CASE 06-E-0894

DEPARTMENT OF PUBLIC SERVICE STAFF REPORT ON ITS INVESTIGATION OF THE JULY 2006 EQUIPMENT FAILURES AND POWER OUTAGES IN CON EDISON'S LONG ISLAND CITY NETWORK IN QUEENS COUNTY, NEW YORK

FEBRUARY 2007

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

1.1 Overview

This Report summarizes Department of Public Service Staff's (Staff) investigation of the July 2006 equipment failures and power outages in Consolidated Edison Company of New York, Inc.'s (Con Edison or the Company) Long Island City distribution network in Queens County, New York (Long Island City Network event). It describes Con Edison's failures with respect to maintenance, operations, and oversight of the network, as well as its failures with respect to communications with consumers, public officials, community groups, and others. This Report makes recommendations for actions by Con Edison and the Public Service Commission (Commission) that are intended to minimize the chance for similar events to occur in the future, not only in the Long Island City Network area, but also throughout the Company's service territory.

In mid-July 2006, temperatures reaching into the 90s were being recorded in the New York City metropolitan area and were forecast to continue for at least several days. In anticipation of continuing high temperatures and rising demands for electricity, on Sunday, July 16, 2006, Con Edison began making standard shifts in its command system structure and staffing in anticipation that its electric system would face high electric demands and possible heat-related equipment failures.

On Monday, July 17, Con Edison began experiencing equipment failures and customer outages in several areas of its system, particularly in its Long Island City Network and in Westchester County. Con Edison responded to these failures and outages using emergency procedures, which included coordination efforts between its Distribution Engineering Command Post and the various affected operating areas. From Monday afternoon, July 17 to Tuesday evening, July 18, the equipment failures in the Company's Long Island City Network escalated greatly. By Thursday, July 20, Con Edison decided that the escalation of damage to the Long Island City Network's secondary system[1] as a result of equipment failures warranted elevation of the corporate response to the situation. Consequently, Con Edison opened its Corporate Emergency Response Center to provide a full Company response to what, by this time, had become a crisis. The Company subsequently concluded on Thursday evening, July 20

[1] A network secondary system is one that supplies power directly to consumers at what is often referred to as service voltage. In the Long Island City Network, it is typically operated at 120/208 volts, similar to household voltage.

that the number of customer outages it had estimated for the Long Island City Network was inaccurate. Consequently, Con Edison conducted a physical field survey of the network and then changed its customer outage estimate from about 2,000 to approximately 25,000.[2] It took up to nine days to restore service to all customers following this event. Even after restoration, many customers were still on generators and others did not have full service. For network customers, this is a major outage. Historically, Con Edison underground network customers have only experienced outages caused by distribution system failures numbering more than 1000 metered customers only six times over the last 40 years. Of those six instances, only the 1999 Washington Heights outage involved a network shutdown.

On Wednesday, July 26, the Commission issued an Order[3] directing Staff to examine issues associated with the network equipment failures and the customer outages. To that end, Staff investigated Con Edison's organization and operations; the structure, design, and condition of the Company's electric system going into the event, including the part of the network system that experienced problems in Queens; Con Edison's historic reliability performance; the Company's financial circumstances and rate plans; the effectiveness of the Company's communication and interaction with people affected by the outages, and public officials representing those individuals; Staff's technical analysis of the feeder and other equipment failures and customer outages; and, the Company's performance during the recovery phase of the event.

Staff finds that Con Edison's performance was unacceptable and a gross disservice to its customers. Based on a Staff-sponsored survey, we find the customer impact to have been significantly greater than estimated by Con Edison. Staff estimates about 65,000 metered customers, equating to about 174,000 people, lost service or experienced low voltage. While most of the Company's operating personnel, field crews, and consumer services representatives worked long hours and under difficult conditions to contain the crisis, the Company either failed or refused to comprehend the magnitude of the crisis on the secondary network equipment and services, especially on electricity consumers using the network. Its efforts were concentrated on containment of the problems that were occurring with the primary voltage feeder cables

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[2] The outage numbers cited by Con Edison relate to customers of the Company. Each customer could represent multiple consumers in the home or business. Typically, a customer has a meter, so one may also refer to them as metered customers.

[3] Case 06-E-0894, Electric Power Outages in Con Edison's Long Island City Network, Order Instituting Proceeding and Directing Staff Investigation (issued July 26, 2006) (Instituting Order).

supplying the network and network transformers.[4] The impact of those failures and damage to secondary cables was not adequately or timely detected by the Company, leading to extreme damage to the power delivery system, customer outages, and low-voltage conditions. The Company claimed that it was either unaware of the impacts on the secondary system or it did not perceive anything extraordinary about the massive number of manhole events (e.g., fires, explosions, smoke). It also claims that it was unaware of the massive number of consumers without power, even though it has employees that live and work in, or at least traverse, the area each day. This lack of knowledge, understanding, or acceptance of the condition of the secondary system and the impacts on consumers led to, or perhaps was the result of, failures of communications within the Company. It also led to failures by the Company with regard to its communications with consumers, public officials, and the media, resulting in extreme hardships for affected consumers.

Con Edison claims the Long Island City Network event was caused by three unrelated incidents. These incidents, however, were simply triggers initiating the failures in the primary voltage system; they were not the cause of the crisis that resulted. The Company failed to take appropriate actions to minimize the impact of the primary cable and transformer failures on the secondary system and consumers. The Company should have known or made greater efforts to determine the severity of the impacts. Not only did this purported lack of information affect the Company's decisions, it also affected what consumers were told, which in turn adversely affected consumers to a much greater extent than was necessary.

Staff concludes that the improvements needed at Con Edison are critical and substantial. First, the Company needs to modify a number of its procedures, especially with regard to understanding how problems with its system affect consumers, and how it can communicate more effectively, both internally and externally, when system problems arise. Second, system improvements and the correction of maintenance practices are required to eliminate significant weaknesses found in Con Edison's system and practices that could lead to similar or worse problems in the future, if not corrected now. A complete list of recommendations is provided in Appendix A.

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[4] The primary voltage system operates at a higher voltage level, typically 13,000 volts (13 kV) or 27,000 volts (27 kV) in Con Edison's system and moves power from local substations to transformers located near customers. At the transformers, the power is reduced from the primary voltage down to the service voltage, which is then carried on the secondary system.

Several financial consequences result from the Company's poor performance during the outage. Staff finds that the Company failed to meet certain reliability and performance standards set forth in the Company's current rate plan. Staff further recommends that the Commission initiate a proceeding to examine the prudence of the Company's actions or inactions that led to unnecessary expenditures of funds provided by ratepayers.

1.2 Consumer Issues

Con Edison's performance was particularly deficient with respect to communications with consumers, public officials, and community organizations. During public statement hearings, at educational forums, and in written comments, consumers recalled their frustrations as they tried unsuccessfully to get information from the Company about the extent of the electric outages and estimates of when service would return. Residential consumers told of their fears and difficulties, and small business owners described losing thousands of dollars in perishable merchandise and equipment.

An inaccurate customer outage count permeated every aspect of the Company's communications with its customers and others. This deficiency was compounded by the Company's inability to provide an estimate of when service would be restored to consumers after it did become aware of the extent of the outages. The Company finally provided a restoration time to customers on July 25, 2006, over a week after the start of the event, and after restoration was nearly completed. Had the Company identified more accurately and timely the number of people without service, or with inadequate voltage, it might have dispatched resources to the Long Island City Network sooner, and the City of New York could have dispatched emergency services closer to the beginning of the event.

It should be noted that deficiencies in the Company's communications efforts were mostly the result of a lack of accurate information; the performance of the Company's internal organizations and staff directly responsible for communicating with the public, the media, public officials, customers with life-support equipment, critical care and large facility customers, and community groups is dependent upon the quality of the information provided to them. It is understandable that the Company's telephone representatives and other outreach staff could not provide outage information and restoration times when they themselves were not provided with adequate information by the Company's management. On the other hand, once the information was passed on to telephone representatives, there were areas where improvements could and

should be made, especially with regard to partnering with community groups and public officials to get information out to the public and developing a procedure to brief media and public officials at set times throughout a crisis. This procedure should include a daily conference call for public officials. Further, the absence of an effective damage/outage assessment system, upon which reasonable estimates of customer impacts and restoration can be founded, is a major failing that needs to be addressed so that the Company's consumer information staff can effectively meet its responsibilities to inform consumers about a crisis and to provide other vital information.

Con Edison should also develop an enhanced program to identify and communicate with customers, as well as other consumers (e.g., those who pay utility costs in their rent or through master metering arrangements) who rely on life-support equipment, to raise such customers awareness of the importance of having their accounts coded as using life support equipment.

1.3 Outage, Restoration, and Recovery Technical Issues

In the Outage, Restoration, and Recovery Section of the Report, Staff analyzes and makes recommendations with regard to the causes of the Long Island City Network equipment failures and the consumer outages. Staff also addresses certain other technical issues identified during its investigation, which while not necessarily directly responsible for the network event, indicate a need for the Company to promptly improve its overall operations, maintenance, and oversight of the Long Island City Network and, in some cases, the Company's entire network distribution system, to minimize the chances that similar failures will occur in the future.

Con Edison claims that the network event was due to three unrelated events. These were: 1) a short-circuit, low-voltage cable fire in an underground conduit that damaged two of the network's 22 primary 27,000 volt supply feeders, causing them to fail; 2) a malfunction of a substation breaker when a third feeder failed because of a faulty connection, which caused three additional network feeders to be isolated from the system; and 3) the occurrence, when operators attempted to restore feeders to service, of a phenomenon known as "inrush" current,[5] which caused circuit breakers to reopen.

[5] Inrush currents are momentary current surges that occur when certain equipment is initially turned on. These currents can be as much as six or more times as large as during normal operations.

After reviewing the many factors involved, Staff concludes that, while those were contributing elements, the overriding cause of the Long Island City Network event, and the extensive and lengthy impacts for consumers, was the Company's failure to confront and resolve a multitude of issues associated with its operation, maintenance, and oversight of the network and to recognize and take effective action to limit the extent of the cascading system damage and the resulting consumer impacts. If the Company had handled its oversight of the network effectively, or managed the event responsibly, the three unrelated failures would either not have occurred or, if they had, would not have resulted in the catastrophic consumer outages, low-voltage service, and extensive damage to the Long Island City Network.

In general, Staff finds that Con Edison's overall performance was deficient and it did not adequately fulfill its responsibilities under the Public Service Law. Although the Company's personnel worked long hours and under difficult conditions, the fact is that the Company was looking down when it should have been looking up. Staff concludes that the Company, inexplicably, was not fully aware, as it should have been, of the extensive damage the primary system failures were inflicting on the lower voltage secondary system and ultimately on consumers, or it ignored indications of mounting damage. As a result of operating the Long Island City Network with so many primary feeders out-of-service, the power flows on the remaining primary feeders, and also on the secondary system used to serve customers, increased greatly. Because the Company failed to monitor adequately the impact of increased power flows on the secondary system, parts of this system operated well beyond design limits, resulting in major damage, extensive consumer outages, and low voltage.[6] The Company, to this day, continues to make repairs to the Long Island City Network's damaged secondary system and, because much of the secondary cable is underground within duct banks, it is likely that some long-term damage exists that will only be discovered over time.

Finally, Staff found the Company's Remote Monitoring System, which is used to monitor transformer conditions, to be woefully inadequate, not only in the Long Island City Network, but throughout the Company's territory. Staff also found that there was an alarming

[6] The secondary distribution system is not designed to carry power over long distances. That is the purpose for using higher voltage primary feeder supply cables. When many primary feeders supplying the Long Island City were out, especially concentrated in certain areas, the secondary system attempted to move power over longer distances, resulting in low voltages in some areas.

rate of corrosion among the Company's underground transformers in the network, and we have no reason to believe this high rate of corrosion does not exist in other networks.

1.4 Financial Issues

In the Financial Issues section of the Report, Staff describes the most recent Rate Order for the Company.[7] Con Edison's actual expenditures are then compared with the rate allowances received from customers, based on its projections in rate cases for expected system maintenance and improvements. Following that review, Staff compared Con Edison's historic expenditure budgets with its actual expenditures to determine if funds were diverted within the budgets from one purpose to another or from one operating area to another. Finally, Staff addresses the manner in which the Company responded to the Commission's July 26, 2006 Order directing identification of the costs of the failures and outages in the network[8] and then considers the ratemaking treatment of those costs.

Staff concludes that, in general, Con Edison spent in excess of its rate allowances for transmission and distribution operations and maintenance expenses since 2000, and it spent more than its rate allowances for transmission and distribution capital expenditures in every year since 2000. Con Edison's financial health was solid for the period reviewed (2000-2005). The Company's level of electric earnings and unfettered access to capital markets afforded the Company the opportunity to finance any reasonable level of necessary investment or improvement to its systems. The Company has the right to petition the Commission for recovery of extraordinary costs it may deem necessary to fulfill its obligations to provide safe and adequate electric service.

Staff found no evidence that the Brooklyn/Queens area was disadvantaged on a budgeted cost or actual cost basis when compared to the Company's other operating and budget areas. Generally, the Company spent its operations and maintenance budgeted funds and exceeded capital budgets from 2001-2005. Staff, however, recommends improvements in the Company's budgeting and tracking processes to include more granular information on a network-by-network basis. Correlation of network capital and maintenance activity with individual network performance should better allow the Company to identify opportunities to improve system performance.

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[7] Case 04-E-0572, et al., Con Edison – Electric Rates, Order Adopting Three-Year Rate Plan (issued March 24, 2005) (2005 Electric Rate Plan).

[8] Instituting Order, pp. 5-6.

To date, the Company has tracked costs totaling $91 million for activities and claims related to equipment failures and outages, and estimates total 2006 costs related to the Long Island City Network event of approximately $120 million. Of the $91 million, $32 million represents capital costs, which the Company is treating like normal plant additions and plans to seek recovery from customers. The expenses and customer claims costs, totaling approximately $59 million, will be absorbed by Con Edison. In addition, Staff expects the Company to incur negative revenue adjustments of at least $9.3 million as a result of the metered customer outages pursuant to the 2005 Electric Rate Plan.

Staff expects the Company to incur costs related to this event for the foreseeable future and, therefore, recommends that the Company continue to track Long Island City Network costs and report them to Staff until further notice.

1.5 Other Issues

The Other Issues section of the Report reviews the Company's compliance with notification and performance requirements concerning system- and safety-related emergency events, and the status of telecommunication capabilities in the network during the event. With regard to the Company's compliance with notification and performance standards, Staff found that: 1) that the Company's compliance with the emergency notification requirements of the Commission Electric Safety Standards was often sloppy, inconsistent, and incomplete; 2) the Company should be subject to a $9 million revenue adjustment under its 2005 Electric Rate Plan because of poor electric reliability performance during calendar year 2006; and 3) the Company should be subject to a payment to ratepayers of $300,000 for failures to comply with the Outage Notification Incentive Mechanism of the Plan. These recommended revenue adjustments are in addition to any that the Commission may find after examination of the prudence of the Company's response to the event.

1.6 Executive Summary Conclusion

In general, Staff found that Con Edison's overall performance was poor and unreasonable. The Company needs to modify a number of its procedures, especially with regard to understanding how problems with its primary, and ultimately secondary systems, affect consumers, and how it should communicate with consumers, public officials, and consumer organizations more effectively. This Report provides recommendations that are intended to address the issues identified.

In addition, Staff provides recommendations that address matters that, while not direct causes or impacts of the Long Island City Network equipment failures and consumer outages, address significant weaknesses found in Con Edison's electric system, and in its operating and maintenance procedures and performance. Many of these weaknesses could lead to similar or worse problems in the future if not corrected now.

Given the magnitude of Company deficiencies identified during Staff's investigation, the breadth of the recommendations that are contained in this Report, and the resulting damage to the secondary system and the magnitude of consumer outages during the event, Staff recommends that the Commission review the prudence of the Company's actions or inactions leading up to and during the Long Island City Network event.

Finally, while this Report centers on Con Edison's actions and inactions with regard to its Long Island City underground distribution network, there are many factors revealed here that should be considered by the other utilities in the State. Staff recommends that each of the utilities in the State review this Report and take appropriate action to prevent similar events in their service territories.

Staff's key findings are summarized below:

- Con Edison's performance in preparing for, and responding to, the outage event was deficient, a gross disservice to its customers.
- The Commission should initiate a proceeding to consider the prudence of the Company's actions or lack thereof. The Company failed to fulfill its responsibilities under Public Service Law.
- While many line employees of Con Edison worked hard to contain the crisis, the Company's senior management failed, or refused to comprehend, the magnitude of the damage to its secondary system and the subsequent impact on consumers. The overall management of the event illustrates deficiencies in the Company's ability to accurately develop and process information in an emergency and properly communicate that information internally and externally.
- The Company's failures, especially with respect to internal and external communications, led to extreme damage to the secondary system and extensive hardships for consumers.

- The Company cited three unrelated events as the cause of the outage (fire in underground conduit, malfunctions in substation breaker, and excessive "inrush current"). Staff finds the overriding cause of the Long Island City Network event and the lengthy outage was the Company's failure to address a multitude of pre-existing problems and issues associated with the operations, maintenance, and oversight of the Long Island City Network and its failure to shut the network down in light of glaring evidence that the secondary system was experiencing severe damage during the early stages of the event.
- Data collected suggests the pre-event conditions of many Long Island City distribution network components were not in conformance with the Company's operating specifications.
- The Company appears to have not fully understood the implications for load growth and transformer additions in the network. The size and complexity of the network outpaced the sophistication of the Company's primary planning and contingency analysis tools.
- An inaccurate customer outage count negatively affected every aspect of the Company's communications with consumers and others, as well as its response to the crisis. The Company's damage/outage assessment system was totally inadequate and resulted in the Company's consumer information staff, along with City and State agencies, being unprepared to deal with the extent of the consumer impacts. The Brooklyn/Queens operating area was the only operating area in the Company's territory without a sophisticated customer outage count system.
- Staff found no evidence that the Brooklyn/Queens area was disadvantaged on a budgeted cost or actual cost basis when compared to the Company's other operating and budget areas. The Company's budgeting and tracking process include more detailed data on a network-by-network basis. The Company should also file detailed five-year capital budgets with the Commission annually until further notice.
- To date, the Company has tracked costs totaling $91 million for activities related to the event, and it estimates total 2006 costs related to the event of approximately $120 million. Of the $91 million, $32 million represents capital costs that will be recovered from customers. The remaining $58 million of expenses and consumer claims costs will be absorbed by the Company. In addition, Staff expects the Company

to absorb revenue adjustments of at least $9.3 million as a result of the event for failure to meet rate plan reliability and reporting targets. Finally, due to the "potentially weakened" condition of the Long Island City Network, Staff expects the Company to incur costs related to this event for the foreseeable future, and these need to be tracked by the Company until further notice.

2.0 INTRODUCTION

In July 2006, the New York City metropolitan area entered a period of high temperatures and a corresponding increase in consumer demand for electricity. On Monday, July 17, Con Edison began experiencing difficulties in its electric distribution system serving the northwest portion of Queens County, which resulted in the failure of a substantial number of the distribution primary feeders and network transformers serving the Long Island City Network. The primary feeder failures ultimately stressed the Long Island City secondary distribution network to the point that substantial portions were damaged and a significant number of consumer outages were caused.

The Company grossly underestimated the number of customers out-of-service in the Long Island City Network. Only upon an in-field survey of the network area during the evening of Thursday, July 20, did the Company begin to comprehend the scope of outages and the level of damage to the secondary network. The Company's failure to comprehend the scope and breadth of customer outages created an outcry from customers, public officials, and community-based organizations.

On July 26, a proceeding was instituted by the Commission, and Staff was directed to conduct a comprehensive examination of the incident and report its findings and recommendations to the Commission. Specifically, Staff was directed to address a number of issues, including:

- the circumstances surrounding the failure of the feeders and the outages;
- the reasonableness of Con Edison's response, communication, and restoration efforts;
- the need for changes to Con Edison's practices and procedures to avoid similar failures and outages in the future; and
- the costs incurred by Con Edison related to the failures and outages.

While Con Edison, nor any utility, cannot guarantee that its customers will never again experience outages related to distribution system failures, the recommendations in this Report are designed to minimize the occurrence of future customer outages associated with network distribution system failures. Further, the recommendations are intended to improve the Company's general communications activities with consumers, public officials, and community-based organizations should any future consumer power outages occur. These findings and recommendations will also be useful for consideration by the other utilities in the State so that they can attempt to avoid similar situations in the future.

The following sections of this Report provide background information concerning the Company and the subject network, then presents Staff's analysis, findings, and recommendations about the various consumer and technical issues the Commission directed Staff to address. Staff's recommendations are summarized in Appendix A.

3.0 BACKGROUND

3.1 Overview of the Long Island City Network Event

On Sunday, July 16, Con Edison forecast high temperatures for the coming week and, consequently, opened its Distribution Command Post. On Monday, July 17, a secondary system cable housed in a wooden duct bank failed, causing the wooden duct bank to catch fire. The fire in the duct bank spread to, and caused the failure of, two primary system cables (commonly referred to as feeders) that were located in an adjacent duct bank.[9] Later that same day, before the first two primary system feeders could be restored to service, another primary system feeder failed because its connection to a transformer was faulty. When that primary feeder failed, the circuit breaker[10] at the substation was should have opened to de-energize the failed feeder, but that breaker also failed. Consequently, the substation bus circuit breaker that fed that primary feeder and two others opened as designed as a back-up/safety operation, thereby de-energizing not only the failed primary feeder, but the other two primary feeders connected to the substation bus circuit breaker. Thus, there were now five primary feeders out-of-service, referred to as a

[9] This resulted in what is called "a second contingency" condition because two primary cables were out-of-service.

[10] A circuit breaker is used to connect and disconnect a circuit (e.g., feeder) from or to a power source. At substations, typically, there are breakers for each feeder leaving the substation and, as back-up protection, there are breakers referred to as "substation bus circuit breakers" that connect and disconnect the incoming power source for the substation to a common location (bus), which then supplies the multiple feeders through individual circuit breakers. A bus is a conductor or group of electrical conductors serving as a common connection between circuits.

fifth contingency condition. Later, when the Company attempted to re-energize one of these five feeders, it said it experienced inrush currents that caused the re-energization of the feeder to fail. With five of the primary feeders in the network out-of-service and customers still demanding service, the power automatically rebalanced its flow among the remaining primary feeders. This stressed many of the remaining feeders and associated equipment far beyond their normal operating limits.

From the evening of Monday, July 17, until the afternoon of Tuesday, July 18, the Long Island City Network fluctuated between having four and six primary feeders out-of-service (i.e., fourth and sixth contingencies). During this time period, and for most of the Long Island City Network event, the Company's main focus was restoring primary feeders to service. The network then went into a seventh contingency when another primary feeder breaker opened, the cause of which is unknown.[11] At around 8:30 p.m. on Tuesday, July 18, three more feeder breakers opened automatically to de-energize three additional feeders nearly simultaneously, putting the network into a 10th contingency. All three of these primary feeder breakers opened because the corresponding transformers failed due to overheating caused by the increased loads that were now being placed on them. The Company operated the network in a 10th contingency (10 primary feeders out-of-service) for over 10 minutes before returning a feeder to service, bringing the network down to a 9th contingency. The network then fluctuated between 9th, 8th, and 7th contingencies for the remainder of Tuesday, July 18 up to and until midday on Wednesday, July 19, when it again reached a 10th contingency. This time the Company operated the network in a 10th contingency for over an hour and a half.

During this period of time, some feeders were returned to service, but other feeders failed. Most of the remaining feeder outages were caused by cable, joint, and transformer failures due to the stress on the equipment from operating with increased loadings due to such a high level of contingency. The primary feeders were gradually returned to service without a further escalation of conditions on the primary system until the network reached a second contingency status on Friday, July 21.

As a result of operating the Long Island City Network with many primary feeders out-of-service, the power flows on the remaining primary feeders, and also on the secondary system used to serve customers, increased greatly, as did the number of concurrent manhole

[11] This feeder was returned to service within 90 minutes of its failure.

events.[12] Because the Company failed to monitor adequately the impact of increased power flows on the secondary system, parts of this system operated well beyond design limits, resulting in extensive damage, consumer outages, and low voltage.[13] As of January 12, 2007, the Company was continuing to make repairs to Long Island City Network's damaged secondary system.

3.2 Process Used by Staff for its Investigation

On Sunday, July 16, 2006, Con Edison notified the Department Staff that it was opening its Distribution Command Post, an action the Company takes when weather or other conditions call for heightened monitoring of its facilities. At this time, Staff began monitoring conditions throughout Con Edison's service territory. On Monday, July 17, after Con Edison reported a number of primary feeder failures in the Long Island City Network (as discussed above), Staff began to monitor conditions there more closely through telephone conversations. On Tuesday, July 18, Staff was dispatched to the Command Post and opened direct communications with Con Edison officials. On Thursday, July 20, Staff was advised by the Company that it was opening its Corporate Emergency Command Center (CERC or Center). Staff relocated its operations from the Distribution Command Post to the Center and other Company offices where it remained to monitor the Company's operations and gather data that might be needed later to assess the Company's performance. The Commission's July 26 Order directing a comprehensive investigation into the Long Island City Network event changed Staff's role from one of informal investigators and observers of the incident to a more formal one. A Staff team of employees from the various disciplines within the Department of Public Service, along with several contractors, was assembled to investigate the Long Island City Network event.

Staff's first order of business was to develop a work plan, which included a tentative timeline and outline for this Report. During the investigation, Staff: gathered and shared information amongst the team and with the active parties to the proceeding; conducted interviews of Company employees, consumers, and public officials; prepared, submitted, and

[12] Manhole events, such as fires and explosions, are an indication that damage is being done to the secondary system.

[13] The secondary distribution system is not designed to carry power over long distances. That is the purpose for using higher voltage primary feeder supply cables. When many primary feeders supplying the Long Island City Network were out, especially concentrated in certain areas, the secondary system attempted to move power over longer distances, resulting in low voltages in some areas.

reviewed responses to information requests (IRs or Discovery Requests); conducted formal inquires on the record (depositions); commissioned a survey of persons residing in the Long Island City Network; observed autopsies of failed network feeders, network protectors, and network transformers; conducted information and educational sessions to assist the public and other parties; reviewed written comments received from the public; monitored and audited Con Edison's claims process; and participated in nine public statement hearings conducted by the Commission to hear from people affected by the event.

3.3 Overview of Con Edison's Long Island City Network

3.3.1 Description

For management and operating purposes, Con Edison is organized into four operating areas: Brooklyn/Queens, Manhattan, Staten Island, and Bronx/Westchester. Throughout its territory, the Company has 57 independent secondary network grids[14] and numerous non-network load areas. The Long Island City Network is one of seven independent, primarily underground, secondary networks operating in Queens County. While this network serves consumers in the Long Island City of Queens County, as its name implies, it also supplies other communities in northwest Queens County (Astoria, Sunnyside, Woodside, and Hunters Point). The East River bounds the Long Island City Network on the north and west (except that Rikers Island and LaGuardia Airport to the north are also included). The Brooklyn/Queens Expressway (I-278) bounds the network on the east, and the Newtown Creek bounds it on the south (see figure below).

The Long Island City Network is operated under the direct day-to-day control of the Regional Control Center for the Brooklyn/Queens Operating Area. It is supplied by the North Queens Substation, which is located at the Con Edison Astoria facility in the northern-most section of the network. Originating from the North Queens Substation, the network is supplied by 22 primary feeders (290 circuit miles) that operate at 27,000 volts (27 kV) and supply 1,198 distribution transformers. These transformers supply the secondary network grid, which includes 1,700 miles of secondary cables that operate at 120/208 volts and is used by customers. This extensive system provides power to approximately 115,000 meters (with most meters representing multiple consumers) interconnected through nearly 15,000

[14] A secondary network grid is an assembly of cables, operated at secondary voltages and supplied through transformers from the primary voltage system, that are interconnected in a mesh-like fashion such that loss of any one cable does not affect customers unless the cable is providing service directly to customers.

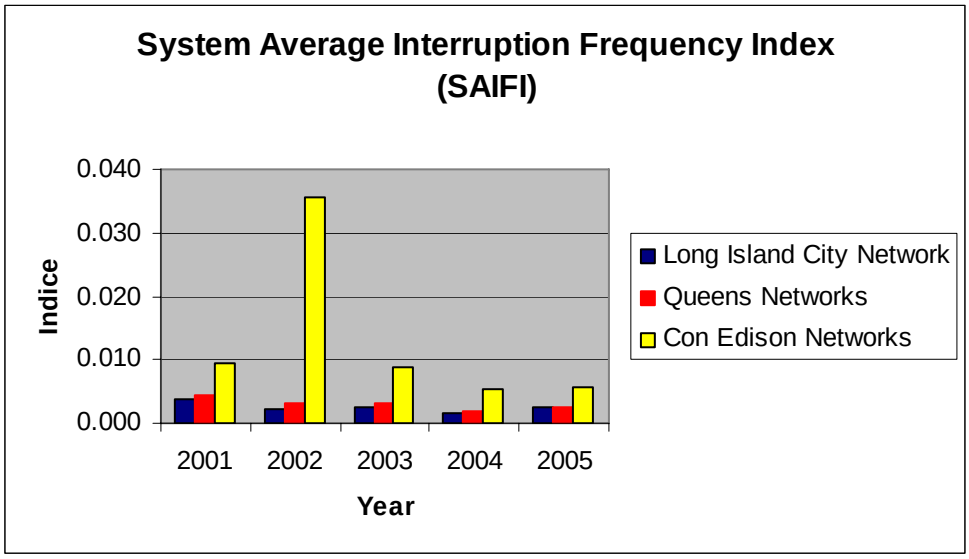
underground structures, including 4,400 manholes and 11,000 service boxes. The following map shows the location of the Long Island City Network.

The Long Island City Network had a forecast peak consumer load demand of 395 MW for 2006, consisting of 300 MW of commercial consumer demand and another 100 MW of demand from residential consumers. Overall, the network has the highest capacity and demand of any Con Edison network, not including any associated non-network loads. It also has the third highest number of metered customers and miles of primary feeder cable in the Company's service territory, with only the Jamaica and Flushing networks, both in Queens, having more.

3.3.2 Performance History

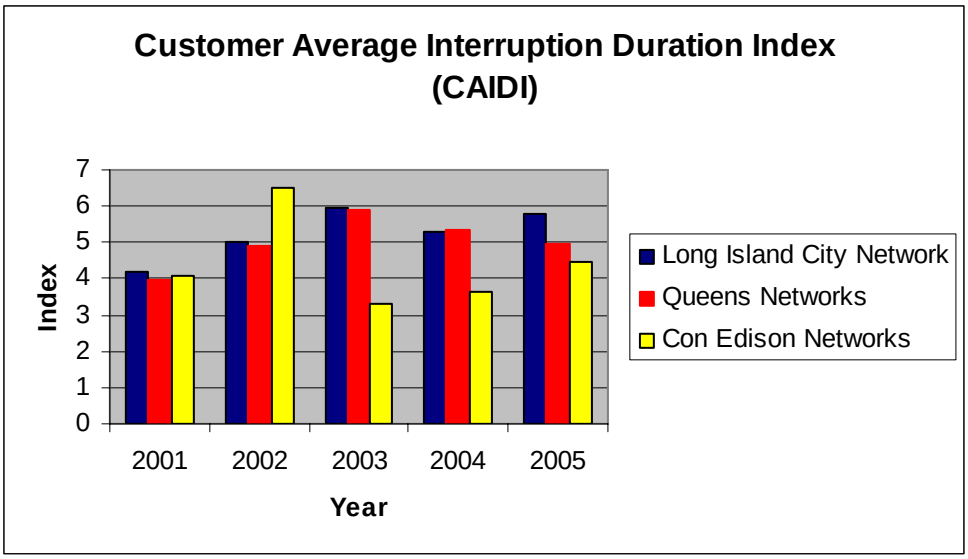
Con Edison's electric distribution system performance is measured annually based on the average number of metered customers that experience an outage (referred to as the System Average Interruption Frequency Index or SAIFI index) and the average duration of the outage for each customer that was affected (referred to as the Customer Average Interruption Duration Index CAIDI index). Note that the Company calculates these statistics and its other customer counts by defining each customer as a single account with a single meter, even though many of those meters may serve multiple households and businesses; in this report, we refer to these as "metered customers."

In recent years, the Long Island City Network has been more reliable than the system as a whole. Between 2001 and 2005, the Company's network distribution system, as a whole, experienced an average interruption rate of 13 metered customers interrupted per 1,000 metered customers served,[15] with an average outage duration of 4.39 hours. During this same period, the Brooklyn/Queens operating area experienced an average interruption rate of three metered customers per 1,000 customers served, and an average duration of 5.02 hours. Long Island City Network consumers experienced an average interruption rate of two metered customers interrupted per 1,000 metered customers served, and an average duration for the same period of 5.30 hours.[16]



[15] The average for Con Edison's entire network distribution system, exclusive of the exceptionally poor year 2002, is about seven metered customers interrupted per 1,000 metered customers served.

[16] Con Edison Response to Staff Discovery Request DPS 21.



Performance of the Long Island City Network's equipment and primary feeders during the past five years was not as good on average as the other networks. Using the Company's "jeopardy" model, which is a method to rank each of the 57 networks in Con Edison's system based on its probability of failure, the Long Island City Network was among the 10 worst each year between 2002 and 2006 as shown in the table below.[17]

Network Rankings Based on Probability of Failure

	2002	2003	2004	2005	2006
Network	**Ranking**	**Ranking**	**Ranking**	**Ranking**	**Ranking**
Fordham	6	3	3	2	1
West Bronx	15	12	2	9	2
Jamaica	3	2	6	6	3
Sheepshead Bay	17	14	15	3	4
Crown Heights	10	5	19	14	5
Williamsburg	11	8	16	10	6
Park Slope	8	11	14	7	7
Flatbush	1	1	1	1	8
Long Island City	4	6	8	8	9
Borough Hall	14	9	13	12	10

[17] Con Edison Response to Staff Discovery Request DPS 68.

Furthermore, based on a Company test of the reliability of primary feeders, the Long Island City Network consistently had some of the worst-performing primary feeders and never any of the best.[18] The network also had the worst failure rate of primary feeders returned to service after an outage,[19] as illustrated in the following table of the worst 10 networks throughout Con Edison's system.[20]

Percent Failure Rate of Primary Feeders Returned to Service					
Network	2003	2004	2005	2006	Total
LONG ISLAND CITY	9.8%	20.0%	31.0%	38.9%	27.2%
BATTERY PK CITY	20.0%	0.0%	50.0%	0.0%	22.2%
GRAND CENTRAL	22.7%	20.0%	25.0%	10.5%	20.2%
ROCKEFELLER	0.0%	19.0%	21.1%	27.3%	19.3%
PLAZA	14.3%	25.0%	19.0%	11.1%	18.3%
RICHMOND HILL	14.0%	17.9%	16.7%	23.3%	18.1%
LINCOLN SQUARE	12.5%	10.0%	9.1%	50.0%	17.8%
FLATBUSH	7.1%	20.8%	16.1%	27.8%	16.8%
GREENBURGH	0.0%	0.0%	0.0%	50.0%	16.7%
TIMES SQUARE	10.5%	16.7%	22.2%	10.0%	16.2%

3.4 Outages in Other Portions of Con Edison's System During the Long Island City Network Event

During the same time period as the Long Island City Network event, Con Edison experienced outages in other areas of its system. Between Tuesday, July 18 and Friday, July 21, approximately 35,000 metered customers lost electric service in the Bronx/Westchester operating area because of heavy rain, high winds, and thunderstorms. On Friday, July 21, at around 10 p.m., another 9,500 metered customers in that operating area lost service, and another 6,000 metered customers lost power on Saturday, July 22 because of additional thunderstorms that damaged overhead equipment, such as transformers and feeders. Given the severity and duration of the storm and its impact on consumers, Staff assembled a team, similar to the

[18] Con Edison Response to Staff Discovery Requests DPS 71 and 72.
[19] Primary feeders returned to service after an outage are also defined as a Cut In Open Auto (CIOA). Cut In Open Autos are discussed in this Report starting in Section 6.3.1.
[20] Con Edison Response to Staff Discovery Request DPS 204.

Long Island City Network investigation team, to investigate and report on the quality of Con Edison's response and the effect that the storm had on consumers. That event will be discussed in a separate Staff report.

During the week of July 17, there were other storm-related outages that lasted longer than 24 hours besides those in Westchester County and the Long Island City Network, throughout Con Edison's service territory. In that week, the Company reported that New York City had 46,208 additional metered customer outages, representing approximately 387,470 total hours of non-service, not including the Long Island City Network outages. Most of the overload and equipment-related outages were exacerbated by the heat conditions during the period. The table below provides the distribution of failure types for these 46,208 outages.

Types of Metered Customer Outages

Failure Types	**Interrupts**	**Percentage**
Tree Contacts	1,435	3.11%
Overloads	2,479	5.36%
Apparatus Or Equipment Failure (radial)	33,257	71.97%
Accidents or Events Not Under Utilities Control	245	0.53%
Pre-arranged	280	0.61%
Customer's Equipment Or Failures	46	0.10%
Lightning	2,761	5.98%
Unknown Or Unclassified (radial)	3,547	7.68%
Service Connections	291	0.63%
Street Mains Cable	1,510	3.27%
Apparatus Or Equipment Failure (network)	350	0.76%
Customer's Equipment Or Failures (network)	6	0.01%
Unknown Or Unclassified (network)	1	0.00%
Total	**46,208**	**100%**

The majority of the consumer outages that extended beyond 24 hours were linked to apparatus or equipment failure. One of the longest outages was in the Jamaica network in Queens County on July 18 where 261 metered customers were affected for about five days. This extended outage was due to failure of primary feeders and a connection for a feeder, which occurred at different times, and the limited availability of crews during this period due to the many other outages occurring in the Con Edison territory at the same time.[21]

[21] Con Edison Response to Staff Discovery Requests DPS #103, 305, 377, and 378.

3.5 Waiver of Tariff and Commission Rules

On August 1, 2006, Con Edison requested Commission authority to waive, temporarily, certain provisions of its tariff so that it could offer financial assistance and prevent terminations, disconnections, and suspensions of service to consumers in the Long Island City Network.[22] On August 3, the Commission granted Con Edison's request, finding it would be in the public interest, necessary to the preservation of the public welfare, and contribute to public health and safety.[23] The Commission, in granting the Company's request, extended the temporary waiver through the September 2006 billing cycle and directed that the temporary waiver request be applied to customers in portions of Jamaica, Queens, and Westchester counties who also suffered extended outages. The Commission also granted Con Edison's request to suspend, temporarily, late payment charges for bills and no-access charges that it could otherwise impose for being unable to gain access to affected customers' meters. Additionally, the Commission suspended those portions of its regulations and the Company's tariff that give the Company the discretion to decide whether to terminate, discontinue, or suspend a customer's service.

3.6 Con Edison's Self-Assessment Reports

Part 105.4(c) of the Commission's regulations requires that, following an emergency event where the service restoration period exceeds three days, utility companies must submit to the Commission within 60 days of completion of service restoration an internal review of their preparations and system restoration performances. On September 25, 2006, Con Edison submitted its internal review for the Long Island City incident titled, "Event Preparation, Recovery, and Communication – Power Outages in Northwest Queens – July 2006." On October 12, 2006, the Company submitted a more in-depth report of events titled, "Comprehensive Report on the Power Outages in Northwest Queens in July 2006."

Con Edison's October 12 report was not required by the Commission's rules, but Con Edison maintains that it was being submitted to report on its own comprehensive study of the causes of the network event and evaluate measures to strengthen the reliability of the Company's network systems, as well as to mitigate the potential for equipment failures to affect

[22] Con Edison's August 1, 2006 letter to Secretary Brilling.

[23] Case 06-E-0894, Electric Power Outages in Con Edison's Long Island City Network, Order Temporarily Waiving Tariff Provisions (issued August 3, 2006).

customers in the future. The Company said the Part 105.4(c) filing and subsequent October 12 report was also intended to examine how the Company can improve its methods for identifying the interactions between the high-voltage primary system and the low-voltage secondary system and the effects of equipment failures on consumers, as well as how such improvement can, in turn, promote enhancements in the Company's emergency preparations, response, and communications.

In general, Con Edison concluded that the customer outages in the Long Island City Network were precipitated by three unrelated events that combined to create an unprecedented set of circumstances and strain on the network. It noted that it recognizes it is critically important to learn from the unique event and to take measures that will reduce the likelihood of such an event happening again. It says that the Company will take the steps needed to remain a reliable partner in the well-being and growth of metropolitan New York.

Staff reviewed Con Edison's required Part 105.4(c) filing and its subsequent October 12 report. Staff's findings with regard to Con Edison's compliance with the requirement of Part 105.4 (c) and with regard to the Company's perceptions of its actions and the causes of the failures and outages are presented throughout this Report along with Staff's recommendations for actions the Company should take in the future. In some cases, Staff's findings and recommendations are consistent with Con Edison's, but in many cases, Staff reaches different conclusions and suggests further or different actions. As noted elsewhere in this Report, while Staff concurs that the three events identified by Con Edison were triggering events, the true cause of the crisis was that the Company failed to understand or acknowledge the impact of the primary feeder problems on the secondary system and consumers, and then failed to take appropriate actions to minimize such impacts.

4.0 CUSTOMER OUTAGE IMPACT ASSESSMENT

4.1 Overview

From Monday, July 17, 2006 until early Friday, July 21, the Company grossly underestimated the number of customers out-of-service in the Long Island City Network. Only after an in-field survey on Thursday, July 20, of the Long Island City Network area did the Company comprehend the scope of customer outages and begin to understand the level of

damage to the secondary network. The Company's failure created an outcry from customers, public officials, and community-based organizations.

A utility must understand the scope and magnitude of an outage in order to determine how to deal with that outage effectively – both to contain the damage and organize restoration efforts and to offer effective and appropriate information and services to affected customers and public officials. Unfortunately, despite a wealth of information and indicators available to Con Edison officials from the start of the event, the Company stuck to its traditional, conservative methods for estimating the number of metered customers out-of-service, and ignored many indications that the outage was significantly more widespread and damaging than they thought. Only on the afternoon of Thursday, July 20, after extensive comment from the press and public officials, did the Company seek an alternate way to estimate the number of customers out-of-service, and send workers out on a night-time survey of the affected area to attempt to determine its perimeter and the number of customers affected. While the Company eventually estimated that 25,000 metered customers might have been out-of-service, Staff estimates, based on survey evidence described in Section 4.3 of this Report, that there could have been as many as 65,000 customers that were either out-of-service or experiencing such low voltage that their electrical appliances were unusable.

Having a grossly inaccurate customer outage estimate hampered the Company's outage management in several ways:

- The company did not recognize the extent of damage on the secondary system, nor the degree to which secondary system equipment failures were compromising primary system equipment and operations;
- It likely experienced significantly more network equipment thermal overloading than was necessary;
- It could not recognize the amount of repairs that would be needed, nor the time required to make those repairs;
- It could not give customers realistic estimates of how long it would take before they were back in service;
- It could not give public officials or the press accurate information about the extent of the outage problems, compromising relief efforts and public safety.

4.2 Con Edison's Identification of Consumer Outages

4.2.1 Background

The identification of the number of consumers affected by outages is a critical step in providing the correct level of emergency response. Because of the importance of determining this information accurately, computer-based systems are often used to assist in the gathering and managing of information. Con Edison identifies outages through calls received from consumers and municipal officials and with input from field crews; of the three, the primary resource is consumer calls.

The Company uses its computer-based Emergency Control System to manage information obtained from the consumer calls.[24] The system involves the company gathering information from its Customer Service Representatives, its Voice Response Unit,[25] and the Control Center. Information from the Consumer Service Representatives and the Voice Response Unit are linked to a program containing customer account information to identify outage locations. The Control Center, where Con Edison manages the restoration of the system, provides information from crew and municipal official calls.

Once the Emergency Control System is populated with information, it provides information to two other systems: Con Edison's Outage Management System and its System Trouble Analysis and Response (STAR) program.[26] The Outage Management System is a web-based reporting tool that captures data from the Emergency Control System. It is the primary source of storm status information.[27] One of the Outage Management System's functions is to display the number of metered customers out-of-service based on data from the Emergency Control System. The STAR program, however, uses data from the Emergency Control System and other parameters to estimate the number of metered customers out-of-service. For example, when a customer reports no service at a location, the program could

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[24] The Emergency Control System is a mainframe computer system used to process, track, and control trouble reports received. (Found on Page 79 of 2006 Consolidated Emergency Response Plan.)

[25] The Voice Response Unit (VRU) is an electronic means of answering and handling phone calls. It enables customers to initiate a trouble report and will automatically call customers back when the system is updated to indicate that service has been restored. (Page 81 of 2006 Consolidated Emergency Response Plan.)

[26] STAR (System Trouble Analysis and Reporting) is a system that analyzes trouble and tracks jobs on the electric distribution system. It receives information from both consumer calls and telemeter field equipment, and it displays it on Control Center maps. By analyzing the information, STAR identifies the causes of system trouble, creates jobs for corrective work, and allows operators to prioritize and track jobs to completion. STAR can quickly identify the number and names of customers affected by outages. (Page 80 of 2006 Consolidated Emergency Response Plan.)

[27] Con Edison's 2006 Consolidated Emergency Response Plan, page 80.

increase the estimated count of metered customers out-of-service based upon the number of customers taking service from the same service box as the customer reporting the outage. Unfortunately, the program has not yet been implemented in the Brooklyn/Queens operating area and, thus, was not available at the time of the network event. Thus, the metered customer outage information between Monday, July 17 and Thursday, July 20 was based entirely on calls received from consumers.

Con Edison has recognized for several years that during instances of metered customer outages, all consumers that experience outages do not actually call the Company to inform it of that fact; therefore, in 1999, it created the STAR program. The program uses data from the Emergency Control System, along with certain system design information, in an algorithm to estimate metered customer outage numbers. The program, which was piloted in Westchester County in November of 1999, was primarily designed for application in radial systems. While it does not perform as well in network systems, it can provide a better account of outages than the Outage Management System.

4.2.2 Analysis and Findings

In the Brooklyn/Queens operating area, the STAR program was not implemented prior to this event, as noted above, although it did receive all the information gathered in the Emergency Control System.[28] On Thursday, July 20, when representatives from Con Edison began to realize that the outage count it had obtained from the Outage Management System might be inaccurate, it ordered a test run of the program.[29] According to this test run, 7,000 customers were found to be out-of-service, as compared to 1,459 customers estimated by use of the Outage Management System.[30] Upon Staff's request, another test run of the program was conducted after the conclusion of the Long Island City Network event. The results of the second test run, compared to the results provided by the Outage Management System, which includes data from the field survey conducted by the Company, are provided in the following table.[31]

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[28] STAR is not scheduled to be fully integrated in the Brooklyn/Queens region until June 2007. This schedule was mainly based on Con Edison's consideration of the level of importance of STAR to its different operating regions. Other factors the Company reported were Con Edison's budget, installation time, and learning curve for workers who would deal with STAR. Prior to this event, Con Edison began computer upgrades and design changes to integrate STAR in the Brooklyn/Queens operating area.

[29] Staff July 7, 2006 interview with former Con Edison employee Eric Stewart and Con Edison Response to Staff Discovery Request DPS 358.

[30] Con Edison Response to Staff Discover Requests DPS 358 and 35.

[31] Con Edison Response to Staff Discover Request DPS 160.

Customer Outage Numbers (Second Test Run)		
Day	**Customer Outage Numbers**	
	STAR	**OMS**
7/17	34	17
7/18	2,312	225
7/19	11,496	1,118
7/20	18,375	1,459
7/21	14,387	23,622
7/22	6,992	17,071
7/23	5,065	5,169
7/24	4,631	1,675
7/25	4,036	0

Although the program did not produce the same number of metered customer outages as provided by the Company surveys, Staff believes its use would at least have identified the severity of metered customer outages much sooner than relying solely on consumer calls.

There were also outside agencies that depended on the accurate identification of customer outage numbers, such as the New York City Office of Emergency Management. The New York City Office of Emergency Management did not initiate an all-out response at the beginning of the event due to the low metered customer outage count reported by Con Edison at the time. Outages above 3,000 customers trigger such action by the City. The 3,000 customer trigger was not indicated by Con Edison until Friday, July 21 when the Company formally revised its official customer outage number from 1,800 to 25,000. Based on information the City had received from elected officials and other contacts, however, the City went forward and prepared for a full-scale response on Thursday, July 20, without relying on the Company's estimates. The City’s Office of Emergency Management also implemented its own procedure to determine the magnitude of customer outages. It assembled a Power Outage Response Team that consisted of representatives of the New York Police Department, the New York City Fire Department, the Office of Emergency Management, and community assistance organizations. The City ordered police department and emergency personnel to drive through the affected area

on Thursday, July 20, and report back what they found with regard to outages. The City used U.S. Census data to estimate the number of consumers without service based on the perimeter of the outage areas found. Consequently, the Office of Emergency Management estimated the number of customer outages to be around 25,000 at that time.

Not until Thursday evening, July 20, did Con Edison conduct a physical field survey overnight to obtain its own estimate of the number of customers out-of-service. Customers were asked through the media to leave their lights on. Selection of areas to be surveyed was based on locations cited in trouble reports the Company had received. Employees who were not essential to the restoration effort were instructed to drive through the area, in a similar effort to that of the City, and to note on distribution network maps where there was or was not service.[32] Survey results were assumed to be representative of those areas not surveyed. On Friday, July 21, after completion of its survey, Con Edison announced that the customer outage number was 25,000 (i.e., metered customers). Additional surveys were conducted the nights of Friday, July 21 to Tuesday, July 25 for the primary purpose of keeping track of restoration progress.

Con Edison's use of the STAR program and the survey provided a more accurate estimate of the number of customers out-of-service than obtained by simply relying on customer calls. Both of these methods should be integrated in estimating customer outage information, but because both systems have limitations that significantly affected the accuracy level of the outage numbers, other methods for determining outages should be derived for a network system. In addition, the Company's methodologies resulted in estimates only of the number of "metered customers" affected, not "consumers". Some method is needed to provide accurate estimates of electricity consumers without service to put the outage counts into perspective. Finally, the outage counts did not account for customers with low voltage.[33] These counts need to be provided as well because they have an effect on customers' use of equipment, i.e., some equipment does not work when the voltage is too low, although the customer technically is still receiving electricity from the utility.

Con Edison's inability to identify consumer outages and low-voltage conditions accurately was totally unacceptable. It also puts in question the validity of data used to determine the level of service reliability, which has an impact on the degree of revenue

[32] Con Edison Response to Staff Discovery Requests DPS 112 and 113 and Staff interview with Con Edison employee R. Murray on July 20, 2006.

[33] A threshold for what constitutes low-voltage for network customers needs to be more clearly defined.

adjustments the Company should face for not complying with service reliability requirement in a network system. That issue is discussed in a later section of this Report.

After the event, Con Edison commissioned a consultant to conduct a survey of 12 large urban utilities to obtain information about how consumer calls are processed, the use of Outage Management Systems, how estimates of customer outages are determined, and how such estimates are communicated to the public. In that survey, it was found that the majority of the companies surveyed use customer calls as their primary way to detect outages. Some companies, however, use e-mails and automated methods (e.g., advanced metering) to assist in gathering outage information.

Advanced meters and fixed network communications systems are another means capable of providing outage detection and enhanced outage management capability when integrated with utility outage management systems. In addition to outage detection, both systems can allow advanced functionality, such as time-differentiated rates and demand-response programs. They can also provide for increased an increased of actual meter readings, improved reading accuracy, and the elimination of the need to enter customer premises. The communication technology employed by the fixed network system, however, has not yet been demonstrated in New York City, an urban setting, although it has been proven in other utility service territories. Further, the cost savings possible through avoidance of meter-reading costs when employing a fixed network in an urban area would not be expected to be as great as in a non-urban area because of the population density and close placement of meters. The costs of advanced metering systems, however, may be justified if designed to capture multiple benefits in addition to outage management, such as billing improvements and revenue management. Outage management benefits can result in additional utility cost savings as well as enhanced customer satisfaction. The Company needs to assess and consider the merits of such improved technologies.

Finally, as noted later in this Report, telecommunications carriers have some capabilities to detect and evaluate the extent of power outages. Coordination with the

telecommunication companies serving Con Edison's system might provide valuable information for the Company during service outages.[34]

4.2.3 Recommendations

- Con Edison should make the System Trouble Analysis and Response (STAR) program available to all its operating regions by June 1, 2007. The Company should report to Staff within 90 days of the issuance of this Report on the status of implementation of this recommendation.
- Con Edison should establish by June 1, 2007, an outage identification system similar to, and in conjunction with, the City's Power Outage Response Team system.
- Con Edison should explore the feasibility and associated costs and benefits of installing a fixed network, advanced metering system in the Long Island City Network and in other networks in the future. This should be done in a manner consistent with the Commission's Metering Order.[35] The Company should report to Staff, within six months of the issuance of this Report, of the results of its analyses.
- Con Edison should explore other monitoring techniques, including coordination between it and the telecommunications carriers in its service territory, to use the carriers' status monitoring capability to detect and evaluate the extent of power outages. The Company should provide Staff with a status report of its efforts in this regard within 90 days of the issuance of this Report.
- Con Edison should report within 90 days of the issuance of this Report its final estimate of how many customer outages and low-voltage conditions existed during the Long Island City Network event, including documentation of how those estimates were derived.
- Con Edison should report to Staff within 90 days of the issuance of this Staff Report, what changes it will implement or has implemented, to ensure that

[34] In addition to use of advanced meters and/or coordination with telecommunication companies, other monitoring techniques should also be considered, such as detection devices scattered at various locations throughout the secondary network.

[35] Case 00-E-0165, et. al., In the Matter of Competitive Metering, Order Relating to Electric and Gas Metering Services (issued August 1, 2006).

outages and low-voltage conditions in a network system are estimated accurately. In its report, the Company should recommend what monitoring thresholds are appropriate.

4.3 Staff Survey of Consumers

As part of the Staff investigation, a telephone survey of residents in the Long Island City Network was conducted by a consultant (see Appendix B). The survey was designed primarily to obtain an independent estimate of the numbers of customers, households, and people who lost service and the period of time they were out-of-service. The survey also examined respondents' experiences with power quality problems (e.g., low voltage), the impacts of the event on life-sustaining equipment consumers, the sources people used to get information about the Long Island City Network event, and how the outages may have affected various electricity-dependent telephone technologies.

Staff retained the Association for the Blind and Visually Impaired-Goodwill Industries (Association) for its survey effort. The Association was supported by Crux Research, Inc., which designed the survey, refined objectives, and completed the script validation. A random digit dial sample was purchased from Survey Sampling International for the six Long Island City designated zip codes (11101, 11102, 11103, 11104, 11105, and 11106) and listed samples for two other zip codes partly served by Con Edison's Long Island City Network (11370 - Jackson Heights and 11377 - Woodside). Business numbers were screened out of the sample. The Association used Zip-codes.com to determine population in each of the areas, including the targeted areas of 11370 and 11377. The survey for zip code 11370 and 11377 respondents included questions about landmarks to ensure that respondents lived in the areas served by the network. The targeted zip code areas are shown on the following map.

Target Zip Codes for Staff Survey

A statistically valid sample was obtained, consisting of 450 completed surveys. The completion rate was better than 12%, with 3,627 surveys attempted, including 757 call backs. Of the unsuccessful attempts, 1,455 were to invalid numbers, 573 were to business numbers, 447 were no answer, and 99 were to households outside the network area. An additional 13 interviews were terminated by the respondents before the surveys were completed, and seven other interviews were terminated when it was learned that they were either Con Edison or Department of Public Service employees. There were 583 refusals.

A weighted average of 56% of all respondents reported losing electricity for some period of time -- this ranged from a high of 84% (zip code 11104) to a low of 19% (zip code 11106). Respondents who indicated they had lost service were out an average of 5 days. From

the percentage of respondents who reported losing electricity, estimates can be made about the number of customers, households, and people who were affected by the outage. Con Edison states that the network serves 115,000 metered customers, while U.S. Census data shows that the network area contains approximately 117,400 occupied housing units and 309,000 people.[36] Applying the 56% figure derived from the survey, about 65,000 metered customers, equating to about 66,000 households and approximately 174,000 people, lost service.

Staff believes many customers that experienced extremely low voltage (i.e., low enough to adversely affect or even totally disrupt the customer's equipment, such as air conditioners) may have responded to the survey as having lost service. This would possibly explain the higher number of metered customers out-of-service found by the survey compared to the Company's estimate of 25,000.

About half (52%) of the respondents indicated that they did not attempt to call the Company, and of those who did about a quarter reported not being able to get through. Staff believes that the reluctance to call is typical customer behavior in cases of widespread outages, where many customers assume that the utility is aware that they are out-of-service or that their neighbors have already called the Company. The finding about not being able to get through, however, is troubling and contrary to the Company's Call Center data on this issue.[37]

Although only 10 people among the 450 surveyed reported having life-sustaining equipment, most of those (7 of 10) stated that they have not reported that fact to the Company. Of the three who had, only one reported being called by the Company during the network failure.

Many (38%) of the respondents reported having other power problems in addition to outages, such as computers or appliances that would not operate (likely due to low voltage at the premises). Of those experiencing such problems, 39% contacted the Company about the problem, and 10% reported hiring an electrician to check the problem (these were about evenly divided between those who had called the Company and those who had not). About 40% of the apartment dwellers live in buildings with an elevator. For those without power or inadequate voltage, loss of elevator service presented an additional difficulty in coping with the outages.

The respondents indicated that they relied on a variety of sources for information regarding the outages, including radio, newspaper, and television reports; the one used most

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[36] The New York City Department of City Planning has challenged the current estimates of New York City population based on Census data. City Planning's estimate for Queens is 0.7% higher than the Census estimate.

[37] Con Edison Response to Part 105.4(c) of the Commission's Rules, pages 6-15.

often, and the one that respondents rated the most highly, however, was word-of-mouth from friends and neighbors. Con Edison was used as a resource less by respondents, and cited less often for reliability of information, than any of the resources just mentioned (slightly less than 10% in both cases). The resources respondents used least, and deemed least reliable, were public officials and the internet. It is noted above, however, that public officials were not given adequate information to be of assistance to their constituents, and problems with the Company's website are described later in this Report.

The survey showed that most respondents (396 or 88%) have land-line telephone service, followed by those having cellular service (235 or 52%). About half of the land-line users (184 or 41%) reported that they were still able to use their service even without power, perhaps because most (279 or 62%) reported still having a standard, corded telephone, which does not require power at the premises to operate. Most of the cellular telephone users (140 or 31%) also reported being able to use their cell phones during the outage, at least for a period of time.[38]

The survey provides an independent estimate of the magnitude of the outage, and the number of customers, households, and people affected. The results support findings and recommendations elsewhere in this Report that the Company's procedures for identifying consumers out-of-service and those using life-support equipment are inadequate, and that relying primarily on customers to report outages is an ineffective strategy.

5.0 CONSUMER ISSUES

5.1 Overview

This section of the Report relates to the comments made by consumers, business people, public officials, community-based organizations and critical care/large facilities. It also describes Staff's review of Con Edison's contacts with consumers, public officials, and the media. It provides Staff's analysis of the performance of the various Company organizations and its employees who were responsible for such contacts, the provision of dry ice, training, and the processing of claims. Staff concludes that Con Edison's performance was deficient in several areas.

[38] Staff contacted the telephone and wireless companies that serve the area. They indicated that their services were not affected. Some consumers, however, had difficulties because of loss of power to their equipment. A more detailed description of Staff's analysis of telecommunications issues is provided in a later section of this Report.

For several days during some of the summer's worst heat, thousands of people were without both electricity and information. During public statement hearings, at educational forums, and in written comments, consumers recalled their frustrations as they tried unsuccessfully to get accurate information from the Company about the extent of the electric outages affecting the Long Island City Network and projected restoration times. They told of their fears as they climbed dark stairwells to their homes, checked on frail and elderly neighbors unable to leave their apartments because elevators were out-of-service, heard utility manholes exploding, and listened in the night to police and fire sirens. Small business owners described losing thousands of dollars in perishable merchandise and equipment. Some of those losses might have been avoided had Con Edison provided accurate information about the extent of the system damage and estimated restoration times. Armed with this information, business people could have postponed deliveries or otherwise adjusted their business plans, and residential consumers could have considered making alternative living arrangements.

Consumers' comments indicate that while they recognize that outages may occur, they also expect that the Company will fix things when they go wrong. Customers also expect that when they are thrust into a crisis, the Company will tell them what is happening and provide them with information as to when normalcy may be restored. Unfortunately, Con Edison failed to meet these expectations.

The best plans to communicate information will fail if the basis for that information is inaccurate. While Con Edison invested considerable expertise and resources in preparing its customer service and communication staffs to assist consumers, these efforts were unavailing because employees did not have the appropriate information to carry out their jobs properly. The Company's inaccurate customer outage count, as described elsewhere in this Report, affected every aspect of its decisions about how to handle the crisis and how and what to communicate with its customers and others. Had the Company identified more accurately and timely the number of people without service or with low voltage, it could have dispatched resources to the Long Island City Network sooner and the City could have dispatched emergency services soon after the event began.

At the beginning of the week of July 17, with temperatures forecast to reach well into the 90s, the Company began its routine preparation for the heat wave. It appealed to consumers throughout its service territory to conserve energy, and it initiated calls to customers whose

accounts are coded to indicate that they use Life-Sustaining Equipment (LSE). The Company dispatched its mobile van, equipped with information about energy conservation measures, heat stress, ice distribution locations, and how customers who wanted to submit claims could do so. The van was staffed with consumer outreach advocates responsible for answering consumers' questions.

As the heat continued and consumers experienced low voltage and power outages, the Company maintained initially that fewer than 2,000 customers had lost service. It continued to appeal for consumers to conserve energy, as it had been doing for several days throughout the entire service territory. Through Thursday of that week, four days into the event, the Company maintained virtually the same outage count of about 2,000 customers.

The results of Staff's review are discussed below. The first section describes some of the more than 340 comments received during the investigation. The subsequent sections give Staff's analysis and recommendations concerning the effectiveness of the Company's various communication, outreach, and claims processing efforts. The final section analyzes the adequacy of Con Edison's training program for its consumer services and communications employees.

5.2 Comments from People Affected by the Event

5.2.1 Background

More than 340 people commented through several methods to the Commission and the Department about the outages: 127 testified at the nine Commission-sponsored Public Statement Hearings held in locations throughout the community; 91 contacted the Department's toll-free Helpline; 54 completed the Department's Comment Form; 28 e-mailed the Department using AskPSC.com; 11 called the Department's Opinion Line; and 32 public officials, members of community-based organizations, and representatives of large, sensitive and/or critical care facilities were contacted by Staff for interviews. The vast majority of consumers, businesspeople, public officials, and representatives of community-based organizations and critical care facilities in the community who testified or provided comments to the Commission or Staff were not satisfied with the information given by the Company during the Long Island City Network event.

From Wednesday, July 19 to Tuesday, July 25, the Department's Office of Consumer Services opened 71 cases as a result of calls from the affected area to the Department's toll-free

Helpline telephone number. The majority of the calls were received before Con Edison announced that 25,000 customers were out-of-service. Callers reported how long their service had been out and that they did not receive estimates about when their service would be restored. Five consumers reported low-voltage problems.

Below are summaries of some of the comments provided by the various residents, businesspeople, public officials, and officials from critical care facilities and community-based organizations in the network compiled by Staff during its investigation. Appendix C contains a more extensive listing of similar comments.

5.2.2 Analysis and Findings

5.2.2.1 Residents

Many residents reported that Con Edison told them that their service was about to be restored - either that day or the next - when in most cases it was not restored for several days. Other people were given no restoration information at all. Most were frustrated that Con Edison did not know the extent of the outages. Some, including those who had no power, were told that it was important to conserve power. Other consumers reported that they attempted to call Con Edison, but the wait times were so long that they hung up in frustration or their phone batteries died before they got through to a Representative. Among the more important information consumers shared was that many did not know they were expected to call Con Edison to report that they were out of power; they assumed that Con Edison was aware of the extent of the outages and knew who had no service. Some people were not sure how or where to get correct information to make decisions affecting them, their family, their friends, their perishable belongings, or where to get supplies, such as ice to keep their food from spoiling.

One consumer wrote:

> My power was lost on Monday evening, July 17. I am 92 years old and live alone. I was very afraid because I live alone and I had no electricity or hot water. My family came to get me and took me to the state of Pennsylvania. If I did not have family, I would have been dead.

Another consumer said:

> ...does Con Edison… have any idea what it is like to sleep in an oven for seven nights, to worry about your mother who is a senior citizen who decided to leave the apartment after three days of sweating like a

> pig, only to find her on the fourth floor crying and stating she had chest pains from trying to walk up six flights of stairs?...

At the same hearing, another person testified:

> I know that there were at least five people in my building who are elderly or frail and cannot leave the building. I know that one resident was carried out on a stretcher.

A resident of the community said:

> I had no electricity from Monday night to Sunday afternoon. I am an asthmatic. I had to walk up five flights. It was absolutely horrible. We got terrible results when we called Con Edison. We have no power. When is it going to come on? We have handicapped people in my building that had to go to hotels. We have a very sick lady, terminally ill, on the sixth floor. The nurses had to stand and fan her 24/7.

Some people who contacted the Company to report the outage were reportedly told, "You are not out of service," and, "It must be a problem with your equipment, call an electrician." The Company's Customer Service Representatives were also reported to have told people that if they had dim lights, it meant they were about to have full power back. Some people felt that the Con Edison Customer Service Representatives were rude and/or uninformed. Staff's investigation team, however, in reviewing recorded calls, observed no rude behavior, but it was and is clear that the Company's Representatives were not adequately informed and did not know who had power and who did not. It is apparent that many of the Representatives did not know the extent of the outages from the onset and that some did not understand low-voltage situations. Some people reported that if the Company had a realistic view of the number of consumers out-of-service and of restoration times, they would likely have been less angry and frustrated, even as they had to endure several days without power. Realistic restoration times would have enabled businesses to postpone deliveries of perishable items, and residential customers could have made arrangements to stay elsewhere. Consumers stated that they would rather be told, "We don't know when your service will be restored," than be given incorrect restoration times.

During the evening Public Statement Hearing on November 2, a representative of Western Queens Power for the People Campaign, a grass-roots organization participating as a party in this proceeding, testified that the Commission should, "mandate a study of the public

health impact of Con Edison's catastrophic failure," and, "commission a demographically balanced scientific study by a New York university that can accurately assess the social and economic toll of the outage." Although such topics are beyond the focus of this investigation, such studies would be extremely beneficial, and Staff urges the Company to identify and work cooperatively with a neutral third party, such as a university, to conduct a study.

5.2.2.2 Public Officials

Staff interviewed 13 public officials who represent citizens in northwest Queens. Staff found that Con Edison's communications with these public officials was inadequate, and in some cases, non-existent. The majority of these officials stated they were not told the magnitude of the outage by Con Edison, nor were they kept updated by the Company. They stated that they did not receive copies of the press releases issued by the Company. Con Edison did contact most federal officials, but for some, it was through their Washington offices rather than through their district offices, which led to some delay in imparting information even to those officials.

New York City Councilman Eric Gioia testified at the Public Statement Hearing held on August 3, 2006 at 6 p.m., stating, in part:

> On the very first day of the blackout I was called to go to Berkely Towers. It's a retirement community. They have no water. They have no electricity. It's a 12-story building. There are a lot of--about a thousand senior citizens live in a one block area over there. The first door I knocked on was an 87-year-old woman who had not had water in one day. I immediately called in the Red Cross for emergency relief who brought out food and brought out water. I did that for the Sunnyside Senior Center, which is a cooling center, where the City sends people in this type of emergency. Well, if the power is out, it's hot, go to the cooling center. Well, guess what? The power wasn't on at the Sunnyside Senior Center. Let me correct that because according to Con Edison the power was on. There was a little yellow light bulb in the hallway. The elevators were out and the air conditioning was off. We actually had to take people in wheelchairs, to carry them down the stairs to get them out of the building. Con Edison didn't know this was going on. When I actually spoke to the head of the senior center he told me Con Edison asked him to turn off his power. When I asked the chairman of Con Edison about this on Monday he didn't have any information about that.

Numerous other elected officials stated that they called the Chairman of Con Edison to speak with him, but the majority of their calls were not returned. Many of the officials stated that they wanted to partner with Con Edison to be liaisons between their constituents and the

Company, but the Company did not provide them with the necessary information to be able to provide this useful role. The Company, curiously, did hold conference calls with municipal and public officials in Westchester County during the outages in July and in September, but chose not to hold any conference calls with similar officials during the Long Island City Network event. Staff recommended in its report on the earlier events, and the Commission concurred that, "The Company should provide daily or more frequent updates and conference calls for municipal and public officials."[39] Because many constituents turn to their elected officials for information, it is imperative Con Edison keep the offices of elected officials continually updated.

5.2.2.3 Community-based Organizations

Staff interviewed leaders of 11 community-based organizations. These interviews revealed that most were not contacted by Con Edison before or during the system event. These community leaders were quite frustrated; many stated that Con Edison did not attempt to work with them to help people in the community find resources or places to go during the event. They stated that they want to be used to help people in the community during outages.

5.2.3 Recommendations

- Con Edison should conduct a thorough evaluation of its outage communications program and develop an enhanced program to inform customers of critical service-related information, including:
  - the importance of contacting the Company if power is lost;
  - alternative ways to contact the Company, in the event telephones do not operate in an electric outage;
  - where to find information about dry ice and water distribution, cooling, or warming centers;
  - where to learn about outage information and estimated times of restoration;
  - the impact of low voltage and the steps people can take to protect appliances, computers, and other equipment;
  - how telecommunications services, technologies, and equipment might function during power outages; and
  - suggested contingency plans for consumers.

[39] January 2006 Windstorm - A report on Con Edison and NYSEG Electric Restoration and Communications Efforts, June 2006, page 20.

The Company should, by June 1, 2007, provide Staff with an implementation plan for the redesigned outage communication program, as described above.

- Con Edison should update, on at least a semi-annual basis, its contact information for public officials, community-based organizations, and critical care/large facilities, by asking those officials and organizations for contact information, including district office locations, e-mail addresses, land-line and cell telephone numbers, and fax numbers. The update should be completed by June 1, 2007, and Staff should be notified when the update is completed, as well as at each six-month interval thereafter.
- Con Edison should establish a new program to ensure adequate communication with federal elected officials that provides specific procedures to communicate with the local offices of federal officials during emergencies, as well as the offices located in Washington, D.C. The Company should, within 90 days of the date of the issuance of this Report, provide Staff with documentation that its procedures have been modified to ensure that federal officials are contacted at both their local and Washington offices.
- Con Edison should develop a new public liaison program that establishes procedures to partner with public officials, community-based organizations, and critical care/large facilities willing to serve as liaisons between their constituents and Con Edison. The Company should submit to Staff for its review before June 1, 2007, a description of the new program, including operating and recruitment procedures, and a status report on its progress in establishing partnership arrangements with such officials.
- Con Edison should hold regular daily briefings for both the media and public officials during emergency events. These briefings should be held on the same schedule as notification activities specified in the Outage Notification Incentive Mechanism.

5.3 Customer Operations Organization

5.3.1 Background

The Customer Operations organization is responsible for both Call Center operations and Customer Assistance. The Company operates a Call Center (Center) with locations in

Brooklyn, Westchester, and Staten Island. Consumers call the Company's Helpline telephone number, 1-800-75-CONED, from all parts of its service territory for assistance with a variety of issues ranging from reporting an emergency to billing inquiries to opening a new account. The calls are forwarded to the first available Customer Service Representative (CSR) regardless of his or her location, and all locations handle emergency calls.

The Centers use interactive voice response (IVR) technology, which allows callers to use a touch-tone telephone to acquire information, enter data, such as meter readings, or report an outage. Consumers may also opt to speak with Company representatives.[40]

In addition to being responsible for the Call Center, including the interactive voice response system, Customer Operations is also responsible for operation of an outreach van, providing dry ice to consumers, and assisting customers having life-support equipment or who have other medical problems that could be adversely affected by loss of power. The various responsibilities that Staff reviewed are described and discussed below.

5.3.2. Call Center Statistics

Con Edison's Call Center reporting system provided Staff with statistics to reflect the number of Representatives that were available to take calls throughout a working day, the number of calls received, the length of time a consumer had to wait to reach a Representative, and whether a consumer chose to and subsequently reached a Representative. Because Con Edison provides only one telephone number for use throughout its service area, the Center's data during the Long Island City Network event captured calls from throughout the Company's service territory, including calls from Westchester citizens experiencing outages from a storm that hit that area.

From Monday, July 17 through Wednesday, July 26, the Center received 565,710 calls. During this period, the Center's staffing was adjusted to accommodate fluctuations in its inbound telephone traffic. The Center's interactive voice response system and its Representatives answered 94.7 percent of the calls. Between those dates, from 9 a.m. to 5 p.m., Company Representatives personally assisted 170,532 callers, 65 percent of them within 30 seconds, well above its benchmark to answer 53.5 percent of calls within 30 seconds.[41] Con Edison's data reflects that 30,224 calls were abandoned, and another 9,727 calls received a

[40] Con Edison Response to Staff Discovery Request DPS 16.
[41] Con Edison Response to Staff Discovery Request DPS 16.

busy signal.[42] This appears inconsistent with Staff's survey results, where about a quarter of respondents reported not getting through; survey respondents, however, may have interpreted other outcomes as not reaching the Company, e.g., hearing a confusing automated message.

Staff concludes that Con Edison performed well with regard to providing a sufficient number of representatives for the Call Center, in providing adequate incoming lines, and in picking up (by representatives or by the automated system) calls within a reasonable time. This does not, however, address the quality of information that callers were given and problems with messages heard through the automated system. Those matters are addressed elsewhere in this report.

5.3.2.1 Use of Automated Messages

Generally, an interactive response system plays pre-recorded voice prompts to which callers respond by pressing numbers on their telephone keypads to select the options they desire. A properly designed system should connect callers to their desired services promptly and with a minimum of difficulty.[43] As Con Edison received information about large-scale outages both in Westchester and Queens counties, the Center began providing recorded information updates for the system to address both locations and other matters of general interest. At the height of the crisis, callers desiring to report outages in Queens had to listen first to messages lasting nearly three minutes that reported on the status of outages in both counties and also explained what they should do in the event of a billing problem. By Monday, July 24 (seven days into the event), however, the Company recognized that the length of the message was causing a problem and, after consulting with Staff, modified the system prompts to allow callers from Queens to bypass the general public messages and reach Company representatives quickly.[44] Unfortunately, this recognition did not occur until virtually the end of the event.

The Company created and offered specially-designed informational messages on its interactive voice response system and then specially tailored them as it became aware, albeit late, of the magnitude of the situation. The Company fell short, however, in its efforts to streamline those messages and to provide appropriate options in its system to enable people in the affected area to report outages and other emergencies quickly.

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42 Con Edison Response to Part 105.4 (c) of the Commission's Rules, p. 6-15.
43 http://en.wikipedia.org/wiki/Interactive_voice_response.
44 Con Edison Response to Staff Discovery Request DPS 16.

5.3.2.2 Information & Training Given to Call Center Representatives

The Company's Representatives were provided internal e-mails with updates (although these internal communications were not necessarily accurate or timely, as noted elsewhere in this Report) that included information about the affected areas, efforts the Company was making, estimated restoration times, information about the Company's claims procedures, the locations of cooling centers, the availability of dry ice, and a list of community contacts. The e-mails also included scripts of the messages that were currently running on the interactive voice response system and reminded the Representatives to refer to a desktop computer application for trouble ticket processing information that was regularly updated throughout the event.

Con Edison also periodically provided its Representatives with scripts and handouts of Frequently Asked Questions and Answers, both of which reminded them to use empathy when talking to callers. Staff's review of a random sampling of the calls revealed no evidence of any failure of the Representatives to employ appropriate skills and empathy; as noted previously, some members of the public have said they had different experiences.[45]

5.3.2.3. Customer Outreach Van

Con Edison has a van that it can send to parts of its service territory that are experiencing service interruptions. The van is staffed by Company Outreach Advocates who are responsible for giving out information about energy conservation, heat stress, the claims process, ice distribution, and for responding to customer questions. The van is equipped with a public address system, telephones, and computers. The staff can also accept customer trouble reports.

The van was stationed in Westchester County during the days before the Long Island City Network problems. There are conflicting reports regarding when the van was dispatched to Long Island City, but there is general agreement that it was there on Wednesday, July 19 and remained there for the duration of the incident.

[45] Con Edison's Response to Staff Discovery Request DPS 16.

Locations of Con Edison's Outreach Van

Once the van was sent to a location, it stayed there until its staff was told to move elsewhere. The van's first site was at the corner of Ditmars Boulevard and Steinway Street, north of the Grand Central Parkway, where it stayed through Tuesday, July 25 (see figure above). It was then moved to 65th Street and 37th Avenue, where it stayed until Thursday, July 27. The first location is a busy intersection lined with retail establishments and restaurants in the northeast part of the affected area; the second location is in a more residential section in the southeast part of the affected area. The van had a rotating staff of 16 who were available from 6 or 7 a.m. through 10 p.m. each day. Later, the Company supplemented the van by opening three field locations.[46]

[46] Con Edison Response to Staff Discovery Request DPS 40.

The Company did not take advantage of the van's capabilities. It limited its reach by keeping it in a fixed location. Van personnel did not use the public address system to make announcements about the availability of consumer information, dry ice, the importance of leaving lights on, and telephoning the Company to report outages. Such information would have been beneficial had the van been driven around the territory slowly and the public address system used at appropriate locations. At the same time, van personnel could have seen that the outage was widespread and reported their observations to their supervisors. The Company could post information on its website about the van's location, schedule, the services it provides, and it could advertise this information through local media.

Although van personnel reported that the crowds were initially, "in the hundreds," they also reported that they were unaware of the extent of the outages because they could not see beyond their immediate surroundings.[47] Van personnel also did not keep track of the consumers they served or their issues. There should, however, be a way for the van staff to record and report their observations to their superiors. Apparently, there were no instructions from senior Company officials to survey the area and report back information about outages.

5.3.2.4 Life-Support Equipment Consumers

Life-support equipment consumers are those who depend on medical equipment to sustain life (e.g., oxygen, dialysis machines). The Company codes accounts to note that someone in the household uses this medical equipment.

The Company's efforts to inform its customers of their right to identify themselves as Life-Support Equipment/Customers and thereby to have their accounts properly coded, includes providing information in the Company's "Annual Notification of Rights and Responsibilities" mailings to customers; including an annual "Life Support Equipment Survey" and a certification form as bill inserts; sending letters to life-support equipment customers annually concerning summer preparedness, and sending letters to emergency service providers and life-support equipment distributors about the program. These materials are available in English, Spanish, Chinese, Haitian-Creole, Hindi, Korean, Polish, and Russian. In addition, life-support equipment information is posted on the Company's website. Because so many of its meters serve multiple households and businesses, it is questionable how often outgoing surveys and letters to the single

[47] Interview with Con Edison employee Toni Tesu.

customers of record actually reach individuals who would otherwise qualify as life-support equipment customers.

Staff contacted all 58 of Con Edison's identified life-support equipment customers in the Long Island City Network and was able to conduct interviews with most of them. Staff also asked the Company to describe its outreach efforts. Con Edison reported that it began contacting its life-support equipment customers on Monday, July 17 at 10 a.m. to advise them of an 8% voltage reduction that was to be implemented. The customers were told of the severe weather conditions that might cause outages and that they should be prepared to go to a hospital, call 911, or if need be, make other arrangements such as battery backup, to ensure that their equipment remained operable. They were also given a priority toll-free number to call to speak to a Company representative for further information or assistance.

Con Edison reported that it called these customers regularly throughout the emergency until August 31 to check on the status of their service and well-being. The Company reported that during the outage it was contacted by 36 life-support customers.[48] Some of these were referred to the New York City Office of Emergency Management for further assistance.

Staff's canvas of Con Edison's coded life-support equipment customers confirmed that they were, indeed, in contact with the Company. Approximately half said they contacted the Company, and the other half said they were contacted initially by the Company. While the customers appeared generally to have received appropriate information and assistance, there were some inadequacies reported in their treatment by the Company. Two indicated that they had difficulty making initial contact with the Company and did not feel they ultimately received adequate information. One non-English speaking customer was not aware that there was an obligation to be recertified annually. In addition, Staff's broader telephone survey of consumers in the Long Island City Network, discussed previously in this Report, revealed a significant number of consumers who have not formally identified themselves to Con Edison as having life-support equipment relied on in their homes. These consumers should be identified, even if they are not Con Edison customers of record (e.g., consumers whose rent includes electricity costs or who are sub-metered).

[48] This finding does not necessarily conflict with the findings of Staff's survey discussed in Section 4.3. The data provided there was with respect to customers with life-support equipment who called the Company, not those who were called by Con Edison as reported here.

Finally, Con Edison reports[49] that, after recognizing the extent of the outage, it worked with the City's Office of Emergency Management to identify large multi-family buildings with elevators and has explored the possible use of a special task force to contact these buildings' managements to determine status and needs for assistance during outages. The Company began calling these customers on Saturday, July 22 and, beginning Sunday, July 23, sent representatives to the buildings to check further on their status. If problems were revealed (e.g., low voltage, no service, elevators out-of-service, no answer to calls), the information was forwarded to the City so that it could provide such emergency assistance to building occupants as might be needed.

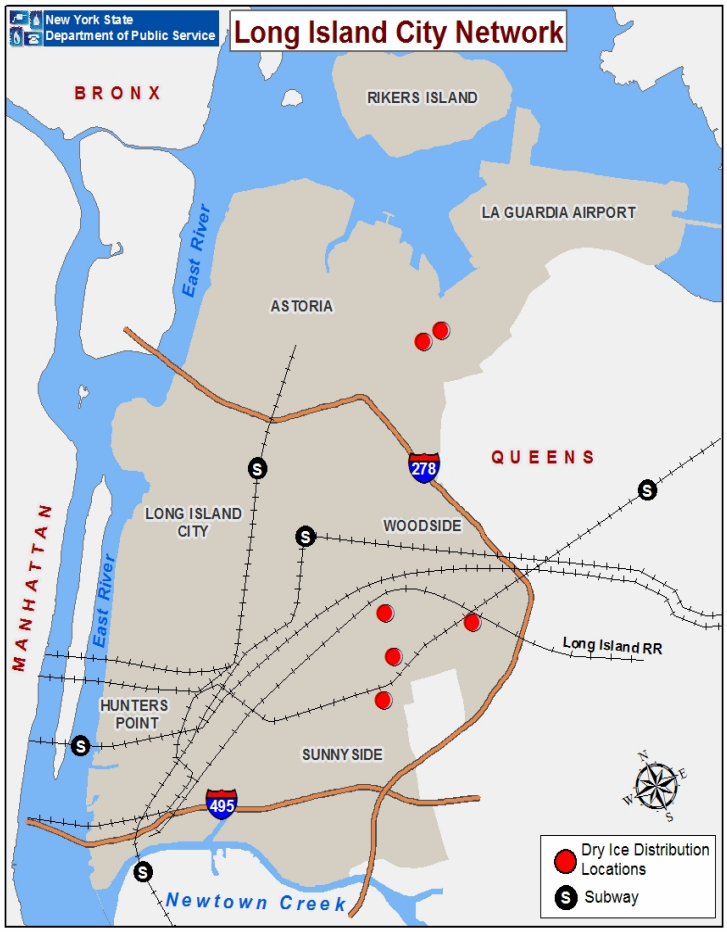
Con Edison should create a task force comprised of customers and experts to consider the problems associated with outages in multi-family buildings with elevators. The task force could develop protocols and procedures to work with the managements of such facilities in anticipation of future emergencies and, if needed, during emergencies. The task force could also address additional ways to identify people who use life-support equipment.

5.3.2.5 Provision of Ice Distribution

Part 105.4 (c) of the Commission's rules requires that if an emergency period is projected to last more than 48 hours, the utility must describe in its emergency plans its method for estimating dry ice needs and the means to make out-of-service customers aware of the availability and locations, dates, hours, and amounts of ice to be distributed. Staff's investigation has determined that the Company complied with this requirement. During the Long Island City Network event, the Company acted appropriately to assist consumers in preserving food and distributed both dry ice and regular ice from Wednesday, July 19 through Wednesday, July 26 at various times.[50] Con Edison made ice available to the public at numerous locations throughout Astoria and Sunnyside (see following map).

[49] Con Edison Response to the Attorney General's Discovery Request 20.
[50] Con Edison Response to Power for the People's Discover Request PFP 69.

Dry Ice Distribution Locations



The Company issued press releases about where and when ice was available. The Company's Customer Service Representatives shared information about the locations and hours of ice distribution centers and provided that information to callers upon request. The information was also on the website, but as noted below, it could have been placed in a more accessible location there.

Approximately 8,190 bags of dry ice and 16,920 bags of regular ice were distributed. Instruction sheets, in English and Spanish, were provided along with the dry ice. Company personnel were available to answer questions and explain the proper use of the ice. Information was also provided on the Company's website.

While the Company did a reasonable job of distributing ice, Staff's interviews with public officials and Company personnel indicated a need to improve communication and

partnering opportunities, as is noted in other sections of this Report.[51] In addition, the dry ice instructions on the website are under the "Frequently Asked Questions" section, but they would be more effective if moved or added to the "Storm Preparation" section and more prominently featured on the website during outages.

5.3.3 Recommendations

- Con Edison should modify its automated call system to enable callers to bypass the interactive voice response message and be placed in queue within 15 seconds to reach a Customer Service Representative to report service problems or obtain information during future emergencies. Within 30 days after the issuance of this Staff Report, the Company should advise Staff of the additional procedures and protocols it has put in place to comply with the intent of this recommendation.
- Con Edison should identify ways to use its outreach van(s) and staff more fully, including providing instructions to its van personnel to count the customers they interact with, keep records of their problems and questions, observe and report on conditions in the vicinity of the van, and use the public address system on the van to make appropriate announcements. A copy of these procedures should be provided to Staff for review by June 1, 2007.
- Con Edison should develop an enhanced program to identify customers, as well as other consumers (e.g., those who pay utility costs in their rent or through master metering arrangements), who rely on life-support equipment, and raise their awareness of the importance of being included in the Company's records as using life-support equipment. The Company should report to Staff, within 30 days of the issuance of this Report, its actions and plans in this regard. It should also include its plans as part of its next rate filing.
- Con Edison should include beginning with in its 2007 summer preparedness letter to customers, service organizations, and equipment distributors, its "Life Support Equipment Survey" and its "In Case of A Storm" brochure. Con Edison should also reach out to such individuals (including apartment dwellers who are not direct Con Edison customers) through doctors, senior care facilities, and other such entities.

[51] Staff interview with Con Edison employee Toni Tesu.

- Con Edison should, in the spring of 2007 and each year thereafter, send information to all its customers informing them of the life-support equipment certification and recertification processes, as well as the importance of their identifying themselves to Con Edison as life-support equipment customers.
- Con Edison should, by June 1, 2007, include instructions on the handling of dry ice in the "Storm Preparations" section of its website. The Company should notify Staff when it has so modified its website.
- Con Edison should establish a task force to address unique outage-related consumer issues associated with large buildings containing elevators. The task force should also address additional ways to identify people who use life-support equipment. The Company should report to Staff by June 1, 2007 the status of its efforts in this regard.

5.4 Public Affairs Organization

5.4.1 Background

The Public Affairs Organization within the Company is responsible for providing information to the media, public officials, and the general public. It is also responsible for the Company's website.

5.4.2 Analysis and Findings

The efforts of the Public Affairs Organization were inadequate, untimely, or, in some cases, non-existent, except with regard to its notices concerning the availability of dry ice and the claims process, as described in other sections of this Report. The lack of useful, timely, adequate, or helpful information, particularly in the early days of the Long Island City Network event, led to confusion, anger, and a distrust of the Company and, more importantly, made it difficult, if not impossible, for people to make appropriate plans to take care of themselves, their families, their businesses, or their pets. Briefings should be held by the Company on a regular schedule and as one of the activities in the Outage Notification Incentive Mechanism. A later section of this Report addresses the Company's compliance with that mechanism. Other sections of this Report also describe the problems that resulted from lack of accurate information being provided to call center representatives, public officials, and consumers.

5.4.2.1 The Company's Website

A well-designed corporate website can be a source of basic information to the general public, the media, and public officials. The public is accustomed to visiting corporate and media websites for information and to conduct business.[52] During a crisis, a good website can help consumers and others bypass a congested call center. Public officials and the media can find the background material they need to respond to their constituencies. Even during power outages, consumers with battery-operated laptops, cell phones, PDAs, and Blackberrys have access to the internet, at least until their battery power is depleted. It makes sense that a business that provides an essential service would advertise the availability of its website and make it as user-friendly and as valuable as possible. Con Edison did none of these.

While many of those affected by power problems in the Long Island City Network were unable to visit, had they chosen to do so, Con Edison's website from their homes or businesses, some visited the site from their offices and from libraries. Unfortunately, the site was not as useful as it could have been as a source for emergency assistance and information. Information for life-support equipment customers is located several layers below the Company's home page. Information about how customers can prepare for and protect themselves during an outage is located in the "storm central" section, a destination that might not be obvious to one experiencing a power outage during a heat wave.

While customers can pay their bills and submit meter readings on line, they could not easily report outages or track outage and restoration status on line. One consumer reported that during the Long Island City crisis, she learned that the Ameren customers in St. Louis, Missouri were able to track the status of that outage event on that company's regularly updated website map. Those customers could also track outage status by zip code. She wondered why this feature was not available to Con Edison customers.[53]

Con Edison has since added an outage reporting feature to its website, although it is not in a prominent location; a customer trying to report an outage must select either "storm central" or "contact us" from the "customer central" drop-down menu, neither of which is an obvious choice.

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[52] According to the Pew Internet & American Life Project February 15 – April 6, 2006 Tracking Survey, 73% adults, and 75% of urban dwellers use the internet.

[53] TR. 399. Ameren serves Missouri and Illinois (www.Amaren.com). Its customers experienced widespread outages at roughly the same time as the Long Island City Network outages.

For the Long Island City Network event, Con Edison added a small box on its home page with links to news releases, but the releases were not always helpful or were not always posted in a timely manner, nor were they written for the web environment. For example, consumers visiting the Con Edison website beginning the evening of Monday, July 17 would have found a news release urging them to reduce energy because, "the utility is experiencing difficulties and customer cooperation will help ensure uninterrupted electric service."[54] The identical news release was posted four times over the following days. No new information about the outage was posted on the website until 4:00 p.m. on Wednesday, July 19 when Con Edison posted a news release about the availability of dry ice.

Visits to the website increased over the course of the network failure period. On Tuesday, July 18, the appeal to reduce energy use was visited 533 times; a similar appeal posted on Wednesday, July 19 was visited 3,435 times, about a 6.5 fold increase over the previous day. On Thursday, July 20, 70 visitors saw a message asking for customers in the affected area to leave a light on; 3,883 visitors saw it on Friday, July 21.

When it became clear to Con Edison on Thursday, July 20 that it might not have an accurate outage count, consumers visiting its website would have found the following paragraph:

> Con Edison is requesting residents in the Long Island City, Sunnyside, Woodside, Hunters Point and Astoria neighborhoods of Queens who have electric service to please leave a light on overnight that will be visible from the street. In order to expedite restoration of power, company personnel will be surveying the area overnight to better identify blocks and homes that are without service. Leaving a visible light on will assist the company in restoring electricity to your neighbors. We appreciate your continued cooperation and patience during this difficult time.[55]

The message is poorly conceived and written and an example of the uneven quality of the Company's written material. The essential information – that customers should leave a light on – is buried in irrelevant statements and bad word choices. The passage scores 15.5 on the Flesch reading ease scale, a level that is roughly equivalent to that of *The Harvard Law Review*, and 13.1 on the Flesch Kincaid grade level scale, indicating that an individual would need some

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[54] We have been unable to verify the exact demand reductions that were achieved as a result of the Company's customer appeals. Con Edison indicated that it does not know how many customers respond to the appeals or the impact the appeals had on the overall load in the Long Island City Network. [Tr. 965 (Technical Conference.)]

[55] News release and web post, Thursday, July 20, 9:00 p.m.

college education to understand this message.[56] Although Staff did not assess the literacy level of Queens residents, it is worth noting that according to the U.S. Census, 32.1 percent of Queens Community District 1 residents and 43 percent of Community District 2 -- the districts served by the Long Island City Network -- are not proficient in English.

Further, this message was of questionable value for internet users, given that it was posted at 9 p.m. on the evening the first physical survey was conducted (note that only 70 visitors saw it that evening, but almost 4,000 visitors saw it the day after the initial survey was completed).

A company website that provides accurate data and background information can relieve telephone congestion by enabling reporters and public officials to obtain information on line rather than from a company spokesperson.

5.4.3 Recommendations

- Con Edison should, within 30 days of the issuance of this Report, redesign its website so that access to the outage reporting feature is in a prominent location on its website home page.
- Con Edison should, by June 1, 2007, be ready to modify quickly its website during emergency events so that essential and up-to-date information is posted on the home page. The Company should notify Staff when such capability has been implemented.
- Con Edison should redesign its website so that heat wave and cold weather specific information is not subsumed in the "storm central" pages.

5.5 Energy Services Operations Organization

5.5.1 Background

The Energy Services Operations organization is responsible for communications with critical care/large facilities, which includes hospitals, prisons, nursing homes, water and sewage treatment plants, government agencies, research institutions, and transportation systems. Critical care facilities may also include those that the City's Office of Emergency Management deems critical. The large facility category includes commercial and industrial customers who

[56] Rudolf Flesch (1948)*; A new readability yardstick, Journal of Applied Psychology,* Vol. 32, pp. 221-233. The Flesch/Flesch–Kincaid Readability Tests measure how difficult a passage of text is to understand. These tests are bundled with the most commonly used word processing programs.

participate in the Company's Distribution Load-Relief Program as well as customers with on-site generation.[57] Critical care/large facilities are also referred to as large, sensitive, and critical customers. These phrases are used interchangeably in this Report.

5.5.2 Analysis and Findings

Staff spoke during its investigation with several administrators of these facilities to gather information to gauge the effectiveness of Con Edison's communications with them. Many of these administrators reported that they were not given timely or accurate information by Con Edison. As many of the facility locations provide housing for senior citizens, the lack of working elevators or air conditioning due to loss of power or low voltage was a serious concern because it created a potential health problem. Facility administrators stated that they wanted and needed information about what to expect as a result of low voltage and when to expect full restoration of power. One hospital in particular reported that the outage posed major problems. The hospital had to reduce its patient load, cancel surgeries, and go on "Official Diversion Status" where patients were diverted from its emergency room to others. The lack of correct information regarding restoration times was a significant contributing factor to the hospital's problems.

Some of the administrators reported that they sensed a major disconnect between the Con Edison "employee on the street" and Con Edison's "upper management" and indicated that they were given conflicting information, in particular, about whether they should go back on the grid or not.[58] Some large facility/critical care facility administrators, however, said they were never contacted at all by Con Edison during the event.[59]

While some facilities reported that they were provided with mobile generators, some of the generators were too small and some were never turned on. This added to the ongoing confusion.[60]

5.5.2.1 Public Transportation

The Metropolitan Transportation Authority (MTA) operates one of the largest transportation networks in North America, transporting over 8 million people in the New York metropolitan region on a daily basis. Two of its subsidiaries, which have facilities located in the

[57] Con Edison Response to Part 105 of the Commission's Rules.
[58] Staff interviews conducted with administrators of critical care/large facilities from October 11-19, 2006.
[59] Con Edison's October 12, 2006 Report.
[60] Staff interviews conducted with administrators of critical care/large facilities on October 11-19, 2006.

Long Island City Network, are the New York City Transit Authority (the Authority) and the Long Island Rail Road Company (LIRR). The MTA receives the electricity for its operations from the New York Power Authority (NYPA). That electricity is delivered through Con Edison's transmission and delivery system to the various transportation facilities.

The Long Island Rail Road representatives reported that the network event had no effect on the railroad's service.[61] Several feeders serving the railroad were lost, but because of redundancy, there was no major service interruption. With two feeders serving each of the railroad's substations, one feeder can be out and the railroad's system would still operate. In addition, the railroad can lose any one of its substations and other substations can handle the increased load. Also, the railroad is interconnected to both Con Edison and the Long Island Power Authority, which provides additional reliability. Railroad officials and Con Edison staff apparently were in communication throughout the event, although Staff was told that there were times when initiating contact may have taken longer than expected. In addition to advising the railroad officials of outage status, Con Edison asked the railroad to reduce load, which it did. We note also that the railroad participated in the New York Power Authority's summer load reduction program, but this only applied to its administrative building and not the railroad itself.

The New York City Transit Authority representative reported that at the beginning of the event, communication with Con Edison focused on requests that it reduce load. The Authority responded, and it reduced service on some of its subway lines. Like the Long Island Rail Road, the Authority also participated in the New York Power Authority's summertime load reduction program. The Authority has the ability to transfer load from its substations in the network to its substations outside of that area, using the subway's third rail as a distribution system. This cannot be done for prolonged periods of time, however, because it can cause overheating of the third rail. In the middle of the event, Con Edison asked the Authority what the effect of shutting down the network would have on the transit system. The Authority responded by expressing concerns that it had several tunnels in the area and a shutdown of the network would cause a loss of signals. The Authority noted that even if it could bring in power from outside the network using the third rail, the signals can be powered only from the Con Edison network or from mobile Authority-owned mobile generators (of which it has about

[61] The New York Times reported on July 20, 2006 that the LIRR experienced scattered delays of up to 45 minutes due to a pole being blown down onto a section of track due to a storm that passed through the area.

20). Consequently, the Authority requested that Con Edison give it about 15 to 20 minute "heads-up" if it should decide to shut the network down. This time would enable it to get trains out of the tunnels and back to the stations. The Authority has its own load-shedding and evacuation procedures that can be used during emergency events. It reported that it did not have any problems with communications with Con Edison, but would have liked to know more details about the extent of the outages during the event. When the Authority asked Con Edison for details during the event, the response was only that there were issues with the primary feeders in the network.

La Guardia Airport is fed by two Con Edison substations – the West End and the Central. Each substation is fed by four feeders. The West End Substation is fed off the Long Island City Network and the Central Substation is not. During day one of the incident, two feeders on the West End Substation failed. Con Edison and La Guardia electrical operations personnel were in direct contact at this point, which is standard practice. Later in the afternoon, a third feeder went down. At this point, La Guardia personnel planned to do a controlled transfer of the control tower and West End runway lights from the West End Substation to the Central Substation. Just prior to implementing the transfer, the fourth and only remaining operable feeder to the West End Substation went down. Upon inspection, it was found that the control tower was actually being fed by the Central Substation at that time so control tower operations were not interrupted and the West End runway lights went onto emergency generation. At this point, La Guardia personnel worked to stabilize the airport's operations by using the Central Substation to supply much of its requirements, which it continued to do during the course of the event. Those airport operations that had emergency generation were using those generation units. As a result of the availability of back-up generation and the ability to use the Central Substation, very few flights were cancelled or delayed during the event. During the nine-day event, La Guardia turned off chillers on two occasions to enable it to continue to supply power to its complex from solely the Central Substation. During the entire event, La Guardia personnel were in direct contact with Con Edison and the Port Authority's Emergency Management Officer. La Guardia representatives indicated to Staff that Con Edison was responsive to their needs and requests for information. They reported that the apparent failure of Con Edison to know the full extent of the outage or its length was unusual.

5.5.3 Recommendations

- The Company should investigate, document, and work cooperatively with the operators of the major transit systems in the Con Edison metropolitan area to mitigate potential effects of power disruptions on the major transit systems in each of it electrical networks. This review should include an analysis of the effects of a network shutdown (by network) on the major transit systems. This information should be integrated into the Company's operating and planning procedures, including its procedures for network shutdowns.
- The Company should determine the lead time notification and other information needs of each of the mass transit systems and include provisions in its operating procedures that will ensure that those entities receive appropriate information in the event of electric system emergencies, including in the event of planned network shutdowns.
- Also see recommendations in Section 5.4 "Comments from People Affected by the Event".

5.6 Claims

5.6.1 Background

Con Edison's tariff (P.S.C. No. 9, General Information) states that, "…the Company will compensate customers for losses…which result from power failures attributable to malfunctions in the Company's local distribution system..." In particular, the tariff says that the Company will reimburse both direct and indirect residential customers for actual losses of food spoiled due to lack of refrigeration, up to $150 upon submission of an itemized list and over $150 upon submission of an itemized list and proof of loss, up to a maximum of $350 for any one customer for any one incident. In addition, the Company will reimburse commercial customers for actual losses of perishable merchandise spoiled due to lack of refrigeration, upon submission of an itemized list and proof of loss, up to a maximum of $7,000 for any one customer for any one incident. Under this tariff, all claims must be filed within 30 days from the date of the occurrence. The tariff provides an overall cap of $10 million for reimbursement for any one incident and a provision for all claims to be pro-rated so that the cap is not exceeded.

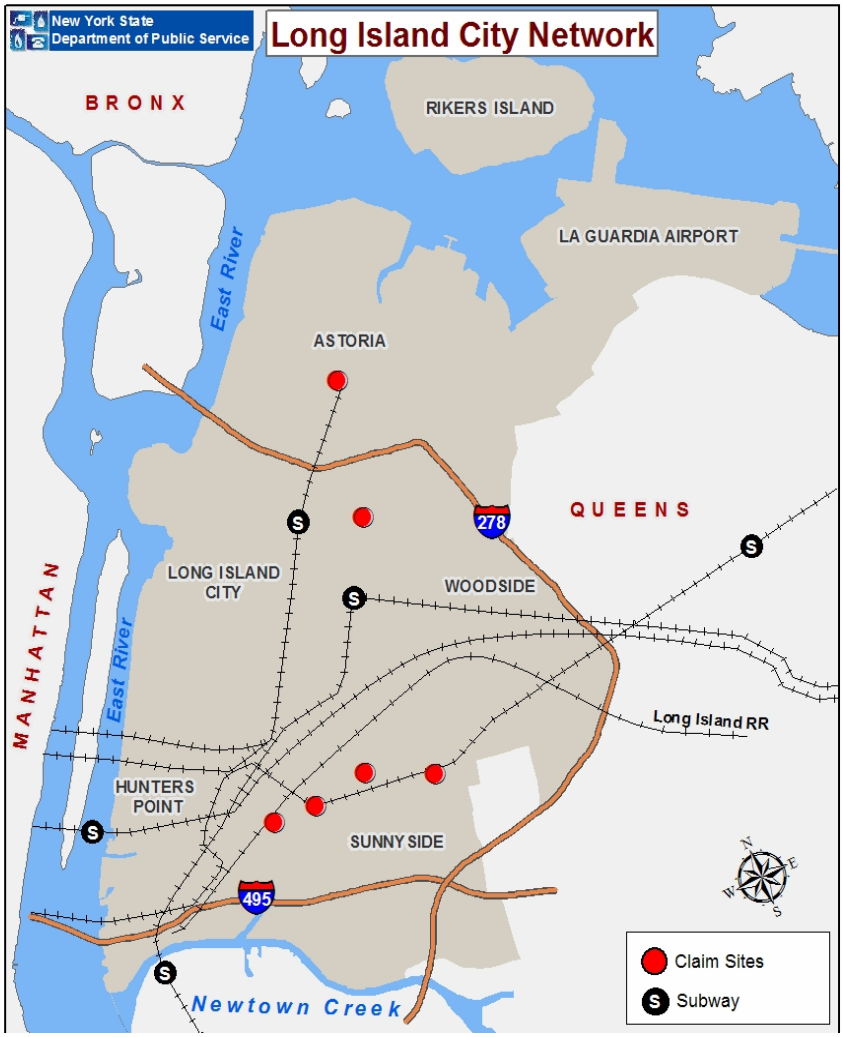
As previously noted, on August 1, the Company requested permission from the Commission to, "relax the tariff requirements for affected residential consumers in the

network…and to honor claims for up to $350 on presentation of an itemized list, with no proof of loss required." The Company proposed to issue reimbursements without regard to the $10 million cap.[62] On, August 3, the Commission granted the waiver.

The Company is continuing to accept claims.

5.6.2 Analysis and Findings

The Company used a variety of methods to make people aware of their right to file claims, including issuing press releases, sending letters with the August bills to all customers who live in the areas of the network that were affected, putting a link on its website for customers to access the form, and providing six sites in the community where customers could both receive and file a claim (see following map).



[62] Letter from Con Edison to Secretary Brilling, dated August 1, 2006.

Staff visited the sites to follow up on concerns that the sites did not have large signs to identify them and found that some sites were not easily identified. After discussions with the Company, the size of the signs was increased. Claim forms were also available from Con Edison personnel in the Company's outreach van. The form was available in six different languages - English, Spanish, Korean, Chinese, Greek, and Italian. People could file a form at any of the site offices by fax, on-line, or by regular mail. Finally, teams of Company Representatives visited and worked directly with commercial customers in the filing of claims.

The Company, as of January 29, 2007, had processed more than 41,000 claims and paid more than $14 million to customers and other consumers whose rent covers electric service or who are sub-metered. While the tariff provision refers to "food", the Company paid claims of residential customers for spoiled medicine because it said it considers medicine as a food product.[63] The Company, however, denied more than 2,000 claims – more than 1,400 from residential customers, and more than 650 from commercial customers. The denials were primarily of the claims from people who requested reimbursement for losses of property, which is not permitted under the provisions of the tariff (see Appendix D), and in situations where multiple people live at the same address and filed claims; in those instances the Company only paid the claim of the customer of record and denied the claim from others at that address. In addition, the Company received claims from residents outside of the affected area for whom there were no records of being out-of-service, who had closed or inactive accounts, or whose meters showed no consumption (including for the period before and after the outage). The overwhelming majority of claims from commercial customers that the Company denied were for loss of business and property damage, which is not permitted under the provisions of the tariff.

Residents said that they did not understand why they were not being paid the "true" amount of their outage-caused losses and were aggravated by Con Edison's actions. Other people stated that the reimbursement amount was not adequate. A representative of Western Queens Power for the People Campaign testified at the evening Public Statement Hearing on November 2 that they would, "... like a change in the reimbursement rate retroactive so Con Ed will cover non-food damages for Western Queens and also for future outages going forward." Some did not have insurance or enough money to replace or repair what was damaged. Many said that they did not have the monetary resources to cover the cost of hotel rooms or to eat out -

[63] Con Edison Response to Staff Discovery Request DPS 364.

both unexpected consequences of the outage. Many consumers believed that incomplete or misleading information given by Con Edison led to their losses, so they did not understand why Con Edison was not compensating them. Other customers were told by the Company to call an electrician to determine the problem, which resulted in additional expense being incurred to hire electricians, adding insult to injury.

Staff reviewed a random sample of residential and commercial claims denied by the Company and found several that the Company should reassess. For example, the Company agreed to reimburse customers for fuel costs incurred to run the generators when the Company requested that customers remain on their own generation.[64] Those customers should be reimbursed for the associated expenses, if the Company has not already done so. In this regard, and as noted elsewhere in this Report, the Company asked some entities to use their own generation. In one case, Memorial Sloan Kettering Cancer Center asked to be reimbursed for the cost of diesel fuel needed to run its emergency generator (about $10,000) was denied because Con Edison purportedly said the facility sought reimbursement for property damage.[65] As a result of this denial, Staff questions whether claims from other customers who were asked to shed load and run their own generators might also have been denied.

Another customer sent an e-mail to the Company asking how to file a claim for "an AC unit that fried as a result of the blackouts."[66] A Customer Service Representative wrote back with instructions about how to access a claim form on the Con Edison's website and went on to explain, "You can send the claim for the air conditioner to the Claims Department." The claim, however, was subsequently denied. The Representative's response most likely led the customer to believe that the Company would seriously consider this claim. Staff asserts that the Representative's response should have informed the customer that the Company's tariff does not reimburse property damage claims; the response was misleading and inappropriate.

5.6.3 Recommendations

- The Commission should examine the sufficiency and appropriateness of Con Edison's claims tariff, and if appropriate, make modifications to such tariff prior to Summer 2007, and then in all of the Company's subsequent rate cases.

[64] Con Edison Response to Staff Discovery Request DPS 292.
[65] Con Edison Response to Staff Discovery Request DPS 328.
[66] Con Edison Response to Staff Discovery Request DPS 328.

Issues to discuss during the examination should include which items should be reimbursed, the amount of the reimbursement, and limits on claims.

- Con Edison should reassess its denial of the claims for fuel reimbursement, and, within 30 days of the issuance of this Report, reimburse these customers for the cost of the fuel used to run the generators, if such operations were at the request of the Company. The Company should immediately thereafter advise Staff of its compliance.
- Con Edison should, within 30 days of the issuance of this Report, contact any other customers whom it asked to run generation and who have not yet filed reimbursement claims. The Company should discuss with those customers what their fuel expenses were and, within 30 days thereafter, reimburse them for those expenses. The Company should, by June 1, 2007, advise Staff of the results of its contacts with such customers.
- Con Edison should instruct its Representatives, within 30 days of the issuance of this Report, not to make assurances to consumers concerning payment of claims, except to the extent those Representatives are the decision-makers and will ensure that the claims decision they impart is carried out.

5.7 Training Exercise

5.7.1 Background

Part 105.4(c) of the Commission's rules requires Con Edison to have at least one drill each year simulating a storm or storm-like event (storm drill). The Company has met the requirement to hold full-scale storm drills every year since 2003. Representatives from the Company's customer operations organizations participated in the most recent drills. The Company has also conducted several smaller-scale storm drills and exercises, some of which were in Queens County.

5.7.2 Analysis and Findings

Staff examined the Company's training program to make sure it complies with the Commission's training requirements and its own internal procedures. Several problems emerged during the course of training activities that suggest that the training program should be the focus of further review. Although Con Edison supports the drills, and the participants take them seriously, the Company should document more clearly the outcomes of the drills and its plans to

take corrective action for the failures identified during the drills. Follow up reports to drills contain only minimal information about the Company's actions. For example, the 2004, 2005, and 2006 drills highlighted the need to identify quickly customer outage counts and geographic boundaries of the affected area. In 2005, following a drill that simulated a heat event in Queens County, the participants said that the Company should be able to match load-shed blocks quickly with affected customers, establish boundaries, determine impacts on critical/sensitive customers, and estimate restoration times. Teams were established in 2004 and 2005 to address this shortcoming identified by the drills. No such effort was initiated following the 2006 drill even though some of the same problems emerged.

The 2004 and 2005 drills simulated events in northern Manhattan and Queens, respectively. The 2006 drill's primary purpose was to test the Company's ability to relocate its Corporate Emergency Response Center from Irving Place to its Learning Center in Queens following a suspected terrorist attack. While response to a large-scale outage was not part of the 2006 drill, the ability to identify specific customer outage counts within a geographic boundary was noted as an "opportunity for improvement." Because drill participants had similar observations following three consecutive full-scale drills, the Company should have been aware of the shortcoming since at least 2004.

Interestingly, the 2005 drill in Queens was based on a heat event in which the Company's network experienced multiple contingencies. According to the Company's evaluation, when the drill simulated six of 12 feeders out-of-service, the Company decided to shut it down in consideration of growing loads and possible cascading failures as well as the potential for severe damage to the infrastructure (secondary grid).[67] The drill report does not document how the decision to shut down the network was made. Unfortunately it is difficult to draw any definitive conclusions between the 2005 Queens drill and what actually happened during the Long Island City Network outage event because every network is different in its own way (e.g., physical size, load demand, load capacity, number of feeders). Each case scenario needs to be assessed for its own specific characteristics and circumstances.

The 2005 post-drill evaluation also noted that, "Customer Outreach should be prepared to dispatch personnel to an affected area based on the ethnicity of the neighborhood(s) so that responding Company personnel are fluent in the language(s) and are thus able to

[67] Con Edison Response to Staff Discover Request DPS 301.

communicate more effectively in those impacted areas." A plan to accomplish this task was not included in the "next steps" portion of the evaluation report.

Most recently, in the Company's assessment of the performance of the Corporate Emergency Response Center during the Long Island City Network event, it noted problems with how well its employees followed procedures for keeping records, the availability of employees trained to work in the Center, telephone reception, the availability of someone to ensure that Incident Command Structure procedures were being followed, and the physical layout of the Center. In the section describing communication with outside agencies, the assessment states that, "[in] general, communications with outside stakeholders was timely and informative," an observation that seems at odds with reality given the circumstances described elsewhere in this Report. Later, it acknowledged that there were, "several issues that caused breakdowns in both accuracy and consistency with information provided." The Company makes several recommendations, some of which lack adequate detail.

5.7.3 Recommendations

- Con Edison should establish procedures and assign employees to ensure that the problems it identifies during training exercises are corrected in a timely manner. A copy of the procedures should be given to Staff for review within 90 days of issuance of this Report.

6.0 OUTAGE, RESTORATION, AND RECOVERY TECHNICAL ISSUES

6.1 Overview

This section of the Report provides Staff's technical analysis, findings, and recommendations with regard to the causes of equipment failures on the primary, damage to the secondary systems of the Long Island City Network, and the associated customer outages. It also addresses certain other technical issues Staff identified during its investigation. Those issues indicate a need for the Company to improve its overall planning, operations, and maintenance of the Long Island City Network, and in some cases, the Company's entire network distribution system. Addressing the underlying causes of the Long Island City Network event and the additional issues identified in this Report will help to minimize the chances that similar equipment failures, secondary system damage, and customer outages will occur in the future.

Con Edison reported that the Long Island City Network event was due to three unrelated events: 1) a short circuit, low-voltage cable fire in an underground conduit that damaged two of the network's 22 primary 27,000-volt supply feeders, causing them to fail; 2) a malfunction of a substation breaker when a third feeder failed because of faulty equipment, which caused three additional network feeders to be isolated from the system; and 3) the occurrence, when operators attempted to restore feeders to service, of a phenomenon known as an inrush current, which caused the circuit breakers to reopen. The initial fire on the low voltage cable, causing the failure of the first two primary feeders, was attributed to a short circuit due to cable insulation failure. At the time of the incident, the low-voltage cable was found to be operating above normal loading conditions due to two area network transformers that were out-of-service because of previous failures. The level of loading on these cables should not have been high enough to cause insulation failure or the resulting fire, unless the insulation was already in a deteriorated state. While these events were contributing elements, the overriding cause of the Long Island City Network event was the Company's failure previously to address a multitude of issues associated with its overall operation and maintenance of the network and, in particular, its failure during the event to recognize and take effective action to limit the extent of the cascading system damage and the resulting consumer impacts. Had these issues been addressed effectively, the three unrelated failures would either not have occurred or, if they had, they would likely not have been followed by the catastrophic consumer outages, low-voltage service, and extensive damage to the Long Island City Network.

Historically, Con Edison underground network customers have only experienced outages caused by distribution system failures numbering more than 1000 metered customers only six times over the last 40 years. Of those six instances, only the 1999 Washington Heights resulted in a network shutdown.

6.2 Network Shutdown Decision

6.2.1 Background

Con Edison's network systems are designed to operate within normal equipment ratings with any two primary feeders out-of-service (called a "second contingency") under peak load conditions. Accordingly, there should be no degradation of service or performance by network equipment when two feeders are out-of-service under peak load conditions. Under high temperature conditions, customer loads rise and push electrical equipment closer to their safe

operating limits (called a "normal rating"); for most distribution equipment, because higher current causes the equipment to heat up, those limits are dictated by the maximum safe temperature the equipment can bear before possible failure (its "emergency rating"). As each individual piece of equipment fails, the electricity it was carrying rebalances along the remaining paths in the network; as each successive path (such as a feeder) is lost, this rebalancing shifts more load onto the remaining feeders. As more feeders go out-of-service, and depending on load conditions, equipment may exceed their normal ratings and approach emergency ratings. Operating above the emergency ratings can seriously damage a piece of equipment, decreasing its performance capability and remaining life over the long term, or even causing it to fail. The need to operate equipment within its operating limits is a principal reason why utilities have extensive remote monitoring of electrical and temperature conditions on the key equipment in their networks.

During the period from late-afternoon on July 17 through mid-afternoon on July 19, more than two primary feeders of the 22 primary feeders supplying the Long Island City Network were out-of-service, resulting in what is called "multiple contingency" conditions. On two occasions, as many as 10 primary feeders were out-of-service (referred to as 10^{th} contingency condition).

6.2.2 Analysis and Findings

Operation of Con Edison's networks is governed by its Specification EO-4095, Distribution System Operation Under Contingency Condition. The procedure identifies a number of actions to be taken in the event of operation in multiple contingencies, but it is vague on the decision-making criteria for deciding when a network should be shut down. In section 10.2.6, it states:

> If the actions have an impact on eliminating the overloads on the primary feeders, there are no reports of cascading manhole fires….continue to monitor the network.

Section 10.2.7 states:

> The shutdown of the distributed network should be considered if the above-proposed actions are not successful in correcting the emergency condition.

The apparent predecessor to EO-4095, EO-4031-2, Network Shutdown Procedure,[68] replaced some time after the Washington Heights event in 1999, while still not overly descriptive in its criteria, was nonetheless clearer. It stated that a network shutdown "may be necessary to avoid extensive damage to the network or customer facilities." It further identified general conditions to be considered in deciding whether to shut a network down. These conditions included the spread of manhole fires.

Within EO-4095, it states that the Regional Vice President of Electric Operations, or his designee, have the responsibility of making the decision whether or not to shut down a network. The Vice President of Electric Operations for the Brooklyn/Queens operating area was present during both the first and second 10th contingency events (July 18 and 19, 2006) and would have been the person responsible for making the decision to shut down the Long Island City Network as per specification EO-4095. On Tuesday night, July 18, during the time when the first 10th contingency occurred, the General Manager of Electric Operations for the Brooklyn/Queens area was functioning as the Incident Commander and, within this role, was involved with the discussions and decisions pertaining to the condition of the network and the possibility of shutting it down. On Wednesday morning, July 19, the General Manager of Electric Operations for the Manhattan area filled in as the Incident Commander for the Long Island City Network event. This individual was the Incident Commander on duty during the second 10th contingency Wednesday morning, July 19, and played the same role as the General Manager of Electric Operations for the Brooklyn/Queens area. During both the first and second 10th contingencies, the Vice President of Engineering and Planning for Electric Operations was also at the Brooklyn/Queens control center and involved with the discussions pertaining to the condition of the network and the possibility of shutting it down. Throughout the investigation, Con Edison has stated that the decision to maintain the Long Island City Network was not made by a single person, but was a collaborative decision of the people mentioned above with the informational resources of all the other employees (system operators, engineers, etc.) working in the Brooklyn Queens control center during the Long Island City Network outage event.

Con Edison elected not to shut down the Long Island City Network during the event. In various venues since the event, the Company has steadfastly and repeatedly defended its

[68] Con Edison Response to Staff Discovery Request DPS 280.

decision to keep operating the network under the severe contingencies present during the event. In defending its decision, the Company stated that it did not do significant damage to the network by continuing to operate it. It further stated that it was better to have 25,000 customers out-of-service for up to nine days than to interrupt service to all 115,000 customers in the network and affect mass transit in the network area.

As a result of the Company's comments about societal implications, Staff inquired into the Company's consultations and coordination with New York City regarding the network shutdown decision process. Both parties stated that the City's emergency personnel asked for advance notice of any network shutdown so that it could adequately prepare by taking steps, such as getting people out of subways and getting additional fire and police personnel on the streets. The City and Con Edison also agreed that the decision of whether to shut down the network was Con Edison's to make.

At the Technical Conference convened on October 26 and 27 by the Administrative Law Judge assigned to this proceeding, Con Edison clarified its position regarding the weight societal impacts had on the decision to shut down the Long Island City Network by saying that the decision not to shut down the Long Island City Network was based on technical considerations, not broader societal needs.[69] The Company presented five criteria that it said formed the basis of its decision. These criteria are:

- number of primary feeders overloaded;
- number of primary feeders returning;
- number of transformers overloaded;
- electricity demand; and
- secondary damage.

Staff's broader investigation confirmed that Con Edison's attention was, indeed, focused heavily on the status and restoration of primary feeders and condition of transformers, as it said. During the event, there were several instances where primary feeders exceeded emergency ratings, but these were for short periods of time and in-and-of themselves would not warrant a network shutdown. There were also 83 transformers that were identified as being overloaded or over their temperature limit during the event.[70]

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[69] Technical Conference transcript, page 830, line 14, to p. 831, line 2.
[70] Con Edison Response to Staff Discovery Request DPS 150.

Other criteria should have been given greater consideration in making the decision to shut down the network. The sheer magnitude of manhole and service box events (manhole events) spoke volumes about the damage that was occurring to Long Island City Network's secondary system during the event. Most manhole events are caused by secondary cable failures, which can result in a smoking manhole or fire, or in severe cases, a gas that can possibly ignite and result in a manhole explosion. All secondary cable failures do not result in a manhole event, so the high level of manhole events would be an indicator of more widespread failures. The Company stated that it did not see the number of manhole events as out of the ordinary, given the conditions. On a CERC conference call on July 20, 2006, a member of the Company's management team reported that based on his observations he estimated that there were in excess of a hundred manhole events in the Long Island City Network. The Company's proffered observation as to the non-severity of manhole events is inexplicable and not supported by the data and other information. In fact, the large increase of manhole events along with the large drop in system load from Tuesday evening, July 18, to Wednesday morning, July 19, portrays the timeframe when the majority of the secondary system damage occurred and customers lost service. Con Edison reaffirmed this in statements during the Technical Conference held on October 26 and 27.

From Monday, July 17 through Tuesday, July 25, there were 141 manhole events in the Long Island City Network, concentrated in the three zones that sustained most of the damage as a result of the incident.[71] It is telling that on Tuesday, July 18, there were 17 manhole events and on Wednesday, July 19, after the first 10th contingency (i.e., the first of several times during the event that there were 10 primary feeders out-of-service) was reached, there were 68 manhole events.[72] Conversely, there were only 12 manhole events over five days during the Washington Heights Network event in 1999, and seven during the three days in 1999 when the Long Island City Network had previously been in a severe multiple contingency condition.[73] Further, manhole events are, generally, more pervasive in the winter months when road salt contaminates runoff and exacerbates cable deterioration. In fact, the maximum number of manhole events throughout Con Edison's entire service territory on a given summer day during the previous seven years was 28 (in 1999). Therefore, 85 manhole events occurring within two

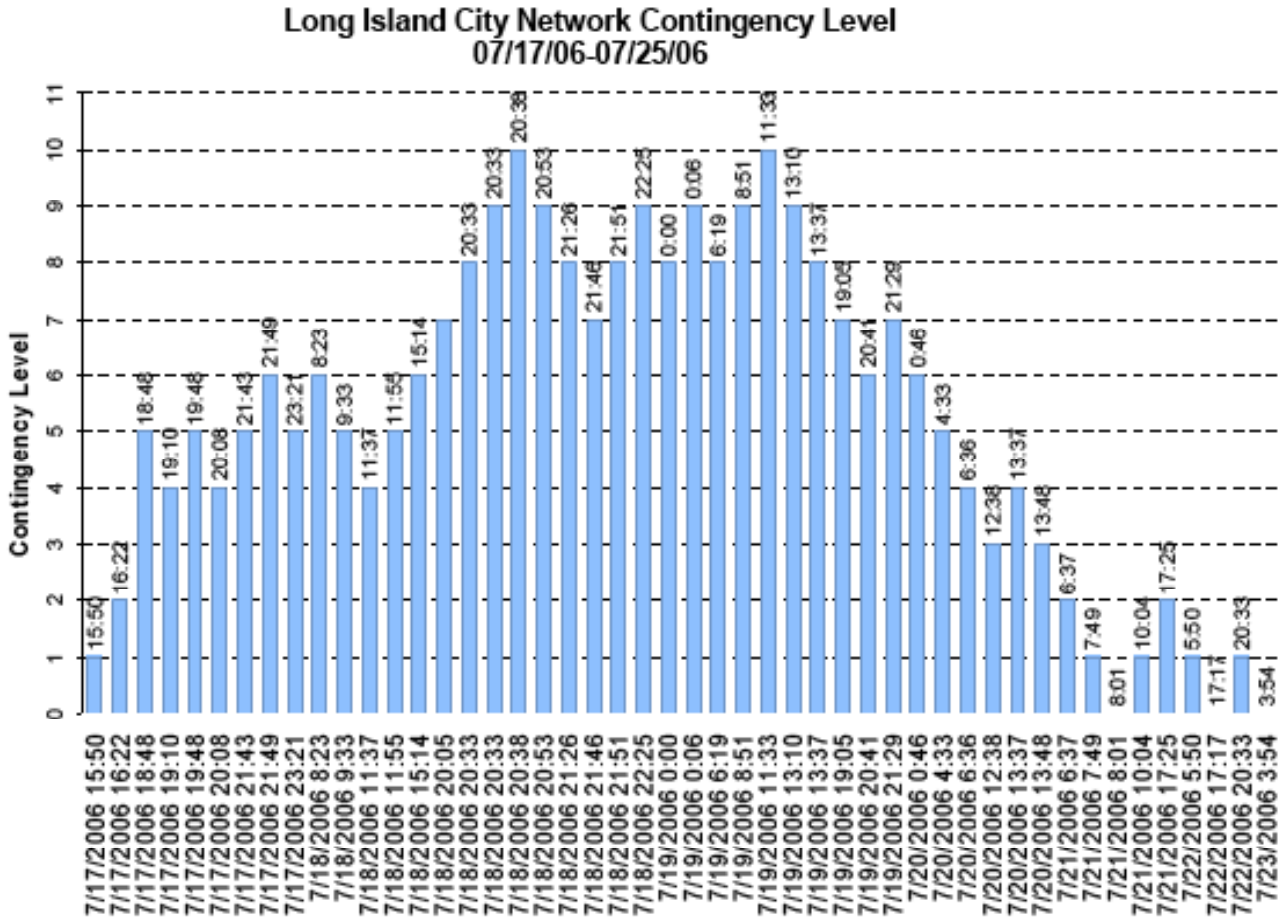
[71] Con Edison Response to Staff Discovery Request DPS 191.
[72] Con Edison Response to Staff Discovery Request DPS 404.
[73] Con Edison Response to Staff Discovery Request DPS 201.

days should have been recognized as indicating a significant problem existed in the secondary network system.

The Company also now asserts, employing a hindsight analysis, that it did not consider the damage to the secondary system significant enough to warrant a network shutdown. Staff strongly disagrees with that conclusion. The recovery cost for the Long Island City Network event is likely to exceed $100 million. Moreover, permanent repairs are still ongoing, nearly seven months after the event, and it is probable that other damage exists in the secondary system that will only be discovered over time. If the aftermath of this event, and the damage done to the secondary system, does not classify the damage as "significant," then the Company is employing a definition of the term that far exceeds any reasonable one imaginable.

Many may wonder why, if primary feeders and transformers were operating within emergency ratings, there was such significant damage caused to the secondary system. The following chart[74] shows the number of primary feeders out-of-service (network contingency level) from Monday, July 17 through Tuesday, July 25. The subsequent figures[75] show the locations of the feeders that were out-of-service at critical times, which illustrates the escalation of the network feeder failures during the event. The final figure shows the subsequent areas of outages reported to the Company through customer calls. The loss of multiple primary feeders within the same contiguous area, also known as feeder bands or zones, means that secondary cables have to carry power further to meet continuing demand. Having multiple feeders out-of-service within the same bands or zones escalates the severity of the outages compared to multiple feeder outages spread out over an entire network. This directly results in low voltage, which may not be sufficient to run customers' equipment. As some secondary cables are overloaded because of having to carry this additional power, and subsequently fail, it puts an even further strain on the remaining secondary cables. Not only does it result in additional secondary cable failures, but, as some secondary cables overheat, there can be additional manhole fires. Any competent network operator would know the facts demonstrate that the Long Island City Network experienced severe damage in the secondary grid during the incident.

[74] Con Edison October 12, 2006 Report.
[75] Con Edison Response to Staff Discovery Requests DPS 183-185.


Long Island City Network Contingency Level
07/17/06-07/25/06
Contingency Level
0
1
2
3
4
5
6
7
8
9
10
11
7/17/2006 15:50
7/17/2006 16:22
7/17/2006 18:48
7/17/2006 19:10
7/17/2006 19:48
7/17/2006 20:08
7/17/2006 21:43
7/17/2006 21:49
7/17/2006 23:21
7/18/2006 8:23
7/18/2006 9:33
7/18/2006 11:37
7/18/2006 11:55
7/18/2006 15:14
7/18/2006 20:05
7/18/2006 20:33
7/18/2006 20:33
7/18/2006 20:38
7/18/2006 20:53
7/18/2006 21:26
7/18/2006 21:46
7/18/2006 21:51
7/18/2006 22:25
7/19/2006 0:00
7/19/2006 0:06
7/19/2006 6:19
7/19/2006 8:51
7/19/2006 11:33
7/19/2006 13:10
7/19/2006 13:37
7/19/2006 19:05
7/19/2006 20:41
7/19/2006 21:29
7/20/2006 0:46
7/20/2006 4:33
7/20/2006 6:36
7/20/2006 12:38
7/20/2006 13:37
7/20/2006 13:48
7/21/2006 6:37
7/21/2006 7:49
7/21/2006 8:01
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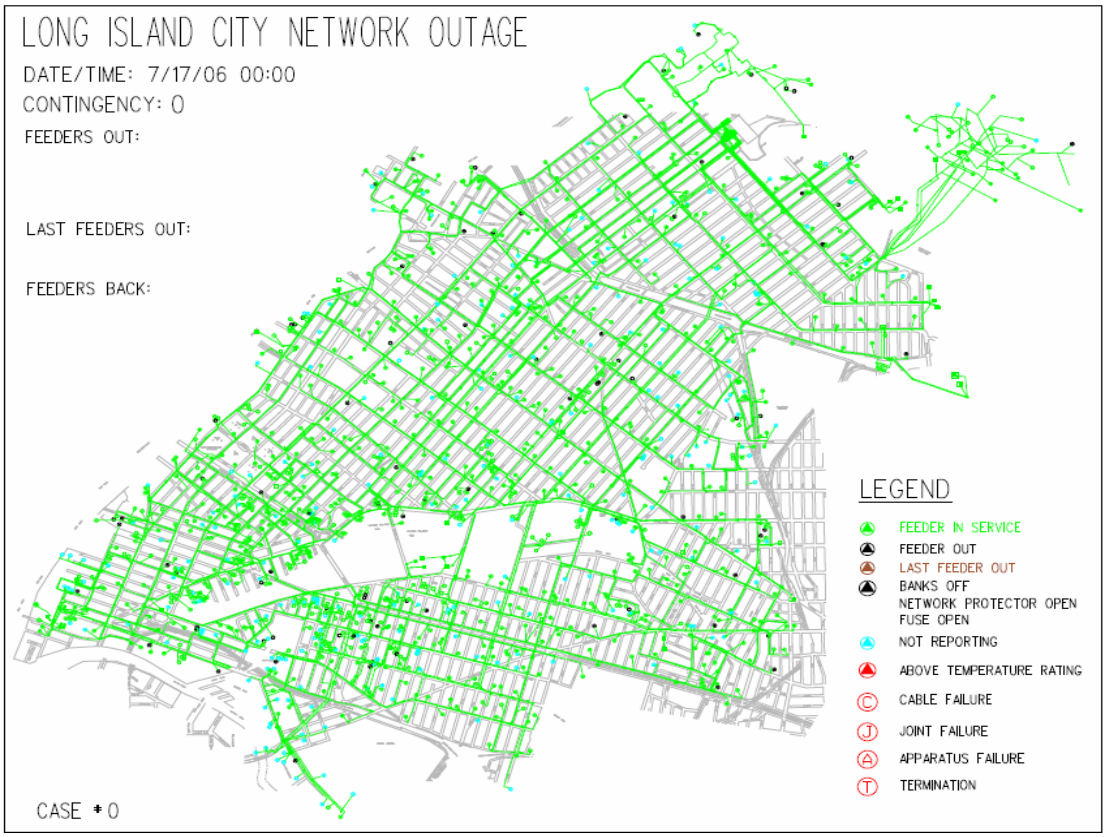
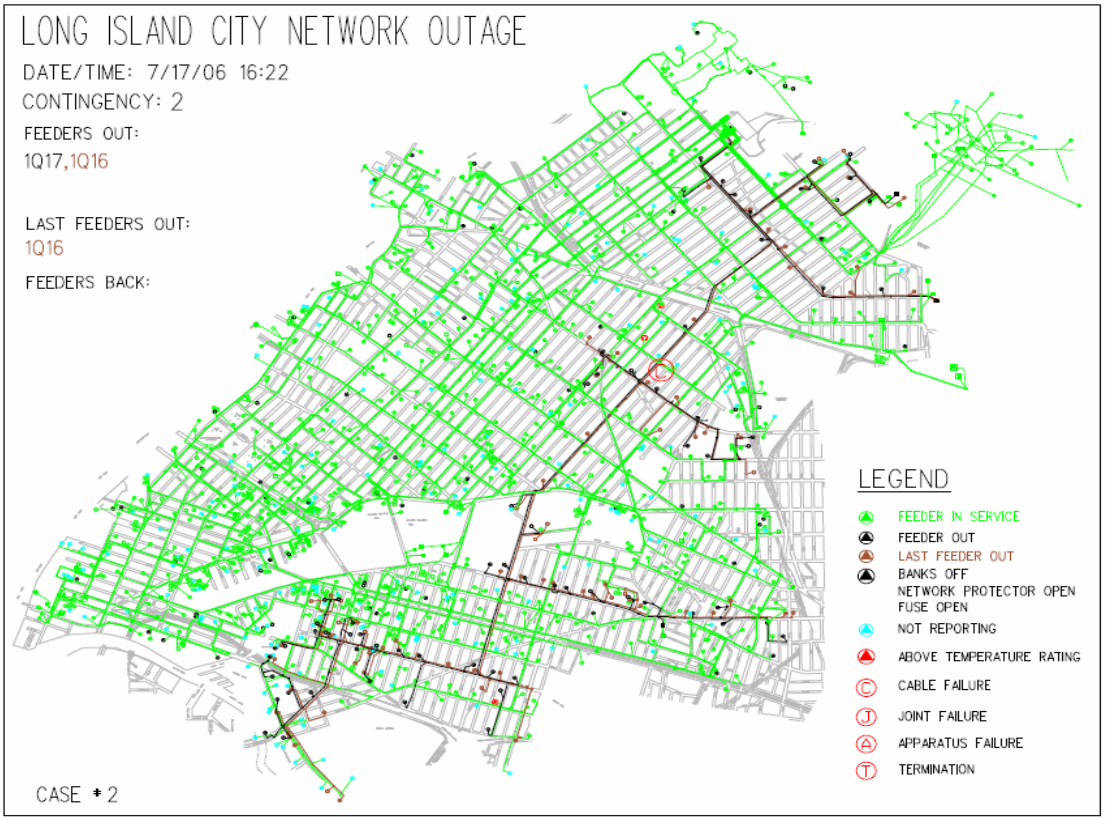
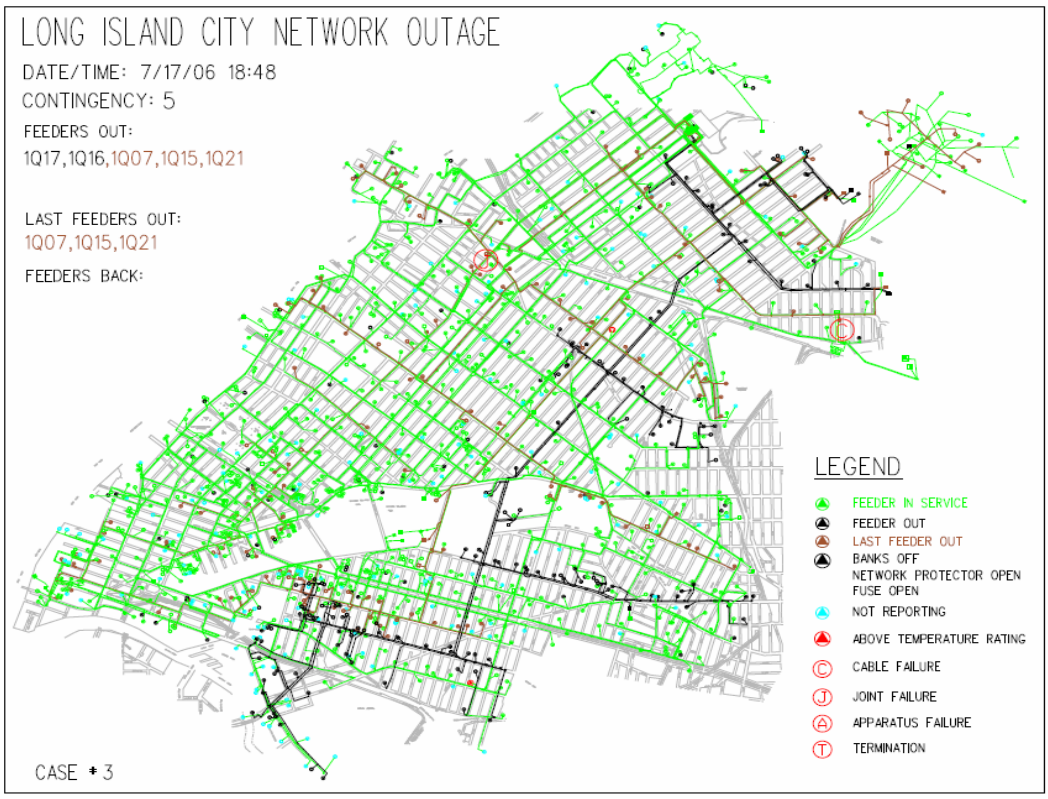
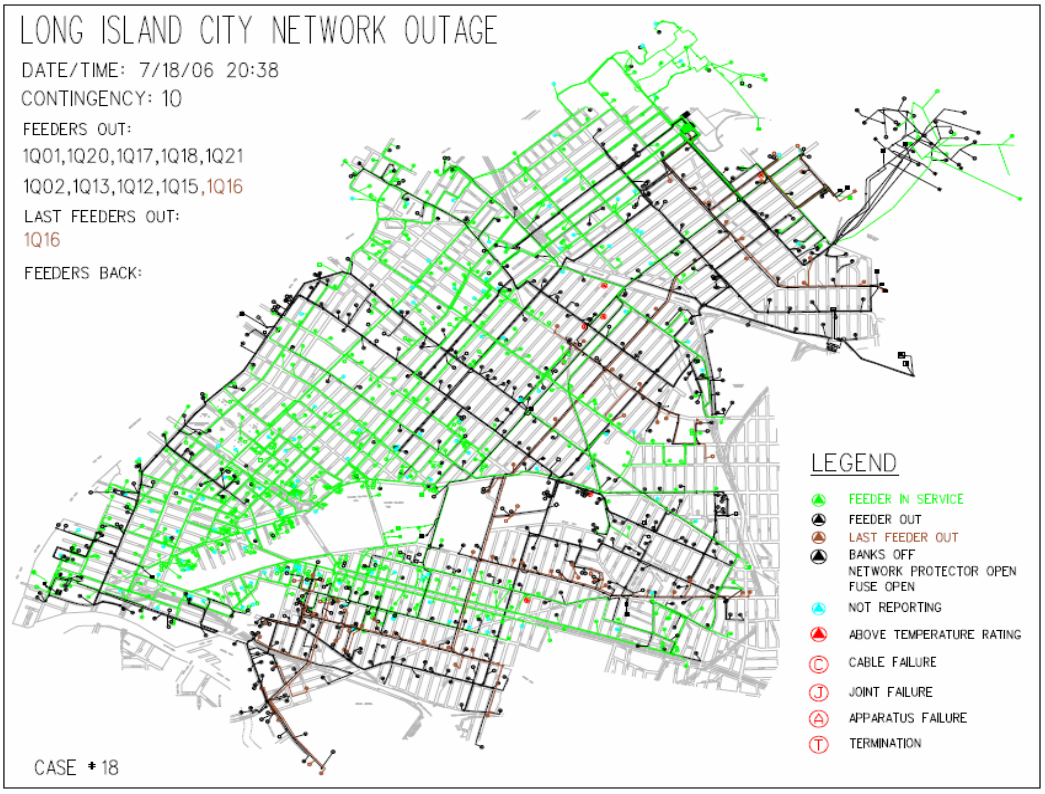
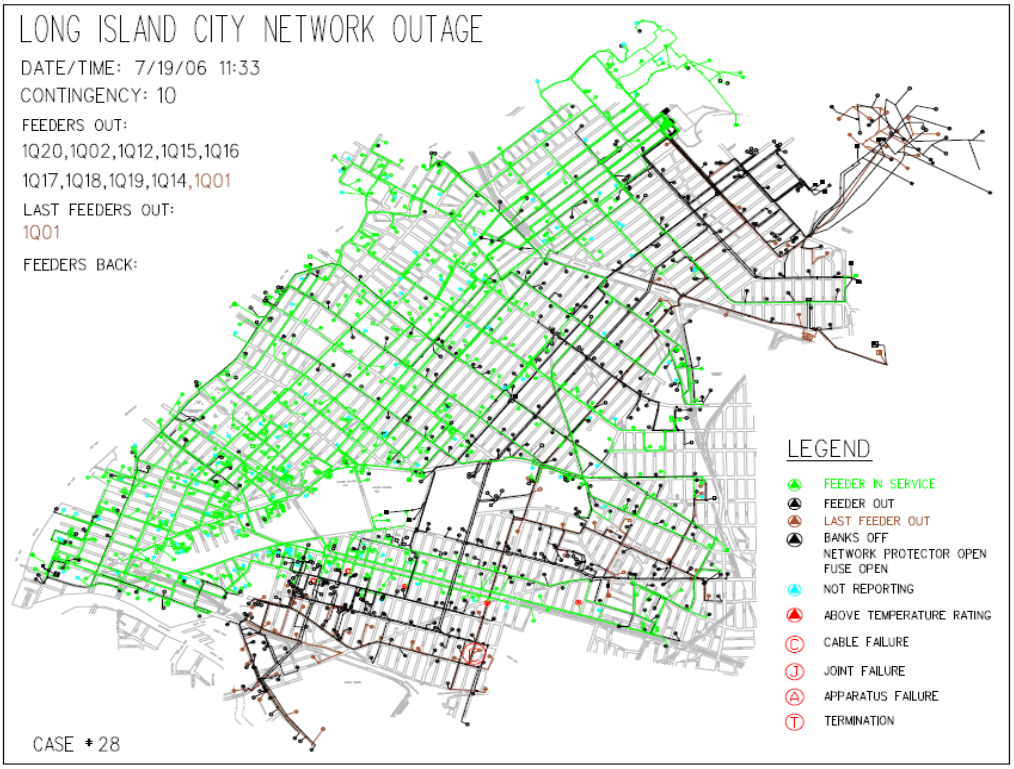
7/22/2006 20:33
7/23/2006 3:54

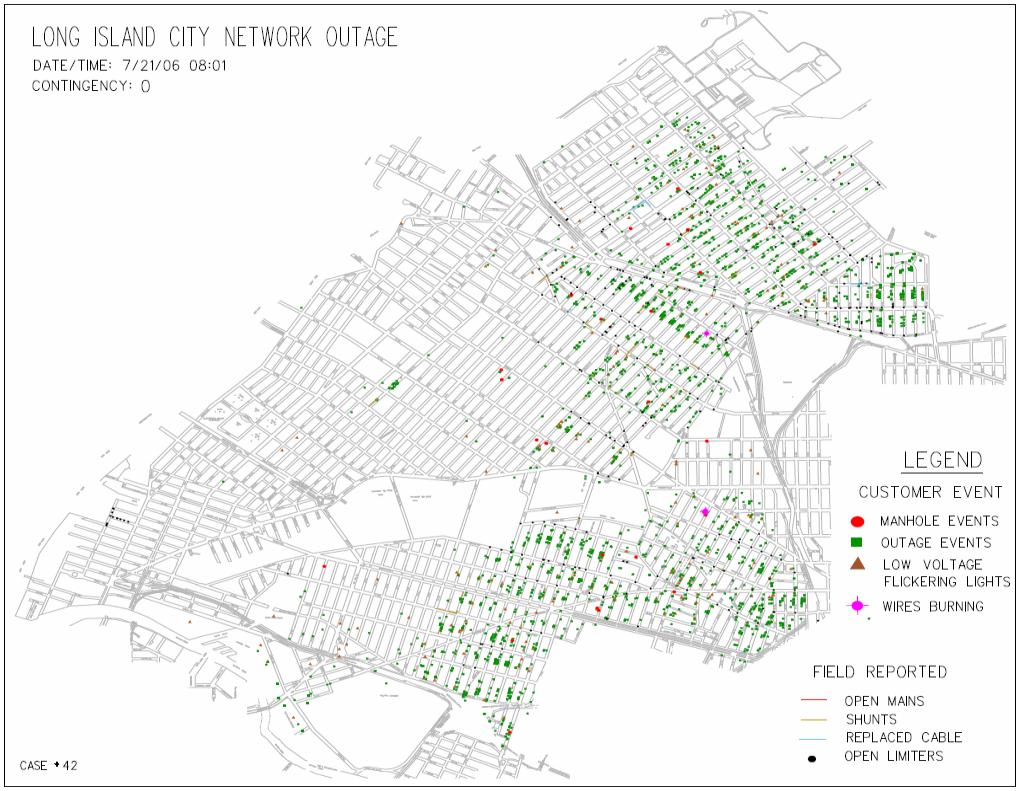

LONG ISLAND CITY NETWORK OUTAGE
DATE/TIME: 7/17/06 00:00
CONTINGENCY: 0
FEEDERS OUT:
LAST FEEDERS OUT:
FEEDERS BACK:
LEGEND
FEEDER IN SERVICE
FEEDER OUT
LAST FEEDER OUT
BANKS OFF
NETWORK PROTECTOR OPEN
FUSE OPEN
NOT REPORTING
ABOVE TEMPERATURE RATING
CABLE FAILURE
JOINT FAILURE
APPARATUS FAILURE
TERMINATION
CASE * 0


LONG ISLAND CITY NETWORK OUTAGE
DATE/TIME: 7/17/06 16:22
CONTINGENCY: 2
FEEDERS OUT:
1Q17,1Q16
LAST FEEDERS OUT:
1Q16
FEEDERS BACK:
LEGEND
FEEDER IN SERVICE
FEEDER OUT
LAST FEEDER OUT
BANKS OFF
NETWORK PROTECTOR OPEN
FUSE OPEN
NOT REPORTING
ABOVE TEMPERATURE RATING
CABLE FAILURE
JOINT FAILURE
APPARATUS FAILURE
TERMINATION
CASE * 2


LONG ISLAND CITY NETWORK OUTAGE
DATE/TIME: 7/17/06 18:48
CONTINGENCY: 5
FEEDERS OUT:
1Q17,1Q16,1Q07,1Q15,1Q21
LAST FEEDERS OUT:
1Q07,1Q15,1Q21
FEEDERS BACK:
LEGEND
FEEDER IN SERVICE
FEEDER OUT
LAST FEEDER OUT
BANKS OFF
NETWORK PROTECTOR OPEN
FUSE OPEN
NOT REPORTING
ABOVE TEMPERATURE RATING
CABLE FAILURE
JOINT FAILURE
APPARATUS FAILURE
TERMINATION
CASE * 3


LONG ISLAND CITY NETWORK OUTAGE
DATE/TIME: 7/18/06 20:38
CONTINGENCY: 10
FEEDERS OUT:
1Q01,1Q20,1Q17,1Q18,1Q21
1Q02,1Q13,1Q12,1Q15,1Q16
LAST FEEDERS OUT:
1Q16
FEEDERS BACK:
LEGEND
FEEDER IN SERVICE
FEEDER OUT
LAST FEEDER OUT
BANKS OFF
NETWORK PROTECTOR OPEN
FUSE OPEN
NOT REPORTING
ABOVE TEMPERATURE RATING
CABLE FAILURE
JOINT FAILURE
APPARATUS FAILURE
TERMINATION
CASE * 18


LONG ISLAND CITY NETWORK OUTAGE
DATE/TIME: 7/19/06 11:33
CONTINGENCY: 10
FEEDERS OUT:
1Q20,1Q02,1Q12,1Q15,1Q16
1Q17,1Q18,1Q19,1Q14,1Q01
LAST FEEDERS OUT:
1Q01
FEEDERS BACK:
LEGEND
FEEDER IN SERVICE
FEEDER OUT
LAST FEEDER OUT
BANKS OFF
NETWORK PROTECTOR OPEN
FUSE OPEN
NOT REPORTING
ABOVE TEMPERATURE RATING
CABLE FAILURE
JOINT FAILURE
APPARATUS FAILURE
TERMINATION
CASE * 28


LONG ISLAND CITY NETWORK OUTAGE
DATE/TIME: 7/21/06 08:01
CONTINGENCY: 0
LEGEND
CUSTOMER EVENT
MANHOLE EVENTS
OUTAGE EVENTS
LOW VOLTAGE
FLICKERING LIGHTS
WIRES BURNING
FIELD REPORTED
OPEN MAINS
SHUNTS
REPLACED CABLE
OPEN LIMITERS
CASE * 42

Staff also concludes that the Company seriously erred in failing to comprehend the number of consumers experiencing low voltage (i.e., below Commission standards and intentional voltage reduction levels) and failing to factor this into its decision-making process. The low-voltage figure could approach the Company's estimated 25,000 metered customers that were without power. Thus, there were significant effects on customers beyond the Company's estimated 25,000 customers that were out-of-service. The Company has made no attempt to assess how many customers were affected by low voltage or the impact the low voltage had on customer equipment. As discussed in the section of this Report pertaining to the consumer survey commissioned by Staff, that survey would lead one to believe the number of customers affected was much greater than the 25,000 estimated by the Company. The survey commissioned by Staff indicates that the number of customers that lost service was more in the range of 65,000. Staff believes many customers that experienced extremely low voltage (i.e., low enough to adversely affect or even totally disrupt customers' equipment, such as air conditioners) may have responded to the survey as having lost service. This would possibly explain the higher number of metered customers out-of-service found by the Staff survey compared to the Company's estimate of 25,000.

The Company claims in its report of the event that its operators were continually analyzing conditions on the system and deduced that conditions did not warrant shutting down the network. The information produced by Staff's depositions of certain Con Edison employees and audio tapes of the Long Island City Network operators and Company management during the event do not support this statement. During the time when system conditions were severe, operators stated that the number of manhole events was cascading out of control and, in effect, that the managers did not have the fortitude to shut the network down. It was clear from the tapes of the operators[76] and subsequent interviews and depositions of various managers and operators that it was the managers, not the operators, who made the decision not to shut the network down. Additionally, the effectiveness of Control Center operators to recognize the severity of the event and direct timely mitigating actions was compromised by the fact that their primary analysis tools were not providing accurate information and had data and perhaps structural shortcomings.

[76] Audio tapes made during the Long Island City Network event and taken from the Brooklyn/Queens distribution control center were provided by Company Responses to DPS-101 and 102.

Staff has not attempted to assess the network shutdown decision based on the overall societal implications, such as the impact on commuters using the railroad and the subway systems, given that the Company claims it did not use that as a basis for its decision making. Staff concludes the Company appears to be using these outside considerations, in hindsight, to justify its decision not to shut down the network. The decision parameters, as explained by the Company and as defined by EO-4095, reflect predominantly operational considerations. Given those parameters, Staff concludes that the Company did not make the right decision and acted incorrectly and unreasonably, given the information it had available at the time of the incident, specifically the number of manhole events and the amount of the secondary system that was destroyed.

The decision to shut down a network must be a calculated and rational decision, not one that is made by the "seat of the pants," which is the approach that appeared to be used in this instance. As such, the Company needs to modify EO-4095 to establish clearer criteria as to when a network should be shut down, including defining what is considered significant damage to a network. The procedure further should establish a clearer protocol for making the decision on whether to shut down a network and for getting input from operators and engineers. If the parameters were to be changed to provide for consideration of broader societal factors, Con Edison would need to enlist the involvement of the City and others because it is not in a position to make such decisions alone.

Prior to actually making the decision to shut down a network, an analysis of what is necessary to bring the network back on line (e.g., how many feeders need to be in service) should be completed before the actual shut-down decision is made. The amount of time it would take for all this work to be completed also needs to be factored into this analysis and decisions. Throughout the investigation, Con Edison offered very little information or data pertaining to any such analysis performed by the Company, other than to say they did do these analyses. The Company stated in its report that the analysis showed that 18 feeders would have needed to be in service before it could safely bring the Long Island City Network back up after shutdown. Then, during the informational requests, the company stated that a total of 20 feeders would have been required to bring the network back up after a post-event load-flow analysis of the system.[77] The Company never provided an estimated amount of time it would have taken to bring the network

[77] Con Edison Response to New York City's Discovery Request NYC-219.

back up or any other information relating to the subject. They Company needs to better define what analysis is required and when it is performed prior to making a decision to shut down a network, including in this analysis should be how this information would impact the actual shut-down decision. There are many factors and issues that go into starting a network up after shutdown or de-energizing, but the more information that is known, the better it makes the decision-making process and defending that decision.

6.2.3 Recommendations

- Con Edison should modify EO-4095 and provide a copy to Staff for review by June 1, 2007. As part of this process, Con Edison should meet with New York City authorities and review societal needs related to outages to determine whether and how to factor those parameters into a shut-down decision and emergency plans. The Company should develop a protocol for including societal impacts into its operational procedures and conduct drills with the City and others (i.e., mass transportation entities) as necessary.
- Con Edison should develop a procedure for the analysis to be performed during multiple contingency events to allow for a more defined process of taking into consideration the requirements for re-starting a network. All parameters and considerations should be listed including when this analysis is first performed, who performs the analysis, how they determine the number of feeders required to be in service before re-energizing, estimated time frame of shut down, and any other related issues. The Company should provide this procedure to Staff by June 1, 2007.

6.3 Primary Feeders Analysis

6.3.1 Background

As previously described, the Long Island City Network is served by a total of 22 primary feeders that run through an underground manhole and conduit system and deliver power from the North Queens Substation to nearly 1,200 transformers. These primary feeders are the supply lines to the secondary grid that provides power to customers. Con Edison currently uses three types of primary feeder cables: ethylene propylene rubber (EPR); cross-linked polyethylene (XLP); and paper-insulated lead-covered (PILC). The Company's entire underground distribution system is approximately 36.5% ethylene propylene rubber, 36.5% cross-linked

polyethylene, and 27% paper-insulated lead-covered cables compared to approximately 47%, 40%, and 13%, respectively, for the Long Island City Network. The average ages of the primary feeder cables are 10 years, 22 years, and 46 years, respectively, for the three types. The Company estimates that the average age of its entire underground distribution system is 25 years, compared to an average age of 19 years for the Long Island City Network.

As previously noted, Con Edison's networks are designed to withstand up to two primary feeders out-of-service at one time during peak load conditions without affecting any customers or causing equipment to exceed normal ratings. During the Long Island City Network event, there were two separate occasions when 10 primary feeders were out-of-service. This put the network well past its design criteria and in severe jeopardy of large-scale damage and resulting customer outages.

When there is a fault or failure somewhere on a primary feeder, the associated circuit breaker is designed to sense the fault or failure and open the circuit to protect any associated equipment from damage. This process is referred to by the Company as an "Open Auto" (OA). When there are multiple failures on a single feeder that are not detected or some other unknown problem occurs with the feeder after the initial fault is repaired, the feeder may trip out-of-service again as it is being returned to service. This is what the Company refers to as "Cut In Open Auto" (CIOA).

There were a total of 54 primary feeder outages within the network from Monday, July 17 to Tuesday, July 25. This includes 28 open auto conditions, 16 cut in open auto conditions, and 10 failures due to tests performed on them. Below is a table that categorizes the 28 open auto conditions by type.

Open Auto Types	
Type	Number of Failures
Bus Trip	4
Transformer	7
Cable	5
Joint	4
Other	8
Total	**28**

As shown in the table above, there were eight "other" primary feeder failures that occurred where the feeder's circuit breaker opened but no obvious fault was found. Those primary feeders were put back into service within a short period of time, but five of the eight

opened again some time later, possibly indicating that there was, in fact, some underlying cause for the initial failure. The discussion below, along with discussions within other sections of this Report (e.g., Transformer & Substation Analysis), addresses the specific causes of these open autos in more detail. No common cause has been identified for the primary feeder failures that occurred during the Long Island City Network event. Once the network reached a fifth contingency, it appears that subsequent feeder failures were the result of operating the network beyond its normal operating design criteria.

6.3.2 Analysis and Findings – Cable and Joint Autopsies

In the aftermath of the network incident, a total of 22 primary feeder cables and joints were taken from the network area and examined by Cable Technology Laboratories (CTL)[78] for dissection and analysis (autopsy). Seven primary feeder cable sections and 15 joints were examined. The following chart summarizes the results from the autopsies.

Autopsy Results

Description	Type	Failure Count	Average Age (Yrs)
Cable	EPR	4	4
Cable	PILC	1	59
Cable	XLP	2	22
Joint	PILC - Stop Joints Elastimold 2W-1W	5	14
Joint	PILC – Stop Joints Raychem 3W-1W	4	13
Joint	PILC	1	N/A
Joint	EPR/XLP	4	6
Joint	EPR/XLP	1	1

Although only one paper-insulated lead-covered cable failed, nine joints for that type of cable failed during the event. Joint failure is a recurring problem related to this cable type.[79] In the 1999 Washington Heights Network outage investigation, 8 of the 13 primary feeder failures involved paper/lead cable and/or associated stop joints such as the Elastimold 2W-1W stop joints. Since the Washington Heights event, the Company has established a replacement program that is designed to have the remaining paper-insulated lead-covered cable (representing

[78] Staff observed many of the cable autopsies that were performed by CTL.

[79] There are two basic types of joints, the stop joint and straight joint. A stop joint is used to connect solid dielectric cable (EPR or XLP) to a paper cable (PILC) and is constructed to stop the oil in the paper cable from contaminating the solid dielectric cable. A straight joint connects similar types of cable.

26% of system cable) replaced system-wide by 2024. With respect to the Elastimold stop joints, they have not been installed in Con Edison's system since 1999 and are targeted for system elimination. The Company reports that the remaining 66 Elastimold stop joints in the Long Island City Network area will be replaced before the summer of 2007, and the approximately 1,000 Elastimold stop joints left on the entire Con Edison system will be replaced by the end of 2008.

The cable autopsy report stated that failure from overheating of the paper-insulated lead-covered cable does not always happen right away; it often occurs several months later. Consequently, additional problems in the Long Island City Network (prior to end of 2008), or anywhere else in Con Edison's network where it may have been overheated, may be realized in the future. This finding, coupled with Con Edison's proposed final replacement date of 2024, means that paper-insulated lead-covered cable and Elastimold stop joint failures will likely continue to occur in higher percentages than for the other cable types.[80] The Company has been replacing paper-insulated lead-covered cable at a rate over the last six years that would indicate removal of all such cable around the 2018 time frame.

Paper-insulated lead-covered cable is replaced through a variety of efforts. The Company's "program" is not fully planned, but rather relies to a large extent on failures and load growth. The Company should continue to replace paper-insulated lead-covered cable at its current rate under each of the programs that replace such cable, but should also reassess its program as a whole. Further, the paper-insulated lead cable in the Long Island City Network should be replaced by the end of 2012. This would not only serve to reinforce the Long Island City Network, but would provide an opportunity to develop a program for replacing paper-insulated lead cable that could be used as a model throughout the system. The replacement program in the Long Island City Network should be documented in a manner that it can be applied to other networks going forward as necessary.[81] Cable and joint autopsies were either stopped short or concluded with no findings for six of the 24 autopsies (25%) because the samples provided by Con Edison were found not to be the actual cable sections or joints that experienced the faults, but instead were samples from elsewhere on the failed primary feeders.

[80] Con Edison Response to Staff Discovery Requests DPS 49 and 76.
[81] Con Edison Response to Staff Discovery Requests DPS 63, 76, 77, and 78.

In order for the autopsies to provide useful information to the Company, the actual point or location of the failure must be used for autopsy.

Staff recognizes that in some isolated cases, the removal and recovery of the failed cable is not possible and crews actually need to abandon cables within the existing duct bank because they cannot be removed. However, when field crews take a random sample of the failed cable instead of the actual failed section, it does little for the purposes of an autopsy and for learning what happened.

Failure to recover specimens of the fault limited the analysis of the cause of the cable/joint failure. Being unable to complete 25% of the autopsies due to failure to collect the actual failed sections of the cable/joint is unacceptable and far exceeds the historic level for such an event. In the future, the Company needs to recover the actual failed cable sections and joints when crews remove equipment from the system after a failure has occurred. The Company was under instructions from Staff to do so during this event. This does not mean that quick restoration efforts should be sacrificed, but a better procedure, and Company adherence to that procedure, is needed if future cable and joint autopsies are to be effective.[82] Accordingly, Con Edison should review and modify existing procedures for use by Summer 2007 that will ensure that actual failed cables and joint samples are set aside in the field for further examination by the cable and splice center.

6.3.2.1 Recommendations

- Staff recommends the Company continue to replace paper-insulated lead-covered cable at its current rate under each of the programs that replace such cable. Staff further recommends that paper-insulated lead-covered cable in the Long Island City Network be replaced by the end of 2012. The replacement program in the Long Island City Network should be documented in a manner that it can be applied to other networks going forward as necessary. The Company should also reassess its paper-insulated lead-covered replacement program as a whole and file a report with Staff within 90 days of the issuance of this Report.
- Con Edison should review and modify existing procedures for use by the summer of 2007 that will ensure the maximum number of actual failed cables and joint

[82] Con Edison Response to Staff Discovery Request 49.

samples possible are set aside in the field for further examination by the cable and splice center. The Company should provide a copy of the procedure to Staff for review by June 1, 2007.

6.3.3 Analysis and Findings - Primary Cable Calculations and Ratings

The Company stated that there were no feeder overloads for the network during its integrated hourly loadings. There were, however, a total of five feeders (1Q01, 02, 14, 19, and 20) that exceeded their emergency current ratings instantaneously at some point during the network event. Currently, the Company calculates the normal and emergency ratings for primary feeders with the Company's computer simulation program. This program takes into account many different parameters, such as temperature and thermal conditions. Specifically, the Company relies on an ambient earth temperature constant of 30°C (86°F) for calculation purposes. This constant parameter does not take into account the actual ambient temperature and its effect on all the other thermal conditions associated with high heat events.

During the event, seven primary feeder cables, which were over their normal operating rating, but below their emergency ratings, failed. Such failures draw into question the validity of the primary cable calculations and ratings derived by the Company. The Company needs to reassess the manner in which it calculates the emergency rating for primary cables, with particular attention to reflecting better the actual temperature and thermal conditions being experienced by the primary cables under high heat, high load, and multiple contingency events.

An evaluation is needed as to the level of stress feeders experience when load increases during multiple contingency events and the resulting impacts on the life expectancy of the cable and joints as a result of the stress. Currently, the calculated normal and emergency load ratings for Con Edison's primary feeders take into account many different parameters. Accordingly, Con Edison needs to adjust its primary cables normal and emergency load ratings to take into account the actual ambient temperatures experienced within its service territory, instead of just using a constant ambient temperature, or it needs to raise the constant value to a level that will not be exceeded.[83] Taking the actual temperature conditions into consideration would make the ratings more realistic and, therefore, less susceptible to failures during high temperature periods. The Company should also include in its emergency equipment rating

[83] Con Edison Response to Staff Discovery Requests DPS 153, 176, and 210.

analyses discrete assumptions that account for unseen degradation in primary network components on a network-specific basis.

6.3.3.1 Recommendation

- The Company should calculate the actual thermal conditions experienced by the underground primary cables under normal and emergency conditions and report its findings to Staff within 90 days of issuance of this Report.

6.3.4 Analysis and Findings - Spacing and Congestion

There were six instances identified where secondary cable failures and/or fires within manholes or conduit duct banks caused primary feeder failures. Currently, primary feeder cables use arc resistant taping to help reduce the effect of arcing and fire related failures. As evidenced by the Long Island City Network event, this practice did not fully protect the primary cables from damage and, therefore, the Company should review whether additional arc resistant taping practices need to be implemented. Additionally, congestion and spacing are existing problems within many manhole structures in Con Edison's underground network system. In most cases, the overloading of the secondary cables was the originating cause of the faults and associated fires within the manholes. The lack of adequate spacing and congestion made it easier for the primary cables to be affected.

The majority of the existing manhole structures do not fully meet the Company's current installation requirements for cable spacing and racking. However, all new installation and rebuild work being performed by the Company follows these requirements. As part of the restoration and recovery processes, Con Edison crews identified at least 168 structures (manholes, service boxes, etc.) that need to be enlarged to reduce the amount of congestion within them. There also have been at least 1,032 cut-and-rack procedures undertaken (i.e., where the Company installs new cable racks to address separation and spacing issues within manhole structures). The Company needs to integrate these efforts into its system-wide improvement and inspection plans.[84]

Two primary feeders failed when a short-circuited secondary cable caused a fire in an underground wooden duct bank. Wooden duct banks were installed within the Con Edison system from the early 1900s to the 1940s. Con Edison estimates that approximately 12% of the entire underground conduit system contains wooden duct banks. The Brooklyn/Queens service

[84] Con Edison Response to Staff Discovery Request DPS 394.

area is comprised of approximately 15% wooden duct banks. Primary feeder failures caused by secondary cable fires within wooden duct banks are rare and have never been a major cause of feeder outages. Currently, Con Edison is replacing wooden duct bank sections in conjunction with secondary cable replacement. In light of the minimal effect wooden duct banks have on primary feeder failures, and the Company's existing replacement activity, no acceleration of wooden duct bank replacement programs is warranted at this time. Con Edison has stated, however, that it is currently performing studies that will evaluate the risk of fire damage from secondary cables, within wooden duct banks, to primary feeder cables. Con Edison should provide this study to Staff upon completion, including what recommendations it has for modifying its policy towards wood duct replacements.[85]

6.3.4.1 Recommendations

- Con Edison should initiate a formal program to reduce congestion within manholes and provide additional spacing between primary and secondary cables. The Company should make congestion and spacing issues a top priority for repair during routine inspection cycles. Con Edison should also consider the feasibility and associated costs to expand its current cut-and-rack procedure being implemented within the Long Island City Network as part of the recovery process of the remaining 56 underground networks within its service territory. The Company should provide Staff, within 90 days of the issuance of this Staff Report, with a report that shows it is initiating a formal program to reduce congestion within manholes.

6.3.5 Analysis and Findings - Cable Restoration Time

One of the factors the Company says contributed to the time it took to process feeders and restore them to service during the event was termed, "operational limitations due to other feeder work in the network." The Company claims that during the Long Island City Network event, it instituted a rapid restoration process to help expedite feeder processing. One element of this expedited process included the elimination of the use of trace currents to positively identify the feeder requiring work along with the short circuits or grounds on that feeder. Using a trace current as part of a feeder restoration can add several hours to the process, depending on the circumstances. Eliminating the use of trace currents to provide positive feeder identification,

[85] Con Edison Response to Staff Discovery Request DPS 30 and NYC Request 191.

however, limits the ability of the Company to apply test voltages safely to other feeders that are out-of-service. As a result, while crews performed expedited feeder repairs on one feeder, the restoration process on other feeders was limited, and overall restoration progress slowed. The Company attributed 26 hours and 39 minutes of feeder processing time to this factor.

Although this process was designed to expedite feeder processing time, in this case it may have limited the work that could be performed on other feeders by focusing efforts on just one feeder. Further analysis is needed to determine the usefulness of this process where multiple feeders are in need of restoration. The analysis should determine whether eliminating the use of trace currents could actually increase the overall restoration time when there are several other feeders simultaneously out-of-service.[86]

6.3.5.1 Recommendations

- Con Edison should analyze and report on the appropriateness of the expedited feeder processing scheme it used during the Long Island City Network incident and which is intended to be used when multiple feeders need restoration and during summer heat events. This should include determining whether or not eliminating the use of trace currents actually increases the overall restoration time when there are multiple feeders are out-of-service. The Company should provide a copy of the report to Staff by June 1, 2007.

6.3.6 Analysis and Findings - Cable Testing

When a feeder's circuit breaker opens, there are several step-by-step restoration steps that are to be followed by Con Edison employees before the feeder can be put back into service. One step is to perform what is called a Direct Current (DC) high potential (hipot) test (where high voltage is supplied to the feeder for a specified duration of time to see if any additional faults or failures can be detected before final restoration occurs). The hipot test is not normally used during summer events. However, given the need to restore the feeder back to service as soon as possible, the Company did use a modified hipot test during the later stages of the incident event, as described below.

After the 1999 Washington Heights Network outage, Con Edison was directed by the Commission to pursue alternatives to hipot testing due to the possibility of additional damage related to this type of testing. Hipot testing has been considered by some experts within the

[86] Con Edison October 12, 2006 Report, pages 4-8 and 4-9.

industry to be destructive because it involves stressing the cables above normal operating limits with very high voltages for short durations of time to see if any incipient failures are present in the cable, in which case the cable fails. An alternative being considered by the Company is "Very Low Frequency" (VFL) high potential testing. Sample testing of this alternative shows promising results on primary network feeders, although the overall sample size at this time is still too small to make any definitive conclusions. Con Edison has not implemented this type of testing as standard practice in place of hipot testing, and it continues to use hipot testing as standard practice during normal restoration efforts. As part of the Company's pre-summer hipot proof-testing program, Very Low Frequency hipot testing will be included along with the traditional DC hipot testing to prepare for summer periods.

Modified hipot testing was used during the latter stages of the Long Island City Network event due to the unusually high number of cut in open autos. The modification was to apply a reduced level of high voltage for a shorter duration of time, reducing the probability of causing damage to the cable while still trying to test the cables' integrities. Con Edison should determine if the Very Low Frequency (VLF) high potential testing is effective on underground network system, and, if effective, adopt such an approach as the Company's standard practice for testing primary cable for integrity by the summer of 2007. If not, the Company should accelerate the research and development of other alternatives to hipot testing with intent to have a new procedure in place by the summer of 2008.

Historically, and also as demonstrated during the Long Island City Network event, high cable and joint temperatures associated with operating a system beyond the design criteria are a leading reason for primary cable and joint failures. Currently, the Company does not include specific testing of cables and joints within its underground inspection criteria. Con Edison is reviewing the advances of both infrared and partial discharge,[87] testing technologies within the industry, although the Company has no specific plans for system-wide implementation for either of these testing technologies. Inclusion of these types of tests during normal underground inspections could help reduce cable and joint failures before they occur[88] by identifying weak spots that are more prone to failure. Accordingly, Con Edison should further

[87] Partial discharge testing is a method of checking the effectiveness of electrical cable insulation.
[88] Con Edison Response to Staff Discovery Requests DPS 58 and 390.

evaluate the use of infrared and/or partial discharge testing of underground cables and joints when conducting its normal underground inspections.

6.3.6.1 Recommendations

- Con Edison should determine if the Very Low Frequency (VLF) high potential testing is effective on underground network systems and, if effective, adopt such an approach as the Company's standard practice for testing primary cable for integrity by June 1, 2007. If not effective, the Company should accelerate the research and development of other alternatives to hipot testing with the intent to have such a new procedure in place by the summer of 2008.
- Con Edison should evaluate and report the effectiveness of performing infrared and/or partial discharge testing on underground cables and joints when conducting its normal underground inspections that are required by the Commission's Safety Standards. The Company should provide a report of its findings to Staff by June 1, 2007.

6.4 System Modeling

6.4.1 Background

The Company's engineering department uses several different tools for the design and analysis of network systems. Con Edison operators also use several different tools and computer programs to monitor changes within the distribution system and associated equipment. Below is a list of some of the tools and programs:

- The Distribution Information System, which shows feeder loading verses ratings;
- The Rapid Restore system, which sends and tracks operating orders electronically to select operating personnel;
- The Feeder Management System, which tracks the status of primary feeder processing and gathers information from the rapid restore system.
- The network Remote Monitoring System (RMS) which provides status, loads, adjacent transformer information, and demand-cycle graphs for network transformers;
- The Emergency Control System (ECS) which tracks emergency calls, including customer outages, manhole events, low-voltage complaints, and flickering lights calls;

- The Outage Management program, which is a web-based application that presents information from the Emergency Control System in a format that operators use to monitor the total number of customers out of, and thereafter restored to, service during an event;
- Poly Voltage Load Flow (PVL), which is a load flow program that models primary feeders and transformers and is used for engineering analyses; it can also be used to estimate loadings that will be imposed on the secondary system;
- World-class Operations Load Flow program (WOLF), which is a subset of the Poly Voltage Load Flow program that is used in real-time, load flow analysis environments.
- System Operations Computer Control System (SOCCSx), which provides a graphical display of the equipment status at the area substations, including breaker positions and feeder loads and voltages; this system is Con Edison's own version of a Supervisory Control and Data Acquisition (SCADA) system;
- Alarm monitors which send alarms from various sources to provide operators with both visual and auditory indications of changes in system conditions.

Con Edison's most powerful simulation tool is the Poly Voltage Load Flow program. This program is capable of simulating the entire primary system, along with limited portions of the secondary system. Given the complexity of the program, however, the simulation results are not generated quickly. Consequently, it is not used by itself during multiple contingency events or for day-to-day operations, where real-time information is necessary for operation of the system. Instead, it is the backbone for other tools used during these events and during everyday system operations. The program is also used to simulate the system to learn from past events and to prepare for the upcoming year in terms of load growth and load profiling. The model used by the Company currently has several limitations which inhibit its ability to accurately estimate secondary main section current flows. First there is no discrete geographical load representation of individual secondary main sections which complicates contingency and reinforcement analyses. Second, there are no discrete assumptions regarding unseen network damage and degradation which would reduce the network's ability to handle stress. Finally, there is minimal data available to validate model estimates of secondary system current flows with actual secondary system current flows at various network load levels.

Con Edison monitors the loading and status of the primary feeders with its System Operations Computer Control System. This system provides a graphical display and status of the Long Island City Network's 22 primary feeders and associated breakers status at the area substations. The system does not give information on other equipment, such as network transformers, network protectors, and the secondary system.

Con Edison relies on the World-class Operations Load Flow program as a real-time monitoring tool during contingency events. This program has the ability to simulate the entire primary system down to the network transformer secondary mains;[89] it provides the condition of all primary feeders, transformers, and network protectors. It uses current system conditions to simulate the next worst-case scenario[90] in a contingency event. The Poly Voltage Load Flow program is the backbone source of information for the World-class Operations Load Flow program, but real-time data are obtained from many other sources.

One of the main sources of data is the Remote Monitoring System. The Remote Monitoring System takes into account real-time data for transformers, such as temperature, loading, and status, which is transmitted via power line carriers from the transformers located throughout the network. Once a network reaches a fifth or sixth contingency, various equipment begins to overload (and/or overheat), does not operate as designed, and can also fail. In this situation, the network's operating condition exceeds its design criteria and the actual condition of the network is not effectively represented by the remaining remote-monitoring system data being transmitted back to the operators. Under these conditions, the Company has stated that the load flow program cannot converge or produce a complete and accurate simulation of the event situation and condition of the network.

Aside from the system conditions during multiple contingency events hampering the convergence of the World-class Operations Load Flow program, the absence of real-time loading data for the high-tension customers[91] throughout Con Edison's networks also presents difficulties for the load-flow model. Without this data, the model has trouble accurately predicting what is occurring out on the system, which leads to a failure of the model to converge.

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89 Secondary mains or secondary main sections are parts of the secondary network deemed of more importance than others.

90 Worst-case scenario: The loss of the most critical primary feeder still in service.

91 High-tension customers are those customers that receive power from the network at higher voltage than the 120/208 voltage normally received by residential and small commercial customers. These high-tension customers are predominately commercial and industrial customers.

Since the Washington Heights event, Con Edison was tasked with monitoring the loading of its high-tension customers as part of its modeling programs. To date, although several attempts have been made, the Company does not have high-tension customer loads included in its modeling programs. Staff understands that the Company is in the process of installing wireless demand metering technology for these high-tension customers system wide. Staff continues to track the progress of this issue to ensure complete compliance is accomplished.

6.4.2 Analysis and Findings

During the first two days (Monday, July 17 and Tuesday, July 18) of the network event, the World-class Operations Load Flow program experienced technical problems and was not fully available for use by the system operators. Instead of the network equipment information and conditions being transferred automatically from the other monitoring tools, such as the Remote Monitoring System, the information and conditions had to be transferred manually. Thus, it took more effort and time to complete the simulations, under circumstances when good analysis and reaction time were essential.

The Company needs to have a better understanding of what is happening on the network system, especially after a network reaches a fifth or sixth contingency. Although system operators have other tools to use when making network decisions during multiple contingency events, there still is a need to improve the World-class Load Flow system modeling tool to ensure that it lives up to its name and corrects the convergence deficiency.[92]

The Company uses its Poly Voltage Load Flow model to estimate loads on the network's secondary main sections under various contingencies, such as when transformers were disconnected and when secondary main section current limiters[93] were open or were damaged from overheating. The model relies largely on a load model representation that lumps the secondary loads to a network distribution transformer's low-voltage bus. As such, the model is not as accurate as might be desired. The simulations, however, were used primarily to understand, for recovery planning purposes, how extensively the underground secondary main section network may have been damaged and in what locations.

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92 Con Edison October 12, 2006 Report, pages 5 – 10, and Staff interviews with Company employees.

93 A current limiter (also referred to as a "load limiter") is a fuse-like device intended to isolate faulted secondary cable sections. A current limiter is essentially a fuse that connects one section of secondary cable with another and, in theory, melts if it exceeds a certain temperature. It is intended to disconnect two sections of secondary cable when excessive currents exist, which causes high temperatures, to protect the cable. Current limiters are a fairly rudimentary protection device.

The simulations take into account known network conditions, such as opened secondary mains and network transformers out-of-service. It is not clear, however, if the "as is" condition of the network regarding opened secondary main sections, and possibly other factors, is adequately captured in the modeling to recognize limitations that may have developed over time, but are unseen or unknown. Consequently, the physical inspection protocol being used to examine the secondary main sections for damage in the network should be used to provide statistics on the number of inoperative secondary main sections and opened current limiters. This information could then be incorporated into future simulations of the network.

Following the 1999 Washington Heights network shutdown, the Company embarked on a program to enhance its secondary network modeling. In its latest status report, the Company stated:

> The Company is working to identify and resolve secondary mapping and data quality issues in order to map load information to service points for six networks in three regional customer service areas. For example, service addresses maintained in CIS are often not consistent with service addresses maintained in the VM database, and the Company has developed a listing of address "aliases," i.e., a corner building may have alternate addresses – one of which is associated with the electric secondary service in VM and another associated with the billing address in CIS. The identification and resolution of such issues will require development of "workarounds" and mapping tools.
>
> After load information is successfully linked to the service points throughout a network, the Service Demand Estimator (SED) software will convert the service-point monthly kilowatt hours or peak demand data into peak summer coincident demands during a single time period. Following this, the Reconciliation software will reconcile the actual Remote Monitoring System (RMS) load information recorded at each network transformer with the SDE output so that the calculated load flow at each network transformer approximates the real time measured points at the secondary bus of each network transformer reported by RMS. At that point, the Company will be able to run Poly Voltage Load calculations to determine load flows on the secondary mains in order to identify mains that are open and mains that require reinforcement.

The Company's progress on this project has been insufficient and it appears that it has not been given sufficient priority. This project needs to be implemented on a priority basis, especially in the Long Island City Network.

6.4.3 Recommendations

- Con Edison should upgrade the World-class Operations Load Flow system program to make it more reliable during normal and emergency operating conditions, and make advances to be able to complete full system simulations, including secondary modeling, during multiple contingency events above the fifth and sixth contingencies. The Company should study all possible improvements and provide its findings and proposed actions with regard to the World-class Operations Load Flow program evaluation to Staff for review by June 1, 2007.
- The Company should improve the capability of its Poly Voltage Load Flow model to work on its secondary system, including accelerating its service demand estimator project. An emphasis needs to be given to developing in a systematic manner the data necessary to calibrate the model's expected secondary main section current flows with actual main section current flows at various network load levels.

6.5 Secondary Cable Analysis and Monitoring

6.5.1 Background

In Staff's Washington Heights network investigation, Staff found that the Company's ability to monitor secondary system performance was extremely limited and there was no accurate real-time monitoring. These factors limited the Company's ability to assess secondary system performance accurately during the Washington Heights Network event, so the Company was directed to make enhancements.

6.5.2 Analysis and Findings

While Con Edison has attempted to enhance its monitoring and modeling capabilities on the secondary system in recent years, little real improvement has been made since the 1999 Washington Heights Network shutdown. As noted elsewhere in this Report, the Company concentrated on and monitored the cascading failures of the primary feeders and essentially ignored the secondary system. Disregard of the secondary system is unacceptable, especially in light of the severe damage to the secondary system, lengthy service interruptions, and low-voltage conditions for consumers, which occurred during this event. With regard to modeling of the secondary system, that was done for recovery planning purposes, not to help monitor or minimize impacts on the secondary system during the course of the incident.

The Company needs to take a more active approach toward monitoring of the secondary systems under normal operating and multiple contingency event conditions to better understand the status of the system at all times. Possible tools/methods that could aid in monitoring the secondary system include advanced metering options that can provide feedback data, monitoring of selected portions and locations within the secondary network, and/or manual monitoring. Because the Poly Voltage Load Flow model provides little information regarding the secondary system and because it is not practicable to examine cable in duct work to detect first hand a problem on the secondary, it is likely that additional damage to the secondary system will go undetected until failure occurs.

In addition, the Company needs to investigate alternatives to the use of current limiters, which essentially are rudimentary fuses that are designed to isolate a faulted or severely overloaded cable from the grid under normal operating contingencies. As in the case of the Long Island City Network event, under multiple contingency events, current limiters do not coordinate well with other protective devices and, thus, fail to adequately protect the secondary network system.

Information about a variety of conditions that were happening throughout the Long Island City Network were available to operators and managers through a variety of individual sources, but not necessarily in a manner that made for effective decision making. The Company should develop a graphic display that will be available to operators and managers and which, based on information obtained from monitoring equipment and other information, overlays primary feeder outages, transformer overloads, manhole events, consumer outages, and other pertinent information. This would allow for a more informed decision-making process because key information would be tied together and easier to analyze. Finally, given the extensive damage to the network and the variety and breadth of problems discovered during the recovery effort, the Company should also inspect all manholes and service boxes in the network and make repairs as soon as possible.

6.5.3 Recommendations

- Con Edison should develop a graphic operator's display, available to operators and managers, which overlays feeder outages, transformer overloads, manhole events, customer outages, and other pertinent information to allow for a more

informed decision-making process. The Company should complete development of the display and provide Staff with a demonstration by June 1, 2007.

- Con Edison should inspect all manholes and service boxes in the Long Island City Network as soon as possible. The Company should notify Staff upon completion of these tasks.
- Con Edison should investigate ways to improve its monitoring of the secondary system during normal and multiple contingency event conditions. If it is unable to develop an adequate technical solution by June 1, 2007, it should develop a manual solution. The Company should report the outcome of its investigation and plans by June 1, 2007.
- Con Edison should investigate alternatives to current limiters and provide a report to Staff within 90 days of this Report.

6.6 Transformer Analysis

6.6.1 Background

The Long Island City Network has a total of 1,198 underground network transformers with an average pre-event age of 20.8 years.[94] The Long Island City Network transformers step down the 27 kV primary system voltage to the 120/208 secondary voltage used by the network consumers. The transformers are located throughout the network in underground vaults. On the secondary system side of each transformer is a network protector switch. This switch is designed to remain closed and in operation during normal conditions, and will open upon sensing a problem or fault on the primary system, to prevent current from the secondary system feeding back onto the primary system. The opened or closed position of these network protector switches, along with the condition and loading information of each transformer, is transmitted back to the control center via the Remote Monitoring System. Information transmitted by the Remote Monitoring System is then used by various system monitoring tools and by system operators to analyze the condition and status of the network.

6.6.2 Analysis and Findings – Transformer Failures

Prior to Monday, July 17, there were 25 transformers (2% overall) that were out-of-service within the Long Island City Network. Even though this is a small percentage of the total number of transformers, every time a transformer fails, or is out-of-service for maintenance, the

[94] System-wide, Con Edison has 24,569 underground transformers with an average age of 21.6 years.

other nearby transformers within the same load area must pick up the required load. For example, prior to the Long Island City Network event, failure of 2% of the transformers put surrounding transformers above their normal operating ratings and put the transformers into contingency conditions even without a primary feeder being out-of-service. In particular, there were two transformer failures that occurred (one on June 29 and the other on July 11) within a couple blocks of each other, which increased the loading on transformer F529863. Then on July 17, at 9:43 p.m., the Long Island City Network went from a 4th to a 5th contingency when transformer F529863 overheated and primary feeder 1Q20 tripped off-line. The fact that this transformer was already operating above[95] its normal operating ratings certainly could have been a major reason for its eventual failure under these multiple contingency conditions.

The failure of transformer F529863 increased the contingency level of the Long Island City Network to a 5th contingency. Thus, even a small percentage of transformer failures can have a major impact on the operation of a network. The Company needs to better assess the effects of multiple transformers out-of-service within a localized area and its affect on the nearby transformers that are required to pick up the remaining load. This should especially important when the Company forecasts high heat events.

From Monday, July 17 and throughout the remainder of the event, the number of transformer failures and transformers that were operating above their normal operating ratings continued to increase. By the time the first 10th contingency (i.e., the first time 10 primary feeders were out-of-service at the same time) was reached Tuesday, July 18 at 8:38 p.m., a total of six transformers had failed due to overheating, approximately 35 transformers were identified as over temperature and 14 transformers were identified as overloaded.[96] However, Con Edison reported during the Technical Conference held on October 26 and 27, 2006 that only 10 of 700 transformers in the most affected part of the network were overloaded at the time of the first 10th contingency, on Tuesday, July 18.

During the Long Island City Network event, a total of 13 transformers failed. The results (see table below) of an in-depth transformer autopsy report completed by Engineering

[95] Transformer autopsy results showed the transformer temperature gauge was over 160°C, the winding hot spot was calculated to have reached 164°C (designed to 135°C), and the top oil temperature was calculated to have reached 141°C (designed to 125°C).

[96] Con Edison Response to Staff Discovery Request DPS 150.

Systems, Inc. (ESI)[97] showed that one transformer failed due to a mechanical failure on a primary connection bushing,[98] two failed due to corrosion, and the remaining 10 transformers failed due to overheating.

Long Island City Network Outage Transformer Failures						
Date	**Time**	**Contingency[99]**	**Trip Type**	**Feeder**	**Age**	**Failure Type**
7/17/06	21:56	4^{th} to 5^{th}	CIOA	1Q20	40	Overheating
7/17/06	21:56	5^{th} to 6^{th}	CIOA	1Q01	41	Overheating
7/18/06	15:14	5^{th} to 6^{th}	OA	1Q18	18	Overheating
7/18/06	20:33	7^{th} to 8^{th}	OA	1Q12	21	Overheating
7/18/06	20:33	8^{th} to 9^{th}	OA	1Q15	43	Overheating
7/18/06	21:49	9^{th} to 10^{th}	CIOA	1Q16	42	Overheating
7/18/06	20:55	4^{th} to 5^{th}	CIOA	1Q17	45	Corrosion
7/18/06	23:57	7^{th} to 8^{th}	CIOA	1Q18	18	Overheating
7/19/06	00:06	8^{th} to 9^{th}	OA	1Q19	37	Overheating
7/19/06	21:29	6^{th} to 7^{th}	OA	1Q17	34	Overheating
7/20/06	08:11	4^{th} to 4th	FOT	1Q16	13	Bushing
7/21/06	17:25	1^{st} to 2^{nd}	OA	1Q19	29	Corrosion
7/22/06	20:33	0 to 1^{st}	OA	1Q17	41	Overheating

In general, with the exception of load reduction procedures, there are limited ways to reduce the loading on the transformers in a network system during multiple contingency events. The failure of 10 transformers due to overheating--out of the transformers operating within the secondary system--in and of itself, is not a large percentage of transformers affected by overheating. Every time a transformer fails due to overloading or overheating it causes a fault, and the associated primary feeder circuit breaker opens, putting the primary feeder out-of-service and causing the contingency level to increase. As stated above, it is not appropriate to measure

[97] The transformer autopsies were observed by Staff.

[98] A primary connection bushing is a type of connector used to connect the primary cables to the primary side of a network transformer.

[99] Contingency refers to the number of primary feeders out-of-service. When a transformer fails, it causes the primary feeder to trip. In most instances, the transformer can be isolated after the fault location is determined and the primary feeder returned to service.

the significance of the number of overheated transformers against the total number of transformers operating in the system, when the real significance of the number is with the associated number of primary feeders placed out-of-service as a result of the transformer failures. Given that there are 22 primary feeders serving the network, the overheating of 10 transformers was significant because it caused 10 primary feeders to go out-of-service when their associated circuit breakers opened. Referring to the transformer failure table shown above, on Tuesday night, July 18, four out of the five feeder failures that escalated the Long Island City Network's contingency level from a fifth to the tenth were caused by transformers overheating.

Transformer F529863, as discussed above, and other transformers during the event were operated by Con Edison well above their emergency ratings. Transformer normal and emergency ratings are determined by Con Edison's specification EO-2002. This specification sets out criteria for determining normal and emergency ratings, which includes identification of when a transformer is overloaded or overheated. To determine when a transformer is overheated, the Company calculates a maximum allowable winding hot-spot temperature and top oil temperature limit for each transformer that should not be exceeded during any hour of the load cycle. The winding hot-spot temperature is the maximum allowable temperature of the internal coil windings of the transformer. The top oil temperature is the maximum allowable temperature of the oil within the transformer. The maximum winding hot-spot temperature and top oil temperature is calculated using several parameters, including the loading, physical characteristics of the transformer, transformer vault conditions, daily load factor, operation modes, and ambient temperature. These parameters are a combination of both loading and heating factors; the two are very closely related and affect one another jointly.

In general, Con Edison should, adjust its normal and emergency ratings for all of its transformers and factor those ratings into its planning to improve network predictability and reliability. During the Long Island City Network event, once the network was operating above a second contingency, transformers easily and quickly exceeded their normal and emergency ratings.

Specifically, one adjustment that needs to be made concerns the data point used for calculating the winding hot-spot temperature and top oil temperature, per specification EO-20002. This data point is currently 79°F , which represents the 24-hour constant average summer ambient temperature determined by the Company. This data point (79°F), however,

should not be determined using a 24-hour constant average summer ambient temperature. Rather it should reflect, based on historical data, the hottest periods of the day when the loading is the highest[100] in order to ensure that normal and emergency ratings are based upon realistic operating possibilities.

The transformer autopsies also revealed that two out of the 13 network transformer failures were caused by corrosion (see table). Corrosion on a transformer can either cause a transformer to leak its internal oil or allows moisture into the transformer, which contaminates the internal transformer oil. The oil within a transformer acts as both an insulating medium and a cooling mechanism for the internal coils. When the oil level drops due to a leak or the oil becomes contaminated with water, the oil's ability to insulate and protect the transformer's internal coils is adversely affected, and the transformer is more susceptible to overheating.

Until recently, Con Edison network transformers have been inspected once by the time they are 10 years old, every five years from 11 through 25 years of age, and every three years thereafter, as required by the Company's network transformer inspection specification EO-10110. In addition to specification EO-10110, Con Edison also has a system-wide inspection criterion that requires the inspection of all Company facilities once every five years in compliance with the Commission's 2005 Safety Standards Order.[101] Inspections required under specification EO-10110 are much more in-depth than the simple visual inspections required under the Safety Standards Order. In addition to those regular inspections, however, the Long Island City Network event resulted in an extensive, targeted inspection effort within the network. As of December 8, 2006, in the Long Island City Network, there were 842 transformer inspections completed by the Company. Of those 842 transformers, 81 were targeted for replacement and seven for repair; another 91 have been placed on a watch list for having higher than normal dissolved gas-in-oil samples. Of the 88 transformers targeted for replacement, over half were due to corrosion issues.

The high quantity of transformers found to have corrosion is alarming. It indicates that the Company's previous inspection procedures failed to identify those transformers with corrosion issues adequately. At the end of 2005 and beginning of 2006, the Company started

[100] Con Edison Response to Staff Discovery Requests DPS 50, 150, 153, 168, 176, and 210.

[101] Case 04-E-0159, Order issued January 5, 2005 establishing Electric Safety Standards including requirements for inspection of utility facilities.

using cathodic protection[102] on all new transformers being installed in the system along with any existing transformers that have been inspected since that timeframe. This entirely prospective approach, while a step in the right direction, does not go far enough and fails to address concerns about the numerous transformers currently operating throughout the entire system without cathodic protection.[103] Additionally, given the condition of transformers that were identified during the targeted inspection efforts immediately following the event, the transformer inspection requirement, per the Commission's five-year inspection cycle, must now include a pressure test and gas-in-oil analysis. This test and analysis would help to identify proactively problems with transformers.

As stated above, with the exception of load reduction, there are limited ways to reduce the loading on the transformers still in service in the network. The Company's only practical option to keep the transformers from overloading and failing due to overheating[104] is to cool them either with air or water. During the network incident, 75 transformers were cooled--73 by water and two by air. Of the 75, seven eventually failed due to overheating, even with the cooling efforts. By contrast, during the 1999 Washington Heights Network event, 32 transformers were cooled[105] and only two failed during the entire event. The number of transformers requiring cooling--along with the ones that actually failed--during the Long Island City Network event met or exceeded the highest quantity of cooling efforts experienced by the Company. The Company, given past experience, along with the large amount of cooling efforts required, should have recognized the severity of the situation. Although transformer cooling efforts are standard practices for the Company, the number of transformers requiring cooling due to overloading and/or overheating, and past experience, makes this event extreme, and thus, such cooling activities during the event should not have been considered a standard network system operational practice.[106]

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[102] Cathodic protection systems impress an electric current into the metal that prevents the otherwise naturally occurring corrosion reaction of electrons and iron atoms within the metal that eventually causes rust and corrosion when moisture is present.

[103] Con Edison Response to Staff Discovery Request DPS 58.

[104] Transformer ratings are calculated in terms of loading or kVA. The kVA produced is a function of the current, which dissipates heat. The thermal limits of a transformation are what ultimately governs whether it will fail or not. The higher the loading, the higher the operating temperature of the transformer.

[105] Con Edison Response to Staff Discovery Request DPS 397.

[106] Con Edison Response to Staff Discovery Request DPS 150 and NYC Request 244.

6.6.3 Recommendations

- Con Edison should consider adjusting transformers' normal and emergency load ratings to take into account the actual ambient temperatures experienced within its service territory, instead of just using a constant ambient temperature. The feasibility of this should be evaluated and reported to Staff within 90 days of the issuance of this Report.
- Con Edison should immediately take into account transformers out-of-service within localized areas and their effects on the surrounding transformers loadings, especially when high summer heat events are forecast.
- Con Edison should define when a transformer requires external cooling efforts. Further, Con Edison should study the effects on a transformer of both water and air cooling when operating beyond its normal and emergency design limits. Inspection criteria for transformers that have been overloaded, overheated, and cooled should be studied and re-evaluated to ensure an appropriate frequency of inspections. The results of these studies should be reported to Staff by June 1, 2007.
- Con Edison should complete the inspections and replacements as necessary of all transformers within the Long Island City Network by June 1, 2007. The inspections should include a pressure test and dissolved gas-in-oil test for all transformers effective immediately.
- The Company should amend its requirements for its five-year inspection cycle to include a pressure test and dissolved gas-in-oil test for all transformers effective immediately.

6.6.4 Analysis and Findings – Transformer Equipment & Modeling

During the Long Island City Network event, there were several cases where the network protector switches on the transformers did not open as designed. If a network protector does not operate properly, then a condition known as "alive on back feed" can exist. This condition occurs when a primary feeder opens automatically and is out-of-service, but the network protector switch stays closed instead of opening, which allows voltage and current to flow in reverse direction from the secondary to the primary system. This condition hampers restoration efforts because, until cleared, crews cannot safely start their repair efforts. This

condition was identified by the Company as one of the issues that slowed feeder restoration efforts during the event.

Due to the number of primary feeders out-of-service, it was found that some areas of the secondary system were experiencing very low-voltage conditions. These voltages, in some cases, were below the level needed for operation by the network protector relays. Thus, some of the relays did not operate as designed and thus, failed to open the network protector switches to prevent the alive on back feed condition. Currently, there are three types of relays used for network protectors: micro-processor, solid-state, and electro-mechanical. The electro-mechanical relays require a minimum of 60 volts to operate properly, the solid-state relays require 50 volts, and the micro-processor relays require only 13 volts. During the network event, remote monitoring systems recorded transformer secondary voltages as low as 26 volts in some areas; consequently, the only relay that would operate correctly would have been the micro-processor relay. The following identifies the types and number of network protector relays in Con Edison's system to the extent they have been identified.[107]

Network Protector Relays					
Area	**Electro Mechanical**	**Micro-Processor**	**Solid State**	**Unknown**	**Totals**
Long Island City*	113	639	95	390	**1237**
Brooklyn	268	2635	430	2412	**5745**
Manhattan	1679	5519	1168	902	**9268**
Queens	477	2495	410	1974	**5356**
Staten Island	24	120	14	178	**336**
Westchester	394	641	61	1004	**2100**
Bronx	708	1317	219	585	**2829**
Totals	**3550**	**12727**	**2302**	**7055**	**25634**

***** *The Long Island City Network protector relay quantities are not included in the totals shown at the bottom of the table.*[108]

Con Edison should evaluate how to reduce the number of network protector relays that fail to operate due to low-voltage conditions within the secondary system and also prevent or at least reduce the number of alive on back feed conditions that occur and hamper restoration

[107] Con Edison October 12, 2006 Report, section 5.12.1.
[108] Con Edison Response to NYC Discovery Request 173.

efforts. The Company should also provide an analysis of the feasibility and cost for replacing the nearly 13,000 non-micro-processor relays system wide.

Con Edison system operators rely on the Company's Remote Monitoring System to monitor network transformers and associated network protector switch conditions. Since the original installation of the system in 1982 until today, there have been three generations of monitoring units installed in the Con Edison system, totaling approximately 25,000 units in all. The amount of data received from the units has increased with every new generation, with the original units reporting the network protector switch position, oil temperature, and some vault conditions. The third generation units report percentage load, oil levels, tank pressure, phase voltages, and status. Con Edison's specifications require a minimum of 95% functionality for the Remote Monitoring System within each network.[109] On July 17, the day the network event started, there were only 79.9% of the units operating and transferring data to the control room. This is well below the Company's threshold of 95% required by Company operating procedures to provide reliable information to operators.[110] Comparing the percentage of units operating within the network with the percentage of units responding in other Con Edison networks reveals that the Long Island City Network Remote Monitoring System had the lowest percentage of units operating compared to all the other networks in the system.

The Company claims that a patent on the original technology for the Remote Monitoring System has limited the options the Company had available to improve the system's operating functionality until recently. Only since the recent expiration of these patents has the Company been able to identify other qualified vendors to provide improved replacement equipment. These new vendors are now producing the most recent third generation of units with improved functionality and performance. Since the outage event, the Company has also been completing repairs on units that were not reporting properly, along with installing the third generation of units. The reporting rate for the Remote Monitoring System units on the Long Island City Network, as of October 2006, rose to 97.8%.

With the units' reporting rate being at 79.9% during the event, the system operators used other tools to evaluate the condition of the transformers. The Company's Remote Monitoring Estimator was used to estimate the loads for transformers not reporting. This

[109] Con Edison specification EO-10110 – Inspection and Maintenance of Network Type Distribution Equipment.
[110] Con Edison Response to Staff Discovery Requests DPS 251 and 277.

estimator, however, is not as accurate or reliable when used in multiple contingency events. The Transformer Operations & Maintenance System was then used to prioritize which transformers may require external cooling. The Company stated that the reduced number of Remote Monitoring System units reporting in the Long Island City Network did not have a significant affect on the system operators' abilities to know what was happening at the transformer level. Staff disagrees with this statement. The low percentage of Remote Monitoring System units operating did affect the operators' overall understanding of transformer conditions throughout the system and this is something that needs to be addressed by the Company. Technology is now available to the Company to improve the functionality and reporting rate of the units within the network, and the Company needs to implement the same effort for the entire system to make the needed changes and ensure the reporting rate meets the specification requirements system wide. The more information the system operators have about the system and what is happening in the field, the more decisions will be made with higher levels of confidence.[111]

6.6.5 Recommendations

- Con Edison should evaluate how to reduce the number of network protector relays that fail to operate due to low voltage conditions within the secondary system and also prevent or at least reduce the number of alive on back feed conditions that occur and hamper restoration efforts within 90 days of issuance of this Report. The Company should also provide feasibility and cost analysis for replacing the nearly 13,000 non-micro-processor relays system-wide by June 1, 2007.
- Con Edison should increase its reporting percentage for Remote Monitoring System units system-wide and become compliant with specification requirements of 95% functionality by December 31, 2007. The Company should submit within 90 days an analysis of the feasibility and cost for upgrading all Remote Monitoring System units to the new third generation unit by 2010.

6.7 Substation Analysis

6.7.1 Background

The North Queens Substation was originally placed into service in 1950. The substation has five transformers whose supply is derived from the Astoria East 138,000-volt

[111] Con Edison Response to Staff Discovery Requests DPS 251, 277, 384, and 392.

transmission substation. The transformers step down the 138,000 volts to 27,000 volts. The transformers then supply an H-configured distribution bus with four main sections and a test bus connecting these four main sections. The network feeders are supplied from the four main load sections via circuit breakers. There are a maximum of eight breakers supplied from each bus section. Four of the breakers are used for the 22 network feeders, while the others are used to supply non-network loads, capacitor banks, or are spare positions.

Throughout the Con Edison system, the Company is currently in the process of replacing older, original equipment circuit breakers with modern rack-out-type[112] circuit breakers. Rack-out-type circuit breakers allow for faster feeder processing with the use of a ground and test unit once the breaker has been racked out and disconnected from the switchgear. The original style breakers were stationary within the switchgear, which limited the options for installing ground and test units to perform tests at the bus location or at the outgoing feeder terminations. The breaker replacement program is being done both to resolve breaker over duty concerns as well as to replace obsolete types of breakers. The North Queens Substation is currently part way through the breaker retro-fit program with 13 out of the 22 network feeder breaker positions converted to rack-out-type breakers, with the remaining units scheduled to be completed before the summer of 2007.

6.7.2 Analysis and Findings – Inrush Currents

As part of the second event that Con Edison claims started the Long Island City Network incident, the North Queens Substation rack-out-type feeder breakers did not perform as designed. At 6:48 p.m. on Monday, July 17, a termination fault on feeder 1Q21 resulted in the entire 3S bus section in the North Queens Substation to trip off-line, essentially acting as the next line of safety protection when feeder breaker 1Q21 did not open or operate as designed. It was found that one of the open sliding contact fingers in the control wiring circuit of the feeder breaker for 1Q21 was not making proper contact, which prevented the relay trip signal from reaching the breaker trip coil and resulted in the failure of the breaker to open as designed. There are two slide contact blocks on each breaker, with 12 sliding contacts per block, for a total of 24 sliding contacts. These contacts are the main electronic circuitry connection point between the actual rack-out breaker and the switchgear compartment. Substation breaker 1Q21's alarm

[112] A rack-out-type circuit breaker is a complete unit that can be easily slid in and out of a breaker compartment to more easily facilitate repair work and returning the breaker to service.

notification circuit wiring was also found to be defective in that the alarm condition was not being sent to the control panel to indicate a problem, as it should have. These two issues combined caused the entire 3S bus to trip out, which in turn affected three Long Island City Network feeders (1Q07, 1Q15, and 1Q21), along with one radial feeder (1Q81). Consequently, the three primary feeders tripped open and the Long Island City Network event escalated from a second to a fifth contingency.

The 1Q21 breaker had been upgraded to the new rack-out-style breakers in the spring of 2002. The breaker was inspected and tested on March 7, 2006 and operated on April 18, 2006. This means that the misaligned and improper contact between the sliding contact fingers of the rack-out breaker that led to the trip of the 3S bus occurred sometime between April 18 and Monday, July 17, 2006. Because the breaker contact fingers and circuitry wiring are located within the switchgear and breaker enclosure, they are not immediately visible to substation operators. As such, during this period of time, no Con Edison employee noticed the condition of the contact fingers on the breaker or identified the defect in the breaker circuitry because the test procedure did not check out the supervisory controls that went back to the Substation Control Center. This is not acceptable and Con Edison needs to address the substation breakers' testing and inspection process to ensure this does not happen in the future.[113]

During the Long Island City Network event, there were a total of 16 times that circuit breakers reopened after being closed to restore primary feeder service. Of those 16, four were attributed to what the Company calls inrush current. In the October 12 Con Edison report, the Company states that when the breakers were reclosed in an attempt to restore these four primary feeders to service, high currents triggered the operation of the protective relays, which then tripped the circuit breaker, causing the feeders to trip out-of-service. The Company attributes this high current to the high connected transformer loading per feeder within the network during normal operating conditions.

The Company says that inrush current sometimes occurs on large network systems with a high connected transformer capacity per primary feeder in excess of 32 MVA. In these cases, the initial inrush of connected transformer magnetizing current can reach eight times the normal current level upon closing of a primary feeder's circuit breaker. Con Edison says that its operators had never experienced a phenomenon of inrush currents causing circuit breakers to

[113] Con Edison October 12, 2006 Report and Staff discussions with Company employee Mucci.

open upon reclosing (cut in open auto). The following table identifies the reasons the breakers reopened.

Cut In Open Autos (CIOA)	
Type	**Quantity**
Bus Trip	1
Transformer*	5
Cable	2
Joint*	7
Other*	1
Total	**16**

***** *Quantity of Cut In Open Autos the Company attributed to inrush current: (2) Joint, (1) Transformer, and (1) Other.*

Some of the Company's statements regarding inrush current are misleading. First, there were only a total of four situations during the network event that were attributed to inrush currents out of the 16 cut in open auto events. Further, there were only three of these that occurred during the height of the event when multiple primary feeders were out-of-service. The fourth occurred on Sunday July 23, when there were no other feeders out-of-service. As such, this phenomenon was not a major cause of the network event. Second, Con Edison referred to the inrush current as a phenomenon that system operators neither recognized nor previously experienced. Inrush current, however, is a well-known issue within the electrical engineering field and by utility system operators. In addition, from January 1, 2003 to August 1, 2006, the Long Island City Network has experienced a total of 73 cut in open autos, compared to the next worst network (Richmond Hill, in Queens) with a total of 26 cut in open autos over the same time period. If Company engineers and operators truly did not recognize or understand the phenomenon, this would lead one to conclude that the Company was not paying enough attention to past experiences in the network with regard to cut in open auto events.[114]

Con Edison needs to take the steps necessary to understand the causes and effects of inrush current in its underground networks. In its October 12 report, the Company addresses the inrush issue by stating that it will be reviewing circuit breaker relay settings on feeders within the network with 32 MVA or more of connected load by this coming summer. Otherwise, the Company offered virtually no analysis of this issue within the report.

[114] Con Edison Responses to Staff Discovery Requests DPS 30, 204, and 234 and Con Edison's October 12, 2006 Report.

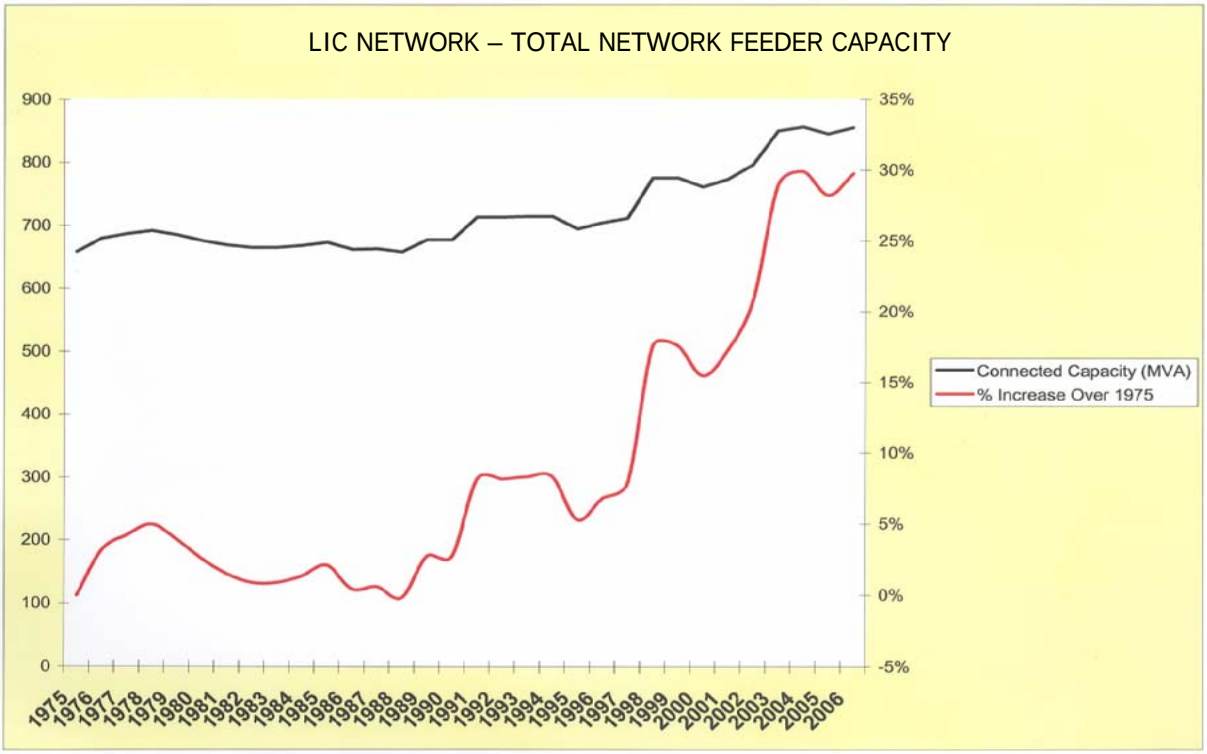
In response to the network event and occurrence of inrush on the system, the Company has been raising the mechanical relay trip settings to their upper limits to account for inrush current levels. The change in mechanical relay trip settings, however, has resulted in fault current protection margins well below the Company's 50% preferred fault current margin, in a few cases the fault current margin reduced to 9%. The Company also plans to install in the Long Island City Network, by December 31, 2007, new micro-processor relays on the circuit breakers, which it states can identify inrush current much better than the existing relays in place, and will help avoid tripping of the breaker due to inrush current. Con Edison should not be raising the trip settings without having first performed a thorough risk analysis of the operational issues that it creates. It is possible that equipment will operate beyond acceptable limits and thus would not be taken out-of-service in a timely manner. Raising the relay limits could cause equipment damage. Raising the settings to prevent one feeder failure, in and of itself, is not warranted.

The Company concluded that higher relay trip settings do not present any additional risks to the system or related equipment. The Company indicates that where adjusting the settings on mechanical relays is not an option, micro-processor relays are being installed. Staff is not satisfied with the Company's limited analysis of adjusting relay settings that was provided in its October 12, 2006 report. Staff recommends that the Company provide a full report of its analysis and risk assessment with regard to adjusting the relay settings by March 1, 2007, at which time Staff will assess whether adjusting relay settings to their upper limits is appropriate.

The Company proposes to adopt a new procedure (EO-2147) which outlines the responsibilities for the review of protective relay settings for 13, 27, and 33 kV feeders and new procedures for notifying relay engineers of changes within a network on associated feeders and the installation of additional transformers that would increase the total connected transfer loading above 25 MVA per feeder. The new procedure would help ensure that proper personnel are informed of changes within a network and equipment settings and adjustments can be made as needed.

For other networks, the Company says that it will also conduct an investigation into the inrush issue for feeders that have connected transformer loading in excess of 32 MVA. It has identified 22 out of its 57 area networks with at least one primary feeder with 32 MVA or more of connected transformer loading. Networks within Queens, Brooklyn, and the Bronx have the

majority of these feeders. Currently within the Long Island City Network, there are 17 of 22 primary feeders with loading in excess of 32 MVA. This is the largest percentage system-wide by a sizeable margin.



As shown in the graph above, the total connected load in MVA has been steadily increasing over the years within the Long Island City Network. Thus, the Company is attempting to address the inrush current issue by setting breaker relay trip settings higher, changing the types of relays used within the breakers, and lowering the connected load threshold per feeder. These solutions, however, are reactionary and not produced by any real in-depth analysis of the inrush current issue and its effects on the system and equipment. Deeper analysis is warranted into these topics to ensure that the best solution is implemented going forward.[115]

6.7.3 Recommendations

- Con Edison should perform a complete test and inspection of all similar substation breakers to the rack-out-type breaker that failed in the Long Island City Network. The Company should notify Staff of completion of the tests, inspections, and results by June 1, 2007.

[115] Con Edison Response to Staff Discovery Requests DPS 276 and 355; Con Edison's October 12, 2006 Report, pages 4 - 15.

- Con Edison should evaluate and report on the effectiveness of its current testing, inspection, and maintenance procedures. The Company should provide a copy of the report to Staff within 90 days of issuance of this Report.
- The Company should provide a full report of its analysis and risk assessment with regard to adjusting the relay settings within the LIC Network to Staff by March 1, 2007, at which time Staff will assess whether adjusting relay settings to their upper limits is appropriate.
- The draft procedure EO-2147, should ensure that all future changes and modifications to networks and associated equipment are identified and shared with the relay engineers so that proposed settings and adjustments can be made as needed. The draft procedure should be finalized and submitted to Staff for review by June 1, 2007.
- Con Edison should perform an in-depth study of the effects of inrush current on substation circuit breakers and the overall system to determine the best solution for addressing the problem and validating the 32 MVA threshold currently being used by the Company. The Company should provide Staff with a copy of the study report for its review within 90 days of the issuance this Report.
- Con Edison should install microprocessor relays on substation breakers with more than 32 MVA of connected transformer capacity by December 31, 2007. The Company should provide a replacement schedule to Staff within 30 days of issuance of this Report. This schedule should emphasize the Company's efforts to complete as many replacements as possible before June 1, 2007.

6.7.4 Analysis and Findings – Division of Long Island City Network

Historically, a large number of open autos and cut in open autos have occurred within the Long Island City Network. Several issues, such as inrush current and the high percentage of open autos and cut in open autos seem to be directly related to networks with a large geographic size, high number of feeders, and high connected load. When you compare the Long Island City Network to Con Edison's other distribution networks such as Jamaica, Flushing, Richmond Hill, and Borough Hall, the Long Island City Network has the highest connected capacity and demand per feeder. The network also has the second highest number of customers and the third highest

number of primary feeder cable miles. Consequently, consideration needs to be given to reducing the size of and the number of customers on the Long Island City Network.

Substation capacity and the amount of connected load are the main factors considered by the Company when it determines whether to add a new substation in a specific area. Con Edison's 2006-2015 area substation and subtransmission load relief program has a new substation tentatively scheduled for the Long Island City Network area in 2015, which Staff understands may recently have been rescheduled to 2013. The addition of this substation would essentially split the network in half, which would reduce the length of the feeders required for each network and reduce the amount of connected transformer loading throughout. In the interim, in response to the Long Island City Network incident, Con Edison is adding two additional feeders to serve the network by the Summer 2007 to help reduce the amount of connected loading per feeder. This feeder addition is a short-term fix to the overall problem because it does little to reduce the length of the feeders serving the Long Island City Network. Con Edison needs to accelerate the addition of the new substation (sooner than 2013 if feasible) to the Long Island City Network to ensure that Con Edison's service in the Long Island City Network is reliable.[116] The Company should also increase efforts in the Long Island City Network to enhance demand reduction and energy efficiency programs. These programs are discussed in further detail later in the report.

Con Edison has a team of engineers working on the design of the third generation of Con Edison's distribution system, including substation planning, referred to as 3G. That project team has been exploring technologies employed by large metropolitan utilities throughout the world. It is evaluating alternate system designs that could reduce the all or nothing approach characteristic of Con Edison's distributed networks. The third generation team should apply what it has learned to see what alternatives might be available for the Long Island City Network. In the course of Staff's review of the Company's analyses supporting the recovery effort, Staff reviewed a summary of a set of analyses conducted by the Company which looked at the possibility of dividing a distribution network into several "Mini Grids" which were supplied from a single distribution substation, but were electrically isolated (or separated) from each other. The potential advantage of such configurations is that if a severe multiple contingency primary feeder outage situations developed in one or more of the "Mini Grids", those elements

[116] Con Edison Response to Staff Discovery Requests DPS 147 and 354.

could be isolated (or shut down) without jeopardizing the majority of the customers supplied from the single distribution substation. Such configurations could increase the likelihood of more frequent (short duration) outages within the network, but prevent the type of widespread secondary network damage experienced in the Long Island City Network. Staff strongly suggests that the Company do the appropriate studies quickly to analyze the possibility of partitioning the Long Island City Network into some combination of "Mini Grids" until such time as a second substation can be built to reduce the risk of another large-scale outage event.

6.7.5 Recommendations

- Con Edison should analyze the feasibility and incremental costs, as well as other pertinent information, for accelerating the process to have a new substation in place within the network area as soon as possible. The Company should provide Staff with the results of the analysis within 90 days of issuance of this Report.
- The Third Generation (3G) team should evaluate alternatives to adding a new substation. The analysis should also assess the feasibility of partitioning the network into sections which are electrically isolated from each other at the secondary voltage level. The Company should submit a report to Staff within 90 days of issuance of this Report.

6.8 Temperature Design Criteria/Temperature Variable

6.8.1 Background

Con Edison has established a reference temperature of 86°F as its temperature criterion for the design of the entire system and its associated equipment. It refers to this reference temperature as the Temperature Variable. It is a measure of ambient temperature (called dry bulb) and humidity (called wet bulb) and is intended to represent the average of the highest three-hour wet and dry bulb temperatures each day over a three-day period. To capture the heat buildup effect, it weighs the current day's weather forecast at 70%, the prior day at 20%, and the day prior at 10%. The 86°F temperature variable used by Con Edison is based on a 94°F dry bulb temperature and a 78°F wet bulb temperature, which corresponds to a relative humidity of 50%. The Company stated that it expects the temperature variable to be exceeded once every three years. Whether the temperature variable is exceeded one time or multiple times in a given year, the Company would simply consider it as having been exceeded for the year, and would not take automatic corrective action.

6.8.2 Analysis and Findings

Since August 1, 1997, Con Edison's reference temperature variable of 86°F has been exceeded in five of 10 years or every other year. The temperature variable also has been met or exceeded a total of 13 times over this 10-year period, an average of 1.4 times per year. The Company's data covering the last 51 years shows that it has been exceeding the one-in-three year criterion on a regular basis. Therefore, the Company has exceeded its temperature variable for greater than once every three years, yet the Company states that a modification of the 86 degree threshold is not warranted.[117] The Company's emergency planning process does not account for how often the temperature variable has been exceeded within given years and whether more frequent stressing of equipment reduces service life or makes equipment more susceptible to failure. The Company's system, however, is actually exceeding its own reference temperature at a rate four times more than it intended. Staff is concerned about the validity of an 86°F reference temperature and how it is used by the Company.

It should also be noted that Con Edison's design temperature criterion of 86°F was not exceeded during the outage event. On July 17 and 18, when the ambient temperatures reached into the low 90's, the temperature variable was calculated to be 86°F for both days (83.8°F and 85°F). During the course of our investigation, however, it was shown that important network components, such as transformers and primary feeders, exceeded their normal and emergency ratings during those times. Therefore, the Long Island City Network event draws into question the sufficiency of the normal and emergency ratings of feeders and transformers given the occurrence of overheating and/or overloading of that equipment at lower temperatures. The Company needs to evaluate how the reference temperature is applied and its impact on the system and all associated equipment. Currently, the temperature variable gets factored into determining the amount of load equipment is expected to be able to handle. Thus, changing this variable would have a direct impact on the operational ratings of the equipment.[118]

6.8.3 Recommendations

- Con Edison should re-evaluate the temperature design criteria/temperature variable of 86°F so that it meets its one-in-three year criteria. This should include

[117] The Company claims that its data shows that it meets the threshold in five of six scenarios when, in fact, the data shows that it only meets the threshold in one of six scenarios. Con Edison Response to Staff Discovery Requests DPS 389 and 398.

[118] Con Edison Response to Staff Discovery Requests DPS 289 and 398; NYC Discovery Requests 165, 166, and 167.

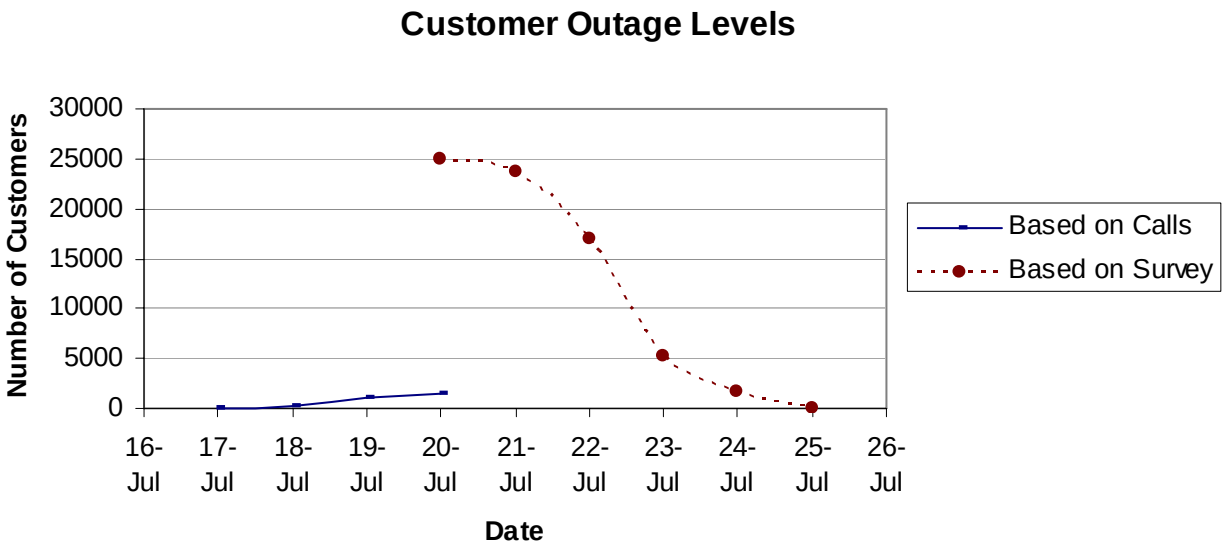
the feasibility, cost, and benefits associated with adjusting the reference temperature and determining how it would affect the design and operation of the system in the future. The Company should provide its findings and results of this temperature design criteria evaluation to Staff for review within 90 days of this Report.

6.9 Restoration

6.9.1 Background

Con Edison's restoration effort spanned eight days, beginning Monday, July 17 through Tuesday, July 25, although even then many customers were still on generators and others did not have full service. The restoration period concluded upon returning electric service to all consumers affected by the event, either through use of temporary (including emergency generators) or permanent repairs. In the case of temporary repairs customers did not necessarily see a return to full electric service, but rather a return to some lesser level of service. Mobile generators were deployed by Con Edison to reduce electric demand during the event and to provide electric power support during the Company's restoration activities. The mobile generators came from Company stores and vendors or from individual customers who owned or acquired their own generators.

Temporary repairs were to be made permanent during what is defined as "the recovery period." Con Edison estimated that 25,000 metered customers (customer accounts) of the 115,000 metered customers in the Long Island City Network were affected during this time period (not to be confused with "consumers," which is a multiple of those numbers). The following chart shows the outage levels during this period.



6.9.2. Analysis and Findings

Con Edison experienced problems in restoring the Long Island City Network to full operation. It stated it was not fully aware of the reasons or full extent of damage to the secondary system, and, therefore, provided no estimated restoration time to consumers until Tuesday, July 25, the day that restoration was completed for the final customers out-of-service. Providing timely and accurate restoration time estimates has been a perpetual problem for Con Edison. The failure to provide restoration time estimates during the incident is unacceptable. Accordingly, strong efforts should be made by the Company to design a program that will provide consumers with reasonable estimated restoration time in a timely manner. Unlike Con Edison, some utilities use their Outage Management Systems to provide estimates for restoration time.

The secondary system was restored by assigning a lead trouble case number for a specified section of the network where all required work within that area to restore service was specified and linked to the lead trouble case number. Work was assigned to crews through these lead trouble case numbers. As temporary or permanent work was completed in an area, electric service would be restored, customer outage numbers would be reduced, and the reduction was confirmed by surveys taken at the end of the day and automatic phone calls to customers. Temporary repairs for the secondary system included installation of shunts (feeders used for temporary restoration of service) and connection of mobile generators to customer facilities.

As part of Con Edison's emergency plan, the Company's crews from its other operating areas were called in to assist with the restoration effort.[119] The following table shows the number of Con Edison crews used during this event.

Number of Con Edison's Crews

Type	**7/17**	**7/18**	**7/19**	**7/20**	**7/21**	**7/22**	**7/23**	**7/24**	**7/25**
Installation & Apparatus	56	109	124	14	78	76	82	172	166
Underground	4	6	22	24	132	130	130	156	180
Cable	0	0	1	1	21	21	20	29	25
Flush	4	14	15	2	23	39	39	40	33
Emergency	12	14	13	0	0	27	29	36	33
Overhead	0	11	15	0	0	0	0	25	32
Contractors - Excavation	0	0	0	8	27	27	27	27	26
Gas Operations (people)	0	0	0	0	16	50	69	71	68
Field Operations/ Substation	18	23	33	0	0	20	16	0	0
Energy Services (people)	0	0	0	0	25	34	33	28	29
Maintenance & Construction	0	2	2	0	0	0	0	0	0
Network	0	8	20	0	0	0	0	0	0
Total	**94**	**187**	**245**	**49**	**322**	**424**	**445**	**584**	**592**

These crews worked 12-hour shifts. Con Edison Installation & Apparatus crews worked on repairing and installing service lines, transformers, and network protectors. Underground crews made the connections between feeders that run underground and cable crews installed and removed primary and secondary cable. Flush crews removed foreign objects from underground structures. Emergency crews served as troubleshooters, who are among the first responders to identify the cause and required repair for the problem, and responded to all manhole events. Overhead crews were deployed to install and remove emergency generators. Gas crews did site safety work to ensure the safety of the public around electric equipment, and performed cooling of transformers through placement of fans or applying water out in the network. The Energy Services organization employees were the point of contact for large customers. The remaining crews assisted with work related to feeder restoration.

[119] Con Edison Responses to Staff Discovery Requests DPS 18, 43, and 236. (One crew equals one person.)

Due to the significant amount of damage, Con Edison requested, and trained, crews from other utilities, called "mutual assistance crews." It also obtained assistance from contractors. The following tables provide a break down of the source for these crews:

Mutual Assistance Crews

Utility	Crews
KeySpan/LIPA	12
National Grid	4
Duquesne Light Co.	5
PHI-PEPCO Holdings Inc.	5
AEP	3
NSTAR	9
PSE&G	34
Energy East	3

Underground Contractor Crews

Company	Crews
WA Chester	4
Hawkeye	23
Welshbach	8
State Electric	20

The first mutual assistance crews arrived on Friday, July 21, and the last crew left on August 12. Mutual assistance crews worked on the secondary system, including the rebuilding of mains, services, and street lights. Mutual assistance crews and the contractor crews were critical to the restoration effort and should be used in all future emergency events to the extent added resources are needed for the underground system.

Unlike the Company's emergency plan for operation of the overhead system, the underground portion of the emergency plan fails to provide procedures for utilizing mutual assistance crews. This failure made the recognition of the need for outside assistance slower than it would have been if the event took place on the overhead system. Instead the Company had to scramble to locate crews to work on its underground system. The use of mutual assistance for the underground system should be provided for in Con Edison's underground emergency plan.

6.9.3 Recommendations

- Con Edison should develop a process for developing expected restoration times for underground outage events and provide a description of the process to Staff for its review within 90 days of the issuance of this Report.
- Con Edison should develop a performance mechanism regarding system restoration and provide a description of the process to Staff for its review within 90 days of the issuance of this Report.
- Con Edison should develop a procedure for when and what minimum level of mutual aid assistance and contractor assistance should be used for each event level identified in its underground emergency plans and guidelines, similar to what is specified for an emergency overhead event. The Company should provide a copy of the procedure to Staff for its review within 90 days of this Report.
- Con Edison should identify resources other utilities have that can assist it during underground emergency events and advise Staff of its findings within 90 days of this Report.

6.10 Demand Reductions

6.10.1 Background

Reductions in electricity usage were sought by Con Edison's operators during the cascading event in an attempt to reduce use of the system and prevent further damage. Such reductions were obtained through programs run by the New York Independent System Operator (NYISO) and by Con Edison. Reductions were also sought through public appeals, use of a voltage reduction on the system, and ultimately through direct loss of consumer load as a result of the equipment failures.

6.10.2 Analysis and Findings

During the event, the NYISO called for implementation of both of its demand reduction programs. The Special Case Resources Program was called by the NYISO on Tuesday, July 18 and again on Wednesday, July 19. The Emergency Demand Response Program was called on Tuesday, July 18 and on Wednesday, July 19.[120] While the programs,

[120] Con Edison Response to Staff Discovery Request DPS 46.

because of their design, were called for the entire Con Edison system, the NYISO estimates that approximately 13 MW of load reduction resulted in the Long Island City Network.[121]

Approximately 1.1 MW of Long Island City Network load is registered in Con Edison's Distribution Load Relief Program. On Tuesday, July 18, Wednesday, July 19, and Thursday, July 20, the Company called on that program.[122] The Company estimates that approximately 1 MW of load reduction occurred in response to this program.[123]

Finally, approximately 390 customers in the network participate in Con Edison's Direct Load Control program. That program was also activated on Tuesday, July 18, Wednesday, July 19 and Thursday, July 20. The Company estimates approximately 0.6 MW of load reduction occurred.[124]

The Company also initiated an 8% voltage reduction on Monday, July 17. The 8% voltage reduction took 55 minutes to implement because of problems with the voltage reduction circuitry at the substation and had to be implemented manually. In the spring of 2006, the same equipment had failed a test, but was not properly repaired. The 8% voltage reduction remained in place until Sunday, July 23. The Company estimates that the voltage reduction resulted in about a 5.2% reduction in load, or about 21 MW on Monday, July 17.[125]

With regard to consumer appeals, the Company made direct contact with its large customers to request that they reduce load and use their on-site generation. Overall, the Company made efforts to contact over 400 large customers between Monday, July 17 and Thursday, July 20. La Guardia Airport shifted electric loads from the West to Central Substation. The Metropolitan Transportation Authority reconfigured its system to remove demand from feeders in the network. In addition, the Company appealed to all other customers using press releases, messages broadcast from police vehicles, and leaflets distributed throughout the network. The Company estimates that a maximum of approximately 71 MW of demand was removed from the network in response to customer appeals and use of emergency generation.[126]

Staff concludes that all existing available short-term measures to reduce demand, except voltage reduction, were employed in a timely manner by Con Edison during the

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121 Con Edison Response to Staff Discovery Request DPS 166.
122 Con Edison Responses to Staff Discovery Request DPS 46.
123 Con Edison Response to Staff Discovery Request DPS 166.
124 Con Edison Response to Staff Discovery Request DPS 46.
125 Con Edison Response to Staff Discovery Request DPS 166.9
126 Con Edison's October 12, 2006 Report, page 4-53.

Long Island City Network incident. The Company, however, is unable to differentiate between the physical outages of its small commercial and residential consumers and any possible voluntary reduction in demand by these consumers. Consumer use of on-site generation and voluntary load reduction measures accounted for 50% to 75% of the estimated demand reduction from all demand management resources. While Con Edison may have assumed, at least initially, that the large drop in network demand was the result of the various demand reduction measures, it is clear that a large component of the reduction was due to consumers losing service. If the Company had been better prepared to understand the implications of these factors, it would have understood the severity of the situation sooner and could have taken other measures to minimize damage to its system and to consumers. Development of a mechanism(s) to understand these matters better is needed.

6.10.3 Recommendations

- Con Edison should correct the deficiencies in the automatic voltage reduction circuitry at the North Queens Substation within 30 days of the issuance of this Report, and further correct and test all similar equipment at other substations by June 1, 2007.
- Con Edison should identify and implement measures to improve and increase participation in the various demand reduction and energy efficiency programs available throughout its service territory. The Company should provide Staff, within 90 days of issuance of this Report, with its plans for improving and increasing such participation.
- Con Edison should develop a method(s) to understand and better identify demand reduction opportunities, including details on specific customer classes, locations, and timing, and to differentiate between voluntary load reductions and losses of load due to loss of service. The approach should have sufficient granularity to allow load reduction (or demand response) resources to be dispatched on a network-by-network basis and to develop an operating protocol that would allow the demand response resources under the control of the NYISO to also be dispatchable on a network basis within Zone J. The Company should provide Staff, within 90 days of this Report, with a report of the method(s) identified.

6.11 Mobile Generators

6.11.1 Background

The Company used mobile generators to assist in load reduction efforts during the event, and, in most instances, the generators also provided full power capabilities to the consumers. For larger consumers, the mobile generators were used to reduce load, but were insufficient to provide full service.[127] Other large consumers that have on-site emergency generation were contacted and asked to shift load off the grid and onto those resources.

Mobile generators were also used to support the Company's system restoration activities. The Company connected mobile generators to isolated portions of the overhead distribution system and at specific residential and commercial demand centers. The decision on where to locate a mobile generator, as well as the type of generator, was based on system and field conditions, customer characteristics, outage reports, input from municipal agencies, and input from various Brooklyn/Queens operational groups.

Con Edison owns six mobile generators consisting of four 2,000 kW units, which were not deployed during the network event due to their size and voltage configurations relative to the secondary 120/208 volt distribution system. The Company also owns two 150 kW units which remained staged in Westchester and Staten Island as a precautionary measure in the event an isolated localized issue arose.[128]

Nine consumers secured mobile generators on their own. A total of 10 mobile generators ranging in size from 56 kW to 600 kW were installed directly by them. Those consumers consisted of several food markets, a restaurant, and a church.[129]

Con Edison's Corporate Emergency Response Center and its Energy Service Desk were responsible for coordinating leased mobile generator deployment.[130] A total of 86 leased mobile generators from 35 kW to 2 MW were deployed to customers from Tuesday, July 18, 2006 to September 19, 2006.[131]

6.11.2 Analysis and Findings

Con Edison encountered several limitations with regard to mobile generator deployment during the event. Due to the large number of units needed, the Company had to

[127] Con Edison Response to Staff Discovery Request DPS 321.
[128] Con Edison Response to Staff Discovery Request DPS 161.
[129] Con Edison Response to Staff Discovery Request DPS 162.
[130] Con Edison Response to Staff Discovery Request DPS 163.
[131] Con Edison Response to Staff Discovery Request DPS 320.

undertake a nationwide search. Because other cities in the nation were experiencing outages during this same time period, the demand was high, which limited the overall availability of units.

In addition to limited availability, the Company experienced operational problems with some of its deployed mobile generators. Several units failed to operate for various reasons: over-heating, battery failure, low fuel, clogged fuel filters, and fuel leak. There were also several instances of units being under-sized and one instance of a unit being accidentally tripped by a service technician.[132]

The Company also encountered several obstacles during the physical placement of mobile generators for system restoration. The obstacles encountered consisted of parked vehicles blocking access, fire hydrants, overhead tree limbs too low, private or business driveways, non-level surfaces (generators need to be placed in no more than a 2% grade to function properly), customers refusing to have generators in front of their locations, and lack of street access points.[133]

Staff is troubled by the Company's inability to use the six mobile generators that it owns. Two-megawatt generators would have been useful in the Long Island City Network and in fact, many similar sized generators were used. If the connection configurations do not allow the use of these generators in a network such as Long Island City, a very common design configuration throughout the Company's service territory, Con Edison needs to come up with a configuration that does work. Finally, while the two other Company-owned units were small, Staff does see any justification for keeping these units in Westchester as a precautionary measure – the Long Island City Network was already is a crisis.

6.11.3 Recommendations

- To address customers' comments that mobile generators physically arrived, but the actual connections of the units were delayed and also the problem that, in some instances, generators were not sized properly, the Company should perform a review and modification of its internal Company procedures and incorporate instructions relating to emergency mobile generators to ensure that they contain quality control processes by which the Company, or the contracted mobile

[132] Con Edison Response to Staff Discovery Request DPS 350,
[133] Con Edison Response to Staff Discovery Request DPS 165.

generator vendor, will verify mobile generator connections and proper operation during an event. The Company should report the review and modifications to Staff within 90 days of issuance this Report.

- To address the issue of availability of mobile generators during the peak summer months, when the risk of generator non-availability is the highest, Con Edison should perform a cost/benefit analysis of owning a greater number of mobile generators and positioning them in strategic locations in its service territory. This analysis should investigate increasing the Company's on-hand emergency generator fleet and the use of emergency generators to provide load-pocket reinforcement when emergency network equipment ratings could be exceeded if operating conditions were to exceed the second contingency network design criteria. The results of the cost/benefit analysis should be provided to Staff within 90 days of the issuance of this Report.
- Con Edison needs to re-assess its connection capabilities for its mobile generators so they are more flexible throughout the entire Company service territory.

6.12 Network Recovery

6.12.1 Background

Staff's primary objective in monitoring the Company's Long Island City Network recovery efforts was to observe and assess its effectiveness and ensure that the network was being returned to a condition that provided safe and reliable service. This review, which began in mid-August, was conducted using over 200 announced and unannounced field observations of Con Edison and contractor personnel performing day-to-day recovery activities; interviews with Con Edison's Long Island City Network recovery effort personnel, and the Company's headquarters staff supporting key aspects of the recovery effort; and reviews of Company documents, data, and responses to information requests. Staff also accompanied Con Edison field supervisory and job planning personnel to their work sites. Additionally, Staff made numerous unannounced visits to temporary walk-in customer claims processing centers in the network area to observe the Company's efforts to work directly with affected customers for claims submittals.

6.12.2. Analysis and Findings

6.12.2.1 Goals and Objectives

Soon after electric service was restored--either through temporary measures or on-site generators--Con Edison developed goals and objectives to guide the permanent repairs for the Long Island City Network recovery effort, which was expected to require a substantial amount of time and resources. The expected timeframe for completion of the recovery effort was the period August 2006 through February 2007. The goals and objectives for the respective work areas are described below.

6.12.2.1.1 Network Transformers

Con Edison's process to identify the network transformer work to be carried out was guided by its procedure EO-10110, Inspection & Maintenance of Network Distribution Equipment. The EO-10110 review identified 212 transformers that required an inspection.[134] Additional transformers needing inspections, however, were identified by the Company's recovery team. Through December 29, 2006, 842 transformers had been inspected and 90 had been identified for replacement or repair. The Company had initially established a goal to reduce the number of network transformers out-of-service to 14 by February 2, 2007, but even with the additional transformers identified as needing to be replaced, it achieved this goal in early September 2006. Even so, the Company, at the time of this Report, was still finding additional transformers requiring replacement.

6.12.2.1.2 Secondary Main Shunts (temporary connections)

At the start of the recovery effort (post-restoration), there were 102 aboveground cable shunts in service and an additional 23 were installed to address heat-related problems that occurred subsequent to the Long Island City Network event. The Company established a goal to have all secondary shunts removed by the end of September 2006, and it achieved this goal in early September.

6.12.2.1.3 Current Limiter Inspections

Con Edison initially identified 41 manhole structures that needed to be inspected for blown current limiters in the secondary main sections. It established a goal to have all 41 manhole structures inspected by September 15, 2006, but as of September 8, 2006, only half of

[134] Consolidated Edison of New York, Inc. (October 12, 2006). *Comprehensive Report on the Power Outages in Northwest Queens in July 2006, page 4-126, section 4.12.7.1* .

the inspections had been completed. This effort was subsequently rolled into a much larger secondary main inspection effort, which is discussed below.

6.12.2.1.4 Open Secondary Main Sections

Open mains are sections of secondary mains that were cut open and away from the grid during the temporary restoration effort until they could be repaired. At the start of the recovery effort, Con Edison had a total of 60 such open mains. The Company estimated it would be able to complete five open main jobs per week, i.e., reconnect the main to the grid, and complete the effort by October 27, 2006. It achieved this goal by mid-September 2006.

6.12.2.1.5 Secondary Main Replacement and Reinforcement

The Company initially identified 775 secondary main sections for replacement or reinforcement. Of these, 200 were secondary mains known to have been damaged due to the Long Island City Network event, 300 were related to shunt removal work, and the remaining 275 were a result of the Company's secondary main inspection program. The Company estimated that it would perform about 45 secondary main section replacements or reinforcements per week and complete this effort by December 8, 2006. As a result of Con Edison's secondary main inspection program discussed below, however, the number of secondary main sections for replacement or reinforcement increased to 985 as of December 29, 2006. The Company expects that the secondary main inspection program will identify additional sections for replacement or reinforcement work. Because of the increase in the number of secondary mains identified for replacement or reinforcement, this effort will continue into the first quarter of 2007. As of December 29, 2006, there were 26 secondary main sections remaining to be replaced and 17 secondary main section reinforcement to be completed.

6.12.2.1.6 Secondary Main Inspections

Just prior to commencing the recovery effort, Con Edison used its Poly Voltage Load Flow model to simulate the network system problems and identified 1,126 secondary main sections that may have experienced excessive loading. In late-August, the Company inspected a statistically valid sample of these sections using an inspection protocol developed specifically for the recovery effort and found a failure rate of 15 to 20 percent. As a result, the Company decided to inspect all sections identified in its modeling and expected to complete this effort by early-December 2006. In the interim, the Company performed a second iteration of the computer modeling to reflect information not available at the time of its initial modeling. This

second modeling iteration identified 1,600 secondary main sections that may have experienced excessive loading. This modeling effort overlapped the initial computer simulation by about 450 sections, resulting in identification of a total of approximately 2,300 secondary main sections for which inspections were needed. The Company completed all of the secondary main section inspections by the end of December 2006.

Staff concludes that Con Edison has conducted a vigorous and well-managed effort to identify and remedy event-related damage in the network. It should be noted, however, that Con Edison intends to disband its Network Recovery Team in January 2007, and the remaining secondary main work (approximately 100 units of replacement/reinforcement work) will be turned over to its Brooklyn/Queens operations organization for completion. Staff is not opposed to this transition, but believes that Con Edison should continue to provide Staff with status reports on secondary main section work generated by the secondary main section inspections program until all such work is completed.

6.12.2.2 Conditions and Inspections

6.12.2.2.1 Transformers

Con Edison attempted to maintain operation of some distribution transformers on the secondary system during the event by using cooling methods, but seven transformers overloaded and short-circuited during the event.[135] In the aftermath of the event, Con Edison inspected 212 transformers. In addition, Con Edison personnel conducted inspections of transformers when other types of work would bring them in the vicinity of a network transformer, such as for general maintenance repairs of suspected open switches and blown fuses. As of December 7, 2006, Con Edison had conducted 842 transformer inspections in the Long Island City Network. As a result, 92 transformers either failed a visual, pressure, or dissolved gas-in-oil (DGOA) test, or sustained event-related damage (an 11% defective rate). Additionally, 91 transformers were put on the "watch list" for more frequent testing.

Con Edison's approach to inspecting the transformers following the event drew Staff's attention. Con Edison appeared initially to consider inspection of only those transformers that overheated during the network event, as reported by its remote monitoring system (RMS). When the Company ran its computer model to determine which secondary main sections to

[135] Consolidated Edison of New York, Inc. (October 12, 2006). *Comprehensive Report on the Power Outages in Northwest Queens in July 2006, page 4-24.* .

inspect, however, the model identified 277 other transformers that had likely overheated, although Con Edison informed Staff that the modeling analysis was not used to identify transformers for inspections. At the time of this Report, only 18 of the 277 potentially overheated transformers identified by the modeling effort had not been inspected by Con Edison.

Staff is concerned by the elevated number of transformer replacements that have been identified so far during the network recovery effort. The Company informed Staff that it annually replaces approximately 3% of the transformers inspected normally across its system, but the percentage on this network in the aftermath of the event is closer to 11%. A review of the transformer replacement history in the network indicates that for 2005 and 2006 the replacement rate for the Long Island City Network transformers has more than doubled over prior years. Staff is even more concerned by the fact that a large number of transformer failures on this network were due to corrosion problems or other leaks that were likely in place prior to the event.

Given the high incidence of failure found here due to the intensive need for inspections, compared to the annual system-wide failure rate, it appears that Con Edison's past methods for transformer inspections are inadequate. The transformer inspections failures also appeared to be spread uniformly across the Long Island City Network, rather than concentrated in areas where the most damage occurred on the secondary mains. This information calls into question the condition of the transformers in the Long Island City Network prior to the event and perhaps has implication for other networks as well. It should be noted that the Company has indicated that it is not aware of any industry standard governing the inspection and maintenance of distribution network transformers and protectors. Instead, the Company relies on its own experience combined with manufacturer's recommendations to develop Company inspection and maintenance procedures.

6.12.2.2.2 Secondary Mains

As discussed earlier, the Company's operators have limited real-time information about secondary main conditions and, therefore, Con Edison does not know the condition of the vast majority of secondary main sections except by means of a direct inspection. Early in the network recovery effort, Con Edison targeted the replacement of the many secondary main sections with obvious and known damage, including 250 sections related to temporary

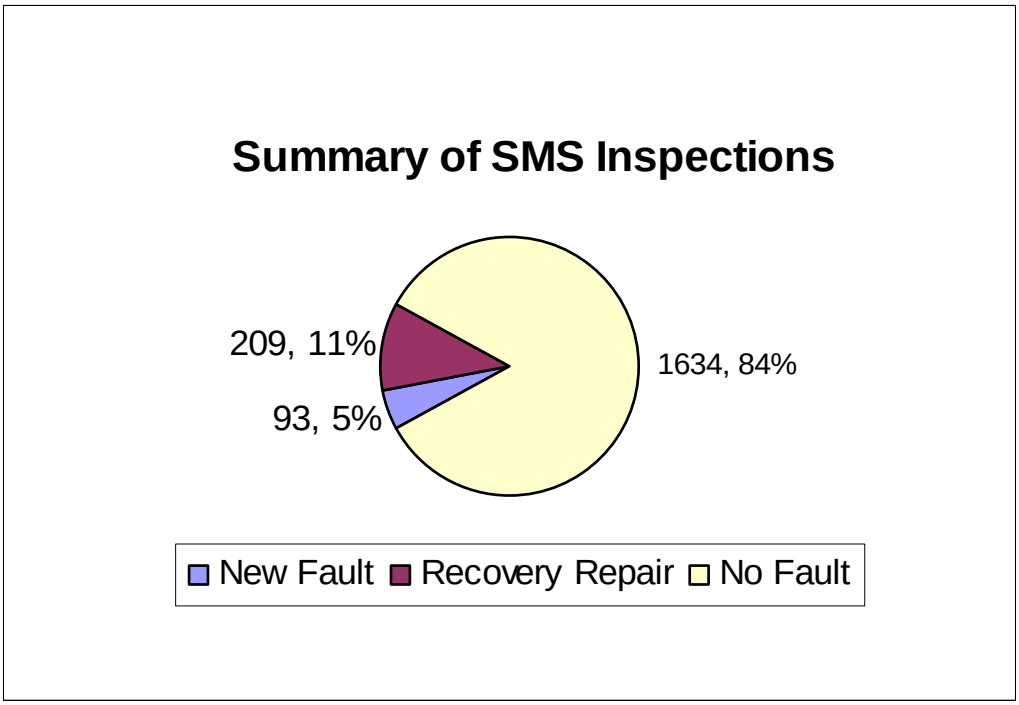
connections (shunts) that were installed during the restoration period.[136] In August, Con Edison estimated that the system would eventually require approximately 775 sections to be replaced. During the recovery process, however, Con Edison determined through load analysis that a few of the secondary main sections should be reinforced, either by additional runs of cable or increased cable size.

Simply restoring service to customers and providing a few upgrades for expected load needs does not ensure that the system will be in an acceptable condition when the recovery work is complete. Network grid systems, by their natures, are designed with redundancies that create the potential for damaged secondary mains to remain undetected underground, as service to customers might not be noticeably affected. Undetected open circuit secondary mains also create weaknesses in the network grid's ability to provide service in the event of a future secondary main outage.[137] As part of the recovery effort, it was and is important that the Company perform inspections to ensure that no undetected conditions created by the overloading conditions in July remain on the network system.

During the inspections, workers took voltage and amperage readings to identify any imbalances or voltage problems. The workers also looked for visual signs of insulation damage. The workers would fix any deficiencies found during the inspection immediately or report on the need for follow-up work. The results of the secondary main section (SMC) inspections undertaken so far were tracked using an inspection protocol and a database created solely for the Long Island City recovery effort. A summary of the inspection data results is shown in the following figure.

[136] Consolidated Edison of New York, Inc. (August 4, 2006). *Supplemental Report on Safe and Reliable Operation of the Electric Distribution System for Summer 2006, page 17-18.*

[137] The number of open secondary mains in existence prior to the July outage, and the role they may have played in the numerous outages and the widespread damage on the system, is unknown.



As of December 29, 2006, the number of sections identified for replacement or reinforcement increased to 985, well above the 775 originally estimated. In addition, such work has frequently required the installation of new duct work. Also, many manhole and handhold structures are being enlarged to accommodate additional main sections and increased duct capacity to accommodate future growth. As of December 29, 2006, some 170 manhole and handhold structures had been identified as needing enlargement with work completed on 167. Duct replacement has been extensive, with 23,204 trench feet of conduit identified for replacement, 22,957 trench feet of conduit having already been installed.[138] Also, as of December 29, 2006, Con Edison had completed at least 1,255 manhole and handhold structure conductor upgrades (as opposed to the enlargements discussed above), commonly known as cut and racks. This work usually consists of organizing and spacing the secondary main connections and equipment located inside the structure to meet proper Company spacing requirements. Such work is typically required in areas where new mains have been installed or areas where structures are particularly congested with many electrical mains. The large number of structure conductor upgrades is a statement to the amount of work that was performed by Con Edison in the recovery effort, but could also be indicative of structure conditions that were undetected prior

[138] One trench foot might include one or several runs of conduit.

to the Long Island City Network event. Congested structures can contribute to collateral damage to secondary mains in the event of primary cable fires or other fault or heat conditions.

A more proactive approach to identifying and repairing defects on the secondary network system could help prevent the escalation of damage in multiple contingency operations in the future. Data collected from a systematic secondary main inspection protocol could also assist the Company in developing more accurate data on the current condition of the network to better inform its modeling efforts.

6.12.3 Recommendations

- Con Edison should establish a protocol for an overall inspection program for network secondary mains program that includes taking current and voltage measurements for all of the Company's secondary networks. The protocol should include a sampling strategy that would develop information on the degradation on network components that could be incorporated into the Company's planning and contingency modeling analyses. A draft of the protocol should be provided to Staff within 90 days of the issuance this Report.
- Con Edison should provide Staff with quarterly reports on the status of its compliance with its distribution transformer inspection and testing protocols, system-wide, tabulated by network.
- Con Edison should provide Staff with weekly status reports on secondary main section work generated by the secondary main section inspection program in the Long Island City Network until all such work is complete. Such reporting should begin one week after the issuance of this Report.
- Con Edison should inspect all of the remaining Long Island City Network transformers (about 500 inspections) and repair or replace by June 1, 2007 all that fail to meet Company specifications (see Section 6.6).

6.13 Washington Heights Network Outage Recommendations and Their Relationships to the Long Island City Network Incident

6.13.1 Introduction

In July 1999, a cascading series of equipment and cable failures in the Washington Heights electric network resulted in the failure of that network.[139] The cascading failures affected 65,000 metered Con Edison customers and posed a threat of further damaging the network. Subsequently, the network was shut down to prevent an even worse catastrophic event, and then it was restored to service within 19 hours of its shutdown. Following the outage event, the Company submitted a plan that consisted of actions, steps, and recommendations to address the various issues identified there and to improve the distribution system. Staff reviewed the Company's plan, including its recommendations, and also issued its own report with recommendations. The Commission subsequently directed Con Edison to implement both its own and Staff's recommendations, and it also directed Staff to monitor the Company's implementation efforts.

There were 44 recommendations developed by Con Edison with regard to system performance, customer communications, capital improvement costs, operations and maintenance expenditures, and compensation to consumers for losses. Of the 44 recommendations, 36 have been completed satisfactorily and eight involve on-going, long-term projects. Four of the eight long-term projects are described in the Analysis/Findings section below as they relate to the problems that occurred in the Long Island City Network and are key to improving system performance.

6.13.2 Analysis and Findings

Staff has been monitoring the Company's implementation of the Washington Heights recommendations since 1999 and notes that the Company has spent billions of dollars over the past seven years to rebuild its infrastructure.[140] The benefits and the gains from the spending, albeit resulting in many equipment upgrades and system improvements, have fallen short of Staff's expectations.

Staff's review of the 36 completed recommendations indicates that several were applied, or had been initiated to some extent, in the Long Island City Network. These included

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[139] Case-99-E-0930 Proceeding on the Motion of the Commission to Investigate the July 6, 1999 Power Outage of Con Edison's Washington Heights Network.

[140] Staff receives a status report twice a year from Con Edison about its implementation efforts.

recommendations dealing with cooling transformers with water, initiating removal of paper-insulated lead-covered cables and joints, and installing vented manhole covers, all of which proved to be beneficial to the extent implemented by that time in the Long Island City Network. The eight recommendations that are still outstanding include four that involve issues that this Report has cited in several sections above as issues that continue to need resolution. These involve: improving modeling techniques, monitoring of the secondary network, expediting elimination of paper-insulated lead-covered cables and joints, and developing an alternative to hipot testing. It is imperative that the Company continue to work on addressing these matters, not only to complete its obligations with respect to the Washington Heights Network, but also to address the similar recommendations made in this Report with regard to the Long Island City Network and the entire Con Edison electric distribution system.

6.13.3 Recommendations

- No additional Washington Heights outage-related recommendations are being made in this Report; Con Edison remains obligated to complete its work on addressing the still-outstanding recommendations from the Washington Heights investigation.

6.14 Emergency Plan

6.14.1 Background

The purpose of a utility emergency plan is to ensure adequate response by a utility in an emergency situation. The plans contain guidelines for internal and external information flow, customer outage assessment, manpower assessment and personnel use, assessment of contingency conditions and anticipated actions as system conditions change, and actions for service restoration. Two emergency procedures were used for the Long Island City Network recovery: the Company's 2006 Consolidated Emergency Response Plan and the Brooklyn/Queens Heat Storm Mobilization Guidelines. As per these documents, mobilization for an extreme weather condition is done when the average wet bulb/dry bulb temperature (defined and described elsewhere in this Report) is forecast to exceed 80 degrees Fahrenheit.[141]

[141] Brooklyn/Queens 2006 Heat Storm Mobilization Guidelines, page 5.

6.14.2 Analysis and Findings

On July 16, 2006, Con Edison followed these procedures and opened its Distribution Engineering Command Post (Command Post) and established a command structure in preparation for a wet bulb/dry bulb forecast of 83.78 degrees on Monday, July 17.[142] The Command Post coordinates the shifting and obtaining of additional resources throughout the Company, monitors and provides updates of system conditions, and provides engineering support. In addition to the Command Post mobilization, the Command Post and the Control Center for the Brooklyn/Queens operating area went into an Incident Command System structure. An Incident Command system structure calls for the assignment of specific titles and respective duties to employees during the emergency event.[143] Consistent with the emergency procedures, a pre-event meeting was conducted at that time to inform employees of the emergency event and to review responsibilities for these employees.

Between Monday, July 17 and Thursday, July 20, system restoration was managed through the Command Post and the Brooklyn/Queens Control Center. During this time, the network status changed from a routine incident level to a full-scale incident, consistent with the Heat Storm Mobilization Guidelines, because of the increasing number of primary feeders out-of-service, overload of transformers, and multiple secondary failures.[144] During that period, Con Edison's main goal was to restore primary feeders. As such, the Control Center made efforts towards reducing load on feeders through demand reduction measures and by reducing voltage.[145] The Command Post followed its internal emergency procedures by holding conference calls every four hours, sending out system updates, monitoring the system, and providing engineering analysis and support.

On Thursday, July 20, Con Edison opened its Corporate Emergency Response Center to provide a full Company response to the Long Island City Network event. The Company attributed this action to the level of damage on the secondary distribution system. The Company's slow response in opening the Center parallels its slowness in recognizing the

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142 Central Information Group e-mail on 7/16/06 at 7:37 p.m.

143 The Incident Command System establishes lines of supervisory authority and formal reporting relationships. It is a system that is used widely throughout the United States to establish common terminology and responsibilities for emergency response.

144 Brooklyn/Queens 2006 Heat Storm Mobilization Guidelines, pages 20 – 25.

145 The 2005 edition of the Heat Storm Mobilization Guideline anticipates when a network is in a level III full-scale incident, as it was on Tuesday, July 18 and Wednesday, July 19 because of loadings on primary feeders and transformers. This anticipation was eliminated from the 2006 version.

seriousness of this event. The Company needs to modify all of its pertinent emergency procedures so that in the future it takes affirmative action more quickly and proactively.

6.14.3 Recommendations

- Con Edison should, within 90 days of the issuance of this Report, modify its Emergency Plans to ensure a more proactive response in the future.

6.15 Planning, Operations, Maintenance, and Oversight

The information found during this investigation draws into serious question the standard of care the Company has exercised in its operation, maintenance, and oversight of the Long Island City Network. This information indicates that the Company exhibited little care for or attention to the secondary system and the stress caused by operating the system at such a high level of contingency. Additionally, the Company failed to monitor the secondary system sufficiently and acknowledge the severity of the situation even though the escalation of manhole events provided clear indication of the need for further action to safeguard the system and customers.

The apparent lack of care demonstrated by the Company for the Long Island City Network, resulting damage to the secondary system, number of customers adversely affected, and the potential financial impact of this event on ratepayers requires Staff to recommend an investigation and examination of the prudence of the Company's operations, maintenance, and oversight of the Long Island City Network. Therefore, the Commission should investigate and examine the prudence of the Company's actions, or failures to act, and practices relating to the Long Island City Network event.

6.15.1 Recommendation

- The Commission should investigate and examine the prudence of the Company's actions, or failures to act, and practices relating to the Long Island City Network event.

7.0 FINANCIAL ISSUES

7.1 Overview

This section of the Staff Report considers financial issues associated with the equipment failures in the Long Island City Network and the resulting consumer outages. It first describes the most recent electric rate Order for the Company, the 2005 Rate Plan. Then

Con Edison's actual expenditures are compared with the rate plan projections of expenses and capital related to system maintenance and improvements used when setting the company's rates for electric service. Following that review, this section compares Con Edison's historic expenditure budgets versus its actual expenditures to determine if funds were diverted within the budgets from one purpose to another or from one operating area to another. Finally, it reviews the manner in which the Company responded to the July 26, 2006 Order directing identification of the costs of the failures and outages in the network and then considers the ratemaking treatment of those costs.

7.2 Historic Expenditures versus Rate Allowances

7.2.1 Background

Con Edison's electric delivery rates since 2000 were established and governed by two rate plans (2000 and 2005) covering the period April 1, 2000 through March 31, 2008. Consistent with the Commission's goal of reducing rates for consumers, the 2000 Electric Rate Plan provided for rate reductions and a five-year stay-out period that placed pressure on the Company to control its costs and to pursue operating efficiencies. The plan also reduced the use of cost true-ups (reconciliations), which further protected customers from cost overruns. Further, earnings thresholds provided customers the opportunity to share in extra earnings achieved from growth or efficiencies not foreseen when establishing rates. The Company's 2000 Electric Rate Plan included performance metrics with both positive and negative revenue adjustments based on the Company's service reliability and customer service performance. The intent of such metrics was to ensure that the Company took appropriate actions so as to not let its service quality decline.

7.2.2 2005 Con Edison Rate Order

The 2005 Electric Rate Plan established Con Edison's electric rates for the three-year period beginning April 1, 2005 and continuing through March 31, 2008. In addition to establishing just and reasonable rates, the Electric Rate Plan provides for continuation and enhancement of certain performance mechanisms designed to ensure that the Company maintains sufficient focus on core functions, including consumer service and system reliability.

The Electric Rate Plan recognizes the Company's need to invest in infrastructure by providing Con Edison with significant increases to its infrastructure capital budgets. It provided the Company with a budget for transmission and distribution capital expenditures of

$774 million for the rate year ended March 2006, $825 million for the rate year ended March 2007, and $876 million for the rate year ended March 2008. The Electric Rate Plan does not prescribe the scope, nature, and priority of capital projects; Con Edison has full authority to alter its capital projects to meet operational requirements. Additionally, the Company is permitted, without limitation, to defer carrying costs on transmission and distribution investments in plants serving customers that are above the levels provided in the Electric Rate Plan.[146] This approach eliminates any financial disincentives the Company might otherwise perceive in making necessary infrastructure investments.

The 2005 Electric Rate Plan also reflects Con Edison's forecast of transmission and distribution operations and maintenance (O&M) expenses. Similar to the transmission and distribution capital budget requests, the Company's operations and maintenance expenses were forecast to increase significantly.[147] For the rate year ended March 31, 2006, Con Edison sought rate recovery of $544 million for transmission and distribution operation and maintenance expenses; the resulting rate plan provided for recovery of $542 million for the rate year ended March 31, 2006, $553 million for the rate year ended March 2007, and $564 million for rate year ended March 2008.

The 2005 Electric Rate Plan includes electric reliability performance and customer service performance mechanisms. Should Con Edison fail to meet established performance standards, it is exposed to negative revenue adjustments of up to $56.5 million per year under the reliability performance mechanism and up to $36 million per year under the customer service performance mechanism.

7.2.3 Analysis and Findings

Staff reviewed the Company's rate plans to evaluate the rate allowances for transmission and distribution operations and maintenance expenses and capital expenditures. Using various sources, Staff determined the estimated expense and capital levels provided in rates.[148] The rate provisions provided by the Company for transmission and distribution operations and maintenance expenses and capital expenditures were then compared to Con Edison's actual expenditures.

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[146] Carrying costs are comprised of the Company's allowed pre-tax rate of return and depreciation allowances.
[147] Con Edison Response to Staff Discovery Request DPS #86.
[148] Staff took no material exception to the levels of transmission and distribution expense and capital expenditures Con Edison claimed were provided for in rates.

Staff found that Con Edison's actual transmission and distribution O&M expenses exceeded the rate allowance in four of the past six rate years (see Appendix E). In the rate years ended March 31, 2004 and 2006, Con Edison's actual operations and maintenance costs were less than the rate allowances. In the aggregate, however, the Company's actual transmission and distribution O&M expenses exceeded rate allowances by $13 million for the six-year period that Staff reviewed.

Con Edison's actual capital expenditures for transmission and distribution plant have exceeded rate allowances in every year since 2000 (see Appendix E). For the years 2000 -2005, the Company's rate allowances for capital expenditures totaled $2.8 billion for transmission and distribution projects. The Company's actual capital expenditures for the same period totaled $4 billion.

Staff concludes that, during the past six years, Con Edison spent its rate allowances for transmission and distribution O&M expenses. The Company spent approximately $1.2 billion more than its rate allowances for transmission and distribution capital projects from 2000-2005. Staff also reviewed Con Edison's financial condition during the period 2000-2005 and found that the Company was in sound financial condition. Con Edison reported electric operations earned returns on equity of 12.5%, 15.25%, 12.74%, 11.89%, 8.63%[149] and 10.95% for the calendar years ended 2000-2005, respectively. These returns are well in excess of the levels envisioned by the Commission when establishing the Company's rates.[150] Accordingly, Con Edison's earnings during 2000-2005 were adequate to have enabled the Company, if necessary, to make additions/improvements to its infrastructure beyond rate allowances, without any need to petition the Commission for recovery of associated costs.

Con Edison conceded to Staff that its access to capital markets was not restricted in any way or any time during this period. Moreover, the Company had the ability to petition the Commission at any time during the period for recovery of extraordinary costs it believed were necessary to provide safe and adequate electric service. Staff concludes that the Company had the ability to finance any reasonable costs required to maintain safe and adequate electric service to its customers since 2000.

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[149] Includes effect of $100 million global adjustment per the Joint Proposal adopted by the Commission's March 24, 2005 Order Adopting Three-Year Rate Plan in Case 04-E-0572.

[150] In Appendix A to Staff's Statement in Support of the Joint Proposal in Cases 00-E-0095 & 96-E-0897, Staff forecasted an average return on equity of 10.65% for rate years ended March 31, 2002-2005.

7.2.4 Recommendations

- Staff has no recommendations on these matters at this time.

7.3 Historic Expenditure Budgets versus Actual Expenditures

7.3.1 Background

Con Edison's transmission and distribution capital and operations and maintenance expenses are tracked according to the regional organizations within which they occur, i.e., Bronx/Westchester, Brooklyn/Queens, Manhattan, and Staten Island. The capital budget data is further broken down into the categories of new business, burnouts, interference, improvements/reinforcements, telecom applications, meter installation, transformer installation, transformers/network protectors install, and meters/meter devices. The operations and maintenance budget data is broken down into the categories of operations, burnouts, transformer installation, maintenance associated with capital, meter & customer work, PCB program, tree trimming, engineering, financial planning & operations analysis, environmental health & safety, VP & staff, public affairs, meter shop and transformer shop.

7.3.2 Analysis and Findings

To determine if the Company's focus shifted from one operating area to another over the time period from when budgets for the operating areas are set to when actual expenditures are made, Staff first calculated the difference between the actual expenditures and the budgeted amount for each of the operating areas and categories. This was done on an annual basis, recognizing the fact that from month-to-month the Company can and does alter actual expenditures among the various categories, with the intention of being within the annual budget. This calculated difference was then divided by the original budget amount to arrive at the difference as a percentage of budget. The Actual Capital Spending chart (see Appendix E) shows actual capital spending by operating area for the past five years. As shown, capital spending has increased steadily from year-to-year in all operating areas except Staten Island. The Capital Spending Variance chart depicts how the Company's actual capital spending by operating area compared to the capital budget for that region. In all of the past five years, the Company's actual capital spending exceeded the capital budget by 5 to 30% depending upon the year. In all but one year, 2001, actual spending in each operating area followed the total Company trend.

Two charts in Appendix E focus on the Company's Operations and Maintenance expenses over the past five years. As the actual expense chart shows, actual expense levels have remained relatively flat over the 2001 to 2005 period.[151] Total expenses decreased slightly from 2001 through 2003, increased in 2004 and then went back down in 2005. Similar trends are seen in each of the operating areas. The Operations and Maintenance variance chart, which shows the variance between the actual expense and the budgeted expense, reveals that in 2004 the Company significantly over spent its budget Company-wide and in each of the regional organizations following minor under-spending in 2001 and 2002.

Staff further analyzed actual spending and the variance for each category of the Company's capital spending. It was found that during the 2001-2005 period, Con Edison spent or exceeded its budgeted amounts in most categories. While some of the Company's operating areas spent more than their budgets in certain categories, and other operating areas spent less than their budgets in certain categories, there is no clear trend of one operating area receiving preference over another.

Adequate infrastructure investment review is one of the main functions Staff performs in a traditional rate case proceeding. In that setting, construction budgets are examined at an overall company-wide level and usually delineated into broad cost categories. In instances such as this investigation, a more focused review of the Company's infrastructure investment adequacy, on a network-by-network basis, would be informative. Unfortunately, Con Edison does not maintain budget and actual expenditures by electric network. This makes the task of examining actual expenditures by network impossible.

Con Edison advises that it has been looking specifically at how much work has been done in the Long Island City Network for the period 2005 through mid-2006, as well as across all other networks**.**[152] This review seeks to quantify how much investment has been made in terms of work volumes, i.e., completed or replaced units of primary cable, secondary cable, and transformers by network. The dollar costs related to this activity, which were presented earlier, were estimated using system-wide average costs derived from engineering layouts and property accounting records.

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[151] The budget data presented here was provided by Con Edison. Con Edison tracks its budget data by functional category (FCAT) and responsibility area. This data is a subset of the O&M expenses presented above in the rates versus actual comparison. The rate allowances referenced above include numerous other costs such as interference, rents, research and development, and training costs that are tracked by individual budget area.

[152] Technical Conference transcript, page 881, lines 18 – 24.

Staff sees value in tracking work activities and related costs on a network-by-network basis. The tracking of expenditures and volumes of work on individual networks will allow the Company to evaluate and compare actual costs and work completed. In addition, the correlation of this data and system performance will enable the Company to prioritize future work to be performed on each network.

7.3.3 Recommendations

- Con Edison should commence budgeting (capital, and operations and maintenance) by electric network beginning as soon a practicable. Con Edison should determine what systematic changes are necessary to implement this recommendation and report its findings to Staff by June 1, 2007.
- Con Edison should commence tracking of actual work volumes and expenditures (capital, and operations and maintenance) by electric network as soon a practicable. Con Edison should determine what systematic changes are necessary to implement this recommendation and report its findings to Staff by June 1, 2007.
- Con Edison should file its current five-year capital budget with Staff within 30 days of the issuance of this Report.
- Con Edison should file a detailed five-year capital budget with the Commission within 30 days of the issuance of this Report, and subsequently by March 1 of each year until further notice.

7.4 Con Edison's Reporting of Costs Related to the Failures and Outages in the Long Island City Network

7.4.1 Background

The Commission's July 26 Order required Con Edison to identify and account separately for all costs it has incurred or will incur related to the Long Island City incident, including, but not limited to its restoration activities, emergency generators, generator fuel, removal and retirement of damaged cables and equipment, capital expenditures for replacement of cables and equipment, damage claims, and contractor services. The segregated costs were specified to include both direct and indirect costs and overheads associated with Company employees, as well as contractors and mutual aid crews. The Company reported to Staff that from July 20, 2006 through November 30, 2006 it incurred costs totaling $91 million related to

the failures and outages. A breakdown of the costs can be found in Appendix F. The Appendix also includes estimates of additional costs Con Edison incurred by December 31, 2006.

7.4.2 Analysis and Findings

Staff reviewed the Company's accounting procedures to test compliance with the Commission's July 26 Order and found two deficiencies. First, Staff observed that the Company's accounting procedures called for an incremental approach for certain costs related to the event. The July 26 Order, however, calls for the tracking of all costs related to the event. Con Edison's accounting procedures provided for supervision and clerical employees to charge their home accounts and management employees to charge only incremental overtime to event work orders. Thus, the Company's accounting provisions tracked only costs incremental to the incident and caused by the need for additional work. Staff discussed this issue with Con Edison and obtained subsequent agreement that the Company would estimate the costs it had incurred and would commence identification and tracking of all future costs related to the event in a manner compliant with the July 26 Order. Staff then reviewed the procedures established by Con Edison to collect the data related to costs that were not charged to event-related accounts and found them to be a reasonable resolution of this issue.

Staff's second finding is that the Company did not start the identification and tracking costs on July 17, 2006, which was explicitly required by the July 26 Order. Con Edison commenced tracking the event costs on Thursday, July 20, 2006. It stated that the event,

> was not categorized as an extraordinary event until Wednesday, July 19 at 12 midnight; therefore, all the emergency response costs prior to Wednesday night were accounted for in the appropriate emergency response accounts. Thursday morning, when the emergency response center was opened, the cost segregation numbers were established to capture future expenditures."

Accordingly, Staff requested the cost data for the July 17 through July 19, 2006 period. Con Edison estimated the costs that it incurred during this period were $822,864.

Staff expects that costs related to the network failure will likely continue to be incurred for the foreseeable future. Con Edison has indicated that it plans on doing certain work in the network in advance of the summer of 2007, and Staff expects that the effect on the

network from the incident may be lingering and not fully identified until the network is subjected to peak- load conditions during the summer of 2007 and beyond.

7.4.3 Recommendations

- Con Edison should continue to track, and then report on a quarterly basis to Staff, all costs it incurred and incurs related to the failures and outages in the Long Island City Network. In addition, the Company should track and report to Staff all other operations and maintenance expenses and capital costs for the Long Island City Network until further notice.

7.5 Ratemaking Treatment of Failures and Outages in the Long Island City Network

7.5.1 Background

The costs incurred by Con Edison related to the Long Island City incident fall into two broad categories – operations and maintenance expenses and capital costs. Operations and maintenance expenses include the costs incurred by the Company for its initial response and temporary restoration of service, operation of temporary generation, payment of spoiled food claims, and other consumer assistance efforts. Capital costs are those costs related to the retirement of damaged equipment as well as the permanent installation of replacement equipment.

7.5.2 Analysis and Findings

Con Edison has indicated that, with a limited exception, operations and maintenance expenses related to the incident will be accounted for in the current period.[153] This means that incremental event-related expenses will negatively impact the Company's earnings in the period that they are incurred because of the Company's commitment not to petition the Commission for deferral accounting treatment of these expenses. Thus, Con Edison will not seek to recover incremental operations and maintenance expenses related to the incident from its customers. Additionally, Staff has received a commitment from Con Edison that all incremental event-related expenses will be eliminated in presenting a normalized test year and in any future rate case. This commitment will ensure that customers will not be required to bear incident-related expenses in future electric delivery rates.

[153] The exception to this treatment relates to temporary generation costs. Con Edison indicates that it will seek to recover fuel costs only up to the market value of the energy consumed.

Con Edison carries excess liability insurance from which it expects to recover a portion of spoiled food claims it pays pursuant to the terms of the Company's tariff. The Company estimates that it will pay event-related claims totaling approximately $14.5 million, and it expects to recover approximately $5 million from its insurers. Con Edison commits to eliminate the $9.5 million of uninsured claims in presenting a normalized test year in its next rate case. Therefore, customers will not be required to pay for unreimbursed spoiled food claims in future electric delivery rates.

Staff's remaining concern with respect to the treatment of incident-related expenses is the potential impact on the shared earnings provision of the current Electric Rate Plan. The Electric Rate Plan includes provisions for the disposition of earnings above defined sharing thresholds. Should the Company's earnings exceed the thresholds, customers are entitled to a defined percentage of earnings above the thresholds. The customers' share of earnings is deferred for the future benefit of customers. Staff is concerned that customers could effectively bear a portion of incremental event-related expenses through foregone shared earnings benefits. This would happen if the Company's earnings exceed the earnings sharing threshold in the absence of the incident. Because the applicable measurement period ends March 31, 2007, it is premature to make such a determination at this time. Staff will continue to monitor Con Edison's costs, as well as the resultant impact on the Company's earnings, and report such information to the Commission as appropriate.

Con Edison indicates that capital costs will be accounted for as normal additions to transmission and distribution plant. The Electric Rate Plan places all electric transmission and distribution plant additions under a tracking mechanism. The tracking mechanism permits the Company to defer, for future collection from customers, carrying costs (rate-of-return and depreciation) on actual investments that are incremental to rate allowances. Therefore, absent a finding of imprudence by the Commission, customers will bear the full cost of all capital additions made to the Long Island City Network as a result of the incident.

As discussed in various sections of this Report, Con Edison has or is expected to trigger performance metric standards as a result of this event. The Company is subject to revenue adjustments of at least $9.3 million. The revenue adjustment dollars will be used for customer benefits and will be excluded from the measurement of the Company's earnings for earnings sharing purposes pursuant to the terms of the 2005 Rate Order.

As stated previously, Staff recommends that the Commission initiate a proceeding to consider the prudence of Con Edison's actions related to the Long Island City event. The principal purpose of such a proceeding is to ensure that ratepayers do not provide the utility with recovery of costs incurred or to be incurred as a result of imprudent actions or practices. Toward that end, a thorough review of the potential impact of costs resultant from imprudent conduct on existing rates as well as future rates will have to be conducted. For example, as noted above, the Company has expensed certain event-related costs that may impact the earnings sharing provision of the Company's current rate plan. If the Commission determines that costs were caused by imprudent conduct, then those costs should be eliminated for purposes of determining shared earnings.

7.5.3 Recommendations

- Staff has no recommendations on these matters at this time.

8.0 OTHER ISSUES

8.1 Overview

This section of the Report provides Staff's analysis and recommendations concerning matters that do not appropriately fit into other sections of the Staff Report. It addresses the Company's compliance with notification and performance requirements concerning system- and safety-related emergency events and Staff review of the impacts on telephone communications.

8.2 Emergency Notifications Compliance

8.2.1 Background

The Electric Safety Standards in Case 04-M-0159 require Con Edison to notify Staff within a prescribed time, and with follow-up by e-mail, regarding system- and safety-related emergency events. These emergency events include transmission control, loss of electric distribution service, personal injury accidents, electric shock incidents from Company equipment, motor vehicle accidents, unusual and other events that might be of interest to the media, and serious threats to facilities. Con Edison maintains a Central Information Group (CIG) to communicate information 24 hours a day about such events to Company personnel and external groups, including Staff. The Central Information Group obtains information from various sources, such as electric operations regional control centers, the Distribution Command Post, and media relations staff.

8.2.2 Analysis and Findings

Staff monitored the network event at the Company's Distribution Command Post and then later at the Corporate Emergency Response Center. This onsite monitoring was undertaken not only to monitor the Company's restoration and recovery activities, but also to provide another mechanism to ensure that vital information would be communicated to the Department's senior staff on a timely basis to enable the senior staff to provide government officials information quickly and effectively about system conditions, restoration efforts, and customer communications. While Staff's presence at these locations allowed it to observe Company actions, such observations do not always ensure that full and accurate information is transmitted. It is, therefore, important that more formal notifications be provided by the Company to Staff on a timely and consistent basis, and with information that accurately and adequately reflects the events.

The Central Information Group follows a set of procedures when notifying Staff during an emergency. These procedures, CG2-2-17, CG10-2-20, and CG10-10-0, outline the process to notify Staff. [154] The procedure identifies the purpose, policy, sources of information, notification requirements, event types, and the manner in which notifications are to be made.

The CIG provided notifications to Staff via the Communication Notification System (CNS). That system sends a pre-recorded message to Staff and then follows up with an e-mail. The e-mail contains the text of the message that was sent. Under the Safety Standard Order, Event Notification Requirements, Appendix B, each message is required to have a follow-up e-mail containing the text of the message. The Company's records indicated that 36 such messages were sent to Staff between July 16 and July 26, but Staff has records of receiving only 31 messages during the same time period. Staff's review of the 36 messages indicates that 22 e-mails were sent while only 11 were made via the CNS and three were by phone contact. Staff should have received a call either by a CIG representative or via CNS on eight other occasions.[155] Further, there were at least two instances in which critical notifications should have been sent but were not.

[154] CG2-2-17 – Notifications For Possible Actual Voltage Reduction, Customer Outages, Or Contingencies; CG10-2-20 – CIG Notifications For Reporting Accidents, Injuries, And Property Damage; and CG10-10-0 – Notifications To The PSC.

[155] Con Edison Response to Staff Discovery Request 336.

Staff assessed the follow-up e-mail messages for timeliness, accuracy, and adequacy. A substantial number of the notifications were sloppy, inconsistent, and hindered Staff's effort to convey critical information to senior Staff. The following are examples showing inconsistencies with the Company's own policy:

- There were five instances where the automatic phone notifications were not provided on a timely basis as required by CG10-10-0, section 5.0.
- There were six instances where e-mail notifications were not sent or not sent on a timely basis as required by CG10-10-0, section 5.5V.A.
- There were eight instances where e-mail notifications were sent but no phone notification was made as required by CG10-10-0, section 4.3 and 5.6.VI.
- Staff was not notified when the system went to a 2nd contingency and when the system went from a 9th to a 10th contingency, as is required by CG2-2-17, section 5.2.4.
- There were two instances where information provided in the notifications was incomplete, inaccurate, and confusing.

The Central Information Group plays an important role in keeping Commission Staff apprised of emergency events related to Con Edison's electric system. As such, it is imperative that Company procedures are up-to-date and an adequate and trained workforce exists to execute the procedures.

The Company's October 12 Comprehensive Report indicates that the Central Information Group e-mailed, every two hours, 114 system status reports to Staff. The system status report provided information on customers interrupted, distribution primary feeders out, number of feeder contingencies, crewing, system demand, and weather forecasts. In general, these status reports were informative, but it should be noted that they contained only limited information and were not a source for vital information that needs to be conveyed immediately to Staff.

8.2.3 Recommendations

- Con Edison should modify the Central Information Group procedures so that they are in compliance with the Appendix B of the Safety Standard Order in Case 04-M-0159. The Company should provide Staff, within 30 days of the

issuance of this Report, a revised version of the Company's procedures that identify when and how notifications should be made.

8.3 Reliability Performance Mechanism

8.3.1 Background

This section examines the Company's performance under its Reliability Performance Mechanism, which is in place to help ensure that the Company pays adequate attention to reliability. The mechanism was adopted as part of Con Edison's rate plan in 2005.[156] It consists of six performance metrics that the Company must achieve in providing electric service to customers. Con Edison is required to defer shareholder money for the benefit of ratepayers if it fails to meet the performance metrics. The maximum deferment for the entire mechanism is $56.5 million.[157]

8.3.2 Analysis and Findings

Staff's preliminary assessment is that the outages sustained during the event will result in the Company failing to meet two of the performance targets: network frequency and duration. The network frequency index is a measure of the average number of times a customer served by Con Edison is interrupted in a year (called the SAIFI index), and the revenue adjustment for not meeting the target is $5 million. The duration index is a measure of the average interruption time in hours by customers that experience a sustained interruption in a given year (called the CAIDI index), and the revenue adjustment for not meeting the duration target is $4 million. The Company is required by its Electric Rate Plan to file, by March 31 following the end of each calendar year, a report assessing its performance under the reliability performance mechanism. Staff believes that the report will show that Con Edison will be subject to a revenue adjustment of $9 million ($5 million plus $4 million) for its Long Island City Network electric reliability performance during calendar year 2006. The Company's problems in estimating the number of meters out-of-service during the Long Island City event, however, call into question the validity of its outage estimates for other prior events and, therefore, the validity of its prior calculations.

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[156] Electric Rate Plan 2005, p. 50.

[157] The most significant element of the reliability performance mechanism provides for a ratepayer credit of $10 million for each outage event in a given year involving a complete network shutdown with loss of all supply feeders to the network. It has a $30 million annual cap (three major outage events). Because the Long Island City event did not result in complete shutdown of the network, this part of the mechanism does not apply here.

8.3.3 Recommendations

- The reliability performance mechanism should be re-examined in the next rate case to determine if changes are needed to make it more effective for a network event similar to what happened in the Long Island City Network.
- Con Edison should file a report with Staff, within 90 days of the issuance of this Report, explaining the basis (calculation methods and supporting evidence for the number of meters affected, for every event) for all outage estimates and every event rolled into the calculations since the Reliability Performance Mechanism went into effect. Staff will examine these and offer the Commission a recommendation on whether prior awards or penalties should be reconsidered due to questionable outage estimates.

8.4 Outage Notification Incentive Mechanism

8.4.1 Background

Con Edison's outage notification incentive mechanism (mechanism) was adopted by the Commission in 2002. It was proposed by Staff and incorporated into a Con Edison rate plan Joint Proposal as a result of the Company's poor communications during the Washington Heights Network outage in 1999. The Company's most recent three-year rate plan incorporates the mechanism by reference.

The mechanism establishes criteria for certain specific activities for communicating with customers, the public, and other external interests during defined electric service outage events. Such activities include: updating the telephone system broadcast message on the general Con Edison customer assistance center number; notifying affected life-sustaining equipment customers and large/sensitive account customers, such as hospitals and nursing homes; contacting appropriate State, City, and local government officials, including the New York City Office of Emergency Management, the County of Westchester Department of Emergency Services, and the Department of Public Service; issuing media releases and/or conducting press briefings; and dispatching a mobile command center vehicle to the affected area. Life-sustaining equipment and large/sensitive account customers are provided customer-specific information, while communications with public officials are required to include the cause of the outage, the geographic area(s) affected, the estimated number of customers affected, and the estimated time of restoration.

8.4.2 Analysis and Findings

Con Edison reports that its communications activities during the network outages met the criteria, and states that no payments are due under the mechanism. The Company states that it performed the required communication activities in a timely and satisfactory manner because the Company initiated communication activities as early as Monday, July 17 and maintained them continuously throughout the event.

Staff's review demonstrates that Con Edison did not meet the requirements. Review of the Company's submissions shows that the telephone broadcast message was not timely updated and that all relevant public officials were not timely contacted.

Con Edison's argument ignores the content requirements of the mechanism which, for at least four of the seven activities, requires the communication to include the estimated number of customers affected. An outage count exceeding 20,000 customers (the minimum number that triggers the mechanism) was not recorded by the Company until 6 a.m. on Friday, July 21. For any communication efforts undertaken prior to this time, the notification activity would have grossly understated the number of customers without service and, therefore, could not have satisfied content requirements.

Staff concludes that Con Edison is liable for a payment to ratepayers. Under the rate plan, the Company's exposure is limited to $150,000 per infraction, which results in $300,000 total under the current situation. It is apparent that the monetary limits did not ensure compliance with the reporting provisions. Accordingly, Staff concludes that these limits need to be increased going forward. Such adjustment should occur at the first available opportunity, such as when the Company next files for a rate change.

8.4.3 Recommendations

- Pursuant to the Outage Notification Incentive Mechanism in Con Edison's rate plan in Case 04-E-0572, the Commission should find that Con Edison should be assessed a payment to ratepayers of $300,000.
- Con Edison's outage notification incentive mechanism should be re-examined and non-performance payment levels adjusted upward at the first available opportunity, such as when the Company next files for a rate change. At that time, there should be discussions about including an additional activity: holding

conference calls to brief public officials about the status of restoration and other outage-related information.

8.5 Impacts on Telecommunications

8.5.1 Background

The provision of telecommunications services (telephone, cable television, and high-speed data service), depends on the availability of electricity to both the telecommunications service provider and to consumers who use the services. The extent that a loss of electricity has on a consumer's ability to use these services will vary, depending on the technology or "mode" used by the underlying telecommunications service provider and the power requirements of the equipment at the customer premise. Experience tells us that some modes of telecommunications service and consumer premise equipment are more or less susceptible to problems due to the loss of electricity than are others.[158]

Telecommunications networks are traditionally designed to survive a loss of commercial electricity by deploying back-up power generation at central offices and head-ends where signal origination (or switching) occurs and at critical points in the distribution or "outside" plant. Traditional telephone networks typically use an all-copper or hybrid fiber-copper infrastructure that delivers power all the way to the consumer's premises. Technically, no other power source is required at the consumer's premise for basic voice communication, but as consumers often rely on devices that require commercial power (e.g., cordless telephones, computers, or Caller ID display devices) they can experience a disruption in service unless they use a line-powered corded telephone. Cable networks carry voice, data and video signals in a hybrid fiber-coaxial cable network[159] similar in many ways to the telephone infrastructure. Cable networks also require electric power at the consumer's premise to operate network interface equipment (e.g., set-top cable boxes for video service and modems for voice and high-speed data service) and the consumer's equipment needed to use such services (e.g., telephones and computers).

Wireless networks, such as those used to provide cellular services, are also usually designed to survive temporary losses of commercial power. They do so by deploying back-up

[158] For the purposes of this section, telecommunications services include wired and wireless, Internet protocol-enabled or traditional circuit-switched, voice, data, broadband, or cable services.

[159] Fiber-optic cables carry signals to and from the cable company's "head-end" or central office to fiber nodes located in neighborhoods. Coaxial cables then carry signals to and from the fiber node to individual residences.

power generation capability at switching locations and battery backup power at wireless transmitter locations and smaller cell sites or "micro cells" and antennae.[160] Battery power can typically last anywhere from one to six hours depending on the size and usage of the facility, and, when depleted, these facilities rely on portable power generation for continued operation. Consumer-supplied power is less of a consideration for cellular networks as phones are battery powered and electricity is required to recharge devices is not location dependent.[161]

Internet protocol-enabled telecommunication services, like VoIP (voice over internet protocol), require that an underlying broadband service be available (usually digital subscriber line or cable modem service). These services are, therefore, dependent not only on electricity to power equipment at the consumer's premise to operate interface devices, telephones, computers, and the like,[162] but also on the power requirements of the underlying data provider's network.

Next generation networks are also being designed and deployed. Verizon's fiber optic service (FiOS) service relies on passive optical network components that do not require electric power in the outside plant but do require commercial electricity and back-up power generation at the fiber optic service nodes where signal origination occurs, and at the customer's premise to power the associated lasers. As with traditional networks, network interface equipment (e.g., set-top cable boxes for video service and modems for voice and high-speed data service, telephones, televisions, and computers) still require commercial power to operate.

During the Long Island City Network event, staff from the Department's Network Reliability section of the Office of Telecommunications were on heightened alert due to the potential impact on telecommunications providers. In addition to service outage monitoring, Staff took steps subsequent to the outage to determine the impact that the outages had on telecommunications networks and its customers.

8.5.2 Analysis and Findings

8.5.2.1 Impact on Telecommunications Providers

Telecommunications networks are continuously monitored by system operators, and real-time reporting of major communication service outages is provided to Staff. Staff's

[160] In urban areas like Queens, small cell sites and antennae are attached to buildings and rely on commercial power at the location which may come directly from Con Edison or be provided by the building owner.

[161] Cellular customers may use any electric source to recharge phones, such as cars, businesses and other residential locations where electricity is available.

[162] Interface equipment, such as a modem or a computer, is necessary to convert voice signals to data signals that are transmitted over the broadband connection.

experience in outage events due solely to commercial power loss suggests that traditional telecommunications networks generally will continue to operate so long as back-up battery and generation systems operate normally and are adequately refueled. Such was the experience for telecommunication networks during the July 2006 power outage in the Long Island City Network.

While no major service outages were reported by carriers during the event, Staff actively communicated with the larger telecommunications providers in the area to keep abreast of network status. Staff had been aware of power concerns by telecommunications carriers in the area and that some companies were requested by Con Edison to go on generated power to shed load or they did so independently when commercial power availability became unstable.

Traditional telephone providers reported that central office and head-end locations remained operable during the event, although some locations switched to generated power. They also reported that power was lost temporarily to parts of the outside plant network, but back-up power systems (batteries and portable power generation) worked properly to keep networks operable. So, except for sporadic service interruptions during the event, telephone and cable services were available to most all customers in the affected area. Cable service providers reported that services were interrupted in areas where segments of the outside plant network relied entirely on commercial electricity and back-up power either did not exist or was exhausted.

No major outage conditions were reported by cellular carriers during the event. Cellular carriers contacted by Staff stated that where power was lost to cell sites and antennae, battery power prevented signal loss and portable generators were deployed as the power outage continued. Some areas in the Long Island City Network area may have suffered in locations where portable generation was not practical or where placement of a generator was not possible or refused by a landlord. It is also possible that future large-scale outages could materially impact wireless services, such as cellular service, and that the impact would likely arise where power was lost to cell sites and antennae and battery power back-up is non-existent or batteries are depleted prior to restoration of electric service.

In sum, the reported experience by telecommunications providers indicates that telecommunications networks in the Long Island City Network area were only minimally affected by the event. Outage-related service interruptions were fixed in a timely manner, and

where commercial power was lost or became unstable, back-up power generation kept telecommunications networks operational.

8.5.2.2 Impact on Telecommunications Customers

Although telecommunications networks generally remained operational during the event, feedback from consumers indicates that some consumers still lost their ability to communicate due to the loss of power at their premises. It would be helpful for the Company to make arrangements with wired and wireless service providers for installation of portable telephone banks and portable cellular transmitters for use by the public during power emergencies of a long duration. Specific questions on telecommunications were included in Staff's survey discussed earlier in this Report. A summary of the applicable results follows.

Summary of Results of Staff Survey on Telecommunications Services	
Cellular customers who lost electricity but continued to have service.	80%
Land-line telephone customers who lost electricity but continued to have telephone service.	60%
Cable telephone customers who lost electricity but continued to have telephone service.	35%
Internet-based telephone customers who lost electricity but continued to have telephone service.	23%

The survey indicated that 52% of respondents (235 of 451) use cellular phones, and a high percentage of those cellular consumers that lost electricity (125 of 156) continued to have cellular service during the event. It is likely that the cellular customers who lost telephone service did so because they were unable to recharge their cell phones. The survey also indicated that many traditional telephone customers (148 of 246, or 60%) continued to have telephone service when power was lost, which is likely due to the fact that 63% of all affected consumers indicated they had cord-connected telephones available in addition to or in lieu of portable hand-set phones. A smaller percentage of cable telephone and internet-based (internet-protocol enabled or VoIP) telephone customers reported that they had telephone service during the outage. In certain areas where customers lost electricity, it is likely that traditional cable outside plant equipment in the neighborhood also lost electricity (likely at the same time and for the same duration) so their telecommunications services were interrupted. In these instances, even

customers with their own uninterrupted power supply or power generation to power modems and telephones would have lost service.

Other survey results show that of the consumers who lost electricity and attempted to contact the Company using a telephone, only 26% were successful in reaching the Company. The results clearly indicate that the loss of electricity had a negative impact on consumers' abilities to communicate during the event. Because telecommunications services and equipment are highly reliant on electricity at the consumer's premise, the reporting of outages via telecommunications for the purpose of identifying the extent of system problems may be inappropriate. Customers would benefit with outreach effort focused on surviving a power outage that provides education on how the various telecommunications services, technology, and equipment work during power outages and suggested contingency plans for consumers. Consumers should be informed of alternative ways to contact the Company and get information in the event their telephones do not operate during electric emergencies. It would also be useful for Con Edison to explore possible coordination between it and the telecommunications carriers in its service territory to use those carriers' status monitoring capability to help detect and evaluate the extent of power failures. A recommendation in this regard is provided earlier in this Report.

8.5.3 Recommendations

- Con Edison should make arrangements with wired and wireless service providers for the installation of portable telephone banks and portable cellular transmitters available in communities affected by outages that are projected to last more than 48 hours.

LIST OF RECOMMENDATONS

Identification of Outages

1. Con Edison should make the System Trouble Analysis and Response (STAR) program available to all its operating regions by June 1, 2007. The Company should report to Staff within 90 days of the issuance of this Report on the status of implementation of this recommendation.
2. Con Edison should establish by June 1, 2007, an outage identification system similar to, and in conjunction with, the City's Power Outage Response Team system.
3. Con Edison should explore the feasibility and associated costs and benefits of installing a fixed network, advanced metering system in the Long Island City Network and in other networks in the future. This should be done in a manner consistent with the Commission's Metering Order.[163] The Company should report to Staff, within six months of the issuance of this Report, of the results of its analyses.
4. Con Edison should explore other monitoring techniques, including coordination between it and the telecommunications carriers in its service territory, to use the carriers' status monitoring capability to detect and evaluate the extent of power outages. The Company should provide Staff with a status report of its efforts in this regard within 90 days of the issuance of this Report.
5. Con Edison should report within 90 days of the issuance of this Report its final estimate of how many customer outages and low-voltage conditions existed during the Long Island City Network event, including documentation of how those estimates were derived.
6. Con Edison should report to Staff within 90 days of the issuance of this Staff Report, what changes it will implement or has implemented, to ensure that outages and low-voltage conditions in a network system are estimated accurately. In its report, the Company should recommend what monitoring thresholds are appropriate.

[163] Case 00-E-0165, et. al., In the Matter of Competitive Metering, Order Relating to Electric and Gas Metering Services (issued August 1, 2006).

Comments from People Affected by the Event

7. Con Edison should conduct a thorough evaluation of its outage communications program and develop an enhanced program to inform customers of critical service-related information, including:
   - the importance of contacting the Company if power is lost;
   - alternative ways to contact the Company, in the event telephones do not operate in an electric outage;
   - where to find information about dry ice and water distribution, cooling, or warming centers;
   - where to learn about outage information and estimated times of restoration;
   - the impact of low voltage and the steps people can take to protect appliances, computers, and other equipment;
   - how telecommunications services, technologies, and equipment might function during power outages; and
   - suggested contingency plans for consumers.

   The Company should, by June 1, 2007, provide Staff with an implementation plan for the redesigned outage communication program, as described above.
8. Con Edison should update, on at least a semi-annual basis, its contact information for public officials, community-based organizations, and critical care/large facilities, by asking those officials and organizations for contact information, including district office locations, e-mail addresses, land-line and cell telephone numbers, and fax numbers. The update should be completed by June 1, 2007, and Staff should be notified when the update is completed, as well as at each six-month interval thereafter.
9. Con Edison should establish a new program to ensure adequate communication with federal elected officials that provides specific procedures to communicate with the local offices of federal officials during emergencies, as well as the offices located in Washington, D.C. The Company should, within 90 days of the date of the issuance of this Report, provide Staff with documentation that its procedures have been modified to ensure that federal officials are contacted at both their local and Washington offices.

10. Con Edison should develop a new public liaison program that establishes procedures to partner with public officials, community-based organizations, and critical care/large facilities willing to serve as liaisons between their constituents and Con Edison. The Company should submit to Staff for its review before June 1, 2007, a description of the new program, including operating and recruitment procedures, and a status report on its progress in establishing partnership arrangements with such officials.
11. Con Edison should hold regular daily briefings for both the media and public officials during emergency events. These briefings should be held on the same schedule as notification activities specified in the Outage Notification Incentive Mechanism.

Customer Operations (Call Center/Customer Assistance)

12. Con Edison should modify its automated call system to enable callers to bypass the interactive voice response message and be placed in queue within 15 seconds to reach a Customer Service Representative to report service problems or obtain information during future emergencies. Within 30 days after the issuance of this Staff Report, the Company should advise Staff of the additional procedures and protocols it has put in place to comply with the intent of this recommendation.
13. Con Edison should identify ways to use its outreach van(s) and staff more fully, including providing instructions to its van personnel to count the customers they interact with, keep records of their problems and questions, observe and report on conditions in the vicinity of the van, and use the public address system on the van to make appropriate announcements. A copy of these procedures should be provided to Staff for review by June 1, 2007.
14. Con Edison should develop an enhanced program to identify customers, as well as other consumers (e.g., those who pay utility costs in their rent or through master metering arrangements), who rely on life-support equipment, and raise their awareness of the importance of being included in the Company's records as using life-support equipment. The Company should report to Staff, within 30 days of the issuance of this Report, its actions and plans in this regard. It should also include its plans as part of its next rate filing.

15. Con Edison should include beginning with in its 2007 summer preparedness letter to customers, service organizations, and equipment distributors, its "Life Support Equipment Survey" and its "In Case of A Storm" brochure. Con Edison should also reach out to such individuals (including apartment dwellers who are not direct Con Edison customers) through doctors, senior care facilities, and other such entities.
16. Con Edison should, in the spring of 2007 and each year thereafter, send information to all its customers informing them of the life-support equipment certification and recertification processes, as well as the importance of their identifying themselves to Con Edison as life-support equipment customers.
17. Con Edison should, by June 1, 2007, include instructions on the handling of dry ice in the "Storm Preparations" section of its website. The Company should notify Staff when it has so modified its website.
18. Con Edison should establish a task force to address unique outage-related consumer issues associated with large buildings containing elevators. The task force should also address additional ways to identify people who use life-support equipment. The Company should report to Staff by June 1, 2007 the status of its efforts in this regard.

Public Affairs Organization

19. Con Edison should, within 30 days of the issuance of this Report, redesign its website so that access to the outage reporting feature is in a prominent location on its website home page.
20. Con Edison should, by June 1, 2007, be ready to modify quickly its website during emergency events so that essential and up-to-date information is posted on the home page. The Company should notify Staff when such capability has been implemented.
21. Con Edison should redesign its website so that heat wave and cold weather specific information is not subsumed in the "storm central" pages.

Energy Services Organization

22. The Company should investigate, document, and work cooperatively with the operators of the major transit systems in the Con Edison metropolitan area to mitigate potential effects of power disruptions on the major transit systems in each of it electrical networks. This review should include an analysis of the effects of a network shutdown (by network)

on the major transit systems. This information should be integrated into the Company's operating and planning procedures, including its procedures for network shutdowns.

23. The Company should determine the lead time notification and other information needs of each of the mass transit systems and include provisions in its operating procedures that will ensure that those entities receive appropriate information in the event of electric system emergencies, including in the event of planned network shutdowns.
24. Also see recommendations in Section 5.4 "Comments from People Affected by the Event".

Claims

25. The Commission should examine the sufficiency and appropriateness of Con Edison's claims tariff, and if appropriate, make modifications to such tariff prior to Summer 2007, and then in all of the Company's subsequent rate cases. Issues to discuss during the examination should include which items should be reimbursed, the amount of the reimbursement, and limits on claims.
26. Con Edison should reassess its denial of the claims for fuel reimbursement, and, within 30 days of the issuance of this Report, reimburse these customers for the cost of the fuel used to run the generators, if such operations were at the request of the Company. The Company should immediately thereafter advise Staff of its compliance.
27. Con Edison should, within 30 days of the issuance of this Report, contact any other customers whom it asked to run generation and who have not yet filed reimbursement claims. The Company should discuss with those customers what their fuel expenses were and, within 30 days thereafter, reimburse them for those expenses. The Company should, by June 1, 2007, advise Staff of the results of its contacts with such customers.
28. Con Edison should instruct its Representatives, within 30 days of the issuance of this Report, not to make assurances to consumers concerning payment of claims, except to the extent those Representatives are the decision-makers and will ensure that the claims decision they impart is carried out.

Training Exercise

29. Con Edison should establish procedures and assign employees to ensure that the problems it identifies during training exercises are corrected in a timely manner. A copy

of the procedures should be given to Staff for review within 90 days of issuance of this Report.

Network Shutdown Decision

30. Con Edison should modify EO-4095 and provide a copy to Staff for review by June 1, 2007. As part of this process, Con Edison should meet with New York City authorities and review societal needs related to outages to determine whether and how to factor those parameters into a shutdown decision and emergency plans. The Company should develop a protocol for including societal impacts into its operational procedures and conduct drills with the City and others (i.e., mass transportation entities) as necessary.
31. Con Edison should develop a procedure for the analysis to be performed during multiple contingency events to allow for a more defined process of taking into consideration the requirements for re-starting a network. All parameters and considerations should be listed including when this analysis is first performed, who performs the analysis, how they determine the number of feeders required to be in service before re-energizing, estimated time frame of shut down, and any other related issues. The Company should provide this procedure to Staff by June 1, 2007.

Primary Feeders Analysis

32. Staff recommends the Company continue to replace paper-insulated lead-covered cable at its current rate under each of the programs that replace such cable. Staff further recommends that paper-insulated lead-covered cable in the Long Island City Network be replaced by the end of 2012. The replacement program in the Long Island City Network should be documented in a manner that it can be applied to other networks going forward as necessary. The Company should also reassess its paper-insulated lead-covered replacement program as a whole and file a report with Staff within 90 days of the issuance of this Report.
33. Con Edison should review and modify existing procedures for use by the summer of 2007 that will ensure the maximum number of actual failed cables and joint samples possible are set aside in the field for further examination by the cable and splice center. The Company should provide a copy of the procedure to Staff for review by June 1, 2007.

34. The Company should calculate the actual thermal conditions experienced by the underground primary cables under normal and emergency conditions and report its findings to Staff within 90 days of issuance of this Report.
35. Con Edison should initiate a formal program to reduce congestion within manholes and provide additional spacing between primary and secondary cables. The Company should make congestion and spacing issues a top priority for repair during routine inspection cycles. Con Edison should also consider the feasibility and associated costs to expand its current cut-and-rack procedure being implemented within the Long Island City Network as part of the recovery process of the remaining 56 underground networks within its service territory. The Company should provide Staff, within 90 days of the issuance of this Staff Report, with a report that shows it is initiating a formal program to reduce congestion within manholes.
36. Con Edison should analyze and report on the appropriateness of the expedited feeder processing scheme it used during the Long Island City Network incident and which is intended to be used when multiple feeders need restoration and during summer heat events. This should include determining whether or not eliminating the use of trace currents actually increases the overall restoration time when there are multiple feeders are out-of-service. The Company should provide a copy of the report to Staff by June 1, 2007.
37. Con Edison should determine if the Very Low Frequency (VLF) high potential testing is effective on underground network systems and, if effective, adopt such an approach as the Company's standard practice for testing primary cable for integrity by June 1, 2007. If not effective, the Company should accelerate the research and development of other alternatives to hipot testing with the intent to have such a new procedure in place by the summer of 2008.
38. Con Edison should evaluate and report the effectiveness of performing infrared and/or partial discharge testing on underground cables and joints when conducting its normal underground inspections that are required by the Commission's Safety Standards. The Company should provide a report of its findings to Staff by June 1, 2007.

System Modeling

39. Con Edison should upgrade the World-class Operations Load Flow system program to make it more reliable during normal and emergency operating conditions, and make advances to be able to complete full system simulations, including secondary modeling, during multiple contingency events above the fifth and sixth contingencies. The Company should study all possible improvements and provide its findings and proposed actions with regard to the World-class Operations Load Flow program evaluation to Staff for review by June 1, 2007.
40. The Company should improve the capability of its Poly Voltage Load Flow model to work on its secondary system, including accelerating its service demand estimator project. An emphasis needs to be given to developing in a systematic manner the data necessary to calibrate the model's expected secondary main section current flows with actual main section current flows at various network load levels.

Secondary Cable Analysis and Monitoring

41. Con Edison should develop a graphic operator's display, available to operators and managers, which overlays feeder outages, transformer overloads, manhole events, customer outages, and other pertinent information to allow for a more informed decision-making process. The Company should complete development of the display and provide Staff with a demonstration by June 1, 2007.
42. Con Edison should inspect all manholes and service boxes in the Long Island City Network as soon as possible. The Company should notify Staff upon completion of these tasks.
43. Con Edison should investigate ways to improve its monitoring of the secondary system during normal and multiple contingency event conditions. If it is unable to develop an adequate technical solution by June 1, 2007, it should develop a manual solution. The Company should report the outcome of its investigation and plans by June 1, 2007.
44. Con Edison should investigate alternatives to current limiters and provide a report to Staff within 90 days of this Report.

Transformer Analysis

45. Con Edison should consider adjusting transformers' normal and emergency load ratings to take into account the actual ambient temperatures experienced within its service territory, instead of just using a constant ambient temperature. The feasibility of this should be evaluated and reported to Staff within 90 days of the issuance of this Report.
46. Con Edison should immediately take into account transformers out-of-service within localized areas and their effects on the surrounding transformers loadings, especially when high summer heat events are forecast.
47. Con Edison should define when a transformer requires external cooling efforts. Further, Con Edison should study the effects on a transformer of both water and air cooling when operating beyond its normal and emergency design limits. Inspection criteria for transformers that have been overloaded, overheated, and cooled should be studied and re-evaluated to ensure an appropriate frequency of inspections. The results of these studies should be reported to Staff by June 1, 2007.
48. Con Edison should complete the inspections and replacements as necessary of all transformers within the Long Island City Network by June 1, 2007. The inspections should include a pressure test and dissolved gas-in-oil test for all transformers effective immediately.
49. The Company should amend its requirements for its five-year inspection cycle to include a pressure test and dissolved gas-in-oil test for all transformers effective immediately.
50. Con Edison should evaluate how to reduce the number of network protector relays that fail to operate due to low voltage conditions within the secondary system and also prevent or at least reduce the number of alive on back feed conditions that occur and hamper restoration efforts within 90 days of issuance of this Report. The Company should also provide feasibility and cost analysis for replacing the nearly 13,000 non-micro-processor relays system-wide by June 1, 2007.
51. Con Edison should increase its reporting percentage for Remote Monitoring System units system-wide and become compliant with specification requirements of 95% functionality by December 31, 2007. The Company should submit within 90 days an analysis of the

feasibility and cost for upgrading all Remote Monitoring System units to the new third generation unit by 2010.

Substation Analysis

52. Con Edison should perform a complete test and inspection of all similar substation breakers to the rack-out-type breaker that failed in the Long Island City Network. The Company should notify Staff of completion of the tests, inspections, and results by June 1, 2007.
53. Con Edison should evaluate and report on the effectiveness of its current testing, inspection, and maintenance procedures. The Company should provide a copy of the report to Staff within 90 days of issuance of this Report.
54. The Company should provide a full report of its analysis and risk assessment with regard to adjusting the relay settings within the LIC Network to Staff by March 1, 2007, at which time Staff will assess whether adjusting relay settings to their upper limits is appropriate.
55. The draft procedure EO-2147, should ensure that all future changes and modifications to networks and associated equipment are identified and shared with the relay engineers so that proposed settings and adjustments can be made as needed. The draft procedure should be finalized and submitted to Staff for review by June 1, 2007.
56. Con Edison should perform an in-depth study of the effects of inrush current on substation circuit breakers and the overall system to determine the best solution for addressing the problem and validating the 32 MVA threshold currently being used by the Company. The Company should provide Staff with a copy of the study report for its review within 90 days of the issuance this Report.
57. Con Edison should install microprocessor relays on substation breakers with more than 32 MVA of connected transformer capacity by December 31, 2007. The Company should provide a replacement schedule to Staff within 30 days of issuance of this Report. This schedule should emphasize the Company's efforts to complete as many replacements as possible before June 1, 2007.
58. Con Edison should analyze the feasibility and incremental costs, as well as other pertinent information, for accelerating the process to have a new substation in place

within the network area as soon as possible. The Company should provide Staff with the results of the analysis within 90 days of issuance of this Report.

59. The Third Generation (3G) team should evaluate alternatives to adding a new substation. The analysis should also assess the feasibility of partitioning the network into sections which are electrically isolated from each other at the secondary voltage level. The Company should submit a report to Staff within 90 days of issuance of this Report.

Temperature Design Criteria/Temperature Variable

60. Con Edison should re-evaluate the temperature design criteria/temperature variable of 86°F so that it meets its one-in-three year criteria. This should include the feasibility, cost, and benefits associated with adjusting the reference temperature and determining how it would affect the design and operation of the system in the future. The Company should provide its findings and results of this temperature design criteria evaluation to Staff for review within 90 days of this Report.

Restoration

61. Con Edison should develop a process for developing expected restoration times for underground outage events and provide a description of the process to Staff for its review within 90 days of the issuance of this Report.
62. Con Edison should develop a performance mechanism regarding system restoration and provide a description of the process to Staff for its review within 90 days of the issuance of this Report.
63. Con Edison should develop a procedure for when and what minimum level of mutual aid assistance and contractor assistance should be used for each event level identified in its underground emergency plans and guidelines, similar to what is specified for an emergency overhead event. The Company should provide a copy of the procedure to Staff for its review within 90 days of this Report.
64. Con Edison should identify resources other utilities have that can assist it during underground emergency events and advise Staff of its findings within 90 days of this Report.

Demand Reductions

65. Con Edison should correct the deficiencies in the automatic voltage reduction circuitry at the North Queens Substation within 30 days of the issuance of this Report, and further correct and test all similar equipment at other substations by June 1, 2007.
66. Con Edison should identify and implement measures to improve and increase participation in the various demand reduction and energy efficiency programs available throughout its service territory. The Company should provide Staff, within 90 days of issuance of this Report, with its plans for improving and increasing such participation.
67. Con Edison should develop a method(s) to understand and better identify demand reduction opportunities, including details on specific customer classes, locations, and timing, and to differentiate between voluntary load reductions and losses of load due to loss of service. The approach should have sufficient granularity to allow load reduction (or demand response) resources to be dispatched on a network-by-network basis and to develop an operating protocol that would allow the demand response resources under the control of the NYISO to also be dispatchable on a network basis within Zone J. The Company should provide Staff, within 90 days of this Report, with a report of the method(s) identified.

Mobile Generators

68. To address customers' comments that mobile generators physically arrived, but the actual connections of the units were delayed and also the problem that, in some instances, generators were not sized properly, the Company should perform a review and modification of its internal Company procedures and incorporate instructions relating to emergency mobile generators to ensure that they contain quality control processes by which the Company, or the contracted mobile generator vendor, will verify mobile generator connections and proper operation during an event. The Company should report the review and modifications to Staff within 90 days of issuance this Report.
69. To address the issue of availability of mobile generators during the peak summer months, when the risk of generator non-availability is the highest, Con Edison should perform a cost/benefit analysis of owning a greater number of mobile generators and positioning them in strategic locations in its service territory. This analysis should investigate

increasing the Company's on-hand emergency generator fleet and the use of emergency generators to provide load-pocket reinforcement when emergency network equipment ratings could be exceeded if operating conditions were to exceed the second contingency network design criteria. The results of the cost/benefit analysis should be provided to Staff within 90 days of the issuance of this Report.

70. Con Edison needs to re-assess its connection capabilities for its mobile generators so they are more flexible throughout the entire Company service territory.

Network Recovery

71. Con Edison should establish a protocol for an overall inspection program for network secondary mains program that includes taking current and voltage measurements for all of the Company's secondary networks. The protocol should include a sampling strategy that would develop information on the degradation on network components that could be incorporated into the Company's planning and contingency modeling analyses. A draft of the protocol should be provided to Staff within 90 days of the issuance this Report.
72. Con Edison should provide Staff with quarterly reports on the status of its compliance with its distribution transformer inspection and testing protocols, system-wide, tabulated by network.
73. Con Edison should provide Staff with weekly status reports on secondary main section work generated by the secondary main section inspection program in the Long Island City Network until all such work is complete. Such reporting should begin one week after the issuance of this Report.
74. Con Edison should inspect all of the remaining Long Island City Network transformers (about 500 inspections) and repair or replace by June 1, 2007 all that fail to meet Company specifications (see Section 6.6).

Emergency Plan

75. Con Edison should, within 90 days of the issuance of this Report, modify its Emergency Plans to ensure a more proactive response in the future.

Planning, Operations, Maintenance, and Oversight

76. The Commission should investigate and examine the prudence of the Company's actions, or failures to act, and practices relating to the Long Island City Network event.

Historic Expenditure Budgets versus Actual Expenditures

77. Con Edison should commence budgeting (capital, and operations and maintenance) by electric network beginning as soon a practicable. Con Edison should determine what systematic changes are necessary to implement this recommendation and report its findings to Staff by June 1, 2007.
78. Con Edison should commence tracking of actual work volumes and expenditures (capital, and operations and maintenance) by electric network as soon a practicable. Con Edison should determine what systematic changes are necessary to implement this recommendation and report its findings to Staff by June 1, 2007.
79. Con Edison should file its current five-year capital budget with Staff within 30 days of the issuance of this Report.
80. Con Edison should file a detailed five-year capital budget with the Commission within 30 days of the issuance of this Report, and subsequently by March 1 of each year until further notice.

Con Edison's Reporting of Costs Related to the Failures and Outages in the Long Island City Network

81. Con Edison should continue to track, and then report on a quarterly basis to Staff, all costs it incurred and incurs related to the failures and outages in the Long Island City Network. In addition, the Company should track and report to Staff all other operations and maintenance expenses and capital costs for the Long Island City Network until further notice.

Emergency Notifications Compliance

82. Con Edison should modify the Central Information Group procedures so that they are in compliance with the Appendix B of the Safety Standard Order in Case 04-M-0159. The Company should provide Staff, within 30 days of the issuance of this Report, a revised version of the Company's procedures that identify when and how notifications should be made.

Reliability Performance Mechanism

83. The reliability performance mechanism should be re-examined in the next rate case to determine if changes are needed to make it more effective for a network event similar to what happened in the Long Island City Network.
84. Con Edison should file a report with Staff, within 90 days of the issuance of this Report, explaining the basis (calculation methods and supporting evidence for the number of meters affected, for every event) for all outage estimates and every event rolled into the calculations since the Reliability Performance Mechanism went into effect. Staff will examine these and offer the Commission a recommendation on whether prior awards or penalties should be reconsidered due to questionable outage estimates.

Outage Notification Incentive Mechanism

85. Pursuant to the Outage Notification Incentive Mechanism in Con Edison's rate plan in Case 04-E-0572, the Commission should find that Con Edison should be assessed a payment to ratepayers of $300,000.
86. Con Edison's outage notification incentive mechanism should be re-examined and non-performance payment levels adjusted upward at the first available opportunity, such as when the Company next files for a rate change. At that time, there should be discussions about including an additional activity: holding conference calls to brief public officials about the status of restoration and other outage-related information.

Impacts on Telecommunications

87. Con Edison should make arrangements with wired and wireless service providers for the installation of portable telephone banks and portable cellular transmitters available in communities affected by outages that are projected to last more than 48 hours.

ABVI – Goodwill
Questionnaire
Long Island City Electric Outage

[V] = Volunteered response that is not read to the respondent

INTRODUCTION AND SCREENING

BASE: ALL RESPONDENTS

Hello, I am _____ calling on behalf of the New York State Department of Public Service who wants to learn how people were affected by electric system problems experienced by Con Edison in July.

Optional You have been randomly selected to be contacted for the survey. This is not a sales call, and the information collected will be kept confidential. The survey will take about 5 minutes to complete

Are you 18 years old or older?
Yes – continue
No- ask to speak to someone who is.

Are you or is anyone in your immediate household an employee of Con Edison, or the New York State Department of Public Service?

1. Yes - Con Edison [TERMINATE INTERVIEW]
2. Yes - NYS Dept of Public Service [TERMINATE INTERVIEW]
3. No
4. Don't know/No Answer

BASE: RESPONDENTS FROM ZIP CODE 11377, WOODSIDE

Q20. Do you live on the east side or the west side of the Brooklyn Queens Expressway?

1. Live on east side of BQE [TERMINATE]
2. Live on west side of BQE

BASE: RESPONDENTS FROM ZIP CODE 11370, JACKSON HEIGHTS

Q25. Do you live north of the Grand Central Parkway?

1. Yes
2. No

BASE: RESPONDENTS FROM ZIP CODE 11370, JACKSON HEIGHTS

Q30. Do you live west of 72nd Street?

1. Yes
2. No

[TERMINATE IF NO TO BOTH Q25 AND Q30]

BASE: ALL RESPONDENTS

Q15. Did you or does anyone in your household pay an electric bill directly to Con Edison?

1.	Yes	364	19%
2.	No	67	15%
3.	Don't Know/No Answer	19	4%

OUTAGE QUESTIONS - RESIDENTIAL

BASE: QUALIFIED RESPONDENTS

Q35. From July 17 to July 25, there was a disruption of electric service for some Con Edison customers in Queens and Long Island. Did your home or apartment lose electric service in July?

1.	Yes		281	62%
2.	No	[JUMP TO Q70]	161	36%
3.	Don't Know/No Answer [V]	[JUMP TO Q70]	8	2%

BASE: HOME/APT. LOST ELECTRICITY DURING OUTAGE (Q35/1)

Q40. For how long did you lose service at your home or apartment? [DO NOT READ LIST]

1.	Less than 1 hour	3	1%
2.	1 to 4 hours	8	3%
3.	5 to 24 hours	21	7%
4.	2 to 3 days	52	19%
5.	4 to 5 days	56	20%
6.	6 to 7 days	56	20%
7.	8 or more days	81	29%
8.	Don't Know/No Answer	4	1%

INFORMATION SOURCES

BASE: QUALIFIED RESPONDENTS

Q45. Which of the following sources of information did you rely upon to learn more about the power outage and when power might be restored? [READ LIST; RECORD ALL THAT APPLY]

[MULTIPLE RESPONSE]

1.	Con Edison	36	9%
2.	Television reports	44	11%
3.	Radio reports	62	15%
4.	The Internet	6	1%
5.	The Newspaper	57	14%
6.	Public officials	9	2%
7.	Friends and neighbors	86	21%
8.	Other (specify _____) [V]	22	5%
9.	None of these [v]	80	20%
10.	Don't Know/No Answer [V]	4	1%

BASE: QUALIFIED RESPONDENTS

Q50. Which was your best source of information about the power outage and when power might be restored? [READ LIST; RECORD ALL THAT APPLY]

[DISPLAY THOSE CHOSEN IN Q45]

1.	Con Edison	31	10%
2.	Television reports	33	10%
3.	Radio reports	46	14%
4.	The Internet	4	1%
5.	The Newspaper	34	11%
6.	Public officials	4	1%
7.	Friends and neighbors	72	23%
8.	Other (specify _____) [V]	23	7%
9.	Don't Know/No Answer [V]	71	22%

BASE: HOME/APT. LOST ELECTRICITY DURING OUTAGE (Q35/1)

Q55. Did you or anyone in your household attempt to contact Con Edison to report the outage?

1.	Yes		130	46%
2.	No	[JUMP TO Q70]	145	51%
3.	Don't Know/No Answer	[JUMP TO Q70]	7	2%

BASE: CONTACTED CON ED (Q55/1)

Q60. How did you contact Con Edison? [READ LIST IF NECESSARY]

1.	Telephone	111	86%
2.	Through Con Edison's Website/E-mail	4	3%
3.	Going to a Con Edison Walk-in Center	2	2%
4.	Some other way (Specify _____)	11	9%
5.	Don't Know/No Answer [V]	1	1%

BASE: CONTACTED CON ED (Q55/1)

Q65. Were you able to reach Con Edison to report the problem?

1.	Yes	98	76%
2.	No	29	22%
3.	Don't Know/No Answer [V]	2	2%

TELEPHONE SERVICES - RESIDENTIAL

BASE: QUALIFIED RESPONDENTS

Q70. Which types of telephone services did you have at home in July? [READ LIST; RECORD ALL THAT APPLY]

1.	Land line telephone service (from Verizon or another phone company)	396	58%
2.	Telephone service from your cable television provider	33	5%
3.	Internet-based telephone service (such as Vonage or Skype)	18	3%
4.	Wireless cellular service (cell phone service)	235	34%
5.	Other (specify) _____	1	0%
6.	Don't know/No Answer [V]	4	1%

BASE: QUALIFIED RESPONDENTS

Q75. Which types of telephone equipment did you have at home in July? [READ LIST; RECORD ALL THAT APPLY]

1.	Cordless telephone, or other telephone requiring power from Con Edison	268	34%
2.	Standard corded telephone not requiring Con Edison power	279	36%
3.	Cellular telephone	227	29%
4.	Other (specify) _____	3	0%
5.	Don't know/No Answer	4	1%

BASE: HOME/APT. LOST ELECTRICITY DURING OUTAGE (Q35/1)

Q80. Which of these types of telephone service continued to work during the power outage in July? [READ LIST; RECORD ALL THAT APPLY]

1.	Land line telephone service from Verizon or other phone company	184	46%
2.	Telephone service from your cable television provider	12	3%
3.	Internet-based telephone service (such as Vonage or Skype)	3	1%
4.	Wireless cellular service (cell phone service)	140	35%
5.	Other (specify) _____	32	8%
6.	Don't know/No Answer [V]	28	7%

SELECTED TOPIC

BASE: QUALIFIED RESPONDENTS

Q85. Do you, or does anyone in your household use life-sustaining equipment such as a dialysis machine or a respirator?

1. Yes		10	2%
2. No	[JUMP TO Q105]	437	97%
3. Don't Know/No Answer	[JUMP TO Q105]	3	1%

BASE: HAS LIFE-SUSTAINING EQUIPMENT (Q85/1)

Q90. Have you contacted Con Edison to let the company know you have this equipment at home?

1. Yes	3	30%
2. No	7	70%
3. Don't Know/No Answer	0	0%

BASE: HAS LIFE-SUSTAINING EQUIPMENT (Q85/1)

Q95. Did the company contact you during the outage to provide information on how you could obtain assistance?

1. Yes	1	10%
2. No	8	80%
3. Don't Know/No Answer	1	10%

BASE: QUALIFIED RESPONDENTS

Q105. Did you experience any power problems besides an outage, such as computers or appliances that would not operate?

1. Yes		169	37%
2. No	[JUMP TO Q120]	267	59%
3. Don't Know/No Answer	[JUMP TO Q120]	15	3%

BASE: HAD OTHER PROBLEMS (Q105/1)

Q110. Did you contact Con Edison regarding these other power problems?

1. Yes	67	40%
2. No	101	60%
3. Don't Know/No Answer	1	1%

BASE: HAD OTHER PROBLEMS (Q105/1)

Q115. Did you hire an electrician to check the problem?

1. Yes	18	11%
2. No	151	89%
3. Don't Know/No Answer	0	0%

DEMOGRAPHICS/CLASSIFICATIONS

BASE: QUALIFIED RESPONDENTS

Q120. I'd now like to ask you a few questions for classification purposes only. These questions allow us to group responses and you will not be individually identified with your answers. Can you tell me how many people live in your household?

_____People	1	73	16%
	2	166	37%
	3	92	20%
	4	61	14%
	5	40	9%
	>5	18	4%

BASE: QUALIFIED RESPONDENTS

Q125. Is your home a single-family house or an apartment?

1. House	[SKIP TO Q100]	149	33%
2. Apartment		301	67%

BASE: LIVE IN APARTMENT (Q135/2)

Q130. Approximately how many apartments are in your building?

_____units	1-25	168	56%
	25-50	60	20%
	50-100	38	13%
	>100	25	8%
	DK/NA	10	3%

BASE: LIVE IN APARTMENT (Q135/2)
Q.100. Does your building have an elevator?

1. Yes	121	40%
2. No	175	58%
3. Don't Know/No Answer	5	2%

BASE: QUALIFIED RESPONDENTS
Q135. Do you own or rent your home or apartment?

1. Own	175	39%
2. Rent	275	61%

BASE: QUALIFIED RESPONDENTS
Q140. On behalf of the New York State Department of Public Service, I'd like to thank you for helping us with this study. Thanks again!

Comments, grouped by issue, from the General Public, Businesspeople, Government Officials, and representatives of Critical Care/Large Facilities and Community Based Organizations about the outage in the Long Island City Network:

Con Edison's Communications Were Not Useful or Timely or Adequate:

- "….this outage has lasted far too long without any definitive communications on the status. Company has blamed a storm from last week for this past Monday's outage….."
- "I have been without electrical service for three days and when I call Con Edison, the Reps are nasty and they only give me information re the weather and Yonkers..….. I need to know what they are doing in my area."
- "…..I am very upset with how Con Ed handled the electric service low voltage and outage in my area…..The Company out and out lies when they said the voltage reduction was 8% when it was 90%.....The Company has no information to give me……I still have no service….they should be feeding their phone reps with current information so they can relay it to their customers."
- "…..I am outraged that the customers in the Astoria LIC areas are asked to conserve power when they have none….I am frustrated and infuriated that a problem like this could not have been foreseen."
- "I lost power on July 18; my power was finally restored on July 23. I called the Company numerous times and the rep I spoke to on the 18th was very rude……"
- "…..I was also unimpressed with the excuses they provided - how could a power company not know people didn't have power? Isn't that their job?"
- "…..the Con Ed Representative actually told us TWICE on July 20th that WE should have an electrician come to our house to see what 'our' problem was!! One of the students living in the house called Con Ed on 7/20 to tell them that partial electricity had come on – there was electricity in just one room of our three-story residence. The Con Ed rep told him that we needed to call an electrician to see what OUR problem was……"
- "….I went online to find out information about the power outage and the only information I could find at the beginning was the amount of profit that they were making each year. I feel that Con Ed was insensitive to Queens residents during this failure and they were unresponsive to the problems they knew existed."
- "I have been out of power for more than 24 hours and I have called Con Ed twice and gotten no resolution. Now when I call Con Ed, their phones are shut-off."

Received Outage Information from a Source Other Than Con Edison:

- "All the information I received was from radio news, neighbors, and unaffected friends and work associates."
- "I only received the information from my relatives that were not affected."
- "I got info from a NYC Parks Dept. employee in our neighborhood who was handing out reimbursement forms."
- "All of my information came at work via online articles."
- "Only by contacting a city agency was I able to get information."
- "NY 1 was the only informative source."
- "…..I watched NY One and 1010 WINS. I was getting information I needed, but it wasn't coming from Con Edison. Con Edison was telling us a completely different story."
- "We get a lot of our information from elected officials."

Con Edison Did Not Give Restoration Time:

- "My service has been out since last Tuesday. I have elderly parents and no hot water. The utility ran out of dry ice. I want to know when I will be restored."
- "I have had no service for five days and there was a rainstorm this morning that is flooding my basement because the pump did not come on. When will service be restored?"
- "…..called the Company numerous times but the Company can't tell me when the service will be restored. I would like the Company to give me the information when my service will be restored so I can make arrangements as to what to do."
- "I have been out-of-service four days and I was just told by Con Ed it may be two weeks before power is restored."
- "During the outages I spoke with field workers, but they couldn't predict how long. This was after a few days into the blackout. At first, they thought it would be fixed quickly."
- "…..I have gotten no information from the Company and cannot understand how it can take Con Edison this long to restore power. I have experienced rudeness, non-responsive, and uncaring customer service reps, who seem to take the attitude that it is the customer's fault that the power is out, when all people want is information and some estimate of restoral."

Consumers Were Inconvenienced By The Outage:

- "…..I am appealing to Con Ed to restore at least one elevator, for the disabled, and the air."
- "How do you force Con Ed and other utilities to realize their customers are people, citizens, human beings with rights, needs and opinions and, unfortunately dependent upon their services?"
- "During the 10-day electric blackout this summer, I lost six work days, which is a loss of $525.00 and I had to depend on friends to loan me money."
- "I lost 4 days of work because I could not refrigerate milk for my child- I had to stay home and nurse him. The baby actually ran a fever last week because the power in the house was not enough to keep the rooms below 85 degrees, even at night. He was overheated, ran a fever and got a terrible heat rash."
- "No light, lost all my food. I had recent surgery and was unable to get out of the building due to the fact the elevator was not working."
- "I did not have electricity for 9 days. No air condition; no refrigerator, and I had my mom with me at that time, who is 80 years old, and we had a heat advisory for that period of time. I am lucky my mom did not have a stroke."
- "…..traffic lights were out, people had no elevators, people had no electricity, people lost appliances, there was no where for people to shop."

Con Edison Did Not Restore Full Power or Power Was Lost Again After July 26th:

- "My house is running at a reduced voltage and my air conditioning will not turn on. This has been going on for three weeks and I have been calling the Company every day and have gotten no response."
- "Since the eight day power outage, I have not gotten full power back. For the past two weeks, I have not been able to use any air-conditioning and my appliances have been burned out by the outage."
- "My power was restored yesterday, after being out a week. We went shopping and replaced our food, but the power went out again last night….."
- "This crisis has had a very negative effect on the present and foreseeable quality of life, and property values of the areas effected. CONED should be held accountable for their negligence in maintaining the system before the crisis, and for their embarrassingly inadequate performance during the crisis. It is 8/10/06 and we, Boulevard Gardens are STILL ON GENERATORS!"
- "I had four day outage and then power came back up, but my power went out again and I have been out three days now. There is a manhole that keeps blowing up and all the Company did so far was put orange tape around it and a cone. I have been in contact with the Company to discuss - they told me I was calling too much."

Con Edison Should Reimburse Customers For More Than Food and Perishables:

- "The blackout destroyed 2 TV's on July 18th. Con Edison does not want to pay the damage. I think it's unfair."
- "I want to know, I don't want to hear Con Ed tell me we are not paying other merchants the non-perishable because the New York State Public Service Commission says we don't have to. Look into it. It's only the right thing to do……"
- "…..I am an attorney. I have a business. I have people working under me. I can't just send them home, which I did send them home, but not pay them. We had to pay our employees. My phones were out. Computers were damaged. Software was destroyed. These things were not recognized by Con Edison."
- "We slept in the heat for 10 days; I have asthma and had to be on the alert because I couldn't plug in my nebulizer if I had an asthma attack. My parents took the animals. We had to eat out every meal so it cost us $300 for lost food, $500 for meals and now Con Ed wants $400 for power we mysteriously had."
- "I have no power and Con Edison is refusing to fix the problem. I need power restored. I suffer from hypertension and diabetes. I need the power for my lights, my fridge is barely running and my landlord is away on vacation out of the country. Con Edison told me to go to a hotel. I don't have the financial means to pay for it. All of my friends have passed away or moved out of state…."
- "Everyone affected should be fully compensated for their losses, not just food."
- "…..Also why is Con Ed only compensating for food but not damages."
- "Con Edison, for instance, is wiling to provide $350 in reimbursements to residential customers who lost food and medicine during the blackout, as well as $7,000 to businesses who lost perishables items. However, given the extent of the damage, which often goes far beyond the loss of perishables, this reimbursement policy is very, very inadequate."
- ….."Providing money for perishables just doesn't go far enough. We need to help these businesses. We need to help them get on their feet again. And we must do everything without nitpicking and finding out who has receipts and who doesn't….."
- "…..I was in the thick of it and all I was reimbursed was $113 for one week of inconvenience. I still had to pay my workers and that money came out of my pocket."

Neighborhood Demographics Played a Role in The Outage:

- "…..I feel the Company is targeting my neighborhood because we are a low income area."
- "…..It also troubles me that these days - long outages only seem to occur in working class areas, such as Washington Heights and Northwest Queens. There is absolutely no way this would happen in Manhattan, south of 125th Street or in Brooklyn Heights…."
- "I feel very discriminated against because Sunnyside and Astoria and Long Island City are largely working class and immigrant areas, and I really feel it had a lot to do with the demographics, okay, because I don't think this would have been pulled on Sutton Place or Beekman in Manhattan."
- "I have been out of power four days and I cannot get a hold of the Company to get an estimated time of restoral…..In more upscale neighborhoods, there are generator trucks being deployed in city blocks with power."
- "I just want to echo all the previous speakers' testimony. ……especially the comments about demographic disparities, because it's so obvious and needs to be acknowledged.
- "…it's not just northwest Queens. Isn't it funny the other place is Washington Heights that had problems?"

Con Edison Was and Is Lacking Plans:

- "….I want Con Ed to properly address and prevent future system failures. After the Washington Heights power outage of 1999, there were several reports and recommendations that we issued and none of these was heeded by Con Edison. Many of the problems that were experienced by the Washington Heights incident are exactly the same problems that caused the Queens outage last week…..The responses from Con Ed was unbelievably poor – little or no public information in the beginning, misrepresenting the number of people this was affecting, slow response that could have potentially resulted in physical harm for the residents of this region."
- "…..I would like to see better contingency plans set in place to prevent further disasters such as these….."
- "The aftermath of the blackout has been a complete confusion. In my neighborhood, we have power cables in the streets and no real sense of when this will be fixed. There are rumors it will take until Feb. 2007. There is also no concrete information why this occurred and why it took so long to fix, especially when a similar event occurred on the east side of Manhattan and it only took a few hours to fix.
- "Never learned from the Washington Heights outage."
- "….They knew from the report that Eliot Spitzer did that they were not prepared….."
- "The lack of communication led us to believe that the response was disorganized and lacking leadership. We had no idea when power would be restored, what steps were being taken, and who was leading the effort……"

Other:

- ….."I think you need to understand that there are thousands of older Greeks and Italians in this neighborhood who are never going to come forward to claim their money. By that I mean people who have lived here since at least the 1960's, are immigrants, may speak English but cannot read or write it, operate only in cash, and have a strong distrust of any sort of public institution. I can guarantee you these older people were the most adversely affected by this outage….yet I can also guarantee you a very small percentage of them will come forward for help….."
- "NO it did not occur to me to call Con Ed. I believed they were aware of the problem."
- "I felt the company continually undermined the critical nature of the crisis by using low figures of those affected. For example, my building has 412 units, and we counted as 1 customer to them although there are more 1,000 residents there, many of them older women living alone."
- "…..The other item that we want to speak about is for people with special needs. Lists that were handed to the police department were out of date, and there was not the best use of resources for the police department to start calling people and then to find out they were calling somebody's house where a loved one passed maybe two years ago."
- "Queens has an incredible network of civic associations, business associations and educational institutions that, if notified of events as they were taking place, could have come to the aid of residents and businesses in a more expeditious manner."
- "I have been out of power since Monday and am getting the run around by Con Ed……Conditions are getting pretty bad here with no gas, electricity, many stores have been closed. The company has not come here to distribute ice or anything."

Some commercial customers requested to be reimbursed for items and services that are not listed in the tariff. This is a representative sampling of items and services denied by the Company.

Equipment

Appliances (refrigerators, freezers, washers & dryers, compressors, air conditioners)
Circuit breakers
Electric lock controllers
Boiler systems and hot water tanks
Intercom systems
Computers, servers, hard drives, modems, network card & router
Security systems
Televisions, DVD players, radios
Telephone systems and related equipment
Elevators
Generators (the purchase or rental and fuel to run them)
Lighting and light bulbs
Coin meters, change machines
Facial machines
Electrical and plumbing systems
Garage motors
Electric gates
Pellet mill frequency drive
Printers, fax machines, copiers, and paper cutters
Cash registers
Batteries, flashlights
ATMs

Services

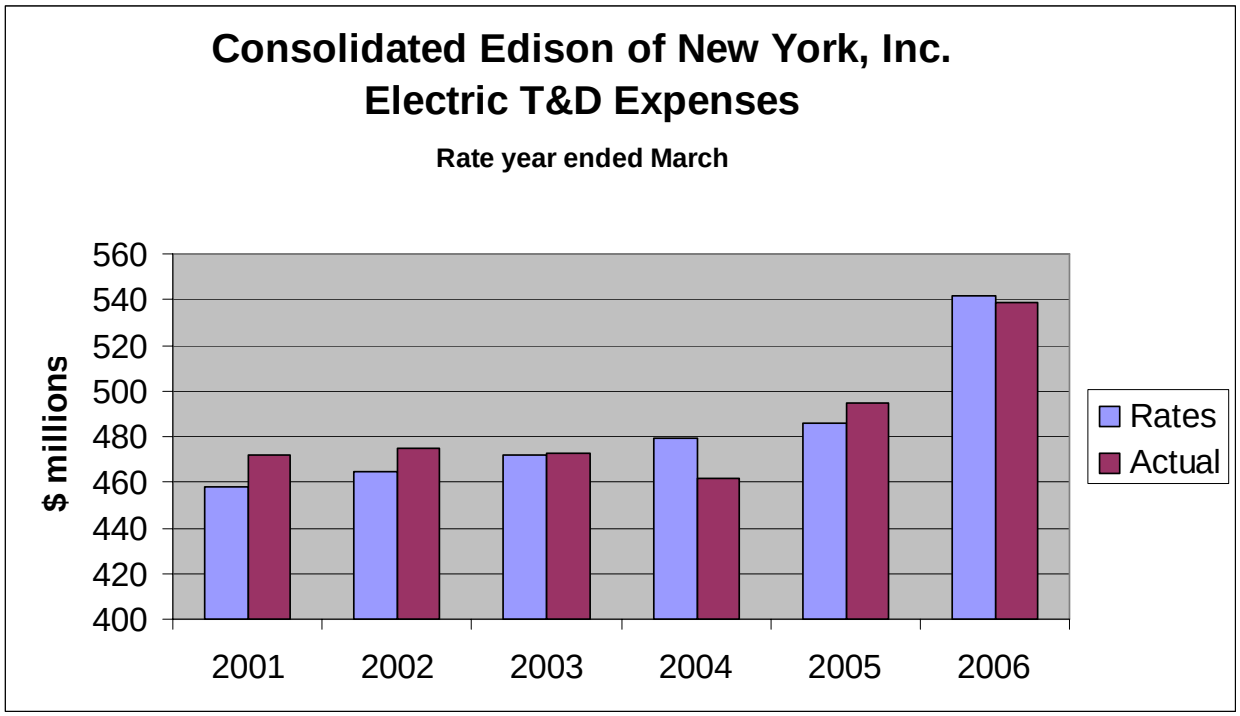
Electricians
Plumbers

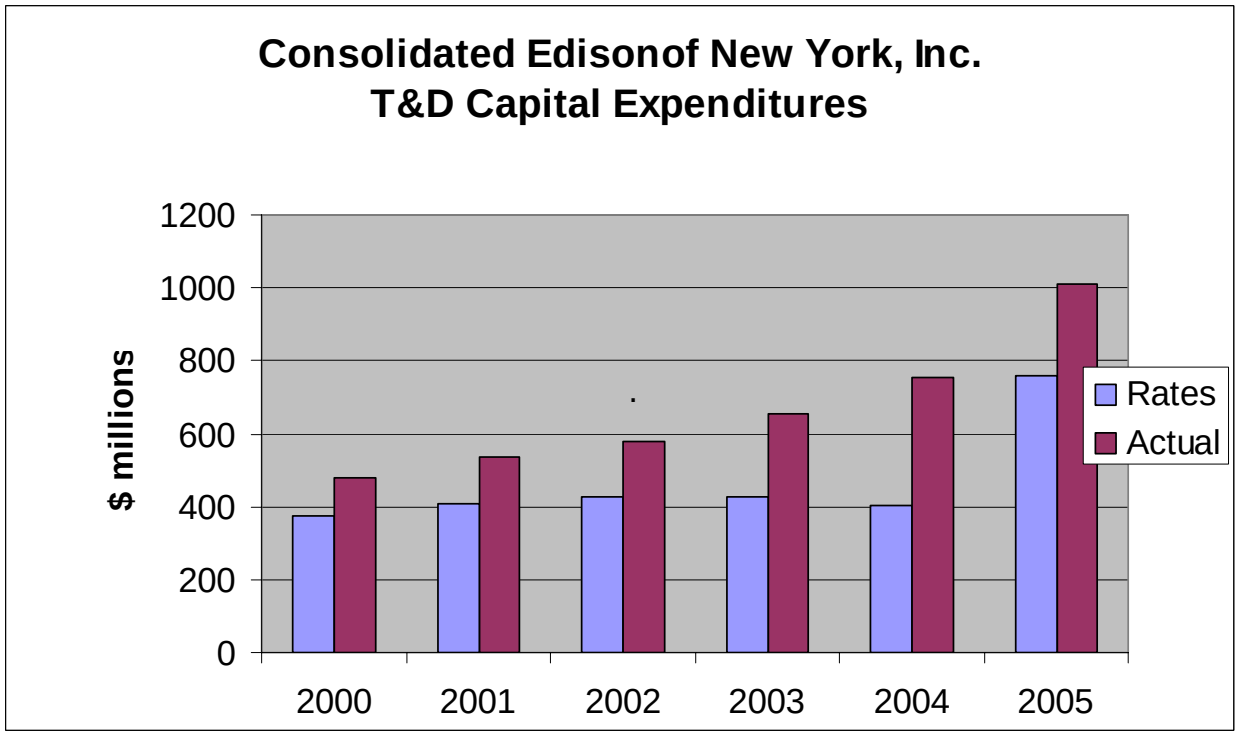
Damages/Miscellaneous/Incidentals

Lost business, payroll, insurance, rent
Burned electric line
Flood damage
Fish in tank
High pressure valve
Circuit board

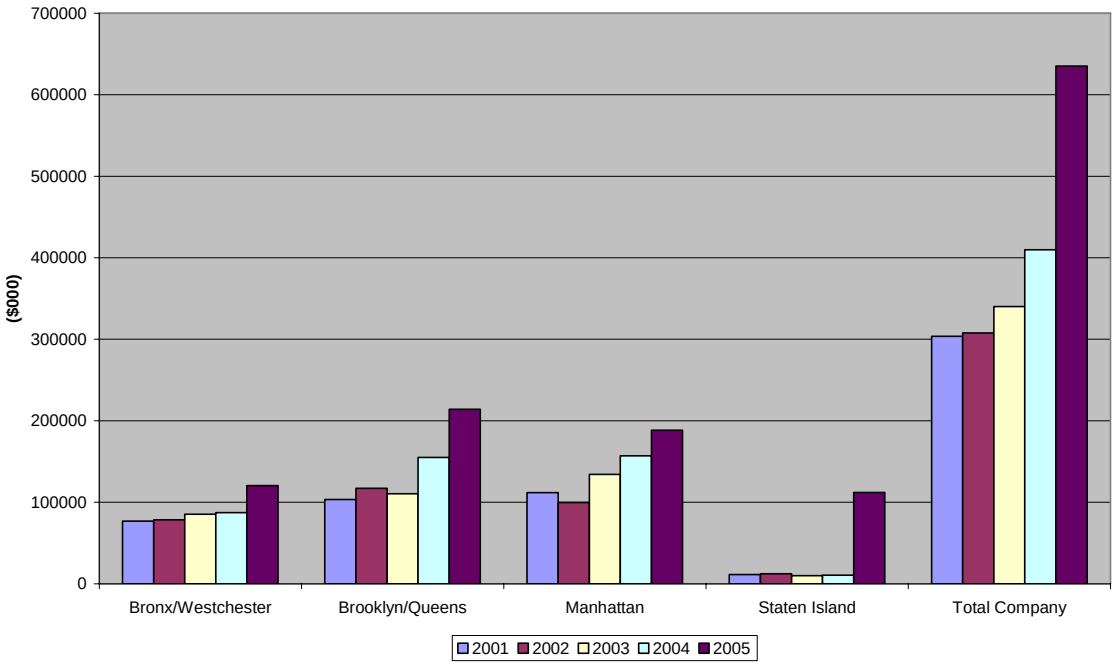
Some residential customers requested to be reimbursed for items and services that are not listed in the tariff. This is a representative sampling of items and services denied by the Company.

Lost wages
Meals in restaurants
Stays in hotels
Air conditioners
Household appliances
Computers
Televisions
Portable telephones
Answering machines
VCRs

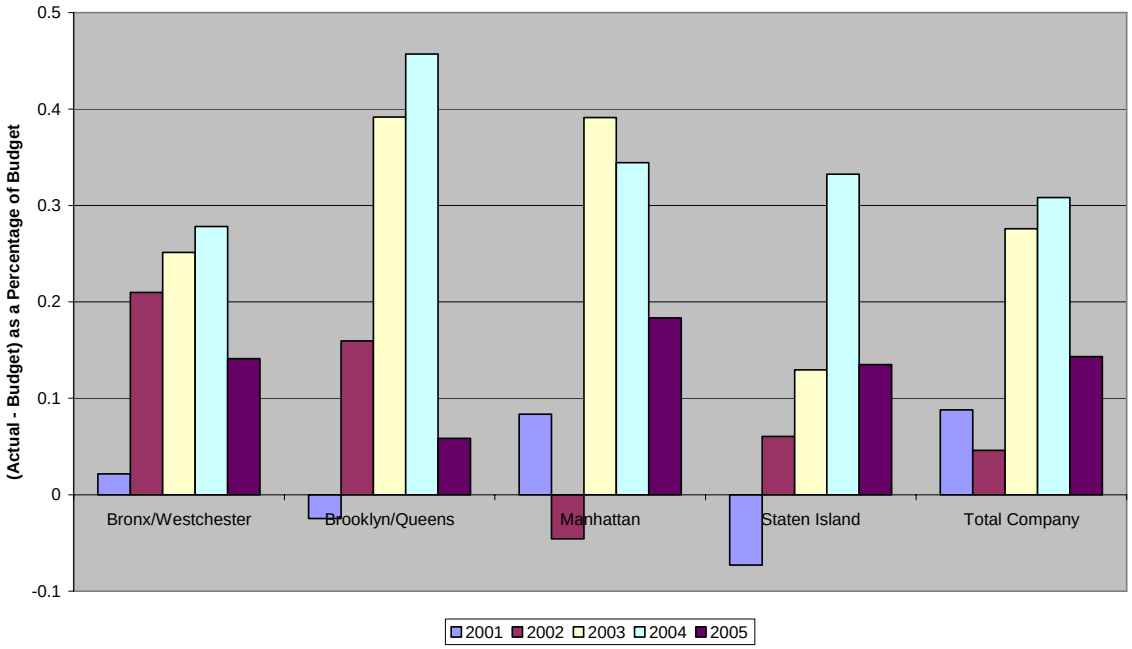

Consolidated Edison of New York, Inc.
Electric T&D Expenses
Rate year ended March
$ millions
560
540
520
500
480
460
440
420
400
2001
2002
2003
2004
2005
2006
Rates
Actual


Consolidated Edisonof New York, Inc.
T&D Capital Expenditures
$ millions
1200
1000
800
600
400
200
0
2000
2001
2002
2003
2004
2005
Rates
Actual

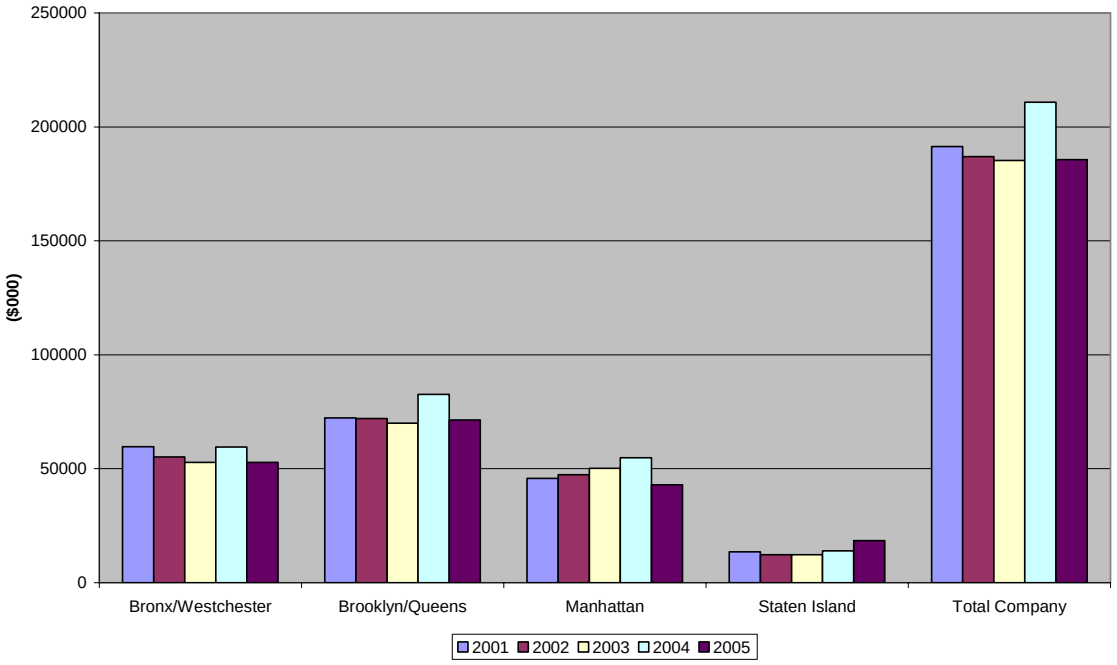
Consolidated Edison of New York, Inc.
Actual Capital Spending



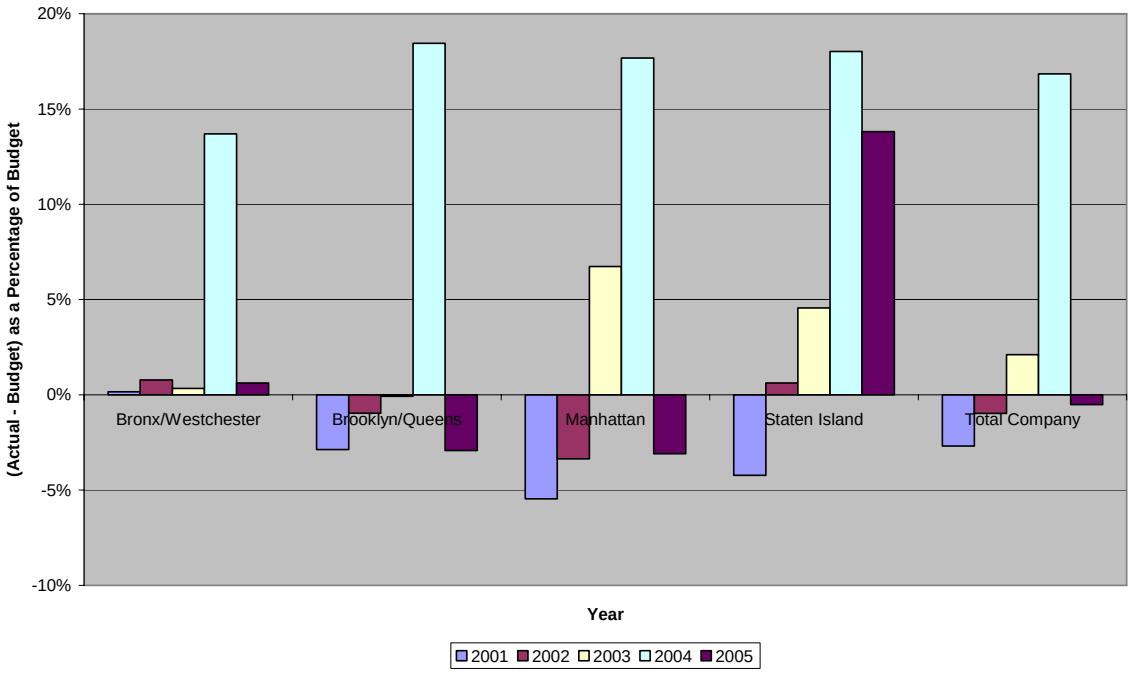
Consolidated Edison of New York, Inc.
Capital Spending Variance



Consolidated Edison of New York, Inc.
Actual Operations & Maintenance Expense



Consolidated Edison of New York, Inc.
Operations and Maintenance Variance



Consolidated Edison of New York, Inc.
Long Island City Outage Cost Summary

	Actual Through November	Projected Through December
Operations and Maintenance Expenses	$ 40,151,444	$ 54,000,000
Outage Claims Settlements	14,255,475	14,500,000
Non incremental costs (i.e. Labor) - December 31, 2007	3,740,760	3,740,760
Cost of Crews, Jul 17-19, 2006	822,864	822,864
Capital Costs	32,387,897	48,038,991
Lost Revenues (proration of customer charge)	250,088	250,088
Total	$ 91,608,528	$ 121,352,703

Consolidated Edison of New York, Inc.
Long Island City Outage Expenses
July 20, 2006 - November 30, 2006

	Emergency Response	Recovery	Total
Distribution Work - Maintenance UG lines	$ 18,963,512	$ 849,408	$ 19,812,920
Mobile Diesel Generators	7,734,115		7,734,115
Support Service - Site Safety, Engineering Analysis, Central Field Services	5,756,502		5,756,502
Customer Contact - Customer Operations, Energy Service, Public Affairs	1,537,679		1,537,679
Misc. - Petty Cash & Food Services	1,216,989		1,216,989
Regulatory Investigatory Cost	1,822,834		1,822,834
Substation Operations	605,306		605,306
Training of Outside Crews	778,613		778,613
Queens Facility Lease and Preparation Work	553,869		553,869
Informational Advertising - Video	168,168		168,168
- Newspaper	81,973		81,973
Supplies & Expenses - Community Relations	46,500		46,500
- Public Information	35,976		35,976
Total	$ 39,302,036	$ 849,408	**$ 40,151,444**

Consolidated Edison of New York, Inc.
Long Island City Outage Capital Costs

Actual Cost July 19, 2006 - November 30,2006

	Emergency Response			Recovery			Total		
	Capital	Removal	Total	Capital	Removal	Total	Capital	Removal	Total
UG Conduit	$277,006	$31,098	$308,104	$3,837,266	$49,894	$3,887,160	$4,114,272	$80,992	$4,195,264
UG Service Conduit	0	0	0	10,830	206	11,036	10,830	206	11,036
UG Primary Cable	585,446	91,896	677,342	38,019	3,372	41,391	623,465	95,268	718,733
UG Secondary Cable	7,546,614	3,777,754	11,324,368	10,285,325	2,874,896	13,160,221	17,831,939	6,652,650	24,484,589
UG Service Cable	319,255	39,773	359,028	16,535	2,361	18,896	335,790	42,134	377,924
UG Transformers	851,346	153,836	1,005,182	61,548	30,676	92,224	912,894	184,512	1,097,406
UG Structures				872,634	327,644	1,200,278	872,634	327,644	1,200,278
RMS	0	0	0	748	0	748	748	0	748
OH Conductor Secondary	0	0	0	195,332	45,172	240,504	195,332	45,172	240,504
OH Conductor Service	0	0	0	31,574	13,651	45,225	31,574	13,651	45,225
OH Transformers	0	0	0	15,716	474	16,190	15,716	474	16,190
	$9,579,667	$4,094,357	$13,674,024	$15,365,527	$3,348,346	$18,713,873	$24,945,194	$7,442,703	**$32,387,897**

Projected Costs - December 31, 2006

	Emergency Response			Recovery			Total		
	Capital	Removal	Total	Capital	Removal	Total	Capital	Removal	Total
UG Conduit	$277,006	$31,098	$308,104	**$5,973,000**	$49,894	$6,022,894	$6,250,006	$80,992	$6,330,998
UG Service Conduit				10,830	206	11,036	10,830	206	11,036
UG Primary Cable	585,446 #	91,896	677,342	**826,000**	3,372	829,372	1,411,446	95,268	1,506,714
UG Secondary Cable	7,546,614 #	3,777,754	11,324,368	**13,566,000**	2,874,896	16,440,896	21,112,614	6,652,650	27,765,264
UG Secondary Upgrade				**1,125,000**		1,125,000	1,125,000	0	1,125,000
UG Service Cable	319,255	39,773	359,028	16,535	2,361	18,896	335,790	42,134	377,924
UG Transformers	851,346	153,836	1,005,182	**7,184,000**	30,676	7,214,676	8,035,346	184,512	8,219,858
UG Structures				872,634	327,644	1,200,278	872,634	327,644	1,200,278
RMS				**1,200,000**	0	1,200,000	1,200,000	0	1,200,000
OH Conductor Secondary				195,332	45,172	240,504	195,332	45,172	240,504
OH Conductor Service				31,574	13,651	45,225	31,574	13,651	45,225
OH Transformers				15,716	474	16,190	15,716	474	16,190
	$9,579,667	$4,094,357	$13,674,024	$31,016,621	$3,348,346	$34,364,967	$40,596,288	$7,442,703	**$48,038,991**

$ 29,874,000