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**JAN 1 2 2017**

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

10 CFR 50.73

**SUSQUEHANNA STEAM ELECTRIC STATION**  
**LICENSEE EVENT REPORT 50-387(388)/2016-016-00**  
**UNIT 1 LICENSE NO. NPF-14**  
**UNIT 2 LICENSE NO. NPF-22**  
**PLA-7567**

**Docket Nos. 50-387**  
**50-388**

Attached is Licensee Event Report (LER) 50-387(388)/2016-016-00. The LER reports an event involving failure of a bus synchronizing select hand switch. This event was determined to be reportable in accordance with 10 CFR 50.73(a)(2)(v)(A), (B), (C), and (D) as a condition that could have prevented fulfillment of a safety function.

There were no actual consequences to the health and safety of the public as a result of this event.

This letter contains no new regulatory commitments.

A handwritten signature in black ink, appearing to read "R. J. Franssen", written in a cursive style.

R. J. Franssen

Attachment: LER 50-387(388)/2016-016-00

Copy: NRC Region I  
Mr. J. E. Greives, NRC Sr. Resident Inspector  
Ms. T. E. Hood, NRC Project Manager  
Mr. M. Shields, PA DEP/BRP



## 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 [Infocollections.Resource@nrc.gov](mailto:Infocollections.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**  
Susquehanna Steam Electric Station Unit 1**2. DOCKET NUMBER**  
05000387**3. PAGE**  
1 OF 4**4. TITLE** Bus Synchronizing Select Hand Switch Failure Due to Less than Adequate Life Cycle Management

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	16	2016	2016	016	00	01	12	2017	Susquehanna Steam Electric Station Unit 2	05000388
									FACILITY NAME	DOCKET NUMBER
										05000
<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"/> 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)		
<b>10. POWER LEVEL</b>			<input type="checkbox"/> 20.2203(a)(2)(ii)		<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
100			<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.36(c)(2)	<input checked="" 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 checked="" 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 checked="" 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		

**12. LICENSEE CONTACT FOR THIS LER**

LICENSEE CONTACT

C. E. Manges, Jr., Senior Engineer - Nuclear Regulatory Affairs

TELEPHONE NUMBER (Include Area Code)

(570) 542-3089

**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
E	EK	SEL	E155	Yes					

**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 November 16, 2016 at 10:45, Unit 1 and 2 entered Technical Specification (TS) 3.8.1 Conditions B, C, D, E, and G and TS 3.0.3 due to failure of a bus synchronizing select hand switch.

The failed switch prevented manual transfer between electrical sources to the Emergency Safety Switchgear (ESS) buses resulting in both offsite sources and all four diesel generators (D/Gs) being declared inoperable due to failure to meet Surveillance Requirement (SR) 3.8.1.8 and SR 3.8.1.16. This condition was reported as a condition that could have prevented fulfillment of a safety function in accordance with 10 CFR 50.72(b)(3)(v)(A), (B), (C), and (D) (EN 52369). The condition also requires this Licensee Event Report (LER) in accordance with the corresponding 10 CFR 50.73 requirements.

The direct cause was mechanical failure of an internal subcomponent of the bus synchronizing select hand switch. The apparent cause was less than adequate life cycle management. The failed switch was replaced as a corrective action. Replacement of other synchronization selector switches within the extent of condition will also be completed.

There were no actual consequences to the health and safety of the public as a result of this event.



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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Susquehanna Steam Electric Station Unit 1	05000-387	2016	- 016	- 00

**NARRATIVE****CONDITIONS PRIOR TO EVENT**

Unit 1 – Mode 1, approximately 100 percent Rated Thermal Power

Unit 2 – Mode 1, approximately 100 percent Rated Thermal Power

There were no structures, systems, or components that were inoperable at the start of the event that contributed to the event.

**EVENT DESCRIPTION**

On November 16, 2016 at 10:45, Unit 1 and 2 entered TS 3.8.1 Conditions B, C, D, E, and G and TS 3.0.3 due to failure of a bus synchronizing select hand switch [EIIS System / Component Identifier: EK/SEL]. A detailed timeline of events is provided as follows:

November 15, 2016 at 03:51 – Units 1 and 2 entered TS 3.8.1 due to Transformer 211 [EIIS System / Component Identifier: EK / XFMR] being taken out of service for scheduled maintenance (loss of one offsite source).

November 16, 2016 at 05:38 – During transfer of ESS Bus 2B (2A202) [EIIS System / Component Identifier: EK / BU] to its preferred source (0X213) [EIIS System / Component Identifier: EK / XFMR], both the phase and voltage spiked and then returned to normal (in phase / matched voltage) when Transformer 211 Bus 2B synchronization selector keyswitch (HS-00049B) was taken to the ON position. The transfer was completed and 2A202 was powered from its normal power supply. After the transfer, voltage was observed spiking and oscillations were observed. The indication would spike and then return to normal. The handswitch was returned to the OFF position.

November 16, 2016 at 10:45 – During investigation of the spiking, HS-00049B was turned to the ON position. During performance of this action, the operator reported that the switch did not feel like it went to the proper position. When the switch was taken to the OFF position, the synchroscope [EIIS System / Component Identifier: EK / SYN] remained energized and the associated alarm [EIIS Component Identifier: ALM] remained locked in, which was not the expected response. Units 1 and 2 entered TS 3.8.1 Conditions B, C, D, E, and G and TS 3.0.3. The applicable off normal procedure was entered to pull fuses associated with the defective synchroscope keyswitch and restore operability to the A, C, and D D/Gs and one offsite power circuit.

November 16, 2016 at 11:30 – HS-00049B was disabled in accordance with the off normal procedure by pulling fuses [EIIS Component Identifier: FU] to isolate the 2B bus synchronization switches from energizing the synchronization bus. Unit 1 and 2 exited TS 3.8.1 Conditions C and E and TS 3.0.3.

November 16, 2016 at 14:17 – Unit 1 exited TS 3.8.1 Conditions B and D (these LCO Conditions remained in effect for Unit 2).

November 16, 2016 at 22:34 – HS-00049B was replaced and the associated clearance order was removed restoring full operability of the diesel synchronization switch for the 2B bus.



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CONTINUATION SHEET**

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Susquehanna Steam Electric Station Unit 1	05000-387		YEAR	SEQUENTIAL NUMBER	REV NO.
			2016	- 016	- 00

The failed switch prevented manual transfer between electrical sources to the ESS buses resulting in both offsite sources and all four D/Gs being declared inoperable due to failure to meet SR 3.8.1.8 and SR 3.8.1.16. This condition was reported as a condition that could have prevented fulfillment of a safety function in accordance with 10 CFR 50.72(b)(3)(v)(A), (B), (C), and (D) (EN 52369). The condition also requires this LER in accordance with the corresponding 10 CFR 50.73 requirements.

## CAUSE OF EVENT

The direct cause was mechanical failure of an internal subcomponent of HS-00049B. The plastic piece that interfaces the keyed portion of the switch to the steel shaft of the switch deck was found broken. This plastic piece most likely failed when the key was taken to the ON position while investigating the spiking.

The apparent cause was less than adequate life cycle management.

## ANALYSIS/SAFETY SIGNIFICANCE

HS-00049B failed in the energized position, which prevented any other manual synchronization from being performed for 4.16kV, 13.8 kV, and the DGs as required by SR 3.8.1.8 and SR 3.8.1.16. The failure would not have prevented any automatic functions from occurring in the 4.16kV, 13.8 kV, or DG systems. The DGs were still able to start and load to the 4kV buses. The automatic transfer of the 4kV buses from primary to alternate supply was unaffected. The 13.8kV auxiliary bus fast and slow transfer logic was not impacted.

An engineering evaluation was performed and concluded that the failure of HS-00049B in the ON position would not have prevented the fulfillment of any safety functions. Details of this evaluation are as follows:

The 13.8kV system is non-Class 1E and provides power to non-safety related plant auxiliary loads. As a result, there was no safety system functional failure associated with the 13.8kV system.

The ability of the A, B, C, D DGs (and E DG, if aligned) to start, load, and run in the event of an emergency (such as a LOCA/LOOP) was not impacted by the failure of HS-00049B. The failed switch does not impact the automatic closure of the DG output breakers. After the emergency condition is terminated (i.e., offsite power restored), the DGs are required by SR 3.8.1.16 to be able to synchronize back to offsite power. Although this function could not be met, it is not described in the design bases as being required to fulfill any safety functions. Based on this discussion, there was no safety system functional failure associated with the Emergency Diesel Generators.

The ability of the 4kV buses to automatically transfer and to provide power to essential loads in the event of an emergency (such as a LOCA/LOOP) was not impacted by the failure of HS-00049B. The two offsite sources to each bus were not impacted: both the primary power supplies were available (Transformer 211 was available but not yet Operable following the scheduled maintenance) and the buses were able to automatically transfer to the alternate supplies. The ability to shed load (if required) was also not impacted. Although the function of manually transferring power supplies on each 4kV bus is required by SR 3.8.1.6, it is not described in the design bases as being required to fulfill any safety functions. Based on this discussion, there was no safety system functional failure associated with 4kV.

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Susquehanna Steam Electric Station Unit 1	05000-387	2016	- 016	- 00

Based on the engineering evaluation that concluded that the failure would not have prevented the fulfillment of any safety functions, this event will not be counted as a safety system functional failure (SSFF) for the NRC performance indicator based on the engineering analysis that shows there was no loss of ability to fulfill the safety function.

### CORRECTIVE ACTIONS

Key corrective actions include the following:

1. HS-00049B was replaced.
2. Synchronization selector switches within the extent of condition will be replaced.

### COMPONENT FAILURE INFORMATION

The failed handswitch was labeled as follows:

Manufacturer: Electroswitch

Series: 20

Type: PR-20

### PREVIOUS SIMILAR EVENTS

There have been two previous failures of synchronization selector switches at Susquehanna. The failures are as follows:

HS-00048B failed in the ON position May 1998 during performance of a Residual Heat Removal (RHR) Division I logic system functional test. The switch was replaced as a corrective action.

HS-00040B failed in the synchronization position in May 2013 during a monthly D/G test. This event was described in LER 50-387(388)/2013-001-01, "Diesel Generator 'B' to Bus '2B' Synchronizing Selector Switch Failure," dated November 4, 2013. A causal factor in the evaluation of the 2016 event was that corrective actions from previous failures did not implement a plan for preventing future failures.