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Metro-North Taken Down by Redundant Power Failure

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A portion of the Metro-North railroad, connecting commuters in Connecticut with New York City, was taken down for almost two weeks by a dual failure of a redundant cable feeding power to its tracks. Workers had impossibly long commutes as major highways were turned into virtual parking lots.



Metro-North

Metro-North is the busiest rail line in the United States, servicing 125,000 commuters. It stops at 38 stations in 23 towns. Its rail network comprises nine branches connecting major towns in Connecticut to Grand Central Station in New York City.

All of Metro-North's lines are electrified. It runs only electric locomotives. Amtrak shares Metro-North's tracks for its service to Boston and to northern points beyond.

About 40,000 commuters ride the New Haven line during each rush hour. This is the line that was taken down by the power outage.

The Redundant Power Failure

On Wednesday, September 25, 2013, at 5:20 AM – the beginning of the rush hour – trains on the busy New Haven line of Metro-North came to a halt. They had no electric power. The power cables feeding an eight-mile section of track had failed.

How could this have happened? Metro-North provides dual 138,000-volt power cables for all of its rail sections. What happened to the backup power cable?

As it turned out, the backup cable for this track section had been taken out of service in Metro-North's New Vernon substation for an upgrade. It was part of Metro-North's USD \$50 million program to add capacity to its lines so that it could add expanded service in the future.

However, the backup cable had not been taken out of service casually. During the summer, Metro-North had thoroughly tested the 38-year-old power cable that was to be left in service (it is to be noted that the design life for the cable was thirty years). Using this cable to power the tracks, Metro-North ran extra trains to ensure that the cable could handle whatever load might be imposed on it.



New York Times

Having concluded successful tests, Metro-North took the backup cable out of service on September 13th. Based on the test results, a secondary source of power, which would cost millions of dollars, did not seem warranted.

The railroad ran smoothly for a week. Then suddenly, the primary power cable massively overheated and failed. The cable was so hot that the maintenance crews had to cool it with liquid nitrogen in order to inspect it to find out what had happened.

The outage affected more than the New Haven line. Though many commuters elected to work at home, many more attempted to get to work. Parts of Interstate 95, the major automobile corridor from Connecticut to New York City, became a virtual parking lot with cars backed up for more than fifteen miles during rush hour. All construction was halted on the major roadways leading into New York City to try to ease the congestion.

Amtrak service between New York City and Boston was curtailed. Many trains were cancelled. Those that ran were typically an hour-and-a-half late.

Attempts to Restore Service

Metro-North determined that the primary power cable that overheated was unrepairable. Service could not be restored until the backup cable could be put back into service. It was estimated that this might take three to four weeks.

To provide some level of service during this period, Metro-North began running diesel locomotives on the New Haven line between Grand Central Station and Stamford, Connecticut, where the power outage terminated. It was able to put 24 diesel engines into service. In addition, it ran 60 buses between Stamford and other Metro-North rail lines to ferry commuters to operating trains. However, these efforts provided a service capacity for only one-third of the normal commuter load.

Officials desperately tried to find alternate sources of power. They finally settled on a plan with Consolidated Edison, the major power provider for the area, to put into service three massive transformers that would siphon power from the local residential power grid and feed it to the dead Metro-North rail section. It could only provide 13,000 kilowatts compared to the normal 100,000 kilowatts of power used by the rail section, but at least it would get some electric locomotives working. In effect, a new power substation was being built in just a few days.

This effort was successful. The capacity of the New Haven line increased from 33% of its normal capacity to 65% by October 2nd. In addition, the return of the backup cable was proceeding nicely; and the three-to-four week estimate was firmed up to three weeks, with the expectation of service restoration by October 14th. However, trains were running more slowly than usual because they were making all of the local stops rather than running express.

The outlook for service restoration continued to improve. The backup cable finally went into service on Monday, October 7th, just shy of two weeks after the outage.

The Cause of the Outage

It is still not clear what caused the primary power cable to overheat and fail. The only clue that has come out from Metro-North is that workers were using liquid nitrogen to freeze cooling oil in the backup cable that they were upgrading and accidentally also froze a portion of ground nearby. It is not clear what this had to do with the primary power cable failure. Metro-North personnel have been doing twenty freezes a year for decades with no problems.

Summary

The power outage was costly to Metro-North, incurring an estimated USD \$2 million dollars per week. Metro-North is giving weekly and monthly ticket holders full credit against future tickets for days lost due to the outage.

Interestingly, the American Society of Civil Engineers has recommended for years that a third cable be put in place to maintain redundancy during periods of planned or unplanned downtime for a cable. Maybe Metro-North will now hear this recommendation.

Acknowledgements

Material for this article was taken from the following sources:

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Limited Power Could be Restored to Metro-North This Weekend: Malloy, *NBC Connecticut*; September 27, 2013.

Con Ed to test fix to get trains back on track, *CT Post*; September 28, 2013.

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Con Ed: Temporary Power Fix Could Alleviate Some Woes On Metro-North, *CBS Local*; September 28, 2013.

Metro-North to boost Connecticut-to New York trains, give riders credit, *ABC Local*; October 2, 2013.

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