2019, Callaway Plant submitted Licensee Event Report (LER) 2019-001-00 in accordance with 10 CFR 50.73(a)(2)(iv)(A) to report the automatic actuation of emergency ac electrical power.

The enclosed LER supplement, LER 2019-001-01, is submitted to update the causes and corrective actions for the same condition.

This letter does not contain new commitments.

Sincerely,

A handwritten signature in dark ink, appearing to read "Fred Bianco", followed by the number "502" written to the right of the signature.

Fred Bianco  
Senior Director, Nuclear Operations

Enclosure

cc: Mr. Scott A. Morris  
Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region IV  
1600 East Lamar Boulevard  
Arlington, TX 76011-4511

Senior Resident Inspector  
Callaway Resident Office  
U.S. Nuclear Regulatory Commission  
8201 NRC Road  
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Mr. L. John Klos  
Project Manager, Callaway Plant  
Office of Nuclear Reactor Regulation  
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Mail Stop O9E3  
Washington, DC 20555-0001


**Index and send hardcopy to QA File A160.0761**

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Missouri Public Service Commission

<b>NRC FORM 366</b> (04-2018)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>			<b>APPROVED BY OMB: NO. 3150-0104</b>		<b>EXPIRES: 03/31/2020</b>			
		<b>LICENSEE EVENT REPORT (LER)</b> (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 <a href="http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/">http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/</a> )			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 <a href="mailto:Infocollects.Resource@nrc.gov">Infocollects.Resource@nrc.gov</a> , 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> Callaway Plant Unit 1				<b>2. Docket Number</b> 05000483			<b>3. Page</b> 1 OF 5			
<b>4. Title</b> Unplanned Loss of Switchyard Bus B Results in System Actuation										
<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
4	17	2019	2019	- 001	- 01	11	7	2019	Facility Name	Docket Number
										05000
										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 checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)	
<b>10. Power Level</b>			<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)	
000			<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 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	
<b>12. Licensee Contact for this LER</b>										
Licensee Contact T.B. Elwood, Supervising Engineer, Regulatory Affairs and Licensing								Telephone Number (Include Area Code) 314-225-1905		
<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	
<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 14 single-spaced typewritten lines) On April 17, 2019 at approximately 0137 CDT, a valid actuation of the "A" emergency diesel generator (EDG) at the Callaway plant occurred due to inadvertent tripping of the "B" switchyard bus. The plant was in No Mode (defueled) when the switchyard 345-kV main generator output breaker (MDV53) was closed to backfeed the unit auxiliary transformer. MDV53 immediately reopened due to a ground located on a set of current transformers that set up an unwanted path for current to flow between the protection circuits for switchyard breakers MDV53 and MDV55. De-energization of the "B" switchyard bus resulted in de-energization of two transformers in the switchyard circuit connection to the 4.16-kV NB01 safety bus. The loss of voltage on the NB01 bus triggered the "A" EDG actuation.										
The following root causes were identified: <ol style="list-style-type: none"> <li>Ineffective management by the Transmission Substations department of a design scope change introduced a design error, i.e., an extraneous jumper that enabled the unwanted current path to the breaker protection circuits.</li> <li>Engineering supervision assumed the Transmissions Substations design process included an independent review, and thus, an independent review was not requested.</li> </ol> Corrective actions to prevent recurrence include: <ol style="list-style-type: none"> <li>Revising the Engineering Design Quality Review Process procedure to require an independent review of Callaway specific schematic and wiring diagrams.</li> <li>Establishing procedural requirements for reviewing the design review documentation from Transmission Substations.</li> </ol>										
The automatic actuation of the emergency diesel generator was a valid actuation and is reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A). There was no impact to the health and safety of the public as a result of this event. Systems responded as expected (i.e., per design) in response to de-energization of the "B" switchyard bus.										

**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/>)

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](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.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Callaway Plant Unit 1	05000-483	YEAR	SEQUENTIAL NUMBER	REV NO.
		2019	- 001	- 01

**NARRATIVE****1. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):****Switchyard System Description:**

As depicted in the figure provided on page 5 of this LER, the 345-kV Callaway switchyard [EIS System: FK] consists of circuit breakers, disconnect switches, buses, transformers, and associated equipment. The offsite circuit connections to the onsite switchyard for Callaway are arranged such that there are four transmission lines incoming and connecting to the switchyard via two physically separated rights of way (i.e., each with two 345-kV circuits). Versatility for connecting these offsite circuits to the onsite plant power system is provided via a dual bus arrangement within the switchyard (i.e., 345-kV Bus A and 345-kV Bus B [EIS Component: BU]) for which a breaker-and-a-half arrangement is utilized. A 345/13.8-kV safeguard transformer [EIS Component: XFMR] is connected directly to each 345-kV bus through a disconnect switch which is capable of interrupting magnetizing current. Each transformer has two low-side breakers connected so that either transformer may supply (via underground duct) a 13.8/4.16-kV engineered safety feature (ESF) transformer at the plant. The safeguard transformers are sized so that either transformer "A" or "B" has the capacity to handle the design shutdown or the design basis loss of coolant accident load.

For the two offsite circuit connections required to satisfy the AC source requirements of Technical Specification (TS) 3.8.1, "AC Sources - Operating," during plant operation (i.e., Modes 1, 2, 3, and 4), two electrically and physically separated circuits provide AC power from the switchyard to the two 4.16-kV Class 1E safety buses (NB01 and NB02) via the ESF transformers, XNB01 and XNB02. Specifically, one required offsite circuit consists of either safeguard transformer A or B, which is supplied from switchyard Bus A or B and feeds through a breaker to ESF transformer XNB01, which in turn powers the NB01 ESF bus through its normal feeder breaker. The other required offsite circuit consists of the startup transformer which is normally fed from the switchyard through breaker PA0201 and feeds power (from one of the startup transformer's two secondary windings) to ESF transformer XNB02, which in turn powers the NB02 ESF bus through its normal feeder breaker.

For shutdown conditions (i.e., Modes 5 and 6 and during movement of irradiated fuel assemblies), either one of the above-noted circuit connections is required to supply one ESF bus per the requirements of TS 3.8.2, "AC Sources - Shutdown."

The switchyard and circuit connection design for Callaway also provides for the supply of power to non-safety loads during plant operation and shutdown conditions. During refueling outages, however, a backfeed alignment is employed to provide power to the non-safety 13.8-kV PA01/PA02 bus(es) via the unit auxiliary transformer. The unit auxiliary transformer is backfed from the switchyard via the main power step-up transformers (used normally to couple the main generator output to the switchyard during plant operation).

**2. INITIAL PLANT CONDITIONS:**

At the time of the event, Refueling Outage 23 was ongoing and the plant was in No Mode with no movement of irradiated fuel in the Fuel Building. Both trains of ESW and CCW were in service and the "A" spent fuel pool cooling pump was running. The "B" spent fuel pool cooling pump was available but not running. The protected train was the "A" train, and the "B" emergency diesel generator was out of service. Both NB01 and NB02 buses were energized from their normal off-site power sources. That is, the NB01 bus was being supplied from the "B" safeguard transformer (off the "B" switchyard bus) via ESF transformer XNB01, and the NB02 bus was being supplied from the startup transformer via ESF transformer XNB02.

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**3. EVENT DESCRIPTION:**

On April 17, 2019, Operations personnel were attempting to energize the unit auxiliary transformer from the switchyard via a backfeed through the main power transformers, as a planned refueling outage activity, utilizing Callaway procedure OTS-MA-00001, "Main Step-Up Transformer Backfeed - Infrequently Performed Test or Evolution." At 0137 CDT, step 5.2.9 of the procedure was performed to close 345-kV main generator output breaker MDV53 [EIS Component: BKR] in order to energize the unit auxiliary transformer. By local observation, and upon closure of the MDV53 breaker, the main and unit auxiliary transformers started to hum and the breaker immediately reopened. The "B" switchyard bus cleared, causing a loss of power to the B safeguard transformer and thus to ESF transformer XNB01. The "A" train Shutdown Sequencer actuated, and the "A" emergency diesel generator (NE01) [EIS Component: DG] started and auto-connected to the NB01 bus via the 4.16-kV bus switchgear. Equipment on the NB01 bus was shed as expected, and the "A" essential service water (ESW) pump, the "A" component cooling water (CCW) pump, and the "A" control room air conditioning unit all automatically restarted.

Off-normal procedure OTO-NB-00001, "Loss Of Power To NB01," was entered to respond to the actuation. The "A" spent fuel pool cooling pump was restarted per procedure at 0149. During this period, spent fuel pool temperature rose from 102 degrees Fahrenheit to 103 degrees Fahrenheit. XNB01 was re-energized from switchyard Bus A, and power to the NB01 bus was transferred back from the "A" emergency diesel generator to ESF transformer XNB01.

It should be noted that there are two breakers that feed the main generator step-up transformers in a backfeed lineup, i.e. MDV53 and MDV55. A set of current transformers (CTs) on MDV53 are wired to a set of current transformers on MDV55 so that current to the main generator step-up transformers can be determined. These main CTs also feed the breaker failure and breaker flashover protection circuitry. For the backfeed that was attempted on April 17, 2019, MDV53 was closed to energize the main generator step-up transformers while MDV55 was still not closed. Due to a ground jumper associated with the MDV55 breaker (explained further in section 6 of this LER), the current in the MDV53 CTs was fed over to a set of CTs on the MDV55 breaker which was still open. This current flow in the MDV55 breaker CTs looked like a breaker failure and flashover since the open breaker was not supposed to be allowing current to flow through the open set of main contacts (breaker failure) or from the main contacts to the breaker outside tank (breaker failure). This protection then cleared another set of 345-kV breakers to isolate MDV55.

**4. ASSESSMENT OF SAFETY CONSEQUENCES:**

Safety systems responded as required and the plant was in No Mode during this event.

**5. REPORTING REQUIREMENTS:**

This LER is submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) to report an automatic actuation of the emergency diesel generator. Specifically, 10 CFR 50.73(a)(2)(iv) states in part that the licensee shall report:

- (A) Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph 10 CFR 50.73(a)(2)(iv)(B) of this section ...
- (B) The systems to which the requirements of paragraph 10 CFR 50.73(a)(2)(iv)(A) of this section apply are:
  - (8) Emergency ac electrical power systems, including: emergency diesel generators (EDGs) ...

For the event that occurred on April 17, 2019, loss of power to the NB01 bus resulted in an undervoltage condition and subsequent safety system actuation of the "A" EDG, including a sequencer actuation.

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CONTINUATION SHEET**

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**6. CAUSE OF THE EVENT:**

A ground wire was inadvertently added on circuit breaker MDV55 as part of a design change under modification package 16-0021 that was implemented in the fall of 2017 (during Refueling Outage 22) in which several switchyard breakers were replaced with a new and different type manufactured by Mitsubishi. When MDV53 was closed for the backfeed on April 17, 2019, this additional ground created a path for current to flow through the protective relays associated with MDV55, and this caused the protection circuitry for MDV55 to detect an unexpected current surge due to the main transformer windings drawing current in order to charge the transformer's field windings. The protective relay actuated on this inrush and initiated a "B" Bus fault clearing of the other breakers. Specifically, the activation triggered circuit breakers MDV45, MDV75, 52-3, and 52-4 to open and clear the bus of load. The opening of 52-3 isolated the "B" safeguard transformer from the "B" switchyard bus, which in turn de-energized ESF transformer XNB01 which was powering the NB01 bus and caused an actuation of Engineered Safety Features equipment.

The following root causes were identified that led to the automatic actuation of the "A" emergency diesel generator:

1. Ineffective management, by the Transmission Substations department, of a design scope change introduced a design error, i.e., an extraneous ground jumper, in connection with the breaker replacement modification. This extraneous ground jumper created a parallel path for current to flow through protective relays associated with MDV55, which detected an unexpected current surge when closing MDV53.
2. Engineering Supervision assumed the Transmission Substations design process included an independent review, and thus, an independent review was not requested.

**7. CORRECTIVE ACTIONS:**

The added ground wire that was part of the newly installed Mitsubishi breakers was removed from MDV55. In addition, drawings of the switchyard were reviewed for duplicate current transformer (CT) grounds of recently modified switchyard breakers. That review confirmed no similar situations exist that would lead to a similar plant event.

Corrective actions to prevent recurrence are as follows:

1. The Transmission Substations department head will add another layer of defense in their design package development process by revising the Engineering Design Quality Review Process procedure. It will require an independent System Protection Engineer to review of all of the Callaway specific schematic and wiring diagrams. In addition, the design review documentation will be reviewed by Callaway.
2. The Major Modifications department will revise the Electrical Design Criteria/Inputs document to establish requirements for reviewing the design review documentation from the Transmission Substations department.
3. The Major Modifications department will revise the Electrical Design Criteria/Inputs document to include a verification by a Design Supervisor of the independent System Protection Engineer review. In addition, the Design Supervisor will be required to determine if an independent third-level review is needed.

**8. PREVIOUS SIMILAR EVENTS:**

A review of Callaway LERs for the past five years did not identify any other examples of system actuations caused by the same or similar reasons for the event.

**9. OTHER INFORMATION:**

A figure of the Callaway switchyard is on the next page.

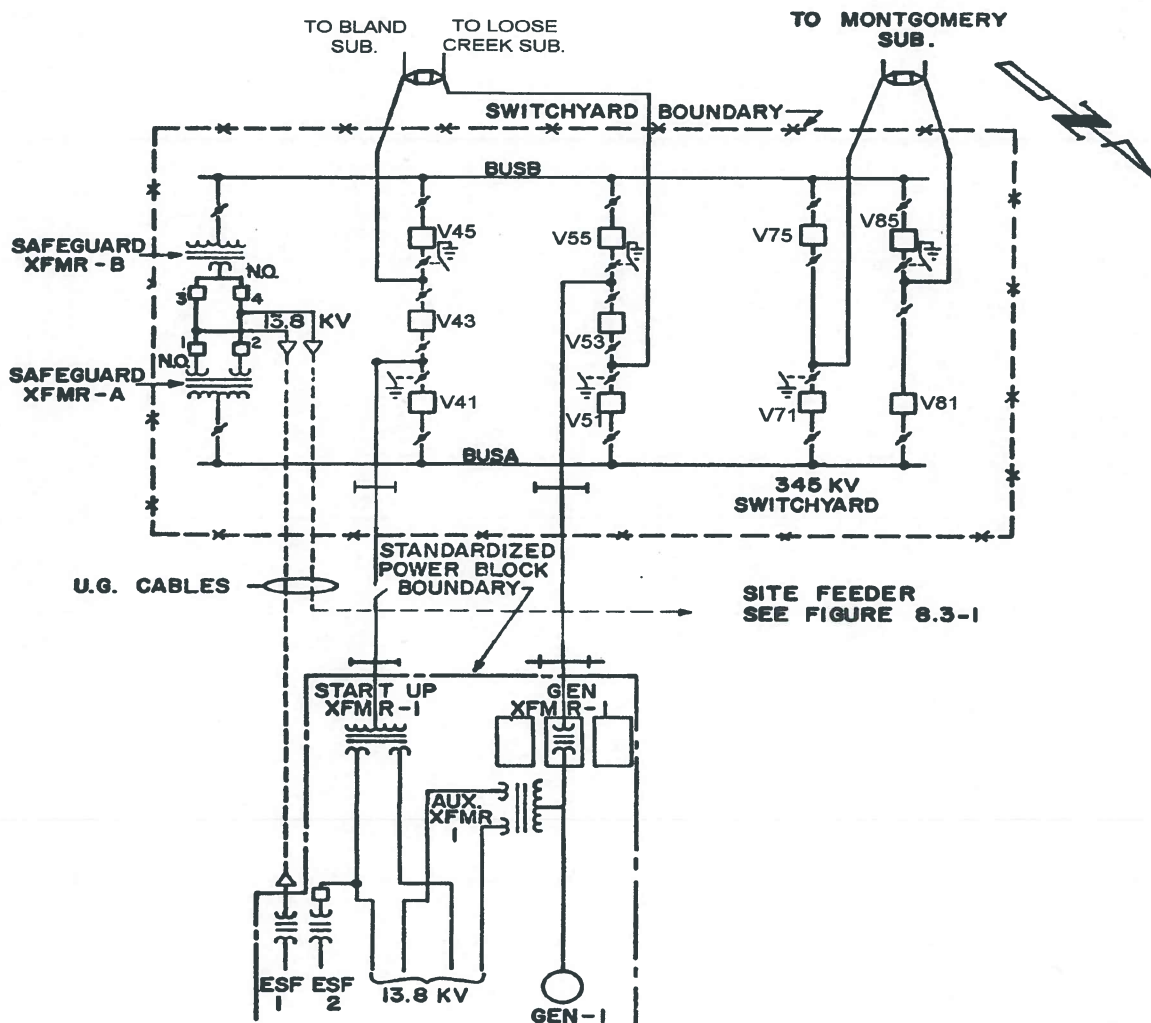


# **LICENSEE EVENT REPORT (LER) CONTINUATION SHEET**

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		2019	- 001	- 01



REV. 15  
10/07

**UNION ELECTRIC COMPANY  
CALLAWAY PLANT  
FINAL SAFETY ANALYSIS REPORT**

**FIGURE 8.2-5  
345 KV ONE LINE AND  
GENERAL ARRANGEMENT  
CALLAWAY PLANT**