

Edison 2005i). This condition existed until the collapse of WTC 7 at 5:21 p.m. when damage to the cable terminations caused faults on both of the remaining live feeders, and protective relaying at the transmission switching station opened the circuits automatically with the consequent loss of power to the Fulton network that was fed through the Seaport substation. The collapse of WTC 7 destroyed the Con Edison substations within the building.

A.4.4 Monitoring of Safety Systems

The Con Edison substations in WTC 7 were provided with a Supervisory Control and Data Acquisition (SCADA) system (Con Edison 2005g) which continuously monitored and logged the vital parameters of the substations. In particular, it documented switching operations and provided flags when key parameters changed or appeared anomalous. These logs were made available to the NIST team by Con Edison. The Investigation staff studied the entries between 8:00 a.m. and 8:40 p.m. on September 11, 2001. A considerable volume of these log entries involved housekeeping matters such as removing and returning apparatus in the scan sequence, but the entries also were the source of the timing of both automatic and manual tripping of the circuit breakers documented in Tables A-3 and A-4. As soon as a circuit breaker was tripped, the system topology changed, and the load currents in the substation changed accordingly. In turn this often caused key voltages to fall momentarily (as a result of the fault) and then rise (as a result of the fault clearance). Such fluctuations caused voltage deviation alarms and the relaying equipment in the substation to signal operation of transformer on-load tap-changing equipment (a device designed to change the ratio of a transformer to restore its terminal voltage to the prescribed level). The SCADA logs are full of such entries, which chronicle the large number of circuit breaker operations resulting from the sequence of events at the WTC that day.

Careful study of the large number of entries indicated that, with a few notable exceptions, the actions were explicable in terms of the events taking place on that date. The exceptions were fire alarms which occurred in WTC 7 Con Edison SS #1. The following fire alarm signals were recorded for SS #1 on September 11:

- 10:00:10 a.m. "Alarm"
- 10:00:18 a.m. "Normal"
- 10:00:23 a.m. "Alarm"
- 10:01:00 a.m. "Normal"
- 10:28:58 a.m. "Alarm"
- 4:34:07 p.m. "Normal"

These communications were obtained from the SCADA data transmitted from the World Trade Center substation to Con Edison's Energy Control Center (ECC). The substation operator's log on which the substation operator recorded incidents, such as fire alarms, was destroyed when WTC 7 collapsed on the substation (Con Edison 2005a).