

End Station Electrical Distribution

Recent Issues and How They Are Being Addressed

General

Work associated with the UIM electrical upgrade has revealed multiple issues with the installed accelerator site electrical distribution. Facilities Management has indicated that as the issues are identified, they will be developing and executing corrective actions coordinated with Accelerator OPS and Physics. This document details a number of issues that recently impacted the End Station Loop and what is being done to avoid future problems.

Emergency Loop Generator Failures

What It Is

The End Station Emergency Loop is a collection of generator backed switchboards, panels and receptacles that are fed from Transformer T-8. When the transformer loses power, the generator automatically starts and begins delivering power to the supported systems within 30 seconds. To ensure that the generator is operating properly it is activated and run (*in test mode*) for 15 minutes each week.

What Happened

Transformers T-7, T-8 and T-9 were taken offline for the UIM upgrade from September 2nd to September 10th. During that time, the generator failed on two separate occasions and power was lost to critical systems in the experimental halls and the Counting House. Facilities Management is trying to identify the cause of the failure. The following information was reported.

- **September 5th, 2014**

On the first occasion that the generator went offline, it was found to be critically low on oil (~14 gallons). The maintenance crew refilled the oil to the proper level and restarted it. Because it was near the end of shift on Friday, Facilities did not send any notifications or updates to the effected staff, but rather worked to correct the equipment and bring the generator back online.

- **September 9th, 2014**

The generator again ran out of oil and went offline on the following Tuesday. When the contracted maintenance crew began refilling the generator, they pointed out that this generator usually requires 3 gallons of oil to be added during each quarterly maintenance. Because there have been no major outages, this generator is only activated for a 15 minute test each week.

- **September 10th, 2014**

To avoid equipment damage, Hall A staff decided that they could not bring their computing systems back online until Facilities Management was able to provide more stable power. This equipment being offline represents a significant risk to achieving 12 GeV milestones related to Hall A.

Corrective Actions

Facilities Management has taken the following steps to correct the issue and deliver stable power to the End Station Emergency Loop.

- **Primary Power Restored**

On September 10th, Facilities restored power to Transformer T-8. This provides electrical service directly from the 40 MVA substation to the End Station Emergency Loop – the generator is no longer directly supporting any loads.

- **Generator Remedial Maintenance Planned**

Facilities Management is making arrangements to have the generator *repaired/rebuilt* to correct the performance problem. Once complete, the generator will be operated at full load for four hours to ensure that the problem has been corrected.

- **Back-Up Emergency Generator**

In the event that a hurricane or tropical storm approaches before the repair is complete, Facilities Management will delay the repair until the storm passes and will rent a portable generator if necessary.

Planned But Unannounced Outages

What It Is

Facilities Management enters utility outage events into the Outage Alert System and notifies the Physics and Operations points of contact before the outage occurs. The Outage Alert System also e-mails an announcement of the planned outage to everyone who has subscribed to the system. In some cases, the announcements have been missed or are incomplete.

What Happened

A specific example is the loss of power to the clean power systems on the End Station Loop that resulted when a Transformer was turned off to perform phase/rotation testing on a larger loop segment.

- **September 10th, 2014**

In order to perform a phase test on the electrical connections through several transformers, Facilities Management switched off the Transformer T-2 at one end of the group. This operation interrupted clean power to the Counting House and experimental Halls A, B and C. In this case, Facilities did not do an announcement or notification to the effected personnel or to the division points of contact.

Corrective Actions

Facilities Management is working with the Physics Division to prevent this occurrence in the future as follows.

- **100% Notification (Except for Emergency Outages)**

Facilities Management has indicated they will not perform work without providing notifications in the future, except in case of a true emergency.

- **All Outages Must Be Explicit**

Going forward, any transformer that will be de-energized for any length of time (*even a blip*) during the UIM project must be explicitly discussed and included on the schedule maintained by the Physics Division after concurrence with the UIM Facilities team.

- **Fast/Unexpected Outages Must Be Coordinated**

If changes in circumstances require an *as yet unplanned* outage to occur, Facilities will communicate the outage through Physics Management to ensure that all effected Halls have been advised and given time to prepare.

Unplanned Outages

What It Is

At some level, because of unknown conditions in the system, unplanned outages may occur. However, some steps can be taken to reduce the problem.

What Happened

At 1:30 on Wednesday, September 10th, while Facilities was replacing the LN1 transformer (*Accelerator/North Loop*), there was a fault that caused the 40 MVA Substation to trip several branch breakers to the 15 kV loops – unexpectedly disrupting power to large regions of the accelerator site. It was determined that the transformer (W-6) that energizes the North Linac LN-1 transformer (*the newly reconditioned unit*), has a faulty switch. Facilities will change out transformer W-6 as soon as they receive a replacement unit. This swap out will be coordinated with the Accelerator Operations group.

Corrective Actions

Facilities will develop a program to identify, replace and repair problem transformers.

Emergency Egress Lighting

What It Is

One of the emergency egress paths from the experimental Halls is the labyrinth and stairway through the first floor of the Counting House. When the Counting House Utility Power was taken offline, it also discontinued power to the egress lights in the stairs and labyrinth.

What Happened

When the problem was identified by Hall staff, the initial solution proposed by Physics was to cordon off the stairs and have staff exit through an alternate experimental Hall in the event of an emergency. After discussions with Facilities Management on September 11th, they indicated that a more appropriate solution would be to add emergency lighting to the area to ensure that the existing egress paths could be safely used.

Corrective Actions

On September 11th, Facilities Management purchased LED lights and connected them to receptacles in Hall A to provide continuous lighting for the labyrinth and Counting House stairway.

Backup Power for Hall C Computing Systems

What It Is

Essential computing systems in the Counting Rooms for Halls A and B are connected to generator backed circuits. These circuits provide continuous power in the event of an extended outage. Computing systems in Counting Room C are connected to two large UPS systems that are not connected to generator backed-power.

What Happened

When power was lost to the UPS systems, they provided continuous power to the computing systems until the batteries were fully discharged – approximately 1 hour. After this, the Hall C computing systems lost power.

Corrective Actions

Working with Facilities, on September 11th Hall A and C staff installed a connection from an existing generator backed welding receptacles to the UPS systems – allowing them to be powered on. At the same time, a work request was submitted to Facilities requesting two generator backed receptacles be installed for the Hall C UPS's to provide continuous power in the event of future power outages.

Contact

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