

JSA  
THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY  
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### **Notable Events #70631**

**Event Title:** FML-17-0927 Breaker Failure Occurred Causing Emergency Power Outage

**Response Owner:** Paul Powers (powersp)

**Category:** O

**Date of Occurrence:** 09/27/2017

**Event Location:** End Stations (Halls A B C and Supporting Bldgs)

**Date Notable Event Report is Due:** 10/27/2017

### **Short Summary of Event and/or Injuries**

On 09/27/2017 around 2:45 pm the emergency power breaker (MDP-EM) tripped off during normal down activities initially affecting Hall A. FM&L responded and was unable to fully restore power to the breaker. This breaker panel fed the conventional utilities such as the roll-up doors, smoke, removal fans, sump pump system, lighting, air intake fans, Oxygen Deficiency Hazard alarms and networks switches.

### **Details of the Event and/or Injuries, including Initial Fact Finding Meeting information: determine the chain of events and timeline**

9/27/2017

1445 Power outage occurred during normal operations. It affected the emergency systems in Hall A, B and C and all of the supporting buildings.

1500 FM&L Electrical Engineer received a call from Hall A Coordinator stating that the power was out in Hall A.

1505 FM&L Electrical Engineer responded to assess the problem and possibly correct it.

1534 Accelerator Coordinator was contacted by Physics in reference to a loss of power in the End Station emergency power loop.

~1538 The Accelerator Coordinator checked the panel book and proceeded to contact the SSG group to inform them that the emergency power panel breaker failed and they PSS racks were off.

~1545 Oxygen Deficiency Hazard (ODH) system alarms in Hall C, and the employees evacuated as trained. Industrial Hygiene (IH) conducted a visual inspection and did not yield any apparent source of the alarms. The alarm was later determined to have been caused by Safety Systems Group moving the equipment over to the house power. This caused the system to alarm.

1838 With makeup air fans inoperable, ODH status was increased from ODH 0 to ODH 2. This message was broadcasted to affected individuals. Halls A, B and C were secured as ODH 2 for the evening.

1900 FM&L determined the problem was most likely a failed main circuit breaker in the MDP-EM panel which supplies emergency power to the End Station Area. Some systems were brought back on-line, however, the breaker would not stay closed in order to bring all systems back online.

9/28/2017 \*No Hot Work was permitted during the day which primarily effected Hall B.

0800 The breaker panel was removed from service and transported to subcontractor repair shop for testing. Initial tests revealed the breaker was not working properly. Portable fans were used to supply makeup air to End Stations from portable generators. Halls returned to ODH 0 status and were opened back up.

1445 Workers noticed groundwater intrusion into Hall C. Temporary power was brought in from welding outlet to power pumps.

1800 Temporary fans powered by portable generators were placed on top of the domes to provide additional fresh air during normal daytime operations. The generators were turned off and secured during the evening. After discussions among the subject matter experts it was determined that the Halls could remain an ODH 0 and as there was still a fully functioning ODH alarm system.

9/29/2017 \*No Hot Work Permitted during the day which primarily affected Hall B

1511 Replacement breaker installed without incident. All systems returned to normal. Temporary equipment was safely removed.

## Casual Analysis

### Root Cause

Equipment Failure- Failed to recognize that the external environment, outdoor installation, is considered less than ideal conditions, most likely reducing the service life of the breaker.

The breaker was installed in 1993. According to the manufacturer, the approximate service life is 30 years in ideal conditions. This breaker failed ahead of schedule.

### Root Cause Corrective Action

**Action Owner:** Paul Powers (powersp) **Due Date:** 11/03/2017

Replace the breaker.

Evidence of completion: Email from Electrical Engineer that the breaker was replaced.

### Root Cause Corrective Action

**Action Owner:** Rusty Sprouse (sprouse) **Due Date:** 01/15/2018

Develop and implement a preventative maintenance program for the large breakers according to NFPA70B as a best practice.

Evidence of completion: Preventative Maintenance Plan for larger breakers and implementation

plan.

### **Root Cause Corrective Action**

**Action Owner:** Paul Powers (powersp) **Due Date:** 01/15/2018

Acquire the breaker failure report from the contractor.

Evidence of completion: Email from contractor with the failure report.

### **Contributing Cause**

Management Less Than Adequate (LTA)- The plan to identify critical equipment has not been fully implemented, to determine how it should be handled when there is a loss of power. There is also no plan to maintain an inventory/supply of critical electrical spare breakers.

### **Contributing Cause Corrective Action**

**Action Owner:** Paul Powers (powersp) **Due Date:** 09/30/2018

Inventory all of the breakers in Accelerator, End station Area, Halls A, B, C, and D.

Evidence of completion: Inventory list

### **Contributing Cause Corrective Action**

**Action Owner:** Walt Akers (akers) **Due Date:** 06/29/2018

Identify the critical systems/components associated with the breakers in the End Station Area, Halls A, B, C and D and create a prioritized list report (i.e Accelerator critical spares report), including single point of failure.

Evidence of completion: Inventory report which includes critical systems/components.

### **Contributing Cause Corrective Action**

**Action Owner:** Stuart Henderson (stuart) **Due Date:** 05/31/2019

Review the critical system report and will determine which critical spares will need to get replaced or purchased for future replacement in the next year and/or agree to accept the risk.

Evidence of completion: Signed report

### **Contributing Cause Corrective Action**

**Action Owner:** Randy Michaud (rmichaud) **Due Date:** 06/29/2018

Identify the critical systems/components associated with the breakers in the Accelerator and create a prioritized list report (i.e Accelerator critical spares report), including single point of failure.

Evidence of completion: Inventory report which includes critical systems/components.

### **Contributing Cause**

Design Less Than Adequate (LTA) - Critical Systems are designed and installed with multiple single points of failure and/or lack of redundancy.

### **Contributing Cause Corrective Action**

**Action Owner:** Paul Powers (powersp) **Due Date:** 09/30/2018

Examine critical systems identified by system owners. Disposition as appropriate to develop action plan to provide redundancy as much as practical. Include approximate costs in report.

Evidence of completion: Report that includes disposition and costs.

### **Contributing Cause**

Management Less Than Adequate (LTA) - Current notification systems do not communicate impacts to operational conditions to all impacted parties.

### **Contributing Cause Corrective Action**

**Action Owner:** Rusty Sprouse (sprouse) **Due Date:** 06/29/2018

Investigate options that are consistent with existing notification systems, to communicate outages to invested parties and develop a path forward

Evidence of completion: Results of the investigation and path forward

### **Extent of Condition Check**

The Lab should promptly validate all systems that are powered by the emergency power.

**Does this event involve failed equipment?:** YES

**Is there similar equipment in other areas?:** YES

### **Extent of Condition Corrective Action**

**Action Owner:** Rusty Sprouse (sprouse) **Due Date:** 07/30/2018

Provide the list of systems that are on the emergency power to the Hall Coordinators and have them validate it for accuracy.

Evidence of completion: Communication from hall coordinators to FM&L

### **Lesson Learned**

A complete and accurate list of systems that run on emergency power breakers including the accurate list of personnel that will be contacted in the event of a power outage was not in place during the event outlined in this report.

## **Records, Documents, Pictures, and Other References**

Elog entry- <https://logbooks.jlab.org/entry/3486133>

<https://logbooks.jlab.org/entry/3486129>

<https://logbooks.jlab.org/entry/3486106>

<https://logbooks.jlab.org/entry/3486122>

<https://logbooks.jlab.org/entry/3486130>

## **Emergency Notifications Made (Subsequent to the Event)**

**ESH&Q Reporting Officer (876-1750):** 09/27/2017

**Other (TJSO):** 09/28/2017

## **Documentation of Findings**

**Notable Event Number:** FML-17-0927

**CATS Number:** NE-2017-07

**Lessons Learned Number:** 1033

**ORPS Number:** N/A

**NTS Number:** N/A

**CAIRS Entry:** N/A

**DOE Cause Code:** A2 Equipment/ Material Problem, B2 Periodic /  
Corrective Maintenance LTA, C01 Preventative Maintenance for  
equipment LTA

**ISM Code:** Analyze the Hazards

## **Signatures**

**Investigation Team:** Paul Powers (powersp)

**Investigation Team:** Tina Johnson (cjohnson)

**Investigation Team:** Andrew Kimber (kimber)

**Investigation Team:** Ken Baggett (baggett)

**Investigation Team:** Chris Cuevas (cuevas)

**Associate Director / Department Manager:** Rusty Sprouse (sprouse)