



FirstEnergy Nuclear Operating Company

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February 08, 2012
L-12-035

10 CFR 50.73(a)(2)(i)(B)
10 CFR 50.73(a)(2)(i)(A)

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

SUBJECT:
Perry Nuclear Power Plant, Unit 1
Docket No. 50-440, License No. NPF-58
Licensee Event Report Submittal

Enclosed is Licensee Event Report (LER) Supplement 2011-002-01, Condition Prohibited by Technical Specifications and Plant Shutdown due to Unit 1 Startup Transformer Issues. This supplement is being submitted to update the cause analysis and corrective actions associated with this event. There are no regulatory commitments contained in this submittal.

If there are any questions or if additional information is required, please contact Mr. Robert Coad, Manager – Regulatory Compliance, at (440) 280-5328.

Sincerely,

Vito A. Kaminskas

Enclosure:
LER 2011-002-01

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III

JE22
11/12

NRC FORM 366 (10-2010)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 Estimated burden per response to comply with this mandatory collection request: 80 hrs. 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.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.		EXPIRES 10/31/2013						
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)												
1. FACILITY NAME Perry Nuclear Power Plant, Unit 1					2. DOCKET NUMBER 05000-440		3. PAGE 1 OF 5					
4. TITLE Condition Prohibited by Technical Specifications and Plant Shutdown due to Unit 1 Startup Transformer Issues.												
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	
09	26	2011	2011	002	01	02	08	2012	FACILITY NAME		05000	
											05000	
9. OPERATING MODE <div style="text-align: center; font-size: 24px;">1</div>		11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)										
		<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 20.2203(a)(2)(v) <input type="checkbox"/> 20.2203(a)(2)(vi)		<input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.46(a)(3)(ii) <input checked="" type="checkbox"/> 50.73(a)(2)(i)(A) <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(iv)(A) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input type="checkbox"/> 50.73(a)(2)(v)(D)		<input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 50.73(a)(2)(ix)(A) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 73.71(a)(4) <input type="checkbox"/> 73.71(a)(5) <input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A				
10. POWER LEVEL <div style="text-align: center; font-size: 24px;">100</div>												
12. LICENSEE CONTACT FOR THIS LER												
FACILITY NAME Perry Nuclear Power Plant, Robert Swartz, Compliance Engineer, Regulatory Compliance									TELEPHONE NUMBER (Include Area Code) (440) 280- 7664			
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT												
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX			
B	EA	XFMR	G080	YES								
14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE). <input checked="" type="checkbox"/> NO								15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) <p>On September 26, 2011, at 0158 hours, the unit 1 startup transformer was taken out of service to perform scheduled maintenance. The unit 2 startup transformer and the manual unit 1 backfeed lineup were OPERABLE and were considered to be the two qualified offsite circuits required by Technical Specifications (TS). Further review of this configuration determined that the backfeed lineup could not be credited as a qualified offsite circuit. This review also revealed that required TS actions were not completed when the startup transformer was declared inoperable on September 26, 2011. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as an operation or condition which was prohibited by the plant's TS. Transformer maintenance was secured and the unit 1 startup transformer was returned to service. Subsequently the transformer tripped due to an internal fault.</p> <p>On October 2, 2011, at 0100 hours, a planned shutdown was commenced to repair the unit 1 startup transformer. On October 2, 2011, at 1614 hours, plant shutdown was completed by manual actuation of the Reactor Protection System. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(A) for completion of any nuclear plant shutdown required by the plant's TS. Corrective actions for these events include approval of a License Amendment to clarify the use of a delayed access circuit as a qualified offsite circuit and installation of a replacement startup transformer. The safety significance of these events is considered to be small.</p>												

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

INTRODUCTION

On September 26, 2011, at 0158 hours, the unit 1 startup transformer [XFMR] [EA] was taken out of service to perform scheduled maintenance. The two qualified offsite circuits required by Technical Specification (TS) Limiting Condition for Operation (LCO) 3.8.1, "AC Sources-Operating," were considered to be through the unit 2 startup transformer and a manual backfeed lineup through the unit 1 main and auxiliary transformers. Subsequent review of this configuration determined that the backfeed lineup could not be credited as a qualified offsite circuit. This determination revealed that TS 3.8.1 LCO Required Actions were not met after the transformer was removed from service. This condition is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as an operation or condition which was prohibited by the plant's TS.

Maintenance activities on the unit 1 startup transformer were suspended and the transformer placed back in service. The transformer (General Electric, Serial No. M-101479) experienced an internal fault on September 29, 2011, at 0529 hours. A controlled plant shutdown was performed on October 2, 2011, to repair the transformer. A four hour non-emergency notification (Event Notification number 47312) in accordance with 10 CFR 50.72(b)(2)(i) was made on October 2, 2011, at 0106 hours, for the initiation of a nuclear plant shutdown required by the plant's TS. This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(A) for completion of any nuclear plant shutdown required by the plant's TS.

EVENT DESCRIPTION

On September 26, 2011, at 0158 hours, the unit 1 startup transformer was declared INOPERABLE in support of scheduled maintenance. Electrical alignment through the OPERABLE unit 2 startup transformer and the unit 1 backfeed lineup were considered to be the two qualified offsite circuits required by TS 3.8.1, "AC Sources-Operating." The plant was operating in Mode 1 at 100 percent rated thermal power at the time.

Following a detailed review of the electrical offsite sources at Perry, it was concluded that the backfeed lineup could not be credited as a qualified offsite circuit. Upon receiving this information, the plant operators entered TS 3.8.1 LCO Condition A, Required Action A.1, "Perform SR 3.8.1.1 for OPERABLE required offsite circuit within 1 hour and once per 8 hours thereafter." The transformer was returned to service on September 28, 2011, at 2222 hours.

On September 29, 2011, at 0529 hours, the unit 1 startup transformer experienced an internal fault. The associated protective relays isolated the transformer by opening all 4 high side 345KV breakers and both low side 13.8 KV breakers and transferring the transformer load to the unit 2 startup transformer as designed. This caused the plant to again enter TS LCO 3.8.1 Condition A.

On September 30, 2011, at 2051 hours, the decision was made to commence a plant shutdown due to inability to meet Required Action A.2, "Restore required offsite circuit to OPERABLE status" within the required completion time of 72 hours.

On October 2, 2011, at 0100 hours, a planned shutdown commenced. The plant was brought into compliance with TS LCO 3.8.1 Action F.1 (ie., MODE 3, Hot Shutdown) on October 2, 2011, at 1614 hours, when shutdown was completed by manual actuation of the Reactor Protection System (RPS)

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in accordance with plant procedures. No Emergency Core Cooling Systems (ECCS) or Reactor Core Isolation Cooling (RCIC) were automatically or manually initiated for level control. No significant deficiencies with major plant equipment were observed. All control rods inserted to the full-in position. The plant entered MODE 4 (ie., Cold Shutdown) at 1456 hours on October 3, 2011, in compliance with the requirements of TS LCO 3.8.1 Required Action F.2.

CAUSE OF EVENT

The cause for operation prohibited by TS was an interpretation of the PNPP TS 3.8.1 LCO and Bases by plant personnel that, based on the original license basis documents, the plant met the LCO for TS 3.8.1 with the off-site power system configuration of one off-site circuit available within a few seconds of a loss-of-coolant accident (as required by GDC 17) (ie., unit 2 startup transformer) and one available delayed access off-site circuit (ie., backfeed alignment). However, after recent interaction and conversation with NRC staff members, in regard to TS 3.8.1, it was determined that electrical lineup through the unit 1 and unit 2 startup transformers are the only two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electric Power Distribution System. The backfeed lineup could not be credited as a qualified offsite circuit.

The transformer failure mechanism was determined to be an internal flash-over between the B phase bushing corona ring and the grounded tank wall. The flash-over resulted from a low transformer oil dielectric and a damaged corona ring on the B phase transformer high voltage bushing where the epoxy coating was cracked and the corona ring was bent toward the tank wall. Forensic analysis determined the cracks pre-existed the fault. First Energy (FE) Energy Delivery personnel installed the unit 1 startup transformer B phase bushing corona ring in 1997. Existence of the two conditions of the failure mechanism was established by less than adequate:

- Energy Delivery personnel maintenance practices
- Perry oversight of Energy Delivery personnel
- System monitoring
- Supervisor oversight of system monitoring

EVENT ANALYSIS

The unit 1 startup transformer is one of two offsite sources of AC electrical power required to be operable by TS 3.8.1, "AC Sources-Operating," while in Modes 1, 2, or 3.

On September 26, 2011, at 0158 hours, the unit 1 startup transformer was declared INOPERABLE in support of scheduled maintenance. The unit 2 startup transformer and the manual unit 1 backfeed lineup were OPERABLE and were considered to be the two qualified offsite circuits required by TS 3.8.1.

TS Bases 3.8.1 described two qualified circuits between the offsite transmission network and the onsite Class 1E Distribution System. The two qualified circuits include the unit 1 and unit 2 startup transformers. TS Bases 3.8.1 stated that several additional paths from the transmission system to the Class 1E system are available as alternate offsite power sources if loss of a startup transformer occurs. For unit 1, this includes feeding 13.8 KV bus L10 from bus L11 or L12, via the unit main and auxiliary transformers.

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The backfeed lineup was designated as an offsite AC power source in accordance with plant procedures on September 26, 2011, at 0041 hours, to facilitate unit 1 startup transformer maintenance. On September 27, 2011, at 1748 hours, it was determined that the backfeed lineup could not be credited as a qualified offsite circuit. At this time, the plant was not in compliance with TS 3.8.1, Condition F, Action F.1 (be in Mode 3 in 12 hours). TS 3.8.1 Condition A was not entered when the transformer was removed from service on September 26 because of the interpretation of the TS at that time.

Maintenance on the transformer was stopped prior to completing the full scope of scheduled work. An analysis of the work not performed was completed by the root cause team and it was determined that the scope of work did not contribute to the transformer failure. The unit 1 startup transformer was declared OPERABLE on September 28, 2011, at 2222 hours, and TS 3.8.1 was exited.

A Probabilistic Risk Assessment (PRA) evaluation was performed for the unit 1 startup transformer being unavailable due to maintenance without TS 3.8.1 being entered. For the purpose of this analysis, plant loads were modeled as being aligned to the unit 2 startup transformer prior to the unit 1 startup transformer maintenance activity. In order to characterize the significance of the impact on core damage frequency, this evaluation utilized the approach contained in Regulatory Guide 1.177 "An Approach for Plant-Specific Risk-Informed Decisionmaking: Technical Specifications." Using the logic as discussed in the regulatory guide, an incremental conditional core damage probability (ICCDP) of $4.5\text{E-}11$ was calculated. The results indicate that ICCDP is below $1\text{E-}06$, signifying a small quantitative impact. Based on this analysis, the event is below the threshold for being risk significant, and this event is viewed as having a small safety significance.

A review of plant narrative logs was performed for the past three years to determine whether the backfeed lineup was previously utilized as a qualified offsite circuit to meet requirements of TS 3.8.1. The review found eight instances, which involved approximately 438 hours, where the unit 1 or unit 2 startup transformer was declared INOPERABLE and the backfeed lineup was designated as a source of offsite power. The plant was operating in MODE 1 in all cases. Noncompliance with TS LCO 3.8.1 was not recognized for these occurrences.

An additional PRA evaluation was performed for these occurrences utilizing the approach described above. Using the logic as discussed in the regulatory guide, the ICCDP was less than $3.1\text{E-}09$ in a one year bounding analysis. The results indicate that ICCDP is below $1\text{E-}06$, signifying a small quantitative impact. Based on this analysis, the event is below the threshold for being risk significant, and this event is viewed as having a small safety significance.

CORRECTIVE ACTIONS

The NRC issued Amendment No. 160 to Facility Operating License No. NPF-58 for the Perry Nuclear Power Plant, Unit No.1 on October 17, 2011. The amendment revises TS 3.8.1, "AC Sources-Operating," to clarify that a delayed access circuit is temporarily qualified for a period until December 12, 2011, as one of two required offsite circuits between the offsite transmission network and the onsite Class 1E alternating current electric power distribution system. This amendment was issued as an emergency amendment to allow the PNPP to resume normal power operation.

TS 3.8.1 Bases change was processed to provide operations personnel information necessary to allow plant operation in accordance with License Amendment No. 160.

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Operations Night Order (Temporary License Amendment for Tech Spec 3.8.1, AC Sources Operating) and Operations Standing Order (Temporary License Amendment – Compensatory Actions) were issued on October 17, 2011, to describe necessary actions to allow plant operation in accordance with License Amendment No. 160.

A replacement startup transformer has been installed to provide the second qualified offsite power source in accordance with TS 3.8.1.

Inspection of the unit 2 startup transformer high voltage bushing corona rings for deformation and cracks in the epoxy coating will be performed.

An assessment of system monitoring practices for power transformers will be conducted. The assessment will verify all system monitoring is being conducted and the system monitoring plans meet the content requirements of plant procedures.

The supplemental oversight process will be improved by clarifying requirements and responsibilities in plant procedures.

Training will be developed and provided to Energy Delivery and Perry maintenance personnel on corona ring function and proper handling requirements. Transformer oil analysis training will be provided to appropriate technical personnel.

PREVIOUS SIMILAR EVENTS

A review of Licensee Event Reports and the corrective action program database for the past three years found that two similar events had occurred.

LER 2009-003, Completion of Technical Specifications Required Shutdown due to Division 2 Emergency Service Water (ESW) Inoperability, documented a shutdown required by TS because of a defect in the ESW pump B power supply cable. The corrective actions associated with this event focused on cable repair, replacement of similar cables, and cable testing methodology. These corrective actions would not have reasonably been expected to have prevented the event documented in LER 2011-002.

Condition Report 2011-94572 documented that between April 19 and April 24, 2011, operators entered TS LCO 3.6.1.3, "Primary Containment Isolation Valves (PCIVs)," Condition A, numerous times to down-power the Residual Heat Removal (RHR) system shutdown cooling suction containment isolation valves with the intention of preventing inadvertent RHR shutdown cooling isolations while performing various outage-related activities. This event involved misinterpretation of TS Bases. The corrective actions focused on TS 3.6.1.3 and would not have been reasonably expected to have prevented the event documented in LER 2011-002.

COMMITMENTS

There are no regulatory commitments contained in this report. Actions described in this document represent intended or planned actions, are described for the NRC's information, and are not regulatory commitments.