



Fadi M. Diya
Vice President
Nuclear Operations
Ameren Missouri
Callaway Plant
T 573.676.6411
F 573.676.4056

January 6, 2012

ULNRC-05836

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

10 CFR 50.73

Ladies and Gentlemen:

**DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 2011-006-00
POSTULATED FIRE COULD DAMAGE HIGH DENSITY POLYETHYLENE (HDPE)
ESSENTIAL SERVICE WATER PIPING**

The enclosed licensee event report (LER) is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B). LER 2011-006-00 is submitted to report the discovery that the effects of a postulated design basis fire event at Callaway Plant could potentially damage piping in one independent train of the Essential Service Water (ESW) system in such a way that the redundant train of ESW could also be adversely affected.

This letter does not contain new commitments.

Sincerely,

Fadi M. Diya
Vice President Nuclear Operations

ACS/nls

Enclosed: LER 2011-006-00

cc: Mr. Elmo E. Collins, Jr.
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
Steedman, MO 65077

Mr. Mohan C. Thadani (2 copies)
Senior Project Manager, Callaway Plant
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8B1
Washington, DC 20555-2738

Index and send hardcopy to QA File A160.0761

Hardcopy:

Certrec Corporation
4200 South Hulen, Suite 422
Fort Worth, TX 76109

(Certrec receives ALL attachments as long as they are non-safeguards and may be publicly disclosed.)

LEREvents@inpo.org (must send the **WORD** version of the LER to this address)

Electronic distribution for the following can be made via LER ULNRC Distribution:

A. C. Heflin
F. M. Diya
C. O. Reasoner III
L. H. Graessle
D. W. Neterer
S. A. Maglio
R. Holmes-Bobo
K. W. Kuechenmeister
D. T. Wingbermuehle
J. D. Schnack
C. B. Serfas
R. M. Nelson
NSRB Secretary
T. B. Elwood
D. E. Dumbacher (NRC)
B. D. Brooks (WCNOC)
Ms. Diane M. Hooper (WCNOC)
Mr. Tim Hope (Luminant Power)
Mr. Ron Barnes (APS)
Mr. Tom Baldwin (PG&E)
Mr. Wayne Harrison (STPNOC)
Ms. Linda Conklin (SCE)
Mr. John O'Neill (Pillsbury Winthrop Shaw Pittman LLP)
Missouri Public Service Commission
Records Center (INPO)

LICENSEE EVENT REPORT (LER)
(See reverse for required number of digits/characters for each block)

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 Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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
Callaway Plant Unit 1

2. DOCKET NUMBER
05000483

3. PAGE
1 OF 4

4. TITLE
Postulated Fire Could Damage High Density Polyethylene (HDPE) Essential Service Water Piping

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
11	09	2011	2011	006	00	01	06	2012	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE MODE 6	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFRs: (Check all that apply)										
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)							
10. POWER LEVEL 0%	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)							
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)							
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)							
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)							
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)							
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)							
	<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)(C)	<input type="checkbox"/> OTHER							
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A								

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME T.B. Elwood, Supervising Engineer, Regulatory Affairs and Licensing	TELEPHONE NUMBER (Include Area Code) 314-225-1905
---	---

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

14. SUPPLEMENTAL REPORT EXPECTED

YES (If yes, complete 15. EXPECTED SUBMISSION DATE) NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On 11/09/2011, Callaway Plant staff determined that the effects of a postulated design basis fire hazard in Control Building Room 3101 could potentially damage High Density Polyethylene (HDPE) piping in the Essential Service Water (ESW) system. In this scenario, fire-induced damage to the HDPE sections of a single train of ESW piping could cause Room 3101 to flood in excess of previously analyzed flood levels. Such a flood could adversely affect valves in redundant trains that function to realign ESW during a fire and the assumed concurrent loss of offsite power.

The root cause of this condition was attributed to human performance error during development of a modification to replace sections of steel piping with HDPE piping in the ESW system. Specifically, personnel developing this modification did not effectively evaluate the failure modes of the HDPE piping installed in Room 3101.

Following identification of this condition, an hourly fire watch was implemented in accordance with the Callaway Plant fire protection program. Corrective actions include implementation of additional management oversight of the design process to ensure Failure Mode and Effects Analysis quality and effective use of subject matter experts.

The configuration of HDPE piping described herein will be analyzed and submitted to the NRC staff as part of Callaway Plant's transition to 10 CFR 50.48(c).

**LICENSEE EVENT REPORT (LER) U.S. NUCLEAR REGULATORY COMMISSION
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE		
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REV NO.	2	OF	4
		2011	- 006	- 00			

NARRATIVE

1. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S)

The Callaway Plant Essential Service Water (ESW) system provides a heat sink for the removal of process and operating heat from safety-related components during a Design Basis Accident. During normal operation and normal shutdown, the ESW system also provides this function for various safety related and non-safety related components. The ESW system consists of two separate full-capacity trains of piping, pumps, valves, and instrumentation. Each train of ESW is interconnected with the non-safety related Service Water (SW) system. The ESW system is designed to perform its intended function following a postulated fire.

In 2008 and 2009, Callaway Plant implemented a modification that replaced underground large bore carbon steel ESW piping with High Density Polyethylene (HDPE) piping. The bolted connections between the existing steel piping and the new HDPE piping were designed to be accessible, either within a vault or inside a building, to support future inspections of the piping interfaces. Steel-to-HDPE piping interfaces for ESW supply and return piping are located in the Control Building basement, Room 3101. On each of the ESW lines in Room 3101, approximately 18 inches of HDPE piping extend into the room before interfacing with the metallic piping.

2. INITIAL PLANT CONDITIONS

This condition was identified when the plant was in Mode 6, "Refueling."

3. EVENT DESCRIPTION

On November 9, 2011 at 1715, Callaway Plant staff determined that the effects of a postulated design basis fire hazard in Control Building Room 3101 could result in failure of the HDPE piping in the ESW system.

As described in Section 1 of this LER, short sections of HDPE piping extend into Room 3101 before interfacing with metallic piping for the ESW system supply and return lines. In the event of a postulated design basis fire in Room 3101, sections of HDPE piping could be susceptible to damage from a hot gas layer associated with the fire. In this scenario, fire-induced damage to the HDPE sections of a single train of ESW piping could cause Room 3101 to flood such that motor-operated valves (MOVs) for both redundant trains of ESW could be adversely affected. These MOVs function to realign ESW, SW, and the Ultimate Heat Sink (UHS) in the event of a fire and the assumed concurrent loss of offsite power.

By the plant's original design, the independent trains of ESW piping in Room 3101 have an adequate degree of physical separation with respect to fire protection design requirements, and a design basis fire is not assumed to adversely affect steel piping such that a flood would occur in the room. Thus, the design of the ESW piping in Room 3101 was adequate prior to the installation of HDPE piping. The installation of HDPE piping, however, introduced fire damage as a new potential failure mode of the ESW system piping, notwithstanding the fact that the likelihood of such a fire occurring is very low. This is discussed further in Section 4.

Upon identification of this condition, an hourly fire watch was imposed in accordance with the Callaway Plant fire protection program. Following the initiation of this fire watch, Event Notification 47426 was submitted to the NRC in accordance with 10 CFR 50.72(b)(3)(ii)(B).

Identification of this condition was prompted by questions posed by the NRC Resident Inspector.

4. ASSESSMENT OF SAFETY CONSEQUENCES

In the event that the HDPE piping on one train of ESW failed completely as a result of a design basis fire, the maximum flood height for Room 3101 would be in excess of what is documented in the analysis of record.

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REV NO.	3	OF 4
		2011	- 006	- 00		

NARRATIVE

Higher maximum flood levels would have the potential to affect MOVs on the opposite train of ESW and could prevent them from repositioning to perform their specified safety functions. In this scenario, both trains of ESW could be lost due to a design basis fire and its direct consequences. This postulated scenario would adversely impact the ability to achieve and maintain safe shutdown conditions. Upon recognition that this condition existed, the condition was determined to be an unanalyzed condition that significantly degraded plant safety and appropriate compensatory actions were taken.

Review of actual plant conditions verified that the combustible material loading in Room 3101 is low and that there are no fixed ignition sources that could create HDPE piping damage. In the event that a fire does occur, the room has automatic fire detection and suppression systems in the area of the piping. This will result in rapid discovery and effective suppression of the postulated fire. Therefore, it is very unlikely that a fire would occur and develop to a size that could damage the HDPE piping. The safety significance of this condition is low.

5. REPORTING REQUIREMENTS

Section 9.5B of the Callaway Plant Final Safety Analysis Report (FSAR) describes the assumption of component failures caused as a "direct consequence of a fire." In this scenario, the consideration of consequential failure as described by the Fire/Hazard Analysis assumptions has been applied to the HDPE sections of the ESW piping in Room 3101.

Additionally, this consideration of "direct consequences of a fire" has been further extended to include an assumed consequential flood event that could occur as a direct result of fire-induced damage to the HDPE pipe. Extending the interpretation of direct consequence of a fire to include resultant flooding from potentially damaged piping is not a clearly defined position in the Fire Hazard Analysis, but is taken for the purposes of evaluating this condition.

NUREG 1022, Rev 2, Section 3.2.4 states:

"...an example of an event reportable as an unanalyzed condition that significantly degraded plant safety would be the discovery that a system required to meet the single failure criterion does not do so. In another example, if fire barriers are found to be missing, such that the required degree of separation for redundant safe shutdown trains is lacking, the event would be reportable as an unanalyzed condition that significantly degraded plant safety."

The above description is similar to the condition described in this LER. Specifically, a single fire near the HDPE sections of ESW piping in Room 3101, despite the very low likelihood of occurrence based on fire loading in the area, could cause a consequential flood that would adversely affect both independent trains of the ESW system. Thus, this condition met the criteria for reportability under 10 CFR 50.73(a)(2)(ii)(B) as an unanalyzed condition that significantly degraded plant safety.

6. CAUSE OF THE EVENT

Analysis of this condition identified one root cause and several contributing causes. The root cause of this condition was attributed to human performance error during development of Modification MP 07-0066. Specifically, the responsible engineer and the qualified reviewer of MP 07-0066 did not effectively evaluate the failure modes and effects of the HDPE piping installed inside Room 3101.

Contributing causes of this condition include an inappropriate level of technical detail regarding failure modes and effects analysis (FMEA) in the written design guidance, excessive use of external references in lieu of technical details in the written design guidance, and a failure to use independent subject matter experts during qualified review of the hazards and programs review screening forms.

**LICENSEE EVENT REPORT (LER) U.S. NUCLEAR REGULATORY COMMISSION
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE	
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REV NO.	4	OF 4
		2011	- 006	- 00		

NARRATIVE

7. CORRECTIVE ACTIONS

The configuration of HDPE piping described in this LER will be analyzed as part of Callaway Plant's transition to 10 CFR 50.48(c) (i.e., NFPA 805). This analysis will be submitted to the NRC staff for final review.

Corrective actions developed to address the root cause listed in Section 6 of this LER include implementation of additional management oversight of the design process to ensure FMEA quality and effective use of subject matter experts. Additionally, since MP 07-0066 was completed, Callaway Plant has implemented a requirement to use focused human performance tools, including quality review checklists and technical job task briefs, during all plant modifications.

Corrective actions for the contributing causes listed above include:

- Revision of written design guidance to incorporate the technical details, guidance, and examples from referenced documents and from this event,
- Performance of group training on FMEA for engineers qualified to develop design changes, and
- Revision of written design guidance to prompt input and review from subject matter experts.

As indicated in Section 3 of this LER, an hourly fire watch was implemented in accordance with the Callaway Plant fire protection program upon identification of this condition.

8. PREVIOUS SIMILAR EVENTS

HDPE pipe had not been used in a safety-related application prior to development of MP 07-0066. Thus, there are no previous similar events specific to FMEAs performed on HDPE piping at Callaway Plant.

Callaway Plant Corrective Action Program documents written in 2002 and 2008 discuss inadequacies in performance of FMEAs not related to HDPE applications:

October 2002: A failure of the sulfuric acid feed system to the cooling tower basin resulted in the release of 1300 gallons of sulfuric acid offsite. This event occurred due to a lack of a requirement to perform an FMEA for non-safety related modifications. The associated corrective actions included improved written guidance describing when an FMEA was required to be performed.

April 2008: Nuclear Oversight personnel documented that the written design guidance was not clear as to when an FMEA is required and stated that the required type and level of FMEA documentation was not specific. The associated corrective actions updated the written design guidance to more clearly describe when and how an FMEA is required to be documented.

9. OTHER INFORMATION

The Energy Industry Identification System (EIIS) identifiers for the components and systems mentioned in this report are as follows:

System: BI, Essential Service Water
Component: V, Valve

System: KG, Service Water

System: BS, Ultimate Heat Sink