Final Report

Independent Audit

Of

Consolidated Edison Company

Electric Emergency Outage Response Program

For The

New York State Department of Public Service

October 24, 2007

Vantage Consulting, Inc.

Audit of Consolidated Edison Emergency Outage Program

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I. EXECUTIVE SUMMARY

This Chapter is an Executive Summary of the Independent Audit of Con Edison's Electric Emergency Outage Response Program. This Management Audit was conducted by Vantage Consulting, Inc., (Vantage) for the New York Department of Public Service (DPS). (Please see the Introduction for a description of the audit's scope, process and other background information). Information in the Appendices may be helpful to the reader, and includes a complete list of recommendations (Appendix 1) and a glossary of terms and acronyms (Appendix 5).

The primary goal of the audit was to identify opportunities to improve Con Edison's Electric Emergency Outage Response Program. In addition to a review of the Company's planning, performance and best practices for responding to and minimizing electric emergency outages, Vantage also reviewed actions that the Company takes to minimize outages and maintain reliability. Vantage's review, as discussed in Finding III-F4, is consistent with the Company's "three prong" approach to electric emergency outage management which includes: (1) reduce the number and size of outages; (2) reduce the duration of outages; and (3) communicate with stakeholders. [1]

As one would expect, Con Edison has many established policies and programs for responding to electric outages and performs adequately in some aspects of its program. In response to internal and external reports on the Company's performance in 2006, the Company has implemented many of the recommended improvements to its program. Unlike the 2006 reports, this audit focuses mainly on the outage management program and opportunities for improvements.

Vantage's major conclusions and recommendations are summarized below to provide an overview of our assessment of Con Edison's efforts to minimize outages, prepare for and perform emergency management activities, and conduct outage restoration. Vantage has primarily identified opportunities for improvement, but also identified activities that Con Edison performs adequately or can be considered as strengths. Chapter VIII recommends an Implementation Strategy and suggests a process for addressing the results of this audit

EMERGENCY RESPONSE, POLICY AND ORGANIZATION (CHAPTER III)

Vantage believes Con Edison did not fully understand the nature and magnitude of shortcomings in emergency planning and response during 2006. This is a root cause for many issues that surfaced during the outages of 2006 and will continue as a barrier to effective resolution until recognized and effectively acted upon. Consequently, Vantage makes recommendations that outline a process to reevaluate, refocus, and redesign Con Edison strategies, tactics and fundamental policies to guide improvements in its reliability and emergency management programs. These recommendations are based on findings that Con Edison lacks a needed strategic framework that is crucial to analyzing and making

[1]/ IR 137

internal decisions on the relative priority of emergency planning and preparedness. This central finding drives conclusions and recommendations on numerous related and germane issues.

The importance of emergency planning and preparedness at Con Edison is not sufficiently defined and articulated, resulting in an organization and support structure which are not fully aligned with the magnitude of the challenge and an internalization of the economic and human consequences of performance failures. The relative priority is not adequately defined, and that creates confusion both internally and with external stakeholders. Since its experience in 2006, Con Edison seems to more fully recognize the importance of emergency planning and has proposed and implemented significant changes.

However, Con Edison still lacks a sufficiently coordinated strategy and Master Plan for reliability and emergency preparedness. A coordinated strategy acts as both a foundation and the glue for an effective program. It sets objectives and priorities, channels the resources and allows the organization to focus on a common set of objectives. A better coordinated strategy for reliability and emergency planning and response is needed to ensure that Con Edison maintains its historic levels of reliability and has an effective and efficient emergency response program.

One of the most important recommendations coming out of the audit is that Con Edison should prepare a multi-year Strategic Plan focusing on system reliability, emergency preparedness, and major outage prevention and event restoration. The Plan should reflect the holistic nature of maintaining a high level of reliability and a highly effective emergency response program.

In addition to this major recommendation, Vantage makes subordinate recommendations that encourage executive management to take a proactive role in setting the vision and priority for the Company's approach to reliability and emergency management, to define and communicate policies, and to coordinate and maintain appropriate policies, oversight, and controls.

Vantage reviewed the principal internal organizations responsible for emergency preparedness planning, as well as other support organizations that are involved in planning and response during events. Vantage recommends that the Company restructure the emergency organizational function in accordance with the proposed Strategic Plan using sound organizational design principles. Vantage found that the Corporate Emergency Management organization is not sufficiently sized or aligned with its mandated responsibilities suggesting that either a change in staffing or a change in responsibilities is in order. Vantage also found that the Emergency Operations Emergency Management Group (currently located in the Bronx/Westchester region) has a number of organizational shortcomings. Vantage recommends the development of a strong central core group of emergency management professionals that have technical expertise in the field of emergency planning and management. This core group would also be responsible for providing technical direction and professional development of emergency management personnel in the operating regions. This matrix structure will achieve the technical benefits of a centralized group, increased corporate oversight, and maintain emergency management skills in the operating regions.

COMPREHENSIVE EMERGENCY RESPONSE PROGRAM (CHAPTER IV)

Con Edison files its Comprehensive Emergency Response Program (CERP) in accordance with the Public Service Law. This document collects in one place the policies, plans, procedures and supporting information on emergency response. The degree of information, and more importantly the level of planning it signifies, is impressive. The CERP contains specific sections tailored to the needs of each region. Also included is a newly-prepared "Coastal Storm Plan" which provides for planning and response to a Katrina-type event.[2] Vantage has made recommendations to improve the effectiveness of the CERP document during events.

Con Edison has adopted and demonstrated a solid commitment to the Incident Command System (ICS) organizational structure for responding to emergencies. This approach to responding to emergencies puts the Company at the forefront of the industry and firmly in tune with other emergency response organizations such as the New York City Office of Emergency Management and the Federal Emergency Management Administration.

This organizational response, allows: (a) a marshaling of the right people; (b) a workable transition from the normal organization to the emergency structure; (c) manageable spans of control over what can become an enormous organization; and (d) a framework in which managers have become increasingly comfortable and effective. Con Edison's application of ICS has provided great benefit to the management of large scale emergencies, and has probably been even more effective "on the street" in managing local incidents. However, there are opportunities for improvement that Vantage has recommended.

EMERGENCY RESPONSE PERFORMANCE (CHAPTER V)

Reduced staffing levels and the movement of supervisors and managers to new positions have created issues within the workforce that affect the Company's ability to respond to emergencies. Some employees indicated that Con Edison's succession planning efforts for key field positions, specifically regional engineering workforce, overhead line constructors, and underground workers have been inadequate. Also, excessive overtime is impacting the callout response rate during emergencies for field employees, with normal overtime for some work groups reaching as high as 40%. Our review resulted in a number of personnel-related improvements, including a review of the succession planning process for key field positions, and implementation of plans to increase the number of qualified employees in the Line Constructor and Underground Worker series. This report also calls for an evaluation of the impact of high levels of overtime and callout response rates.

Many of the recommendations that came from other stakeholder studies, and which were independently confirmed by Vantage, indicate that there is a need to refine policies related to maintenance and repair of critical systems and to better develop procedures for making operational decisions during major outages. Included in these recommendations is the need

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[2]/ The Corporate Coastal Storm Plan (CCSP) is not actually part of the CERP. It is broader and includes planning for emergencies affecting non-electric Company facilities.

to ensure that all diagnostic and data retrieval systems are working up to their design specifications.

There are also opportunities for improving operational performance through the upgrade and further development of information monitoring and analysis systems currently being used. These include the network reliability predictor system, weather forecasting systems, proof testing of networks, and load flow systems.

Many of the systems that retrieve and analyze field information in order to help determine system status have not performed at an adequate level. Con Edison has made significant strides in response to previous recommendations to improve these systems and Vantage provides further recommendations to ensure that the best information is available for decision makers.

Networks size, complexity and procedures for shutdown during emergencies have come into question in a number of post-outage reports and need to be addressed to ensure that Con Edison can meet its established goals of reliability and operational performance. Studies commissioned by Con Edison suggest that smaller networks with shorter feeders and fewer connected loads may be inherently more stable. Vantage recommends that guidelines regarding network shutdown and the decision process be further analyzed, more defined and less subjective, and that future network configurations consider secondary feeds to high profile customers such as the Metropolitan Transportation Authority and the Long Island Rail Road.

This chapter of the report also makes recommendations which address technical improvements to emergency drills, training, load reduction, and other operational elements of emergency management and response.

COMMUNICATION (CHAPTER VI)

Con Edison has enhanced the outage information available to its Customer Service Representatives so it can more accurately inform customers of the status of the outage and estimated time of restoration (ETR), however, the current estimates still appear to be conservative. Vantage recommends that Con Edison develop a methodology based on previous outage experiences to provide customers with a global ETR on a timelier basis.

Con Edison should also continue to improve information and communication provided through its web site, increase communication with customers on the need to report outages, and test the Call Center capability under major outage scenarios.

As a result of the events in 2006, Con Edison has implemented many policies and procedures to provide a consistent message to the media during outage events in a timely fashion. They have also worked to establish effective communications with the numerous public entities that it deals with during outage events.

RELIABILITY (CHAPTER VII)

One element of our investigation was to determine if Con Edison was doing all it should to reduce the number and seriousness of outages through adequate and properly focused design and maintenance of their system. This included questions about the level of spending, use of available funds and policies on design of systems.

The analysis in this chapter was limited to changes in spending related to reliability over the last five years. While spending did increase, beginning in 2004, it is not clear if it was directed primarily at new load requirements or reliability and safety. Further, Vantage's review of O&M and capital spending, although limited, does suggest that a more detailed analysis is required to determine if funding is being appropriately planned and focused. Vantage is recommending a comprehensive study on the adequacy of spending for capital and O&M by category to determine if Con Edison is providing adequate resources to support their infrastructure. Associated with this are the issues of staffing, rate structure, inflation, and overall corporate policy regarding system maintenance.

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Reliability performance measures began to deteriorate in Con Edison's distribution system in recent years. It is not clear if management was fully cognizant of these changes. Vantage found that internal reliability reporting has changed so that the 20-year analysis that would have straight-forwardly portrayed Con Edison's decline was no longer included in the annual internal reports to management. These tables of raw data could have permitted an engaged and knowledgeable observer to see overall trends and results. Further, the manner in which other reliability results were expressed to management minimized the appearance of the decline.

Based on our review of performance measures and reporting, Vantage recommends that Con Edison develop a broader and more comprehensive set of performance indicators that, when tracked, will permit Con Edison, DPS Staff, and other stakeholders to understand performance of all relevant activities associated with reliability, emergency response management, and customer satisfaction against both targets and overtime.

Tree trimming was also reviewed with recommendations that propose a study using outside resources to determine the actual health status of the forest in Con Edison's service territory, and an evaluation of the effectiveness of current tree trimming and clearing program relative to other reliability measures.

BEST PRACTICES (CHAPTER VIII)

Con Edison has failed to participate in several highly respected distribution system-related benchmarking programs whose goal is to identify best practices, including those within the areas of emergency planning and storm restoration. Because Con Edison views itself as a highly unique electric utility due to its extensive underground network system, it has created an artificial barrier for which Con Edison is missing opportunities for identifying and implementing best practices associated with emergency preparedness and restoration.

Con Edison funds an array of research and development programs for which Vantage identified a number of potential best practices should they become commercialized. However, the adequacy of senior management's ongoing support, from both a financial and prioritization perspective, raises the question as to whether these R&D projects will ever reach commercial fruition in time to meet Con Edison pressing needs.

II. AUDIT PROCESS

The proposal Vantage submitted and which was accepted by the Public Service Commission addressed Consolidated Edison Company of New York (Con Edison), which serves the five boroughs of New York City and most of Westchester County. Con Edison experienced four major outage events on its distribution system in 2006. Three were overhead storms that did extensive damage to the mature urban forest of Westchester County. One was a heat wave that caused extensive outages on the Long Island City secondary network, one of 59 such networks that Con Edison maintains in New York City.

The Commission was concerned about the effectiveness of Con Edison's Electric Emergency Outage Program based, in part, upon customer complaints regarding the Company's performance and in response to electric emergency outages in January 2006, July 2006, and September 2006. Effective and efficient electric emergency preparedness, mobilization, execution, effective communications with customers, and prompt restoration are essential in times of electric emergency outages, whether they are storm related or other electric system events. The broad parameters of the scope of this audit were identified in the Commission's September 8, 2006 Order:

…the Commission determines that there is a need to initiate a proceeding and to conduct an independent audit of the Company's system-wide operations, practices and procedures as they relate to emergency planning, response to outages, and restoration of service.

Specifically, the scope of the audit consisted of several elements of review of Con Edison's electric emergency outage program as cited from the RFP.

I. Planning/Preparedness – This element centers on the Company's planning efforts for electric emergency outages. It incorporates a review of the policies and procedures that form the framework for the Company's response to electric emergency outages.

II. Performance/Effectiveness – This element focuses on the Company's ability to mobilize adequate resources, establish critical priorities, effectively execute plans with the agility needed to quickly make adjustments in response to changing circumstances, and the effectiveness of the Company's communications with customers, other responders, stakeholders, etc. Included in this review will be a detailed assessment of restoration activities encompassing its ability to function effectively within the National Incident Management System framework and protocols.

III. Best Practices – This aspect of the audit will compare the Company's electric emergency outage planning and restoration activities to industry "best practices" appropriate to the Company's operating environment. The audit should identify best practices that the Company is, or should consider, employing in the area of electric emergency outage response as well as opportunities for improvement.

In order to do a complete assessment of performance and effectiveness, it is necessary to understand how reliability is measured and tracked, and to understand the capital and O&M resources dedicated to reliability programs. These two topics are covered in enough detail to provide the readers with an understanding of historical reliability measures, and O&M and capital spending.

REPORT LAYOUT

Findings and recommendations are numbered as follows: III-F1 refers to the 1st finding in *Chapter III,* III-R4 is the 4th recommendation in *Chapter III*, and so on.

The layout for this report was developed after all field work and drafts were complete. The report organization and related numbers of findings and recommendations by chapters is as follows.

Chapter	Title	Number of Findings	Number of Recommendations
Chapter I	Executive Summary		
Chapter II	Audit Process		
Chapter III	Comprehensive Emergency Response Program (CERP)	29	22
Chapter IV	Emergency Response Performance	25	9
Chapter V	Stakeholder Issues and Analysis	67	20
Chapter VI	Communication	14	5
Chapter VII	Reliability	18	4
Chapter VIII	Best Practices	6	2
Chapter IX	Implementation Strategy		
Appendix 1	List of Recommendations		
Appendix 2	Discussion of 2006 Outages		
Appendix 3	Post Event Studies, Reports		
Appendix 4	Review and Analysis of Outage Reports		
Appendix 5	Glossary/Acronyms		

The names of the project consultants and areas they addressed are shown below. Together they have extensive utility operations and consulting experience.

Consultant	Position
Walt Drabinski, BSEE, MBA	Project Director
Howard Axelrod, PhD, BSEE, MSEE, MBA	Senior Consultant
Chuck Buechel, BS, MA	Senior Consultant
Rich Mazzini, MS, BEE, P.E. (Nuclear)	Senior Consultant
Mark Fowler, BSME, MBA	Senior Consultant
Michael Boismenu, P.E	Senior Engineer
Don Palys , BSEE, P.E	Senior Engineer
Doug Tulley, BSEE	Senior Engineer

AUDITING STANDARDS

The audit was conducted in accordance with the United States Government Accounting Office's Generally Accepted Government Auditing Standards (GAGAS - the Yellow Book) as revised in 2003 with specific reference to the provisions and standards for Performance Audits.

AUDIT FIELD WORK APPROACH

Vantage Consultants initiated this assignment in late January 2007 with a series of meetings with Con Edison's emergency management and operating personnel, and DPS Staff. Data collection, field visits, and interviews took place during the period of February to June 2007. In total, Vantage consultants conducted 260 interviews, visited 20 field locations, observed three live drills, observed three actual outage events, and received responses to 327 data requests. In addition, Vantage consultants interviewed twelve government officials and held sessions regarding best practices with seven organizations.

DATA REQUEST LISTING

A total of 327 data requests were reviewed as part of the process. Many of the footnotes refer to these data requests.

INTERVIEW LISTING

A total of 260 interviews were conducted.

III. EMERGENCY RESPONSE, POLICY AND ORGANIZATION

A. STRATEGY, POLICY AND MASTER PLAN

Through the setting of strategy and policies, management charts the course for the organization. The subsequent successes and failures can often be traced directly back to the effectiveness of this initial road map. This is the case for emergency planning and response at Con Edison, where inadequate direction and oversight played a part in the problems of 2006. In evaluating Con Edison's effectiveness in setting strategy, we reviewed many activities undertaken during the last ten years to improve performance. Our list is not complete and our intent was not to categorize all actions of management. Our concern is that the many activities being undertaken are being done with strategic purpose and therefore both operationally and cost effective.

In this Section of the Report, Vantage will examine management's actions, which paint a picture of insufficient involvement and commitment prior to the outages of 2006. These actions, and the results they produced, lead to an inevitable conclusion.

III-F1 Con Edison did not fully understand the nature and magnitude of shortcomings in emergency planning and response during 2006.

This conclusion is a root cause for many of the Company's problems and will continue as a barrier to effective resolution until recognized and acted upon. Directly flowing from this first conclusion are numerous associated issues, as illustrated in Exhibit III-1. Each element of the figure, which also serves as a chapter summary, will be discussed below, and that information will paint a convincing picture. However, there are also simpler and more visible manifestations of this Finding.

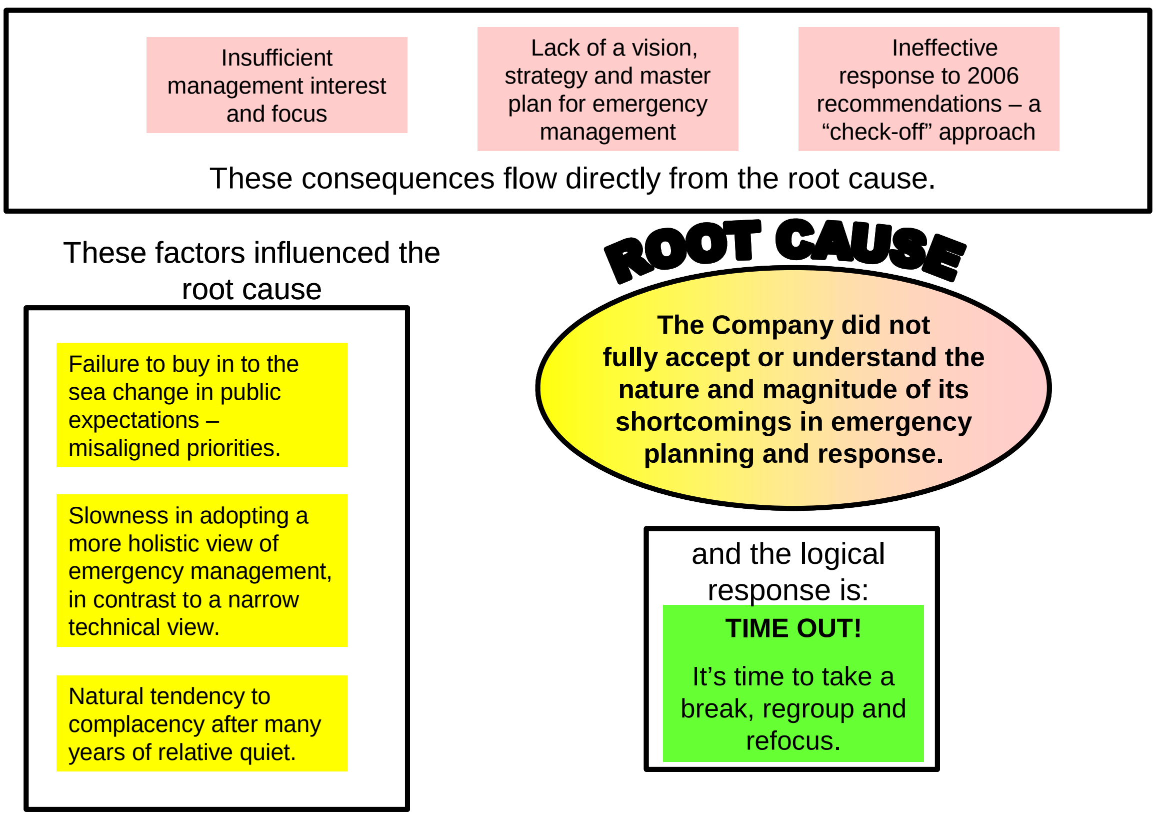
Vantage was particularly struck by Con Edison's testimony before the Consumer Affairs Committee of City Council,[3] in which the primary thrust appeared to be how proficient the Company is in matters of electric reliability. It was stated that Con Edison 's reliability "exceeds that of any other utility in the country by a wide margin." The testimony also pointed to the superior past performance of the Long Island City (LIC) network by a number of measures. However, Con Edison's testimony concedes, "In the case of this outage, however, we did not meet our high standards and our customers' expectations."

At best, such remarks are evidence of an underestimation of the public's response to LIC. However, they also indicate that, at least at that time, the Company saw its 2006 problems as "extraordinary" events that were not indicative of any deeper issues. That notion has since been disproved by the multiple reports on the topic.

[3]/ DR 107. Testimony of Mr. Burke before the City Council's Consumer Affairs Committee. July 31, 2006.

Audit of Con Edison Outage Management

Exhibit III-1
Root Cause Summary



MANAGEMENT INTEREST AND FOCUS

III-F2 <u>Management did not exhibit a high degree of interest, direction, and support to the emergency planning and management functions prior to the 2006 outages.</u>

There is a significant amount of evidence that supports the argument that emergency planning and outage management were not high priorities for Con Edison prior to the outages of 2006. These include:

- low levels in staffing in departments associated with emergency management;
- reductions in O&M expenditures (in real dollars) on reliability related activities;
- minimal capital expenditures on reliability related projects prior to 2005;
- failure to push for new technologies and software that improved outage assessments and responses;
- lack of an effective interface with government leaders and local emergency organizations;

- a failure to recognize customer's expectations related to outage response and communication.

However, once management became engaged in the process and recognized the significance of the problem it marshaled its resources and focused on moving forward. A number of specific actions support this.

- Con Edison cooperated with numerous agencies and organizations conducting studies of the 2006 outages.
- It conducted its own internal studies, as required by the Commission, and filed Part 105 reports for each outage.
- It commissioned two external, technical, in-depth, and extremely critical reports of the LIC outage and network issues in general, (Incident Investigation Committee Report – 2/12/07 and Dr. Allen study on network size and configuration).
- It cooperated fully with Vantage on this study, including a total of 260 interviews of employees (20 of VP or higher), site investigations of all related work areas, and responses to almost 327 data requests.
- Con Edison agreed to implement virtually every recommendation made in the Commission Staff reports.
- In response to the LIC outage, Con Edison assigned a Vice President to oversee recovery and repair of the system.
- Con Edison has proposed increasing staffing to sixteen in its Emergency Management Department.
- Programs with local governments have improved over the last year.
- Con Edison has undertaken several initiatives to improve communications with customers.
- Con Edison seems to recognize that its position as a leader in reliability has deteriorated and that changes need to be made.

Despite all these improvements, there are still many concerns that must be addressed before customers and regulators can be satisfied.

The following sections provide findings and recommendations for correcting these root cause issues. Implementation of these recommendations will make the Company more effective while improving employee morale. Conversely, a failure to correct root causes will likely obviate the hundreds of prior recommendations now being implemented and lead to a repetition of problems in the years ahead.

Vantage hopes that Con Edison's senior management adopts this critical conclusion and aggressively moves forward with it for the benefit of the Company, its customers, its employees, and other stakeholders.

A MASTER PLAN?

III-F3 Con Edison still lacks a coordinated strategy and Master Plan for emergency preparedness, an underlying root cause of many of the problems of 2006.

A coordinated strategy acts as both a foundation and the glue for an effective program. It sets objectives and priorities, channels the resources, and allows the organization to focus on a common set of objectives. In the following discussion, Vantage will show that the lack of a coordinated strategy for emergency planning and response is a root cause leading to many other problems. This was a basis for the 2006 issues and is a continuing restraint in effectively responding to those issues.

It should be obvious that, in anything but the simplest endeavors, a well thought out and communicated strategy, including policies that guide the organization, is mandatory. Vantage has no concerns regarding the skills and dedication of Con Edison's people, but the utilization of those capabilities and hence the overall effectiveness of the program will be limited in the absence of a viable strategy that channels the efforts of the organization.

In evaluating this element of the emergency planning and response program, Vantage, therefore, looks for a master plan or road map, and then it tests that plan against criteria that are generally recognized as management requirements. These criteria include:

- Is the plan aligned with the overall corporate strategy, vision, and values?
- Is the plan well communicated and understood by the organization?
- Are clear goals and objectives enumerated?
- Are priorities clearly laid out, including a logical presentation of the program's relative priority within the Company's overall business framework?
- Is the plan accompanied by metrics that define expectations and provide performance measures?

Vantage's first and most critical question is whether or not a road map is indeed in place. The logical follow-on questions above will then relate to the degree to which that road map is adequately designed for its purpose and the degree to which it is being followed.

Notwithstanding the efforts of Con Edison vis-à-vis emergency preparedness, the consultants, nonetheless, are unable to successfully get beyond that first question. Simply stated, there is no coordinated strategy or strategic plan driving emergency preparedness within the Company. As such, the organization is deprived of consistent priorities, uniform guiding principles, and a common vision. While Con Edison in its review of the Draft Report articulates a broad range of programs and initiatives it undertook during recent years, it does not provide any new evidence that there was a cohesive strategy with goals and tactical steps in place.

The basis for this conclusion goes beyond interview responses and includes many other relevant observations.

- Con Edison has not indicated that any strategic document or plan exists related to emergency planning. Vantage is unaware of any document fulfilling the objectives of a master plan in this area. Key documents received by Vantage that define the emergency planning program cannot be considered strategic plans. Specifically, CI 260-4[4] and CERP[5] are both valuable and critical documents, but neither is intended to serve a strategic role.

- Functionally,[6] there is no central organizational source within Con Edison that performs a corporate-wide planning, oversight, or management role with respect to emergency preparedness. Accordingly, there is no organization that has accepted the mandate for a coordinated plan.
- Similarly, there is no program for coordinating the monitoring and focus on reliability which is directly associated with reducing outage management demands.
- Con Edison has addressed the hundreds of recommendations from the 2006 reports on a fragmented basis with no linkages to an overall plan or strategy and no integrated approach. The failure to gauge these recommendations for their strategic import is further evidence of a lack of a meaningful strategic approach.

III-F4 Management did begin to communicate a more refined focus of objectives related to reliability and emergency management during the course of this study.

During interviews with Vantage consultants, the Vice President of Bronx/Westchester and the Manager of Emergency Management Department and the Manager of Emergency the Management Department indicated that they believed there were three objectives that needed to be achieved in order to be successful.[7]

Objective 1 – Minimize the number of outages and size of outages. This objective goes to the issue of reliability and includes the need for adequate and well directed funding, refined maintenance programs and monitoring and evaluation systems that give real time data on system status.

Objective 2 – Minimize the length of outages. Here the focus is on outage management and response. Early evaluation of outage details, marshalling of resources, appropriate decision making on restoration plans are the key criteria here.

Objective 3 – Communication with stakeholders . Here the key is to provide all stakeholders, employees, government officials, emergency management responders, the press and customers early, accurate and useful information so that each stakeholder can properly respond to the specific circumstances they face.

4/ DR 123. Corporate Instruction – *Corporate Response to Incidents and Emergencies.*

5/ DR 287. *Comprehensive Emergency Response Program.*

6/ We emphasize the word "functionally" since such accountabilities are assigned but the organizations are not staffed to align with those accountabilities. Please see Section III.B, Organization, for further discussion.

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While these three objectives appear quite reasonable, there was little indication that the message had been fully communicated to all levels of the organization and that plans and programs were being designed in response to the objectives.

RELATIONSHIP OF RELIABILITY, SPENDING AND EMERGENCY PLANNING

In preparing the Work Plan for this assignment and in conducting our analysis, it became obvious that there is a direct relationship between the reliability of an electric system, the level and application of Operations and Maintenance (O&M) and Capital spending and emergency planning. Therefore, Vantage expanded the work scope to include an appropriate level of spending and reliability analysis. This analysis is included in Chapter VI and supports many of the conclusions reached elsewhere in this Report.

Some of or initial observations are provided here and then expanded upon in later sections.

Con Edison uses two primary measures for tracking reliability of its distribution system.

- System Average Interruption Frequency Index (SAIFI) is the average number of times that a customer is interrupted during a year.
- Customer Average Interruption Duration Index (CAIDI) is the average interruption duration time for those customers that experience an interruption.

These two measures are tracked in many ways and reported annually to the NY DPS, where the results are evaluated and compared to targets. Based on these results, Con Edison can be penalized for not meeting these targets.

Management employees at Con Edison also have their overall performance measured. They operate under a Management Variable Pay Plan (MVP). The intent of the Plan is to link a manager's compensation with job responsibilities and individual performance.

The key performance indicators (KPI) that Con Edison uses in its MVP include SAIFI and CAIDI for both network and non-network, safety, customer satisfaction surveys, budgets, and other operational variables that are outage related. In addition, selected corporate financial results are included in the MVP.

The issue of spending, either O&M or capital, is more complex. As a regulated utility, Con Edison's rates and hence, its revenue, is determined based on periodic rate cases. With that revenue, the Company must set budgets for ongoing operations (O&M), expansion (capital), and attempt to earn a profit and pay dividends that help maintain its financial integrity. Further, there are competing requests for available funds and management must decide where money is most appropriately spent.

Spending levels for reliability-related programs have been questioned by many, both before and after the incidents of 2006. Some observations that this Report will later elaborate on include the following.

- As stated later in this chapter, the level of spending for the Emergency Management group appears to have decreased significantly in recent years.

- O&M spending for reliability-related projects was very flat until 2005 when it began to increase.[8]
- Capital spending on reliability-related programs was flat until 2004 when it began to increase significantly.
- SAIFI and CAIDI results began to deteriorate in 2004 and should have provided management with an indication of future problems.
- The use of only two metrics to measure reliability and the lack of any real metrics for performance during outages may result in inadequate feedback to management as to overall performance during outages.

PRIORITIES – A MAJOR SEA CHANGE

III-F5 The importance of emergency planning and preparedness in Con Edison is not defined, and the result is that the Organization and its support structures are not yet fully aligned with the magnitude of the challenge and the economic and human consequences of failure.

An overriding element of Con Edison's strategic framework needs to be an internal decision on the relative priority of emergency planning and preparedness. The relative priority was not adequately defined, and that creates confusion on the part of both internal and external stakeholders. Con Edison seems to have recognized the importance of emergency planning and has proposed increasing staffing in its current rate case.

In defining priority, Con Edison must consider the changing landscape regarding emergency planning and preparedness throughout the country. There has been, on both a national and local basis, a major sea change[9] in the challenges and public expectations associated with emergency planning. There is a strong and rational basis for the sea change.

- The events of 9/11/01 changed the perceptions on the nature and magnitude of man-made threats.
- Hurricane Katrina demonstrated that natural threats can have consequences previously unimagined including the destruction of nearly an entire city and the displacement of hundreds of thousands of people, many of them permanently.
- The new thrust of government agencies responsible for emergency management has changed the utility's role in major emergencies. The utility is now a cog in a bigger wheel as opposed to a fully independent organization that can focus totally on its physical restoration work.[10]

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[8]/ Vantage used data supplied by Con Edison in its 'Annual Report on Electric Service Power Quality' regarding O&M and Capital spending for reliability as the basis for our analysis.

[9]/ S**ea change** is an informal term meaning a profound transformation.

[10]/ In a recent coastal storm drill, the NYC Emergency Operations organization made it clear that in major emergencies, utilities would take direction from them until a comprehensive damage assessment was complete.

- The LIC event of 2006 demonstrated that the forever-reliable networks may not be as robust and healthy as was thought, and this potential new fragility may have far reaching consequences as an old system grows even older.
- The overhead events of 2006, although far from catastrophic, produced an overwhelmingly (and, perhaps, disproportionate) negative stakeholder response. This was an unmistakable signal that perceptions and expectations had changed.

The challenges facing Con Edison are in many ways unique, and few of the many utilities with which we have worked are subject to the same complexities, pressures, and potential impact on the community as Con Edison. This means that the stakes are higher for Con Edison, and the consequences of failure can be far greater in terms of economic and human impact.

Therefore, the post-sea change view of emergency preparedness is more important to Con Edison than to its peers, and a super-aggressive response is in order.

AN HOLISTIC VIEW

III-F6 The transition to an holistic view of outage management (as opposed to a narrow, technical, physical restoration viewpoint) is well underway but remains a work in progress.

Utilities have traditionally taken the challenge of restoration to be a serious task worthy of full mobilization and maximum effort on the part of employees, and Con Edison is no different. Utility workers consider restoration to be a key part of their job and, in the consultant's experience, they are almost always good at it. In this context, the "job" is considered both a technical and a physical challenge relating to restoring service to customers.

Con Edison's experience of the last year sends a strong message that this traditional view of the restoration challenge is no longer valid. Getting the lights back on is not sufficient in Con Edison's current environment, where emergency management is under a new set of microscopes. As a result, the narrowly defined view of emergency management must give way to a more holistic perspective in which Con Edison's measures of performance cover many elements of an emergency and not just the physical restoration work.

It is the opinion of Vantage that Con Edison is indeed moving to this more holistic view, but the resulting culture change is difficult to bring about.[11] The conversion remains a work in progress as many still see emergency response as the same relatively narrow challenge they have been meeting so well for decades. Until the conversion is more complete, issues of planning, preparedness, communications, customer service, public relations, government relations and regulation will tend to persist.

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[11]/ Interviews and observations of emergency response.

THE QUIET TIMES

III-F7 There is a natural tendency for emergency preparedness to slip during periods of relative quiet, as it did before 2006, and this cycle is likely to continue unless strong policies, oversight, and control become an important element of Con Edison's strategy.

There is one compelling question that plagues any emergency function: how to stay sharp during prolonged periods of quiet? Priorities change in any organization, and, as other challenges become more current and more plentiful, they tend to displace the less frequent events. This is a natural and logical process that can, and does, happen in the best of organizations.

There is a case that this did indeed happen at Con Edison over the last several years. Although the Company was faced with major challenges, including 9/11 and a widespread blackout, trouble in the more traditional storm and heat events was relatively minor. The 1999 Washington Heights event was the last major weather incident until January 2006, and the January incident was followed by three other serious events in 2006.[12] It is logical to consider that the Company may not have been optimally prepared after six years of relative quiet.[13]

The Company accelerated its storm-related planning and preparedness in 1996 and thereafter with the creation of "the storm team." This group evolved into the Emergency Management organization that is presently in Electric Operations. Meanwhile, due largely to the aggressive efforts of New York's Office of Emergency Management (OEM), Con Edison responded with the establishment of a corporate level emergency management function as well. It was clear that in the early part of the decade, emergency planning had taken on a new and significant priority at Con Edison.

It seems that perhaps the priority of, and commitment to, the Electric Operations function began to slip in years leading up to the 2006 problems. Consider the following.

- Staffing of the Emergency Management organization in the Distribution Department, which ranged from six to nine through 2000 dropped to four in 2005 and three in 2006.[14]
- There was no consistent leadership of the group with the Director position changing nearly every year.
- The group was shuffled among several different Vice Presidents.

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[12]/ It should be noted that network reliability in 2003 was one of the poorest since at least 1985 which is the limit of our data. (See Chapter on Reliability for table of 22 years of data.)

[13]/ It should be noted that there was a consistent number of major outages in most years since 1999, but the severity of the 2006 events was considerably greater, resulting in the heightened level of public outcry. Refer to data in the Reliability Chapter of this Report.

[14]/ DR 285. Staffing table for EO EM.

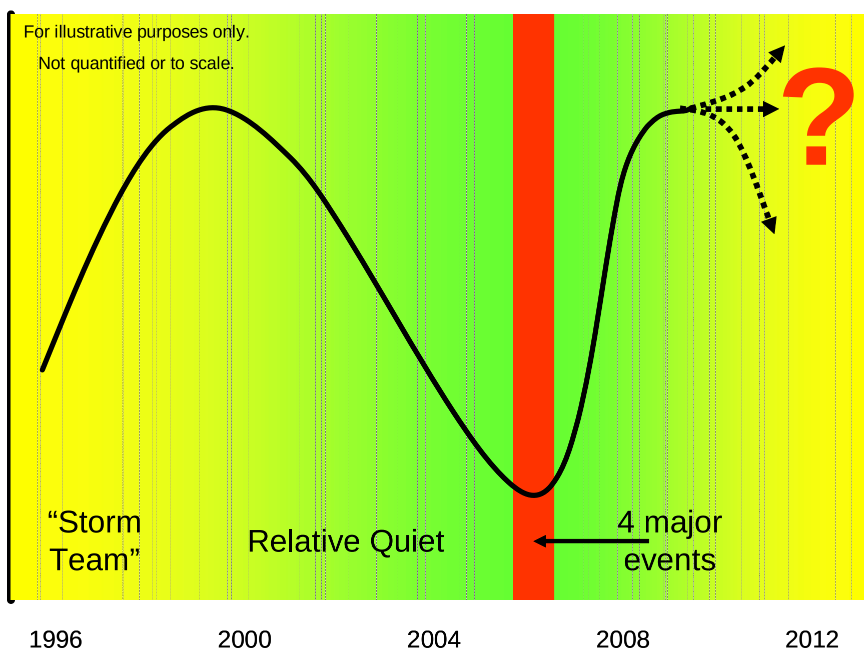
- The group is currently under Bronx-Westchester Electric Operations Division although it plays a major corporate role.

Any criticism of this "relaxation" needs to be somewhat tempered. As Vantage has stated, the tendency to shift resources to more current and urgent needs is both natural and understandable. Nevertheless, the prevention of any future backsliding should be the focus.

It should be noted that Con Edison has reacted to the 2006 problems with many initiatives including several that correct the treatments noted above regarding the Electric Operations group. As illustrated in the following Exhibit, Vantage's concern is now for the future. The 2006 events were a wake-up call, and one would expect an aggressive response. However, will that response and level of preparedness be sustained?

Audit of Con Edison Outage Management

Exhibit III-2
State of Preparedness



REGROUP AND REFOCUS

The Con Edison organization has worked diligently in dealing with emergencies, and this includes planning and preparedness activities, response to external recommendations, and actual execution of emergency duties. While there can be no respite from the latter (execution), the work in the other areas deserves reexamination.

The stressing of an organization is both understandable and unavoidable in emergency conditions, and, in fact, the Con Edison employees (and every other known utility organization) respond with a level of effort and commitment that makes all employees proud. However, organizations do not respond well when they cannot understand the reasons and eventual outcomes of heightened and newly-stressful activities. This is indeed the case in many of Con Edison's current emergency planning and preparedness actions.

It is, therefore, appropriate to regroup and refocus on developing an effective strategy and tactical plan related to emergency planning and outage management. This temporary respite will provide the opportunity to accomplish several critical changes that will attack the root causes of Con Edison's emergency planning issues and, if management is so inclined, establish a new vision and improved processes for going forward.

The Next Step? A Strategic Regrouping

A strategic regrouping by Con Edison on issues of reliability and emergency management should be a positive step for the Company and will provide a considerable benefit to its customers and a welcome set of clear priorities, objectives, and expectations for its employees. Vantage, therefore, suggests that such a rethinking take place.

Vantage will offer a suggested framework for this effort, but it emphasizes that the choices on how to proceed must be management's. The consultants have intentionally limited themselves to broad concepts and flexible guidelines recognizing that success will only come from a legitimate buy-in by management and a corresponding commitment. A perfunctory or directed acceptance by management will represent a real failure. On the other hand, if management enthusiastically accepts the basic concepts, Vantage is very confident that they will be able to build a successful program with long-lasting benefits.

RECOMMENDATIONS

Our overall recommendation for this Section of the Report strongly suggests that Con Edison evaluate, refocus, and redesign Con Edison strategies, tactics, and fundamental policies that guide its reliability and emergency management programs.

This recommendation is divided into a number of subordinate recommendations, including the following.

The Importance of Executive Direction

III-R1 <u>Highlight the role of senior management in communicating and implementing vision and priority for the Company's approach to reliability and emergency management.</u> (Refer to Finding III-F1 & F2.)

Vantage began this Chapter with the finding, "Con Edison did not fully understand the nature and magnitude of its shortcomings in emergency planning and response." While management may disagree with this assessment, the consultants nevertheless hope that common ground on this issue can be established between the DPS and the Company.

Without agreement on the relative importance of emergency management, the parties will never concur on the effectiveness of implementation. It is likely that some compromises on the part of management employees will be necessary here, but a difference on the place for emergency management in Con Edison's hierarchy of priorities cannot be allowed to continue.

III-R2 Define and communicate policies regarding the importance of emergency management that are proportionate to the unique circumstances surrounding Con Edison's service territory and the sea change in expectations that has transpired in recent years. (Refer to Finding III-F4.)

Although Vantage feels strongly that emergency management should be assigned a high priority, it nonetheless, respects that reasonable people can differ. The discussion of the sea change is compelling evidence that public expectations are high. Con Edison's senior management is acutely aware of its obligations in serving such an important community. The hope is that the common ground established among the parties recognizes those realities and defines a commitment that is both substantive and long-term.

A Master Plan

III-R3 Develop and implement a coordinated strategy and Master Plan for reliability and outage management. (Refer to Finding III-F3 & 4.)

The lack of a coordinated plan has been identified as a root cause of many of the 2006 problems. The planning effort to bring together all of Con Edison's reliability and outage management objectives should, therefore, be a high priority.

What might such a plan look like? A potential plan design is offered in the following Exhibit but only as an illustration of the concept and its essential features. Con Edison's management will surely prefer to design its own plan, and it should.

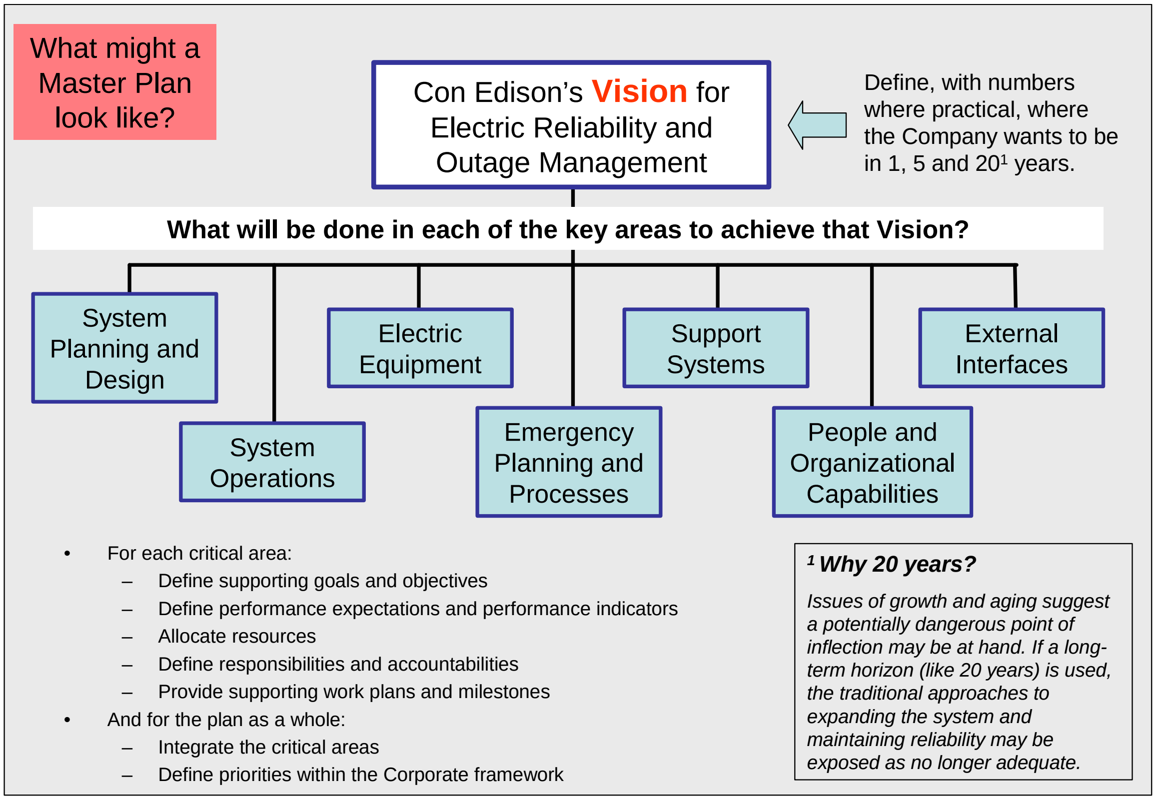
The balance of this report adds support to this recommendation and stresses the need to improve area such as budgeting, maintenance practices, R&D focus and other related areas.

A Vision

Recalling that the Master Plan will serve as an organizational road map, it makes sense to start with a crystal clear definition of the intended destination. Strong leadership will be able to communicate to the Organization a clear vision of precisely how the Company sees itself in the future vis-à-vis electric reliability and outage management.

Audit of Con Edison Outage Management

Exhibit III-3
Master Plan Vision



However, it is here that Con Edison will depart from the practice of many U.S. companies. Because Con Edison will be constructing an integrated plan, management will have to define exactly how the vision will be achieved, how much it will cost, where the various resources will be applied, milestones for judging progress along the way, and a full menu of other supporting commitments. Therefore, by definition, there can be no question about 'walking the talk.' This realization surely adds a great deal of religion to the process of defining goals and will make the Plan more credible and successful.

Philosophy and Relative Priorities

III-R4 Emphasize the holistic nature of reliability and outage management and communicate that notion to employees as part of the Integrated Plan. (Refer to Finding III-F6.)

A precursor to defining the vision is internal agreement and buy-in on just where reliability and outage management fit in the Con Edison hierarchy of priorities. This initial determination sets the foundation for the Plan. Vantage has recommended that the priority be consistent with the high expectations of the public for emergency management and the unique nature of Con Edison's service territory, but that decision will have to be made by senior management and made clear as an underpinning of the Plan.

The identification of philosophical assumptions establishes management's guidelines and directives. As the Plan evolves to a greater level of detail, senior management influence lessens, therefore, it is here that senior management involvement must be substantial.

The type of assumptions that should be of particular interest at this time will include those relating to Con Edison's philosophy for attacking challenges of this magnitude. For example, an important Con Edison principle seems to be the requirement to keep responsibility and accountability with the operating organizations. The initial definition of such criterion will have a continuing impact as the elements of the Plan are developed.

Management should also establish scope and boundaries for the Plan. This might define the typical events on which the bulk of the effort will focus plus it might determine guidelines for contingency planning related to far more catastrophic and unlikely events. The guidelines should also include assumptions on the potential magnitude of events.

An extremely important philosophical element is management's expectations for dealing with customers, regulators and other external stakeholders. Also, in this context, is the necessity to frame the emergency management challenge holistically, thereby, avoiding the serious flaw of a plan that is totally technically oriented.

Timeframes

The near-term timeframe will get the most focus, but Vantage urges Con Edison to carefully examine long-term implications as well. The concern is that the traditional approaches to expanding and maintaining the networks might begin to break down when examined in a longer-term perspective. Much of the equipment and components are old and getting older, and the costs of replacing infrastructure in the dense New York installations could be massive.[15]

Con Edison has a system that is aging while simultaneously facing the need to sustain more and more growth. Can the traditional approaches to system expansion, network design, equipment replacement, maintenance, and upgrade continue to serve this necessary expansion? The question has to be asked even though the answer may not be pleasing. An answer can only come from consideration of a longer planning horizon.

Critical Areas and the Plan Structure

The following seven critical areas serve as an illustration of a proposed plan structure.

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[15]/ Needless to say, our discussion relates solely to the electric system in New York, but the ramifications of aging infrastructure, electric or otherwise, in American cities go well beyond this narrow view.

- System planning and design.
- System operations.
- Electric Equipment.
- Emergency planning and processes.
- Support systems.
- People and organizational capabilities.
- External interfaces.

The objective here is to capture all of the key tasks associated with the challenge in a manner that permits integration and consistency of effort.

Plan Elements

Within each of the critical areas, there can be considerable flexibility in just how to build the plan provided that the fundamental direction is followed, consistency with the Master Plan maintained, and the basic contents of a good plan are included. Such contents will generally include:

- clear supporting goals and objectives;
- clear definition of expectations with quantifiable performance indicators ;
- an allocation of resources, including people and money, that is proportionate to the stated priorities;
- clear definition of responsibilities and accountabilities;
- work plans and summary milestones;
- clear linkages to the Master Plan.

SUSTAINING THE EFFORT

III-R5 Include specific measures for maintaining preparedness and the priority of emergency management including appropriate policies, oversight and controls in the revised Plan. (Refer to Finding III-F8.)

The difficulty in maintaining focus and priority during quiet times was discussed earlier. While the consultants can be confident that recent events will instill a certain sense of urgency in the development of the Plan today, provisions must also be included to sustain that sense of urgency and commitment for a prolonged period.

A Fresh Approach

III-R6 Integrate the implementation of recommendations through the new coordinated strategy. (Refer to Finding II-F3, 4 & 5.)

Vantage is critical of Con Edison's approach to the implementation of the many recommendations in the 2006 reports and characterized the process as flawed. Con Edison's management is fully capable of correcting the flaws and arriving at an improved and satisfactory process. Some suggestions and supporting criteria for that effort are offered below with the proviso that they are guidelines. Con Edison can best design the final process.

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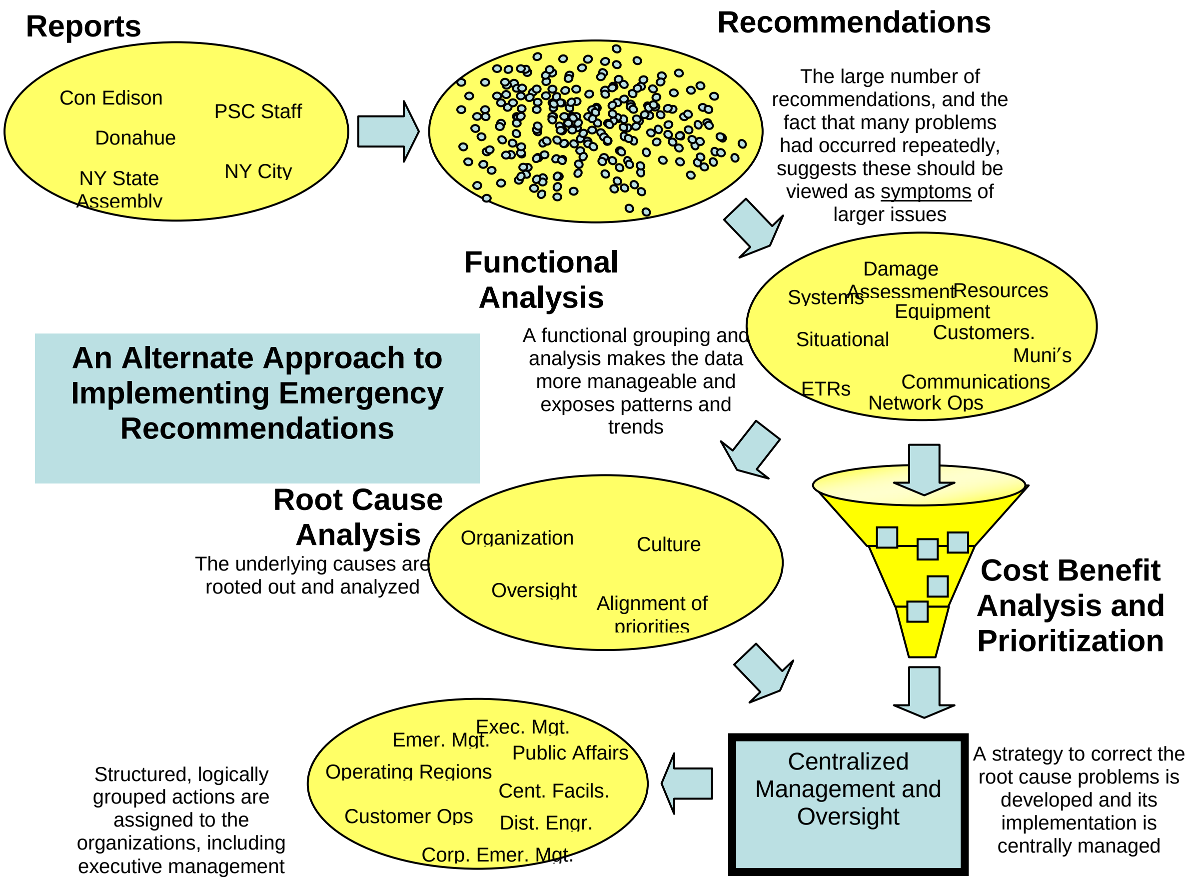
Exhibit III-4
Evaluation of Recommendations



The Exhibit above provides one example of an improved process. This sample illustrates some important concepts that should be seriously considered in Con Edison's eventual design. First, some analysis of the recommendations should be performed. As a start, a grouping of all of the recommendations along functional lines might offer many insights, allow for coordination of related recommendations, facilitate assignments, and assist in root cause analysis.

Second, an analysis aimed at underlying root causes is essential. It is these issues that will provide the opportunity for long-lasting improvements. Vantage views the hundreds of recommendations to be symptoms in many cases of deeper problems, and success will be elusive if those deeper issues are not ferreted out and addressed.

Third, cost benefit analysis must be considered. The notion of improvement at any price, or acceptance of all recommendations regardless of their cost effectiveness, is clearly unacceptable. While the Company's customers may indeed be willing to pay for enhanced reliability, there is nonetheless an obligation to make sure they get value for those added costs.

Fourth, the 2006 recommendations need to be both individually and collectively tested against the Master Plan. Those that provide limited or no support for the strategic objectives need to be downgraded or, with suitable justification and Staff concurrence, eliminated. Those that are critical to the strategic objectives need to be given a high priority. In this sense, each recommendation needs to be considered within its strategic context and dealt with accordingly.

Finally, there must be some central point of management and oversight. This is necessary to get the work done but is even more important from quality and consistency viewpoints. Each organization has its own priorities, and only strong oversight can assure a company-wide effective response.

The recommendations of the various reviewers, including Con Edison itself, have a potentially high value but only within the framework of an effective implementation process.

B. ORGANIZATIONAL ISSUES

In any examination of root cause, organization is often high on the list of usual suspects, and that is indeed the case in the examination of Con Edison's emergency planning and preparedness. Vantage will discuss organization from two perspectives: the permanent organization and the emergency organization, the latter being defined within the Incident Command System (ICS).

The ICS organizational approach is highly regimented and has evolved into an effective vehicle for Con Edison. While all organizations seek to build a structure around functions, rather than people, few are successful. However, there is no question that this objective has been met within the ICS context, and Con Edison is enjoying real benefits as a result.

The picture is less clear in the permanent organization, and this begins with a far looser structure. This should be no surprise – in the absence of a coordinated strategy, it simply is not possible to design an optimum organization.

Our evaluation of staffing for field operations, including internal personnel, contractors and mutual aid support is addressed in Chapter V in our evaluation of Emergency Response Performance.

PERMANENT ORGANIZATION

The abbreviated organization chart in the following Exhibit shows the major organizations with direct emergency planning responsibilities and their reporting relationships. Actually, most organizations in Con Edison have responsibilities in this area, but the consultants have chosen only those with a significant programmatic responsibility that extends well beyond the group's boundaries.

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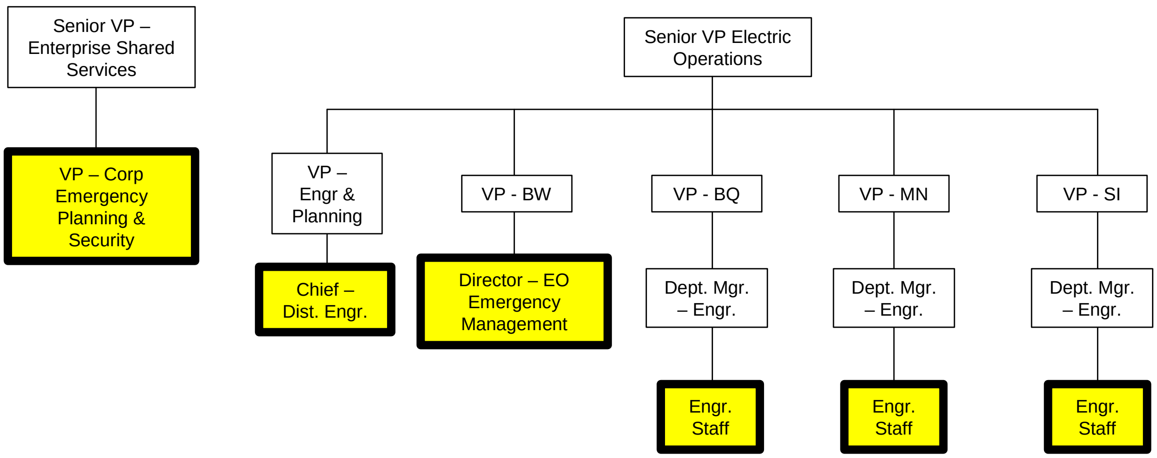
Exhibit III-5
Current Emergency Operations Permanent Organization



The four major functions of interest (and six organizational units) in the permanent organization are:

- Corporate Emergency Management and Security;
- Electric Operations Emergency Management (located in B/W);
- Distribution Engineering;
- The Engineering groups in the other three regions.

Before presenting the conclusions, Vantage will first discuss some of the apparent characteristics of each organization. It is important to understand the de facto roles (which may differ from documented roles) as well as the personality and roots of each group. This "primer" on the organization will describe some of the attributes that lead to the conclusions that follow.

Corporate Emergency Planning and Security

- A rather small organization for the broad range of responsibilities assigned, consists of a Vice President and four technical staff.
- The only organization focused on total corporate events including commodities other than electricity.
- Close relationships with NY OEM and other emergency organizations and in many ways has evolved from their influence.
- Active in all areas but a bias to Manhattan and the networks.
- Content with a guidance and support role – less inclined towards oversight or direction.

- A staff well-versed in emergency management – professionals.

EO Emergency Management

- Evolved from the "storm team" of the late 90s.
- Seems to have been somewhat of an organizational orphan and has been shuffled about.
- Spotty staffing levels and frequent management changes. Staffing ranged from a high of nine to a current low of four.
- Active in all areas but a bias to overhead and BW.
- Core group of experienced professionals.
- Content with guidance and support role – less inclined towards oversight or direction (but more inclined than Corporate EM).
- Has correctly become more aggressive as times change.

Distribution Engineering

- Roles and responsibilities continue to be critical, particularly for technical and reliability role.
- Does not seem to have transitioned to a well defined place in an ICS world that insists on such definition.

Regional Engineering Groups

- Responsible for emergency planning, preparedness and response.
- Emergency management is generally a part-time responsibility of an assigned staff member.
- Regions generally lack the same skills and capabilities of the Corporate and EO EM staffs.
- Regions are often inconsistent in their approaches.

III-F8 The lack of a coordinated plan means there is no framework, common vision, or set of priorities or focused objectives around which to design a permanent organization. Structural deficiencies are, therefore, unavoidable.

Organizational Design

Vantage begins with a fundamental assumption that strategy comes first, and organizational design follows. Too many managers reverse the order starting with an existing organization that is assumed to be a given. However, the folly of taking the structure as a given should be obvious – how can one optimally design an organization when there is not yet agreement on what that organization is to accomplish?

This question is in play for Con Edison. In the absence of a coordinated strategy, it is simply not possible to have an optimum supporting organization.

Vantage can and will offer some design principles that will benefit Con Edison, but until a clear master plan is in place, organizational design should be delayed.

Oversight and Program Management

III-F9 Functionally, there is no visible organizational source of strategy, policies, and priorities regarding emergency preparedness, nor is there a central point of emergency management and oversight.

III-F10 The Corporate Emergency Management organization is not sufficiently sized to align with its mandated responsibilities, suggesting that a change in staffing or a change in responsibilities is in order.

The biggest missing ingredient in the current organization is overall program management, but this is not by design. Corporate Instruction 260-4 (Corporate Response to Incidents and Emergencies)[16] and the Comprehensive Emergency Response Program (CERP)[17] do a good job of explaining the theoretical roles and responsibilities of the various groups. In reality, however, these roles and responsibilities are not consistently carried out.

In terms of overall responsibility, CI 260-4 clearly assigns oversight to the VP-Corporate Emergency Management[18] The instruction goes on to delineate many responsibilities that fall under the VP and his staff. Despite a capable and experienced staff, however, the group is simply not of sufficient size to meet this mandated oversight role while performing their many other emergency planning and management tasks.

As a result, a number of responsibilities that are critical to the success of Con Edison's program are not being fulfilled. These include specific CI 260-4 commitments such as review of departmental operating procedures; requirements for reporting and critiquing incidents and drills; the lessons learned process; and periodic assessments of the overall effectiveness of the EM Program.

The most critical failing in this regard is the inability to put in place a uniform strategy and policies and to provide for measures to ensure their effective implementation. Within Con Edison's culture, most are unwilling to assume a strong oversight role, but such firm direction is sorely needed and should be provided for in any new organizational design.

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[16]/ DR 123.

[17]/ DR 287.

[18]/ DR 123; Paragraph 3.1.c.

Emergency Organization/Emergency Management Staffing

III- F11 There was a sharp drop in staffing, both in absolute levels and numbers versus budget, for the EO EM group in 2005 and 2006 suggesting a lessened management priority and level of commitment in that timeframe.[19]

III- F12 The recent filling of EO EM vacancies and the announced plan to add 14 people to the organization demonstrates a new level of commitment, however, it is impossible to evaluate or justify such a change in the absence of a long-term strategy.

Vantage has concluded that the Corporate EM group is understaffed and suspects the same for the EO EM group. The latter has had a spotty staffing trend, as discussed under 'The Quiet Times'earlier in this Chapter, with personnel dropping to only three in 2006. The recent rate filing by Con Edison now proposes to add fourteen people to the group, seven of whom will be matrixed to the regions.[20]

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[19]/ Three to four people who were Emergency Response Group (ERG) personnel now report directly to regional Control Centers.

[20] / DR 285

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Exhibit III-6
EOM Staffing

Year	Average Staffing
1999	5
2000	6
2001	6
2002	6
2003	9
2004	8
2005	4
2006	3
2007	6

- 2007 is through April

Evolving Identities

III- F13 The Corporate and EO emergency planning functions have each developed an identity with a corresponding preferred focus. The preferred focus receives the bulk of the attention and resources to the potential detriment of other important functions (including strategic planning).

It is not unusual for people and organizations to gravitate to what they do best, what interests them the most or what provides the most value. This is one of the reasons why a master plan and supporting structure are so important – to control and channel organizational drift. We can see some degree of such evolution in the Con Edison emergency organizations.

The EO EM group, as a result of its roots and its current location, has taken on a primary identity of a BW overhead organization. They perform other functions and have broader responsibilities, and Vantage does not mean to diminish those tasks or to denigrate the group's performance in those other areas. The Organization's focus has, nonetheless, been clear, and the bulk of the resources and management attention are dedicated to overhead issues and more precisely those in BW.

It can be argued that the focus of EO EM is changing towards a broader EO role, and there has been considerable real progress in that regard. Vantage views this as positive, but notes that such an evolution would be more effective within the framework of a unified corporate strategy and supporting organizational redesign.

The Corporate group has evolved differently, again steered by its roots and location. Its identity has become aligned with Manhattan and the related emergency threats that can have severe consequences for the world's financial capital as well as broader non-electric threats. Again, they perform many other valuable functions, but the focus is generally as stated.

It is difficult to criticize an organization for focusing on what it perceives to be its most important tasks. However, the resultant voids must, nonetheless, be dealt with, and the suggested reorganization within a new strategic framework should resolve this concern.

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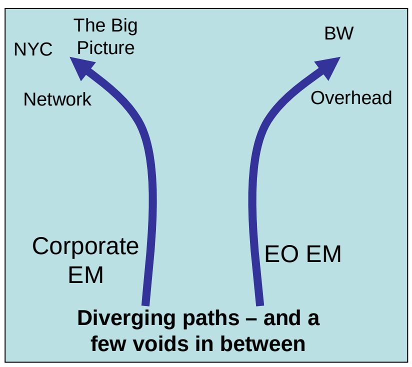
Exhibit III-7
Diverging Paths Issue



Distribution Engineering

III- F14 The role of Distribution Engineering (DE) in emergency planning, preparedness, and management seems to be in a state of flux resulting in the group executing important functions which are inconsistent with the ICS framework, lacking the understanding of other groups, and in conflict with various procedural documents.

Of all of the organizations, the role of Distribution Engineering, as it relates to emergency management, appears to be the most difficult to define. This is not to suggest that their role is not critically important – it is, but their evolution has not been as smooth as the other organizations.

This is particularly apparent in the ICS environment which will be discussed later in this Chapter, but it is also apparent in assigned tasks, where it appears that vestiges of an older, outdated organization may persist. For example, Distribution Engineering has final approval of the Comprehensive Emergency Management Program with the Chief's signature on the front page. However, the department has no responsibility for any of the content, no responsibility for the document, nor does it review or judge the program. Distribution Engineering files the CERP with Staff because Distribution Engineering is the Organization within Electric Operations that makes regulatory filings related to electric operations, e.g., the Annual Report on Electric Service and Power Quality.

Distribution Engineering has been the key point in the coordination of resources among regions in an emergency, a critical responsibility for timely mobilization, but EO EM now seems to have this responsibility. Distribution Engineering has been responsible for securing Mutual Aid. Again, this now appears to be coordinated by EO EM, and coordination among regions at the start of events was the responsibility of DE. However, the inter-regional conference calls in anticipation of an event are now placed and coordinated by EO EM.

Some of these changes are reflected in the latest CERP update, but there remain some procedural inconsistencies.

Organizational Dynamics

III- F15 <u>There is a lack of clear definition of the inter-relationships among the emergency management organizations complicated by a lack of consistency between what is written and what is practiced.</u>

What Vantage has described so far sets the stage for an interesting set of organizational dynamics particularly between the Corporate and EO emergency management groups. However, the academic reader may be disappointed because any disputes, turf battles, unnecessary duplications, or professional differences seem minimal or non-existent. Despite the structural problems described above, the various groups seem to work well together. As one manager stated, "it works," and at least in the sense of relationships and attention to many important issues, he is right.

The interfaces, relationships, and relative roles have been evolving and often for the better. However, this has been an ad hoc process with no grand design or underlying vision. The result is that all of the relationships among the key organizations are loosely structured, only partially defined, and, for better or worse, subject to continuing drift.

Any student of organizational design will, therefore, suspect that "it works" is probably a misleading and temporary conclusion. While a given group of people can find a way to make anything work, the lack of proper structure will prove fatal when that delicate balance is perturbed, and such perturbations can come from many sources (changes in people, new threats, new scope, external forces, etc.). Also, a sub-optimum structure takes a toll on effectiveness and morale.

Summary of Organizational Issues

The above discussions suggest that there are opportunities for gains in the structural design of the emergency organizations. Vantage has not dismissed the current arrangement out of hand. It has many positive features and is driven by a strong team of capable people, however, the fundamental flaws argue for attention These include:

- lack of linkage to an underlying strategy and plan;
- lack of program management and oversight;
- inadequate staffing;
- a drifting of organizational identities;
- loose definition of roles and interrelationships;
- inconsistencies between what is written and what is practiced.

While none of the above are fatal flaws, it is, nevertheless, clear that a cleaner structure tied to a new master plan should produce real benefits for Con Edison's emergency management capabilities.

Emergency Management Requires Professional Personnel

III- F16 Emergency planning at the level of skill and sophistication that Con Edison correctly intends to carry it out requires professionals. A centralized organizational approach provides the best chances to build and retain such capabilities.

III- F17 With the increasing need for greater sophistication in emergency planning and preparedness, relegating emergency planning to a part-time engineering assignment in the operating regions is a questionable practice.

Vantage will provide recommendations for a potential restructuring of emergency management functions, but first it is necessary to examine other factors that will influence any new design.

This Report has discussed how the sea change in public expectations has raised the stakes of emergency planning. It has also discussed how Con Edison has employed professionals in this pursuit. The necessity for highly skilled people in a highly specialized area has real implications for organizational design.

First, such specialists need a career path, and that path may not exist in the rest of the Company. Second, opportunities for professional development will be less likely in a non-specialist organization. Third, such specialists will tend to be more effective when working among their peers, and fourth, a high level of skill and organizational sophistication will be difficult to develop and maintain without a strong specialist-oriented organization.

The preferred organizational approach is rather obvious. A centralized organization consisting of professional emergency planning and management specialists will afford the best chances for success.

This issue becomes especially critical within the regional organizations, where emergency planning is a part-time function assigned to engineers whose primary duties are unrelated. It appears that such organizations have received a good level of support from both Corporate and EO planners, but their staffing and capabilities are not consistent with their accountabilities.

Con Edison's governing procedures make it clear that the operating organizations are accountable for emergency response, and that specifically includes plans and procedures, qualifying people, and the lessons learned process.[21] The skills and capabilities to effectively carry out those duties need to be developed.

Cultural Restraints

III- F18 Con Edison has a culture that values the autonomy of the operating organizations and restricts the degree to which appropriate corporate oversight can be assigned and carried out.

A centralized structure for emergency planning and management is preferable given Con Edison's challenges including the need for strong oversight, effective program design and management, organizational focus on a broad array of challenges, and the desire to build a quality specialized staff. These are extremely important attributes, but one must also recognize and respect the associated cultural restraints. Specifically, it appears that Con Edison is an organization that values the autonomy of the regional operating organizations, therefore the notion of a strong staff function, including accountability for oversight and program direction, is somewhat counter-culture.

This complicates matters but is by no means a fatal flaw. Nevertheless, it is important that Con Edison consider this cultural impact and not simply rush to a centralized approach.

ORGANIZATIONAL RESTRUCTURING RECOMMENDATIONS

The following major recommendation has a number of support recommendations that provide detail on a comprehensive plan.

III-R7 Restructure the key organizational functions in support of the Plan and in accordance with sound design principles. (Refer to Finding III-F8.)

Vantage suggests that the Con Edison organization be structured in a manner consistent with the new coordinated Strategy and Master Plan, but it recognizes that organizational design is a challenge best dealt with internally. Accordingly, Vantage will provide

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[21]/ DR 123; Paragraph 3.1.b.

suggested guidelines and criteria for the design effort in the confidence that management will consider them in any subsequent restructuring process.

Issues of Structure

In this category, three major areas which should influence management's selection of an organizational design have been identified. These include:

- the degree of centralization or other techniques for establishing a strong, professional presence;
- the establishment of a structure that allows for a logical assignment of emergency management resources throughout the operating organizations;
- the organizational placement of capabilities for Electric Operations Emergency Management.

The merits of a strong, centralized organizational approach were previously discussed, but it was noted that such an approach might be somewhat counter-culture for Con Edison. There are alternate ways to realize the same benefits of a centralized organizational approach, however, while remaining faithful to the Company's guiding philosophies.

The benefits, and perhaps necessity, of a central core organization flows from the requirement for a strong cadre of skilled professionals. This does not have to be a "do everything" group, nor must all of the key people reside there permanently. The same benefits can result if the core group is viewed as a permanent home, but its members may work in varying locations and under alternate management arrangements.

Consider, for example, a centralized Emergency Management staff function which is the professional center for EM expertise. That organization would be responsible for technical direction of all EM personnel wherever located in the broader organization. In addition, the central group would be responsible for each EM employee's professional growth and development, performance appraisals, and salary administration (with considerable input, of course, from the host organization).

Such an arrangement could be put into place while maintaining day-to-day responsibility for outage management with the operating organizations. The professional EM personnel would report to operating management and have a dotted line back to their "home" in the centralized group. This hybrid approach is one technique for meeting the Company's requirements, and there are likely other options that can achieve the desired objectives.

III-R8 Consider the creation of a central, core group of emergency management professionals with the management of that group responsible for technical excellence in the field of emergency planning and management as well as technical direction and professional development of the EM personnel. (Refer to Finding III-F16.)

III-R9 Consider, in designing a new organizational structure, a hybrid approach that assigns EM professionals to operating organizations on a matrixed basis as a means to achieve the technical benefits of a centralized group while maintaining Con Edison's culture of accountability to the operating organizations. (Refer to Finding III-F16 & F17.)

As a matter of clarification, consider that central staff functions may actually exist on a number of levels. For example, there might be the main central group at a corporate level, a secondary central group within Electric Operations, and EM personnel assigned to the regions. In the sample arrangement above, however, all would have a permanent administrative home in the main central group.

A final structural issue is the placement of the Emergency Operations/Emergency Management (EO/EM) function, or any successor. At the present time, the group is located under the Bronx/Westchester Vice President. From a design perspective, there is little to argue for such an arrangement and a number of potentially negative considerations. This is not a criticism of any of the managers involved but is simply an observation on a design that could be stronger.

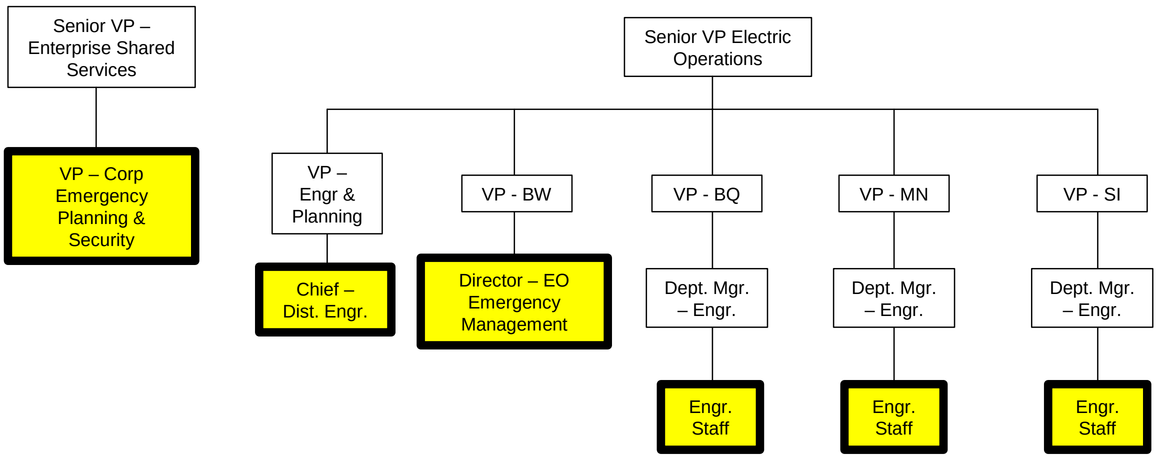
The current reporting relationship likely contributes to the bias previously discussed towards BW and overhead issues. It also raises obvious questions as to the priority that other regions might receive in their day-to-day emergency management tasks and the degree of support the regions might receive in a multi-region event.

III-R10 Consider, locating the EO EM group, or its successor, to the group reporting to an organization that spans all of EO, such as the VP-Engineering and Planning. (Refer to Finding III-F9.)

The following structure is offered as an illustration of these principles. It is not intended as a recommended new structure for Con Edison. Vantage believes that management can and should perform the requisite organizational analysis and come to their own conclusions on what structure will work best for them.

Audit of Con Edison Outage Management

Exhibit III-8
Current Emergency Operations Permanent Organization



Program Management and Oversight

Responsibility for program management and oversight needs to be firmly defined. More importantly, the notion that oversight should indeed be a critical part of the program should be established and implemented. At the present time, there does not appear to be any organization anxious to assume that responsibility or even concede that it is required.

The problems stemming from a lack of oversight are plentiful and are discussed throughout this report. Vantage, therefore, believes that steps to manage Con Edison's overall program and to provide an oversight function are essential for the future.

III-R11 Responsibility for management of Con Edison's overall emergency programs should be clearly assigned, and the responsible entity should be charged with the various program management functions now contained in CI 260-4. (Refer to Finding III-F9.)

III-R12 A corporate oversight function for emergency management should be added that is charged with ensuring that all organizations are aligned with corporate priorities and principles. (Refer to Finding III-F9.)

Roles and Responsibilities

It is natural for gray areas to develop as various organizations evolve. This is particularly true in Con Edison as the emergency management functions adapt to new pressures and changing requirements. The inevitable outcome is difficulty in keeping the paperwork and procedures aligned with the way things are really working. The restructuring initiative provides the opportunity to clean up the loose definitions and inconsistencies.

III-R13 Ensure that the recommended organizational restructuring acts firms up roles and relationships, minimizes gray areas, and resolve procedural inconsistencies. (Refer to Finding III-F13 and F15.)

It was previously noted that the tendency to gravitate to one's highest priorities can leave voids in the overall program and that this might be taking place with the evolution of the current EM groups. With the complex nature of Con Edison's emergency management challenge, the completeness of scope definition is important and needs to be fully reflected in organizational assignments.

III-R14 Ensure assignment of all elements of the Master Plan and the allocation of corresponding resources to those elements in order to prevent inappropriate domination by local preferences, "program of the month," or other transient priorities. (Refer to Finding III-F8 and F13.)

The role of Distribution Engineering is important and should be unambiguously defined.

III-R15 Redefine the role of Distribution Engineering in emergency preparedness and response to make it consistent with ICS principles and Con Edison's current and future needs. (Refer to Finding III-F14.)

Supporting documentation and procedures should be revised as appropriate.

Corporate Emergency Management

Vantage has shown that the Corporate EM group does not have the resources to fully carry out its currently assigned responsibilities. The group, or its successor in any new organization, will need to increase or have its responsibilities reallocated. This should be examined early in the restructuring process.

III-R16 Add resources to the Corporate EM group, or its successor in any new structure, so that the resources align with its substantial and broad responsibilities. (Refer to Finding III-F11.)

Meanwhile, the EO EM group plans to make an extremely large addition to its staff. While this is a positive development, it is also premature, and any such major expansion should instead take place within the framework of the recommended restructuring initiative.

III-R17 Defer the pending expansion of the EO EM group until a new organizational structure is defined and staffing for EO EM, or its successor, is evaluated within the context of that new structure and the new Master Plan. (Refer to Finding III-F12.)

As a final note on staffing, Vantage notes that the variations in EO EM staffing over the past few years had a real impact on preparedness. In addition to its implications for organizational priorities, the reduction also limited the degree of planning and support the group could provide. The new Organization needs measures to ensure that the ebb and flow of personnel levels will not be detrimental to the overall program. This will be an important function of program management and oversight.

III-R18 Develop a sound staffing plan and supporting commitment, as part of the new recommended strategy development, to ensure staffing is adequate and justified and that management commitments do not ebb and flow as they have in the past. (Refer to Finding III-F10 and F11.)

EMERGENCY ORGANIZATION, NIMS AND ICS

III- F19 Con Edison has demonstrated a solid commitment to ICS that puts it at the forefront of the industry and firmly in tune with other emergency response organizations.

III- F20 Con Edison's application of ICS has provided great benefit to the management of large scale emergencies and has probably been even more effective "on the street" in managing local incidents.

Many years ago, Con Edison made a pivotal and forward-thinking decision to adopt the Incident Command System (ICS) as its fundamental organizational approach to incidents of all kinds. This was a pioneering effort among utilities, and Con Edison today remains as one of the few electric utilities making this commitment.[22]

ICS is the key command and control ingredient of emergency management. In an emergency, an Incident Commander (IC, or White Hat) is named and the ICS organization is built around him or her. The design and mechanics of that organization are discussed later in this section.

The ICS Organization can be mobilized in a variety of ways, however, the primary procedural vehicle for mobilization is via the Control Room Shift Manager. The various thresholds and triggers for such action are discussed later in this Report. Using weather forecasts and other measures, the ICS is established in anticipation of the emergency and, as a result, there are 'false alarms'. Those false starts have many of the benefits of drills and therefore contribute to overall program effectiveness.

We find universal agreement within Con Edison that ICS works. It is rare to find an approach that earns the commitment of an entire organization, but this appears to be it. Con Edison calls upon ICS for major emergencies, extensive challenges (the LIC rebuild), and relatively small incidents. Emergency Response Group (ERG) personnel are especially effective in this latter regard as they are quick on the scene and are able to immediately

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[22]/ Various utilities practice pieces of ICS and this leads to confusion as to the industry's level of commitment. Con Edison's consultant (DR 135) indicates ten utilities utilize ICS, while Con Edison employees suggest the figure is far less. On a "pure" ICS basis, we suspect Con Edison is one of a very few.

establish a command post and presence for the management of any kind of Con Edison event.

III- F21 The other elements of the NIMS program (non-ICS) offer little benefit to Con Edison at this time, and Con Edison's limited implementation is appropriate. Resource typing may be one emerging exception.

ICS is a key element of the National Incident Management System (NIMS). NIMS is the central mechanism for a fundamentally improved system of emergency response regardless of the cause, size, location, or complexity of the incident. It provides a framework that facilitates government and private entities at all levels to work together to manage incidents. It is a direct consequence of the sea change discussed earlier regarding expectations for emergency management.

The six elements of NIMS are:

- Command and Management (primarily ICS);
- Preparedness;
- Resource Management;
- Communications and Information Management;
- Supporting Technologies;
- Ongoing Management and Maintenance.

The elements of NIMS have been received with varying levels of commitment and success. With the introduction of NIMS, ICS was made the first priority, and mandatory for those agencies receiving federal emergency funds. It is, therefore, not surprising that it took hold and was successfully implemented.

The other elements of NIMS have been slower to develop and have not had the same forcing function behind them. Although these elements contain a wealth of good direction, the supporting infrastructure is still a work in progress. The planning and management concepts are surely beneficial to electric utilities and others, but other benefits for electric utilities are still in the future.

III-R19 Revisit the question of resource typing after the issuance of new FEMA software. (Refer to Finding III-F20.)

Con Edison sees benefits to FEMA's resource typing plans, but the application to the utility has not been easy to implement. This may change with FEMA's pending issuance of its IRIS software, which is designed to facilitate the process.

III- F22 While NIMS (and specifically ICS) represents a better way of operating in a "normal" emergency, it has further reaching consequences in a catastrophic event, where Con Edison becomes part of a unified command and may be required to work outside its normal processes. More planning is necessary to accommodate this emerging reality.

III-F23 The implications of changes to Con Edison's role in a unified command structure, where Con Edison may be a cog in a bigger wheel, should be evaluated and factored into emergency planning scenarios, particularly for EO events.

One side effect of NIMS relates to how Con Edison will work with government emergency organizations in a catastrophic event. A recent drill involving New York's Office of Emergency Management (OEM) led to a scenario in which Con Edison becomes part of a unified command under the overall direction of OEM. This essentially short circuits some of the Company's existing restoration plans, requires OEM to set the restoration priorities, and places Con Edison as part of a team (in this case for damage assessment).

III- F24 Con Edison maintains an excellent working relationship with NY OEM and other emergency related organizations.

As a result of its commitment to a coordinated response to emergencies, Con Edison has worked well with NY OEM and other agencies. This has produced real benefits in terms of coordination and communication as well as broader implications including what appears to be the driving force and motivation behind many of the Company's emergency preparedness initiatives. Our conclusion flows in part from the Company's actions over the last few years, in which the development of the overall Emergency Management Program and internal functions have often been in direct response to those outside organizations.

This conclusion is also supported by our own observations in the CERC drill, in which the participation and role of other emergency groups, including NY OEM, WC OEM, and NYPD were considerable. In addition, the Company conducts frequent drills with the NYFD.

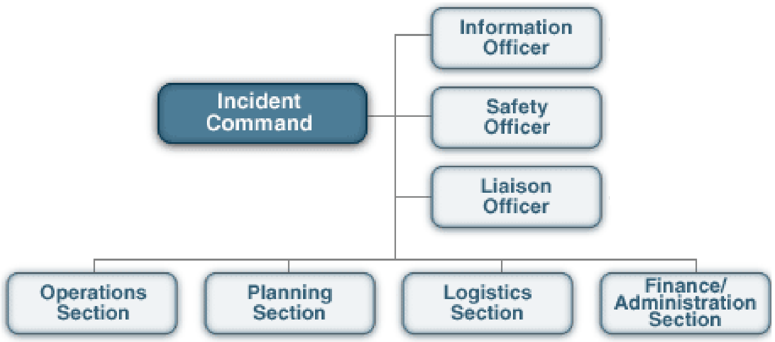
EMERGENCY ORGANIZATION DESIGN

III- F25 The ICS organizational design created for emergencies by Con Edison is highly complex yet in many ways elegant allowing: (a) a marshaling of the right people; (b) a workable transition from the normal organization to the emergency structure; (c) manageable spans of control over what can become an enormous organization; and (d) a framework in which managers have become increasingly comfortable and effective.

The ICS organization designed by Con Edison is highly complex, yet elegant at the same time. It begins with the standard ICS template developed by FEMA. That template has two levels of support, the Command Staff and the General Staff, both of whom report to an Incident Commander as illustrated in the following Exhibit. Note that all of these positions are described in standardized terminology that transcends the various participating organizations. Accordingly, Con Edison can effectively interface with any other emergency organization and speak the same language.

Audit of Con Edison Outage Management

Exhibit III-9
FEMA ICS Template



The above Exhibit is simply the typical foundation for the building of a tailored organization. For example, Con Edison has elected to add a position to the Command Staff representing Customer Operations. Various organizations within the Company may find it necessary to add positions and flesh out the structure in ways that satisfy their needs. Such flexibility is encouraged, but the basic features of ICS must be maintained. These features include:

- common terminology and clear text;
- modular organization;
- management by objectives;
- incident action plans (IAP);
- manageable spans of control (approx 5:1);
- pre-designated incident locations and facilities;
- resource management;
- integrated communications;
- chain of command/unity of command;
- accountability;
- information and intelligence management.

A valuable feature of the Organization is its scalability, and the basic structure can grow extremely large for a large-scale emergency. Standard terminology is still employed as various subordinate groups are added such as units, divisions, groups, branches, task forces, strike teams, etc. As the building blocks grow, spans of control are maintained at about five.

Despite the complexity of the organization in larger events, Con Edison managers appear to function well within the structure. Support personnel provide organization charts that include names and contact information for all key players. In addition, the transition from the day-to-day organization to the emergency structure appears to be nearly seamless in the examples Vantage witnessed suggesting a high degree of buy-in to the process. Such trumping of one's regular responsibilities and position by the emergency organization could be a source of difficulty in a less mature or less practiced organization.

III- F26 An essential quality of ICS is clarity of purpose and responsibility. The Con Edison organization generally seems to function well despite some ambiguities and overlaps in documented responsibilities.

Con Edison's ICS initiatives earn high marks. There are a few suggestions for improvement, however, which do not represent serious issues.

As noted earlier, Vantage found that Distribution Engineering's role in ICS is somewhat confusing. In many events, the Distribution Engineering Command Post (DECP) is mobilized early in the game and has a number of predefined functions. Yet, neither Distribution Engineering nor the DECP appear anywhere in Con Edison's ICS organizational charts. While DE personnel may assume positions in the command structure, the role of the organization itself remains somewhat undefined. This is a particular problem in that the ICS concept insists on clearly defined roles and accountabilities. During events affecting multiple regions, the DECP provides a single point of communication to senior executives seeking information on how the system is performing without contacting individual ICS entities. DECP also allocates resources among the regions and provides technical support when needed. Starting in the summer of 2007, when certain peak Heat Index conditions occur/when system peak electric loads exceed a stated number, the DECP closes and selected DE staff move to the CERC to staff the ICS based Planning Section.

Roles and accountabilities also become a little confusing based on some overlap in terminology, which is also counter-ICS. Terms such as "information," "communication," and "prioritization of work" are used repeatedly in the context of different positions, thus, making it difficult to understand just who has the responsibility and accountability.

III-R20 The refinement of ICS accountabilities should be a subject of continuous improvement with particular focus on those positions for which descriptions are complex and for different positions that contain similar concepts or overworked phrases (such as 'information,' 'communication,' 'prioritization of work,' etc.). (Refer to Finding III-F26.)

III- F27 The application of Incident Action Plans (IAPs) is uneven and may not be achieving all of the benefits contemplated by ICS. While some individual flexibility and variations due to style are acceptable, the current differences in how IAPs are applied is substantial.

The use of Incident Action Plans is inconsistent among organizations with their purpose, perhaps, not being uniformly understood. For example, some IAPs were ten pages long and included detailed Work Plans for every organization for the next shift while other IAPs were less than one page with generic statements such as 'continue restoration.'

III-R21 Redefine the purpose and expectations for IAPs for the benefit of emergency managers, and Incident Management Assistance Teams (IMATs) should assist in ensuring a reasonably consistent application. (Refer to Finding III-F26.)

III- F28 The role of the IMATs is extremely important and of potentially very high value to the Incident Commander and the Command Staff, yet it does not seem to get the attention and priority it deserves in planning, drills, procedures, and other elements of the Emergency Program.

IMATs are used to support the ICS process and their role can be extremely significant. Vantage observed IMAT personnel in action and found them, in some cases, to make a remarkable contribution. In other cases, including drills, Vantage found them to be not participating. In such cases, this is a real lost opportunity, especially for the Incident Commander. Whether helping discussions stay on point, helping maintain an orderly room, or assisting the IC in following the process, the IMATs can be valuable.

It will be noted that IMATs were not on the ICS organization charts or provided for in the CERP until recently. This appears to have been an oversight that has been corrected and the role of the IMATs should be encouraged and expanded.

III-R22 The IMATs should assume a full role in drills to act as an in-process helper to the IC and other managers and should also take an aggressive facilitation role (consistent with IC needs and expectations) in emergencies. (Refer to Finding III-F28.)

C. RESPONSE TO OUTSIDE STUDIES

PRIOR RECOMMENDATIONS

III-F29 The process for the evaluation and implementation of the many 2006 recommendations, while responsive to the many outside stakeholders, is flawed and may not lead to permanent improvements proportionate to the cost and effort expended.

The question our consultants raise here is whether this is simply a "Check-off" Approach or Substantive Change in approach to resolving problems by Con Edison. Vantage has discussed how the lack of a coordinated strategy inhibits the Organization's ability to function optimally, and nowhere is that more clear than in the handling of the hundreds of recommendations that flowed from the various reports on the 2006 events. There is no question that real improvements have already resulted from those recommendations, but it also appears that the implementation program may be reaching the point of diminishing returns.

In the absence of an overall strategy, there can be no assurance that the hundreds of tasks currently underway will indeed make a proportionate, permanent contribution to Con Edison's level of emergency preparedness. In fact, Vantage believes those tasks may not provide such a contribution and that the sum of the parts will indeed amount to less than the whole.

We emphasize that this is in no way a criticism of the reports prepared in the wake of the 2006 problems including those by the Staff, Con Edison, the Incident Investigation Committee,[23] New York City, and the NYS Assembly. We found each of those reports to be well done and the recommendations, for the most part, to be well thought out and credible. However, the process for the subsequent evaluation and implementation of those recommendations has been seriously flawed. The magnitude of the recommendations will challenge any process.

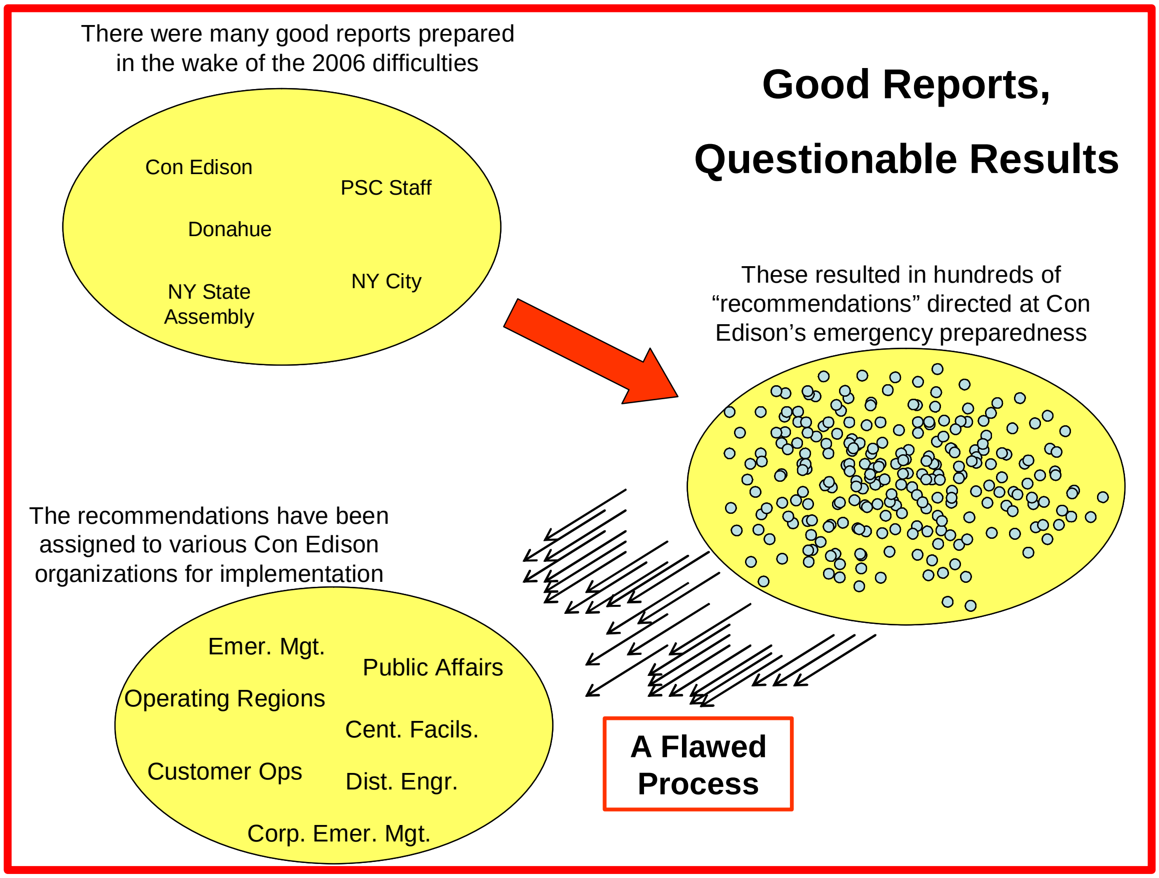
The following Exhibit simplifies the actual process in use, yet accurately portrays the key elements. The implementation of the hundreds of recommendations, without structure or logical grouping and with little discrimination, fall onto the Organization like a downpour. The various groups are given lists of tasks, often fragmented and disconnected. Any end objectives are quickly lost (assuming they were ever defined in the first place), and replaced by the new primary objective of checking off the hundreds of tasks. This objective appears

[23]/ This is commonly known as the Incident Investigation Committee (Donahue) Report.

to be especially paramount for the tasks assigned by the regulator. Later, we provide an analysis of all recommendations to provide a sense of the emphasis they provided.

Audit of Con Edison Outage Management

Exhibit III-10
Response to Outside Studies



It is easy to see how such a well-intended improvement process can deteriorate into a "bean count" with a loss of focus on what really needs to be accomplished and the collective impact of the recommendations. This outcome is inevitable given the following.

- It is impossible for Con Edison to intelligently evaluate and prioritize the individual recommendations in the absence of an overall emergency planning and response strategy.

- There is no central accountability, no meaningful tracking of tasks, and no overall evaluation of the effectiveness of implementation.[24]
- Cost/benefit analysis of the recommendations by Con Edison has generally been lacking.
- There has been no analytical grouping of the collective recommendations, for example, by categories, functions, or organizations.
- There has been no analysis or identification of root causes by Con Edison.
- There has been too little discrimination of the recommendations including many that might be deemed overly prescriptive.

Vantage must conclude that this is a process that is not being managed effectively, and that it is unlikely to bring about lasting improvements for Con Edison and its customers, and that it is surely not proportionate to the time and effort invested. A grossly inefficient and, perhaps, unmanageable array of activities has emerged, and the sooner the process is replaced with a more effective mechanism the better.

OUTAGE RECOMMENDATIONS ANALYSIS

In response to the outages during 2006, several reports were prepared and submitted for consideration. (See Appendix 3). Con Edison prepared four reports; the Commission Staff prepared three reports; the State Assembly Task Force submitted a report; and the City of New York also submitted a report. By our count, 344 recommendations were offered, 62 for overhead outages and 282 for Long Island City (LIC). Appendix 4 provides a listing of all recommendations. To provide some perspective on the basis or focus of the recommendations, Vantage developed a system for grouping the recommendations. The recommendation groups or "buckets" follow. The number of recommendations that falls in each bucket is also provided in the right column.

Audit of Con Edison Outage Management

Exhibit III-11

Analysis of Outside Report Recommendations

Organization	Function	Specifics	# OH Recs.	# LIC Recs.
1. Engineer & Operations	A. Outage	Procedure	4	28
		Damage Assessment	3	1
		Human Resources/ Training	8	10
		Systems & System Modification	8	13
		Equipment		6

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[24]/ Vantage prepared its own analysis of all recommendations made for both LIC and overhead outages in 2006. This analysis is in an Appendix to the report.

Organization	Function	Specifics	# OH Recs.	# LIC Recs.
		Demand Reduction/ Mobile Generation		9
		Other		16
	B. Maintenance	Procedure		33
		System/System Modification		25
		Equipment		29
		Other		36
	C. Communications	Number of Customers		8
		ETR/Status	2	2
	D. Other			1
Total Engineering & Operations Recs			25	217
2. Customer Operations	A. Call Center	Procedure	4	3
		Equipment	1	3
		Human Resources/ Training	3	
		Other	1	1
	B. Communications	LSE	3	1
		Dry Ice	2	4
		Web site	3	1
		ETR/Status	1	1
		Other	2	3
Total Customer Operations Recs			20	17
3. Public Affairs & Corporate Communications	A. Media		5	1
	B. Public Officials		7	6
	C. Web site		1	3
	D. Customer Information		3	3
Total Public Affairs & Corporate Communications Recs			16	13
4. Regulatory	A. Oversight		1	22
	B. Compensation		1	9
	C. Other			2
Total Regulatory Recs			2	33

This analysis does provide some interesting observations. As can be seen on the table above, the preponderance of the recommendations fall into the 1.B category - Engineering & Operations, Maintenance. Several of the recommendations in 1.B.4 - Other relate to various studies for Con Edison to conduct regarding equipment performance and maintenance practices. Interestingly, none of the Westchester-Underground recommendations fall into categories 1.B, 1.C or 1.D. Clearly, the LIC studies focused more on the technical aspects of the outage. It should also be noted that there are numerous times when the intent of a recommendation is repeated in more than one study. This explains why so many of the recommendations are grouped into Category 1. – Engineering & Operations. Another interesting observation is the number of recommendations that fall into category 4.A – Regulatory Oversight.

IV. COMPREHENSIVE EMERGENCY RESPONSE PROGRAM

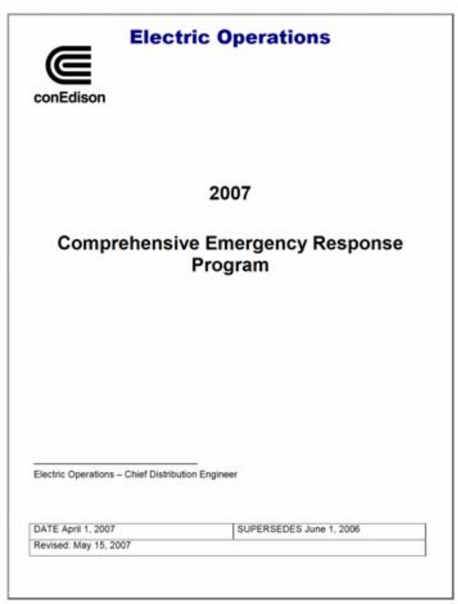
A. COMPREHENSIVE EMERGENCY RESPONSE PROGRAM (CERP)

Con Edison has a hierarchy of procedures that define how its electric emergency program is implemented. The key document is the Electric Operations' Comprehensive Emergency Response Program (CERP), which is an extensive document encompassing all of the key activities associated with emergency management.

Other important procedures include certain Corporate Instructions (CI) and Customer Service Procedures (CSP). These tend to be at a higher level and provide governing concepts and policies.

Vantage will review several of the key supporting features of Con Edison's program including the planning criteria utilized, trigger points selected for various emergency actions, and the methodology for linking such criteria and thresholds to resource needs. We will also discuss subordinate procedures and other documents that flow from CERP requirements. Finally, Vantage will discuss Con Edison's approach to large scale and multi-region emergencies.

IV- F1 <u>The scope of the CERP is extensive with a wealth of emergency information.</u>


Electric Operations

conEdison

2007

Comprehensive Emergency Response Program

Electric Operations – Chief Distribution Engineer

DATE April 1, 2007	SUPERSEDES June 1, 2006
Revised: May 15, 2007	

New York law requires that utilities "file with the Commission an electric emergency plan."[25] Detailed requirements for this plan are stated and utilities must update their material by April 1 of each year. Con Edison submitted such an update in 2007 and followed it with another update on about June 1.

The CERP is a voluminous document spanning hundreds of pages and containing a wealth of information for supporting emergencies. In addition to procedures that are applicable system-wide, it contains specific sections tailored to the needs of each region. Also, a newly-prepared "Coastal Storm Plan" provides for planning and response to a Katrina-type event.

The CERP is perhaps the single most important document in a review of the emergency response process because it is the only document that collects

[25]/ Part 105.

so many policies, plans, procedures, and supporting information in one place. The CERP does a generally good job of assimilating this information. The degree of information and more importantly, the level of planning it signifies are impressive.

CERP Compliance

IV- F2 <u>The CERP is in literal compliance with Part 105 requirements.</u>

Vantage's review of CERP concludes that it is in compliance with requirements and in many cases exceeds those requirements. One possible exception is the conduct of emergency drills and, more precisely, the extent of external participation in these drills, which will be discussed in further detail later in this Report. Nevertheless, this document is of high technical quality although it has a number of shortcomings.

An identity crisis?

IV- F3 <u>There is confusion as to whether the CERP is primarily a response to a regulatory requirement or a set of planning guidelines that are critical to the effective management of an outage.</u>

As stated earlier, the CERP has extensive information in it. However, there is evidence supporting the argument that it is designed largely to meet the regulatory reporting requirements, which can limit its effectiveness as an operational document. Due to its broad scope and mass of valuable information, the CERP is clearly in a position to play the preeminent role in Con Edison's management of emergencies. However, Vantage was unable to determine if the document actually fulfills that promise. Is the CERP a vibrant set of guides and plans that are critical to the effective management of outages, or is it merely an administrative response to a regulatory requirement? While the preferred answer is "both," there is evidence suggesting otherwise.

- It is signed by the Chief Distribution Engineer apparently because of his responsibility as the lead communicator with the regulator. There are no signatures or endorsements from operating or emergency management leadership.

- It is not well communicated to the Organization, nor does it have a wide internal distribution. Notice of a new document is sent to a relatively short list via e-mail.[26]
- It is not user-friendly.
- It contains little in the way of policy, management expectations, or vision. In fact, the three main guiding principles of Bronx/Westchester emergency management are absent.
- The latest update was exclusively driven by the regulator.

Several of these issues will be discussed with specific recommendations below.

Can the document adequately serve both purposes? There is no apparent reason why that cannot or should not be the case, but at the present time the regulatory focus is overshadowing the operational needs of the document and limiting its effectiveness in that latter role.

This is not meant to suggest that the CERP is window dressing and does not reflect how the Organization works. However, it can be much more, and the strong foundation is indeed there to build upon. This will require the material to be tested against a new criterion; i.e., how does it support the needs of emergency managers? The regulatory criterion (does it meet Part 105 requirements?) is also valid, but not exclusive. The character and usefulness of the CERP, as well as the overall effectiveness of the Program, will increase considerably if that new criterion is added.

IV-R1 Clarify the role and purpose of the CERP, for internal management purposes, with the objective of replacing or repairing the document where it does not effectively serve the needs of the organization. (Refer to Finding IV-F3.)

CERP-related Issues

IV- F4 The information in the CERP seems like it should be invaluable to the Organization in planning and reacting to an emergency, yet how its contents get to and benefit the respective managers is less than clear.

IV- F5 Communication of the CERP and especially changes to the program are particularly weak. Distribution is not clear, and there are no accompanying instructions or expectations for its use and no listing or summary of "new policies or requirements."

We have noted the wealth of valuable information in CERP and elsewhere, but also note that such information is not necessarily accessible or of optimum use to emergency managers and other personnel. Consider the distribution of the document itself, which is electronic but limited. It reaches an audience but contains no description of what is expected from that audience. There is no accompanying report of the changes that have

[26]/ DR 257.

been made since the last issuance leaving the reader in the dark as to what, if anything, is different.[27]

IV-R2 Standardize distribution of the CERP and provide a clear explanation for any changes that take place. Further, where changes are significant, employees should receive a briefing to ensure full awareness. Also, at the time of distribution, managers should be reminded of their responsibilities concerning the use of the document. (Refer to Finding IV F4 & F5.)

IV- F6 The Con Edison intranet contains a vast storehouse of important emergency management information including the CERP and related documents. The structure and organization of this information, however, suggests that easy and useful access by managers is problematic.

The CERP is contained on Con Edison's intranet, which also houses a massive amount of other information on emergency preparedness and response. However, it is not clear that managers enjoy the optimum benefit of this valuable source due to the structure (or lack thereof) of the material. Further complicating this situation is the use by managers of Public Outlook folders for the storage of important documents. The end result is a complex maze of valuable, but elusive, data. Finally, it is not clear how available data is, should the intranet be out of service.

IV-R3 Assist Con Edison managers and improve their effectiveness under emergency conditions by creating a more useable structure for important documents and providing managers with easy-to-use guides for accessing those documents. (Refer to Finding IV -F6.)

IV- F7 The CERP can be difficult to read.

In reviewing CERP, Vantage found it to be rather unfriendly to the reader. While its overall structure is good, and there were some real improvements in cosmetics in the latest updates, there are numerous features which will tend to minimize its effectiveness for managers and other users.

The document contains little in the way of summarization or overview leaving the readers to develop their own flavor, themes, and priorities. This is especially true in terms of management policies, vision, and expectations. The graphics are overly complex and difficult to understand. To the extent these overly complex depictions correctly reflect actual processes, then process review and optimization might be of benefit. Terminology does not stay consistent with ICS requirements from a clarity and ambiguity perspective with a jumping between "blue sky" job titles and emergency titles seemingly overlapping descriptions of responsibilities and use of terms that have not been introduced or defined.

[27]/ This changed with the June 1, 2007 distribution (DR# 287).

IV-R4 Improve the presentation of the CERP material so that it can be easier to read and thus of greater use to managers. (Refer to Finding IV-F7.)

IV-F8 The signatories to key procedures do not necessarily correlate to their roles and responsibilities for those procedures, thus exacerbating the already confusing issue of accountability.

Vantage has discussed the question of who signs various documents and we believe that the answer is significant. The name of the sponsor helps to indicate the expectation for compliance within various organizations as well as the degree to which the requirements are considered important commitments.

IV-R5 Redefine which managers should have responsibility for approving emergency planning documents and then hold them responsible for meeting that commitment. (Refer to Finding IV-F8.)

IV- F9 Although the CERP provides for extensive checklists which are included in the CERP itself or on the intranet, it does not appear that these checklists are being optimally used.

A strong point of CERP, and the Con Edison program as a whole, is the existence of extensive checklists for emergency positions. Con Edison's procedures are necessarily complex, and it is easy to forget important steps, particularly under stressful conditions. The existing checklists should greatly mitigate this threat. Vantage did observe, however, that the checklists did not seem to be in visible use, especially in the several drills that were attended. Vantage learned that the checklists are not trusted in some cases even though it is the using manager's responsibility to have such a list in place. Regardless of the reason, a more disciplined use of checklists would appear to be helpful.

IV-R6 Define expectations for the use of checklists and implement improvements where the quality of the checklists limits their use. (Refer to Finding IV-F9.)

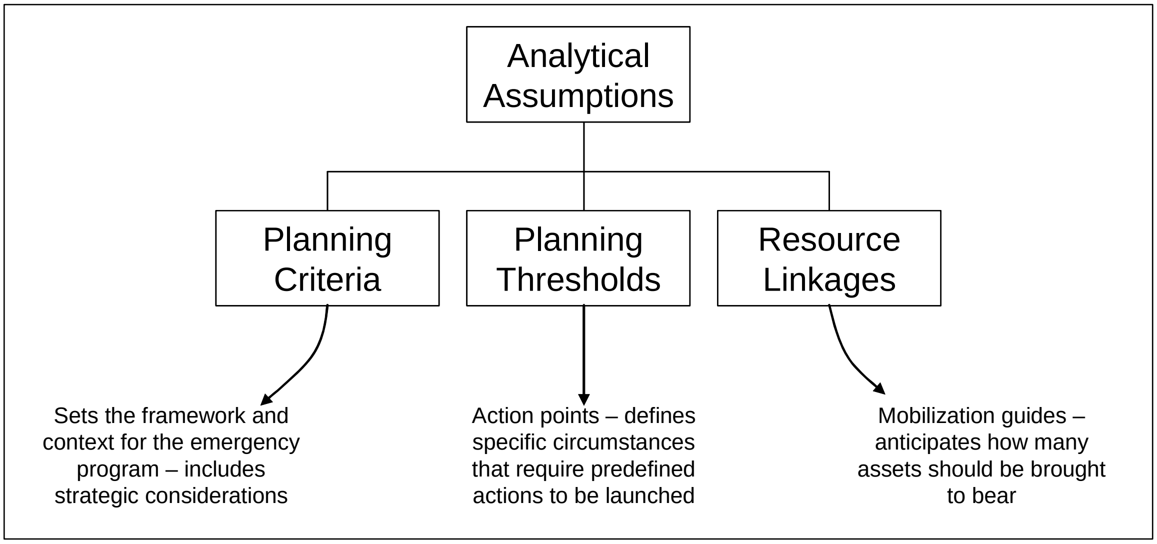
B. ANALYTICAL ASSUMPTIONS AND PLANNING CRITERIA

IV- F10 The planning criteria and assumptions embedded in Con Edison's program: (a) are not structured or well defined; (b) are generally implicit as opposed to specifically laid out; (c) lack an analytical basis; and (d) are not in a form that allows test and debate as part of the planning process.

The direction for this assignment included consideration of three elements of Con Edison's program that Vantage has grouped under the heading of assumptions. The consultants were specifically instructed to examine: (a) the planning criteria behind Con Edison's program; (b) the thresholds in the Plan that trigger various actions; and (c) the Program linkages between emergency situations and resource needs. The consultants see all of these as drivers, at times inter-related, that underlie the Plan and that should provide an analytical basis for Con Edison's program of response. The role of each is summarized in the following Exhibit.

Audit of Con Edison Outage Management

Exhibit IV-1
Analytical Assumptions



Planning Criteria

The planning criteria defined for the Program set a strategic and tactical framework. They establish a context for all of the actions and planning decisions that follow. It is management's best chance at building its key concepts into the Plan. Such concepts can span many subjects including philosophy, priorities, expectations, policies, desired planning scenarios, and whatever other fundamental assumptions will steer the planning process.

In addition to embodying management's strategic direction, the planning criteria should also include important tactical assumptions that shape the Plan. These will include the nature of worst case assumptions and the extent to which the Organization wishes to be prepared for various scenarios. Important parameters, such as the maximum number of customers to be assumed out, the maximum number of hourly phone calls to be handled, or the maximum number of trouble tickets to be processed, will emerge from these criteria, and around them the systems and infrastructure of emergency response will then be built.

Therefore, planning criteria are far from an academic exercise – they drive the design of the Plan and define just how robust the response organization and infrastructure will be for various emergency scenarios.

Ideally, all of the planning criteria will be explicit and contained in one planning document, and Vantage suggests that be the case for the recommended new planning initiatives for Con Edison. However, life is not so kind for the immediate challenge where the planning criteria and many fundamental assumptions underlying the Plan are either implicit or absent. In any case, they are not readily apparent and a structured analysis is difficult.

The lack of a coordinated strategic plan is a serious shortcoming, therefore, it makes little sense to belabor that point by taking it to the next level (planning assumptions). Suffice to say that the new Plan will be far more effective, better understood and accepted by all parties if the underlying assumptions are clearly defined.

IV-R7 Establish a clearly defined and structured set of criteria and assumptions that establish the bases for the Plan, define the environment in which the Plan must operate, and set a foundation and framework around which to build the Plan. (Refer to Finding IV-F20.)

This activity should be performed as part of the recommended new strategic planning initiative. In summary, the new planning criteria should:

- be structured and well defined;
- be specifically laid out as opposed to implicit in the Plan;
- have an analytic basis; and
- be in a form to facilitate test and debate as part of the planning process.

IV- F11 Attributing Con Edison's 2006 problems to "unique" events contradicts a key planning criterion that should be in place; i.e., effectively coping with unique events is the very purpose of emergency planning.

This important finding is the basis for laying out the new planning criteria. It is critical to remember the purpose of an emergency plan; i.e., to prepare for the unexpected. Some analyses of the 2006 events characterize Con Edison's problems as unique, and such explanations carry the implication that the problems were, therefore, unmanageable. While Vantage is the first to agree that Con Edison's circumstances are indeed unique and among the most challenging for any electric utility, this is largely irrelevant in considering the effectiveness of emergency response. Again, the very purpose of emergency planning is to be prepared for events, unique or otherwise, therefore, a discussion of how out-of-the-ordinary an event might be has no place in the analysis.

Planning Thresholds

IV-F12 Con Edison's planning thresholds have a number of weaknesses.

- Con Edison's definition of planning thresholds are cumbersome and complex, suggesting a potential for misapplication.
- Con Edison does not present its many planning thresholds in a structured form that can allow a clear understanding of the trigger points.
- The ramifications of many thresholds i.e., the specific actions they trigger are not clear.
- Con Edison's planning thresholds are generally derived from experience and rules of thumb rather than any analytical basis.

- Despite the lack of structure and simplicity in the planning thresholds, there is no evidence to conclude that these shortcomings are having a significantly detrimental effect on Con Edison's emergency response capabilities.

Planning thresholds are defined as set points that, when reached, trigger a pre-determined action. They, therefore, frame Con Edison's response to various sets of circumstances.

Consider the following.

- There are many different sets of thresholds requiring familiarity with numerous triggering systems.
- None of the thresholds are simple. Virtually every designator has multiple criteria and many require multiple combinations of those criteria.
- Triggers differ depending on other circumstances such as summer/winter or overhead/underground.
- The actions triggered vary among the thresholds and in some cases vary among regions.

It is clear that the permutations associated with the above four data sets are of a magnitude that they threaten the ease of usefulness of these triggers. While some thresholds are more straightforward than others such as the overhead storm matrix, most are complex, especially those involving network incidents.

The following Exhibit provides a summary of the various trigger points as defined in Con Edison procedures, policies, checklists, and decision matrices. This grossly simplified version was constructed in order to provide a reasonable summary. In practice, the determinants are derived from a complex combination of parameters.

Each of the "types" of thresholds from the table are described further below.

Audit of Con Edison Outage Management

Exhibit IV-2
Planning Thresholds

Simplified Tabulation of Planning Thresholds / Trigger Points			
Type	**Application**	**Categories**	**Primary Determinants**
Incident Levels	Generic	1 – Routine 2 – Upgraded 3 – Serious 4 – Full Scale	Sources of resources required
Storm Matrix (differ by region)	Overhead	1, 2, 3A, 3B, Coastal	Precipitation, wind, damage
Winter Storm Matrix	Underground	Routine, Upgraded, Serious, Full Scale	Run-off, temperature, manhole events
Heat Classification	Underground	Extreme weather criteria, Heat event	Temperature and load
Summer UG Response	Underground	Routine, Upgraded, Serious, Full Scale	Load
System Conditions	Overhead	Alert, Emergency	Pending storm, Imminent damage
System Conditions	General	Yellow, Red	Pending outages, Equipment loadings

Incident Levels

Incident levels are defined in CI 260-4 (Corporate Response to Incidents and Emergencies). The four levels are Routine, Upgraded, Serious, and Full Scale. The defining matrix in CI 260-4 is three pages long and includes multiple complex criteria, but it notes that the incident level should be generally assigned based on the company response.

- **Routine:** locally assigned crews.
- **Upgraded:** locally assigned crews plus diverted crews.
- **Serious:** resources from other regions.
- **Full Scale:** resources beyond Con Edison.

The matrix also provides direction in establishing the ICS structure as a function of incident level. Accordingly, the defined thresholds can lead directly to a change in the ICS structure, the Incident Commander, or the degree of staffing.

The incident levels in the various matrices are defined by event conditions such as weather or load, and those incident levels then aid in defining the required response.

Overhead Storm Matrix

The Storm Classification Matrix, which can differ in some respects by region, is one of the more critical planning mechanisms and will be discussed further under resource linkages. The matrix begins with sets of various weather conditions and uses those to forecast damage and customer impacts, restoration resource requirements, and estimated times to restoration (ETR).

Con Edison has chosen to parse the Commission storm categories further and has included multiple categories for major storms so as to produce more accurate resource and restoration estimates.

Winter Storm Matrix

The Winter Storm Matrix, which can also vary by region, is used for potential underground incidents. The severity of the incident is gauged by the degree of winter run-off and resulting manhole events. This then translates into the incident level which triggers predefined resource mobilization and other actions.

Heat Classifications

Under the following circumstances, Extreme Weather Criteria or a Heat Event will be declared.

- **Extreme weather criteria:** that is the predicted average of the wet and dry bulb temperatures of 80 degrees Fahrenheit/forecasted system load > 10,500 MW.
- **Heat event:** heat index is predicted to reach 100 degrees Fahrenheit.

The heat classification acts largely as a warning and sets the stage for anticipatory actions. For example, the Distribution Emergency Command Post (DECP) is mobilized under an extreme weather criteria situation and numerous operating restrictions are applied to the network.

Underground Event Responses

The response to network events is guided by a highly complex matrix involving system load, alert levels, customer outages, number of contingencies/equipment loadings. Looking only at system load, the response is:

- **Routine:** system load > 11,000 MW;
- **Upgraded:** system load > 11,500 MW;

- **Serious:** system load > 12,000 MW;
- **Full Scale:** equipment is significantly overloaded.

System Conditions - Overhead

Overhead system conditions are classified as alert or emergency. An **alert** is declared if a storm is tracking towards the area and could cause damage. An **emergency** is declared if damage from an approaching storm is imminent.

System Conditions – General

A **yellow** alert is declared if outages are pending. A **red** alert is declared if equipment loads are already excessive.

Applications – What triggers what?

Each of the classifications described above relates to some specific action or series of actions, most of which will be found on decision matrices in the CERP and position checklists. The linkages between the thresholds and the various action-oriented documents are not easily traced and there is no summary level documentation of how these linkages are structured and preserved.

This does not diminish the value of the extensive and carefully prepared decision matrices, which play an important role in defining the actions required of managers throughout an emergency. The concerns may, therefore, lean towards form over substance, but Vantage nonetheless believes a more clear structure will mitigate confusion and indecision in times of stress and permit a more effective response.

On a more substantive note, the values of the trigger points in most cases lack analytical basis and derive largely from experience and rules of thumb. This is not necessarily a serious shortcoming, but the trigger points should receive some periodic analysis and testing. In addition, some level of explanation should also be provided.

IV-R8 Construct an improved framework and process for the development, documentation, and management of planning thresholds that: includes a matrix, for the benefit of managers and emergency planners; that summarizes all of Con Edison's emergency classifications as well as the actions they trigger; provides for a possible simplification recognizing that ease of use will lessen confusion and improve uniform application; and requires analysis and testing of planning thresholds periodically. (Refer to Finding IV-F22.).

Resource Linkages

IV- F13 The Con Edison regionally based resource tables that link resource needs to event classifications are a valuable tool that resulted from extensive planning and represent a positive contribution to the overall emergency program.

As discussed above, one of the more important impacts of planning thresholds is their linkage to resource requirements. Each region has established detailed tables that define minimum levels for every emergency position as a function of event classification.

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Exhibit IV-3
Minimum Staffing Requirements

A. Minimum Staffing Requirements

Position	1	2A	2B	2C	3A	3B (2-3 days)	3B (4-7 days)	3B (7 days)
CC Mgmt	6	9	9	9	11	11	11	11
Dispatchers/Clerical	3	4	4	4	8	8	8	8
OH Supv	1	2	2	2	2	2	2	2
OH TrblShooters	12	16	16	16	16	16	16	16
UG Supv	0	2	2	2	2	2	2	2
UG TrblShooters	2	4	4	4	4	4	4	4
Muni Planner*	0	0	0	0	0	0	0	0
Muni Crews*	0	0	0	0	0	0	0	0
Oper Auth STAR Analysts	0	2	2	2	3	4	4	4
STAR Analysts	0	2	2	2	4	6	6	6
EH&S Officer	0	1	1	1	1	1	1	1
Desk	1	1	1	1	1	1	1	1
Field Support	on call	on call	on call	on call	4	5	5	5
Cleanup crews	on call	2	2	2	4	4	4	4
CSRs (or IVR equivalent)	180	180	180	180	220	300	300	300

The accompanying chart is an excerpt from the Bronx/Westchester matrix. The full table is contained in the CERP and is far more extensive. These tables exist for all regions and all classifications and, as is the case in the example shown, some are greatly expanded across emergency classifications to present finer-tuned estimates.

There should be no mistake that the resource linkages are an extremely valuable tool that have involved a great deal of planning. The effectiveness of Con Edison's resource mobilization in response to the 2006 events has come into question, and that, of course, brings the focus to these resource plans. This does not change the fact that the existence of these plans is a big plus, and the challenge is to be sure they live up to their potential.

The questions then become the degree to which the tables are soundly based and the effectiveness with which they are applied, and there appears to be legitimate concerns on both scores.

Minimum Levels

IV- F14 While, as stated earlier, the minimum resource tables are a positive contributor to emergency preparedness, they currently lack an analytical basis and justification.

IV- F15 Con Edison's responses to Staff's well founded recommendations on staffing tables do not appear to be adequate.

In its reviews of the 2006 events, the Staff were particularly concerned about how initial mobilization levels were established and the adequacy of those levels. They observed "an overly optimistic application" of the resource matrices.[28] More importantly, Staff noted wide discrepancies between the defined minimum levels and the numbers actually required for the evaluated events. As a result, they recommended that "Con Edison should do a complete re-evaluation of its staffing and storm emergency classification matrices for the Bronx–Westchester portion of its storm plan."

Staff concerns are well founded in this area. Vantage's intent is, therefore, to build on those findings in the discussion.

Vantage can begin with Con Edison's response to the recommendation which, on the surface, does not appear to deal with the issue. Although the Company has revised the minimum staffing levels, those revisions are both minimal and unexplained. As the consultants have noted repeatedly in this Section, Con Edison's assumptions, criteria and estimates typically lack a demonstrated analytical basis. The accompanying lack of documentation or explanation makes any kind of testing or debate of those parameters difficult or impossible.

IV- F16 The designation of the storm tables as "minimum staffing levels" and the reality that staffing requirements may be, (and have been,) much higher, limits their effectiveness in helping managers and their role in "getting a jump" on restoration activities.

The designation of the stated staffing levels as "minimum" raises several concerns. First, if the estimated levels are so far below what might eventually be required, then their benefit is

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[28]/ DR 190; Page 22 - "July and September 2006 Storms – A Report on Con Edison's Performance".

questionable – as if one simply started at zero. Second, low estimates immediately put the manager "on the spot." Can he justify higher levels? If he is wrong, what is the economic and personal downside? The least risk position is to go with the (understated) staffing levels in the table.

Therefore, the very use of "minimum" staffing tables can be problematic and will be a real issue if the values are too low/or the assigning manager is not very well versed in their derivation and adequacy.

IV-R9 Elevate the priority of resource planning within the emergency planning framework. (Refer to Finding IV-24, 25 & 26).

More sophisticated manpower estimates, better documentation, capabilities to estimate upward exposure, consistent approaches across regions, and techniques for getting ahead of the curve when the need to scale up seems possible should all be features of a new, more aggressive program.

A New Model

IV- F17 Con Edison has commissioned a new storm model which should theoretically enhance damage predictions and resource requirements.

Con Edison recently commissioned a new model for use in predicting storm impacts and to assist in resource planning. The model is scheduled for completion on August 1, 2007, and is, therefore, unavailable for review in this Report. Based on the specification for the model, it should be beneficial in making the storm classification matrices more accurate and helpful.

This discussion has focused on the adequacy of the processes to link resource needs to event classifications. Resource availability and application are also discussed in Chapter V-B, Staffing.

Resource estimation has also received a great deal of attention in Staff reports, as discussed above, and actions are underway at Con Edison to respond.

MULTIPLE REGION OUTAGES

Most of our analysis focuses on Con Edison's responses to specific regional events, and these could be compromised when, and if, such events cover multiple regions. In such cases, resources and other emergency assets become more scarce and the response challenge can quickly escalate.

Fortunately, Con Edison's planning activities go well beyond a regional response. In fact, those activities go well beyond traditional electric storm and heat events. Con Edison's efforts here are essential, and consistent with the new realities of the emergency planning business.

IV- F18 Con Edison has an aggressive and effective emergency planning program that examines many high-consequence contingencies including those with a very low probability of occurrence.

One of the key responsibilities of the Corporate Emergency Management organization is contingency planning, in which major catastrophes, including those going well beyond electrical outages, are considered. For example, business continuity issues, key office destruction and epidemics are included in the scenarios examined.

IV- F19 Con Edison's new "Coastal Storm Plan" is the product of an extensive planning effort and, although designed around a Katrina-type weather event, has provided a valuable planning basis for a wide variety of potential catastrophes in which the scenario may be different but many of the response challenges and characteristics will be similar.

Typical of this mode of thinking is the planning effort behind Con Edison's new Coastal Storm Plan. This presumes a catastrophic event on a scale that would probably not have been theorized before Katrina. Will such a scenario develop in the next decade, or ever? It is highly unlikely, yet the economic and human consequences demand preparation, and Con Edison has heeded this call.

There are other more immediate benefits to this sort of contingency planning. For example, while the coastal storm catastrophe may never happen, many of the sub-plots in that story are more probable including the effects of mass evacuations, employee availability in a devastated community, widespread disasters, and changes in emergency response actions to accommodate higher authorities. Con Edison's inability to cope with such issues in a catastrophe would surely hamper the community's ability to recover, with potentially devastating consequences. The Company's aggressive stand in this regard is therefore a big plus and a major contribution to the communities it serves.

IV- F20 Con Edison executive management has demonstrated support and commitment for the planning and rehearsal of catastrophic emergencies and has been personally involved in stressing and testing the organization.

Vantage observed a significant amount of interest on the part of executive management relating to contingency planning. This is clearly an area in which a level of priority is communicated and practiced. Specific examples include the level of participation and questioning associated with major drill scenarios as well as continuing challenging of Corporate Emergency Management in the planning effort.

Multi-Region Events

IV-F21 Con Edison's plans to coordinate emergency response for a multi-region scenario are multi-faceted, well defined, and reasonably tested.

IV- F22 The scalable nature of the ICS structure, the ability of the regional commands to function effectively under a central Incident Commander, and the frequent use of multi-region conference calls considerably strengthen Con Edison's capability for dealing with multiple events.

Con Edison has many vehicles in place to ensure company-wide coordination in an emergency. The DECP is mobilized promptly when an event has the potential to impact more than one region. Company-wide communications are established quickly via inter-regional calls even if only one region will be impacted.

The ICS structure is also an invaluable aid in responding to large-scale events because of its scalability and its ability to focus management and restoration resources on a local level. The capability for each region to manage effectively within its own command structure significantly strengthens the Organizations' ability to cope with multi-region incidents.

IV- F23 The resulting scarcity of Con Edison crews and mutual aid personnel in a multi-region event may not be adequately reflected in Con Edison's resource plans and assumptions.

The bigger challenge in such a scenario is securing scarce resources, and the consultants have seen earlier that this is a potentially troublesome area. The regional tables, which have been called into question above, offer minimum staffing levels, but they do not, of course, guarantee availability. Further, in a widespread emergency, resources will be limited due to the need for other Con Edison crews to stay in their home area and mutual aid crews being less available.

While this subject will be discussed in greater detail later, it is not clear that Con Edison's resource plans and the underlying assumptions have adequately built in this reality.

The issue of crew availability in a multi-region event should be factored into the more aggressive resource planning initiative.

Bulk Power Events

Interruptions on the bulk power system can be another form of multi-region event and, in the extreme, can result in a total blackout. Vantage did not examine bulk power scenarios to any great extent in this study because the Company's emergency response is essentially the same as for the much more common events on the distribution system. The key difference is that correction of the initiating problems is the responsibility of the System Operator as opposed to the regional control centers. In the meantime, the regions retain their outage management responsibilities and mobilize their organizations to restore service at the local level once bulk supply is reestablished.

The local situations are managed by the established ICS structure, and corporate coordination is maintained by the organizations previously discussed such as the Distribution Engineering Command Post (DECP). For a widespread event, such as a multi-region blackout, the Corporate Emergency Response Center would be mobilized.

It is, therefore, clear that outages caused by the bulk power system are, for emergency planning purposes, logical extensions of regional and multi-regional distribution incidents with the same processes and procedures as used for the typical distribution emergencies. The conclusion regarding the adequacy of Con Edison's plans and capabilities to handle multi-regional events is, therefore, also applicable here.

C. ANALYSIS AND PROGRAM IMPROVEMENT

Many who study organizational performance believe a Company can best be judged not by the problems it suffers, but by its response to those problems. Vantage will leave that debate for others, but there is no question we can learn a lot about a Company from its effectiveness, speed and commitment in responding to changing circumstances. Con Edison's approach to dealing with the issues of 2006 therefore provides us with an interesting laboratory.

We previously made the observation that management apparently did not believe, initially at least, that the 2006 problems were indicative of deeper issues. In retrospect, that overly optimistic outlook set the stage for what followed. The Company was not aggressive in identifying root causes or in proposing substantive changes and, as we have seen, continued to wrap its responses in the "we're #1" mantra. It was not surprising, therefore, that the Company's actions fell short of public and regulatory expectations and the void was quickly filled with hundreds of "recommendations" from others.

While the Company's initial responses inevitably limited the effectiveness of the improvement effort, there were many improvements that did indeed take place over the next year and this was by no means a small effort. In this section, we will discuss the Company's efforts and what they say about the Company's commitment to do better.

Specific improvements, and their impact on emergency preparedness have been addressed throughout the Report. In this Section, we will discuss Con Edison's improvement practices, more so than the specific improvements. We will focus on changes to the emergency program in the last year.

Emergency Plan Changes

With the hundreds of recommendations from 2006, there is no question that the Company has implemented many changes. Vantage concluded earlier that the overall effectiveness of that improvement effort was less than optimal. In this Section, we will consider the nature of the specific improvements as well as the character of the improvement process in terms of pace and commitment. We will begin with a discussion of changes to the CERP, since that document represents the "bottom line" in terms of Con Edison's commitments. We will then review changes that impacted the Company's preparedness but are not necessarily contained in CERP, and finally, we will draw conclusions on what this experience tells us about the trajectory of change at Con Edison and whether it is keeping with expectations.

CERP Changes

In our discussion of the CERP, we noted that the program was updated on, or about, April 1, 2007, as required by law, but was also updated again about two months later. Lists of the specific changes made in those two updates were provided by Con Edison.[29] The usual update (April 1, 2007) contained changes made by Con Edison in the normal course of business. The second update (June 1, 2007) contained only changes flowing from DPS Staff recommendations.

From an emergency management perspective, the CERP is "where the rubber meets the road"; i.e., most process and procedural improvements to Con Edison's program of emergency preparedness and response should find their way into the CERP. The changes to the CERP in the first half of 2007 can, therefore, be viewed as a good barometer on the effectiveness of improvements made in the wake of the 2006 problems.

The first set of changes, which were initiated by Con Edison, amounted to 20 items. A brief analysis of those changes results in the following categorizations:

Editorial Changes	3
Corrections and Clarifications	9
Significant Improvements	6
Minor Improvements	2

We counted the following changes as "significant improvements."

- Addition of the Customer Count Teams.
- Separation of site safety and damage assessment.
- Transfer of mutual aid accountability to EO EM.
- Earlier requirement for global ETR.
- Addition of inter-regional conference calls.
- New Coastal Storm Plan.

While each of these represents a solid step forward, it is nonetheless clear that this is a rather short list, given the degree of upheaval in 2006. Improvements in other areas, including preparedness actions that did not find their way into CERP, were surely made (and will be discussed in the next Section), so there is no pretence that our list is complete. However, this list does have value as an indicator, and it suggests that Con Edison's response was not particularly aggressive. From the viewpoint of the defining document, there certainly was no overhaul of the program in the wake of the 2006 problems.

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[29]/ DR 288 CERP Plan Changes.

IV-F24 Changes to the CERP that were driven by Con Edison were generally few in number and are not suggestive of an aggressive improvement effort in the wake of the 2006 problems.

The changes in the June 1 revision were Staff-directed, so they say little about the Company's propensity for improvement. These changes were more detailed in nature and primarily addressed improvements in communications, such as the web site, VRU, press releases, critical care contacts and distribution of ETR information. The 20 items can be roughly categorized as follows.

Communications	16
Resource Management	4

These changes may be deemed positive, but they are generally at a detailed level and represent specifics of execution rather than programmatic improvements. Con Edison accepted Staff direction and included these changes in CERP, but this did not lead to the kind of broad program review and revision that might have been expected from the Company.

Other Changes

IV-F25 Changes to the CERP that were driven by Staff produced operational improvements at a detailed execution level but did not lead management to initiate substantive programmatic improvements

Con Edison prepared a briefing document for this review and summarized its improvements in that document.[30] The document states that "the events of 2006 caused Con Edison to re-evaluate its processes for planning and responding to outage emergencies". The Company indicates it called upon several sources, including insights from Staff, to develop a "significant number of process improvements". A summary table of these improvements was included in the briefing document and is included in the following Exhibit.[31]

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[30]/ DR 178. *Briefing Document for NY PSC Audit,* Page I-2

[31]/ DR 178. *Briefing Document for NY PSC Audit*, Page I-2

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Exhibit IV-4
Summary of Improvements – June 2007

Broad Area of Outage Response	Specific Topic	Improvement Action
Planning	Update plans for lessons learned	Besides the annual update of the CERP, special updates were done during 2006 to reflect lessons learned in the January and July events.
Communications	Customers' ability to contact Con Edison about outages	After difficulties in January, the system was upgraded by expanding line capacity and by modifying the VRU. During 2006, a significant number of process enhancements were made by the Customer Management Group.
	Press releases and public communication	Press releases were significantly increased and press conferences added as required in order to fully update the media so that they could relay information to the public.
	Communication with local community officials, especially in Westchester County	Over the course of the year, Con Edison, using lessons learned from each event, made improvements in keeping municipal leaders informed about system damage and restoration progress. During the July and September events, Con Edison dispatched extra liaisons directly to municipal organization locations and arranged conference calls for their information.
	Estimated Times of Restoration (ETR's)	Numerous improvements are being made to Con Edison's ETR practices, including: automating the process of calculating historical restoration averages which are used to calculate global ETR; making estimates of ETR's for public safety jobs once a crew is on site and has reviewed the situation; providing job-specific estimates 24 hrs after the end of the storm and updating the same daily until all customers were restored; and improving the customer service system to provide regular reports showing ETR's provided during outages to ensure consistency of information.
Restoration	Tree Trimming/Line Clearance	The vegetation management supervision was enhanced and revised to increase clearances in Westchester, with special emphasis on removal of branches overhanging lines. A study will be commissioned to assess the over-all health and condition of the urban forests of Westchester County.
Systems	Performance of Outage Management System	Significant system and technical process enhancements were implemented in 2006 to address problems experienced in January.
Staffing	Management/oversight of mutual assistance resources	Con Edison has created a Mutual Aid organization and established formal procedures for processing, handling, and dispatching of mutual assistances crews.
Mobilization	Obtaining accurate predictions of weather and system impact	Con Edison has contracted for additional weather services and continues to evaluate methods of predicting system impact.
Damage Assessment	Obtaining accurate estimates of event impact on the system	Con Edison has made enhancements to its damage assessment process and to its ability to estimate customers affected by secondary network outages.
Training	Training for emergency response	Process and systems training for liaisons has been conducted and Con Edison will continue to develop and conduct training and drills for all emergency response groups and to educate the municipal officials and the general public about the Company's processes regarding storm response and the hazards associated with downed electric wires.

The reader will note that all of these improvements have been discussed in the appropriate sections of this Report, so we will not repeat those prior observations. Rather, a summary of major progress will be presented with an eye towards establishing the overall level of improvement since 2006.

In considering the Company-provided list of improvements, we can call out the following as being particularly positive.

- The customer service initiatives (process improvements) represented many real steps forward. On the other hand, the addition of telephone lines was an obvious requirement after customer difficulties in early 2006.
- While the ultimate effectiveness of tree trimming improvements might be debated, the Company did indeed make a quantum change in its clearance activities.
- There were many improvements to the Outage Management System and supporting software in 2006 and 2007, starting with a correction of the January capacity issues and flowing through to eventual improvements and expansion of STAR.
- Aggressive steps were taken to enhance the mutual aid program, including earlier actions, re-focused accountabilities and expansion of the underground mutual aid program.
- Significant enhancements in damage assessment were made, including separation from site safety, CCTs and improved training and procedures.
- The Company continued its strong training efforts and expanded them to more employees as well as key stakeholders such as municipal personnel.

The efforts of the Company, as defined in its own summary, produced benefits and represented real steps forward, however, we would not characterize these steps as extensive or far-reaching. Accordingly, the Con Edison summary ratifies the conclusions reached earlier in this Section that the improvement actions were generally few in number and not suggestive of an aggressive improvement effort .

How Much is Enough?

In discussing the many contradictions surrounding Con Edison, we suggested that the Company is doing more than anyone else – but not enough. It is here that we can now clarify that conclusion within the context of the emergency preparedness effort.

The results of the 2006 emergencies, and especially LIC, have taken a toll on the Company in terms of its reputation. The problems exposed by those events argued for an aggressive response. More importantly perhaps, that aggressive response was also critically necessary for the Company's credibility. Steps "above and beyond" were in order to earn back the trust of customers and stakeholders.

Such aggressive moves were also appropriate in light of the sea change in public expectations, where customers and other stakeholders now perceive the emergency management challenge as a vital imperative. The Company needed to make clear that it was on board with this message as well as fully capable of meeting the challenge.

Our key questions at this point are then:

- Can the Company's actions in the wake of the 2006 events be considered "aggressive"?
- Did the Company go "above and beyond" in an effort to restore public trust?
- Were the Company's subsequent actions consistent with the magnitude and priority of the challenges as defined by the sea change?

While we respect the actions taken by the Company so far, we nevertheless must answer "no" to each of these three questions. The track record, as defined in the Company's summary of its actions and in its testimony, strongly suggests that not enough has been done.

Recommendations

No recommendations are necessary here as the concerns expressed will be satisfied by the other recommendations in this Report, particularly those relating to priorities and management commitment.

V. EMERGENCY RESPONSE PERFORMANCE

A. EMERGENCY RESPONSE PREPARATION

In the category of preparation, Con Edison carries out many beneficial tasks. These include human preparedness through drills, assurance of adequate skills, and training. In addition, Con Edison takes many physical actions in anticipation of a threatened event with the goal of mitigating impacts and getting a jump start on restoration. Finally, the Company has a program of load reduction that, like other anticipatory measures, is aimed at mitigating damage and preventing outages. Collectively, these activities are designed to ensure an at-the-ready capability to deal with events.

Recognizing that the success of any emergency plan lies in the level of preemptive or anticipatory actions taken by the Organization in advance of an emergency event, Con Edison has identified a comprehensive set of activities which are intended to serve as anticipatory measures.[32] Examples of these measures are outlined in the following by general and seasonal criteria.

General

- An Inter-regional Conference Call is initiated by Electric Operations Emergency Management when there is a reasonable probability of a storm or emergency. The goal of the conference call is to discuss each region's weather information, the expected impact on the system, availability of resources, and the allocation of these resources.
- "Storm Kits" are pre assembled and stored at primary work centers i.e. East View in Westchester, for distribution to foreign crews. Included are basic startup items such as local maps, primary and secondary connectors, wire insulation stripping tools, wire wraps, basically tools and hardware unique to Con Edison's system. Appropriate work kits are also on hand for Field Damage Assessors, Site Safety Representatives, Ladder Line workers and Customer Assessment Team members.
- A Pre-storm Checklist for Overhead System Preparation which includes the verification of the availability of crews, the preparation of vehicles, loading of poles, verification of the operation of all portable pumps and generators, alerting tree trimming contractors, notifying the Customer Management Group to contact customer eligible for life-sustaining equipment, verifying that all remote monitoring and SCADA systems are available and verifying the availability of dry ice.

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[32]/ DR 287.

Summer

- The Heat Event Decision Matrix, as outlined in the CERP, is implemented. The matrix provides direction to Con Edison Shift Managers, Central Field Services, and Construction Management in the event of a high heat event coupled with a loss of one (1) or more feeders.
- A dry ice distribution program is in place to mitigate the impact of extended outages to reduce the impact on food spoilage. The program includes the establishment of contracts with dry ice suppliers and the logistics involved with the staging of distribution points and the use of gas employees to distribute dry ice to the customers.

Winter

- Based on the contracted weather service forecast for extreme winter weather including snow, heavy snow, ice, or a blizzard, an Extreme Weather Alert is issued by the Shift Manager. The Winter Storm Classification Matrix provides a preemptive plan to mitigate the impact of a major ice and snow melt due to the municipalities' use of salt.

DRILLS

V-F1 Con Edison has made a major commitment to emergency drills in terms of numbers, scope, applications, quality, and resources.

Con Edison's program of emergency drills, which occur at many levels, is significant. It is ironic, however, that the Company exerts so much effort but does not "finish it off" with the final and most important 10% (lessons learned and resulting process improvements). This at times creates the impression of "drills for the sake of drills."

Otherwise, Vantage can only offer high marks for the drill program. From relatively small incidents with one or two local respondents to massive simulations of catastrophes at the corporate level, Con Edison utilizes drills as an essential element of training and practice as well as a method for testing processes. The number of drills planned for 2007, as of January 2007, was 42. On balance, these drills are highly effective.

V-F2 Con Edison has correctly adopted drills as preparedness enhancers, refreshers, and learning experiences rather than as "tests".

Con Edison's attitude towards drills also enhances their effectiveness. The Company is careful to avoid treating drills as tests of the participating personnel. Rather, employees are given the opportunity to practice and to shake out procedures, communications, information systems, and other necessary features of emergency response. The drills would not be as effective if they were viewed as tests.

V-F3 In meeting the challenge of keeping the Organization's emergency skills and capabilities proficient, particularly during "quiet" times, drills must be an increasingly critical element of Con Edison's program.

Con Edison's commitments in this regard are especially appropriate at this time for at least two reasons. First, the sea change discussed earlier demands such attention and heightened preparedness. Second, drills are one of the more important means for staying proficient during the quiet times when the Organization is particularly vulnerable to complacency.

V-F4 Documentation of drills has been weak.

Notwithstanding the reality that Con Edison surpasses most or all other utilities in their level of effort regarding exercises, there is room for improvement. In its LIC report, Staff offered several suggestions for such improvements, and these remain valid today.[33] Their principal concerns related to documentation and follow-up of drills, particularly, with respect to building on lessons learned. From what Vantage has observed over the last few months, there has been little improvement in those areas.

The documentation issue spans the whole program although the "high visibility" exercises surely produce better documentation. The lack of oversight is clear in this regard as there are wide variations among the regions in the level of planning and documentation of drills.

Staff particularly focused on the CERC (Corporate Emergency Response Center) drills in their analysis. These drills are at the highest level and simulate a full corporate response. Planning is extensive and well documented, and a final report covering all aspects of the drill is prepared. Staff observed that, despite this effort and the discovery of many lessons learned, the underlying issues were repeated. Vantage observed similar questions this year. In examining the CERC reports of prior years, one finds many action items for improvement but no closure; i.e., no documentation that the actions were ever addressed.

As might be expected, if this problem exists at the top, it would be expected to worsen as one moves down through the Organization. This is indeed the case. The drill reports from the regions are of varying quality, but few really qualify as good documentation.[34] The action items again lack any follow up or closure. Further, there is no checking for follow up, documented or not.

This represents a lost opportunity of major proportion. It is a tragedy that the excellent effort and sophistication of the drill planning process and the hard work and commitment required for execution are in some ways wasted by the failure to close the loop at the end of the process.

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[33]/ Staff's Report on LIC, Paragraph 5.7.2 and associated recommendation in Paragraph 5.2.3.

[34]/ DR 255 includes a good sampling of such reports which demonstrate the wide variation in content and quality.

V-R1 Document the lessons learned process (after action reviews) from drills to achieve the payback from drills that should be realized. (Refer to Finding V-F4.)

V-F5 Con Edison has no written guidelines, suggestions, hints, criteria, or directions to assist the responsible organizations in the design, planning, or execution of emergency drills.

V-F6 Con Edison lacks a company-wide oversight function for drills that is required in order to ensure inclusion of current issues in drill design, adequate documentation, and effective follow-up of lessons learned.

A lack of oversight is a root cause for the lack of follow-up by the responsible organizations. Further, the help given to those organizations could be improved. Although "consulting" support is provided for the operating organizations, there are no written guidelines or aids that assist them.[35] Also, more importantly, there is no specification of drill requirements; i.e., issues that must be addressed in drills.

V-R2 Revamp the drill program in line with the proposed new strategy and organization. (Refer to Finding V-F5 & F6.)

Specific program fixes should include a more meaningful and better managed lessons learned program, improved documentation of drills, guidelines for the design and management of drills, and an oversight function to ensure obligations are met and that drills are designed and executed for the maximum benefit.

V-F7 The annual drill plan is not well communicated with many emergency managers being unaware of the schedule more than three months after its issuance.

Although the corporate coordination of the overall drill program is limited, there is an annual schedule compiled by Corporate Emergency Management.[36] The application and usefulness of this schedule is somewhat in question, however, since none of the managers that Vantage spoke with outside of Corporate Emergency Management were aware of its existence.

V-R3 Prepare and communicate an integrated annual drill schedule and plan, including information on each planned drill, before the start of the year. (Refer to Finding V-F7.)

For small local initiatives, perhaps only the requirement for the drill need be stated. For larger drill events, milestones for preparation, execution and follow-up are suggested.

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[35]/ DR 284.

[36]/ DR 254.

V-F8 There is little or no participation of external stakeholders in major drills other than CERC, and this is at odds with Part 105 requirements.

With respect to drill planning and design requirements, it was noted that many of Con Edison's difficulties in 2006 resulted from dealings with stakeholders outside the Company including officials, customers, municipals, and other agencies. It, therefore, makes sense to consider such relationships in the drill process, preferably with the participation of such stakeholders, either real or simulated. Further, Part 105 requires that "the drill must involve contacts with outside agencies, local governments, and others who would normally be included in service restoration responses."

Con Edison's compliance with this requirement is borderline.[37] The CERC drill in 2007 did include several outside agencies who participated directly. These were generally emergency management professionals and not necessarily the types of stakeholder around whom Con Edison experienced problems in 2006. Their participation was highly beneficial.

In addition, the many smaller drills involving coordination with agencies such as NYPD and NYFD are beneficial. The other major drills, however, including the annual storm/heat drills in the regions do not generally have external participation, and this may be a lost opportunity for dealing with many of the very problems experienced in 2006.

V-R4 Include external parties (municipals, customers, press, elected officials) in major drills. To the extent direct participation might be unwieldy or ineffective, simulated participation might be appropriate. (Refer to Finding V-F8.)

SKILL NEEDS

V-F9 Skill requirements for staffing the ICS organization are clearly defined in CERP.

Assignees to these positions are thoroughly screened for related work experience and training. Con Edison is doing a good job of matching up the skills and work experience of its management employees to the Incident Command Systems' (ICS) roles detailed in the Comprehensive Emergency Response Program (CERP).[38] The ICS Emergency Response Organization Chart[39] for a major event could include up to 61 different positions. Fortunately, most events do not require all functions to be staffed. A nice feature of the CERP is its organizational flexibility that allows for quick ramping up or down of its staffing.

37/ Part 105 (§105.3 (b)) requires one annual drill. DPS Staff, NYOEM and WCOEM are all invited to the annual storm and heat drills in the regions. Given space limitations, Con Edison believes that it would be impossible to invite all 42 municipalities in Westchester, Media, and elected officials to drills. These functions are often simulated in the drill scenarios.

38/ DR 287 Con Edison Comprehensive Emergency Response Program (CERP).

39/ DR 287 CERP Emergency Response Organization Chart-typical.

Sixty one positions to fill in a temporary organization, with little notice, might appear to be a daunting task. However, the process is made easier because CERP planners have been clear about the roles and responsibilities of each position. Regional General Managers make the initial assignments as they are in the best positions to assess their own staffs' experience and capabilities. In most cases, assignments will match up closely with a person's normal day-to-day work. Electric Operations Emergency Management also has input. They want to be assured that the assignees' meet the needs of the Plan and that their ICS training is current. The end product is staffing rosters with primary and backup designees for each position. The rosters are reviewed semi-annually and are accessible via the intranet.

CERP further defines skill requirements of the Incident Command Organization in two other ways. First, they have included in their Plan position overviews that discuss concepts of operations, organization, and workflow for the sixteen functional areas of the Plan. Second, Position Checklists[40] have been developed for each position that provide excellent summaries of responsibilities discussing such things as pre-emergency planning, on shift duties, change of shift responsibilities, de-mobilization, and communication obligations.

Vantage interviewed a wide cross section of Con Edison's management team, many at the Section Manager and Department Manager level, and noted there was seemingly an on-going turnover in many of these positions. Some departments routinely see new managers every three years or so. Managers themselves suggested that this constant rotation was an expectation of Senior Management. Clearly those managers with tenure in their positions or career fields demonstrated the most institutional knowledge and competency while those changing departments and titles frequently demonstrated less. It is this dichotomy of skill level and experience that could present problems in the future. A new job title does not necessarily qualify a person to immediately assume new ICS responsibilities.

Con Edison must remain diligent in its oversight of replacement designee's to Incident Command Structure supervisory positions. A waiting period or assessment of readiness before assuming all the responsibilities of these senior positions may be appropriate.

V-F10 Resource levels of skilled field support personnel such as Site Safety Representatives, Field Damage Assessors, and Crew Guides are reasonable.[41]

There are other positions, not depicted in the Emergency Response Organization Chart, whose skills are also important to the successful implementation of the Restoration Plan. Specifically: Site Safety Representatives; Field Damage Assessors; and Crew Guides. The three jobs discussed here are typically filled by Union employees. Since workers are assigned tasks outside their normal job duties, certain protocols have to be followed, not the least of which is good communications with Union Leadership. Vantage discovered no indications of any Union – Management discord regarding any of the temporary storm assignments.

40/ DR 327 Sampling of Position Checklists.

41/ Details on resources provided during 2006 major outages are provided in Appendix 2.

Site Safety Representatives are normally provided by the Meter Reading Organization. The issue here is not skills training but safety training which the department has addressed.

Field Damage Assessors are drawn from a variety of departments with priority given to those with the most field experience. Requests go to Construction Management, Maintenance Services, Energy Services, Revenue Protection, Meter & Test, and Distribution Engineering. This mix of departments may not be ideal but seems to be the Company's best option. The Company compensates, to some degree, with a significant training effort which has been effective. Once trained, these employees can prepare reasonably detailed site specific damage reports.

Crew Guides were a problem in some earlier storms as the draftees, Meter Readers, often knew little more about the area they were assigned to than the crews they were guiding. The Company quickly addressed this by selecting employees with local knowledge, county residents at a minimum, to serve as guides. They also reached out to other departments to assist which has expanded their pool of Crew Guides.

V-F11 Con Edison's performance appraisal techniques for its ICS organization and the field support roles are satisfactory.

Performance appraisals of field workers such as Site Safety, Damage Assessors, and Crew Guides are a shared responsibility of the providing department and their storm supervisors. The home department is responsible for selecting employees that are capable and willing to work in temporary storm assignments and ensuring that their training is current. Once assigned to storm duty, their supervisor is responsible for providing refresher training, job briefings, and safety talks before releasing the employees to the field. Supervisors also check on employees in the field to ensure that they are working safely, performing their assigned tasks, and maintaining the proper communications. Lapsed training or unsatisfactory performance in an actual storm would result in the employee's removal from the department's storm roster.

Incident Command Structure staff's performance is appraised in a couple of ways. Usually the first opportunity is in drill scenarios. Their participation may be critiqued by Emergency Management staff, if present, as part of the post event lessons learned discussion. The second appraisal opportunity, and the most important, is the lessons learned session that follows shortly after a real storm event mobilization. Real events test all the processes along with the actions of individuals and functions. Key storm participants report out on what worked well and what needs improvement. The Incident Commanders and the Director of Electric Operations Emergency Management are often in the best positions to see how the various functions interacted, performed, and communicated during the event and are obligated to be candid about those observations. Con Edison is using the lessons learned process in the correct way as a learning opportunity and not to assign blame. Care must be exercised to maintain that posture so that participants will be forthcoming with their own observations even when they must acknowledge they need to make improvements in their own areas.

V-F12 Job packages and trouble assessments originating in the Engineering and Planning Area (EAP) sometimes lack sufficient detail to be dispatched efficiently by the field organization.

Vantage generally received positive feedback from Con Edison employees about the effectiveness of the Incident Command Structure and the functions that they managed. There was one exception, however, that needs to be discussed. For whatever reason(s) the perception is that the Damage Assessment process is not functioning at its optimal level. This may be a process anomaly, but there are indicators that there may be a skill component to the problem. Some of the comments received from Field Operations dealt with the lack of useful or complete information in job packages forwarded to them from the Engineering and Planning Area. When jobs show up stating the obvious, "area outage," they basically have to perform their own damage assessment or trouble analysis. There was also commentary about a slowdown in the flow of jobs in the middle of storms. Interesting, and related, is that the Lessons Learned notes[42] from the September 2006 storm had nine comments related to Damage Assessment. It is these multiple references that suggest a problem, may in fact, still exist.

V-R5 Research the cause of incomplete job packages and trouble assessments originating in the Engineering and Planning Area which are then forwarded to the Operations Section for assignment. (Refer to Finding V-F12.)

Vantage does not want Con Edison to just focus on the Damage Assessment process as this may not be the root cause. The direct interface between Field Operations and the Engineering and Planning Area is the Trouble Analysis Situation Unit (TAU). This unit not only receives information from the Field Assessors but from ECS/STAR, Municipal Liaison Group, Distribution System Telemetry (SCADA), and other Field Operations groups. It is their responsibility to analyze the information and issue jobs to the field organization or the Control Center. From the way the problems were being described to Vantage it seemed more likely that the problem, if one exists, resides in TAU and not directly with the Damage Assessors.

Distribution Engineering Supervisors, Technicians, and Designers staff the TAU and there is a documented shortage of skilled/qualified Designers in these organizations. In Bronx/Westchester for example, just 15 Technicians/Designers would be rated as experienced while another 29 positions are listed as Junior Designers and relatively new to the department. This skill gap is just one possibility of why the quality of jobs and analysis being provided to Field Operations may be less than is expected.

Of course the problem could reside on the receiving end in Field Operations, but Vantage does not believe that to be the case. Planners are receiving the information and they are probably one of Con Edison's most valuable field assets. These second line supervisors bring an abundance of experience and local systems knowledge and hold the key to getting job packages assigned to restoration crews efficiently.

[42]/ DR 255.

TRAINING

V-F13 Job training of management employees for their roles in the Incident Command Structure (ICS) as defined in the Comprehensive Emergency Response Program (CERP) is reasonable.

The Learning Center (TLC) is responsible for the ICS Training Program. Program elements consist of four core courses, position specific courses, and team training.[43]

The general ICS courses, or core courses, have been accepted as comparable to the FEMA ICS-100 and FEMA ICS-200 courses.[44] That determination means that Con Edison's Incident Command Structure complies with Homeland Security's National Incident Management System (NIMS).

1. **SAF 3050 Orientation to Incident Command**

   This course is designed as an overview for supporting personnel who do not hold ICS positions. It provides a description of the ICS process, common ICS terminology, and references to related Company policies.

2. **SAF 3060 Basic Incident Command System**

   This course is designed for first line management employees who have roles in a basic ICS response. Attendees learn about their roles and responsibilities and how they interface with others on the response team. The one day program is held at The Learning Center and includes a classroom exercise where participants are observed and evaluated.

3. **SAF 3070 Advanced Incident Command System**

   This course is designed for those employees pre-designated to fill specific ICS supervisory positions. The two day classroom based program addresses complex incidents, preparation of Incident Action Plans, resource management, and the critical consequences of decisions. Observed and critiqued classroom exercises are an important part of this training.

4. **SAF 3071 Basic ICS Refresher**

   Graduates from the SAF-3060 and SAF-3070 programs return to The Learning Center periodically to participate in an event simulation exercise. The training's effectiveness is enhanced by participation of outside agencies such as FDNY and the NYC-OEM.

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[43]/ DR 124 Incident Command System Training Plan.

[44]/ DR 136 ICS Compliance with NIMS.

Position Specific Courses have been designed for those holding the higher level positions such as Incident Commander, Planning Chief, and Logistics Chief. As an example, SAF 3001, Incident Commander, delves further into the interactions of Con Edison's Emergency response plans and those of Federal, State, and City government. There is also an increased emphasis on leadership responsibilities and the critical consequences of decisions. Participants must pass a written test and demonstrate proficiency in a drill scenario to receive credit for completing position specific courses.

The Team Training component of the program is designed for small groups with varied ICS responsibilities. The objectives are to help people work better together, strengthen communications, and to work more efficiently as a unit. This training is held at The Learning Center and typically includes an event simulation exercise.

Drills present more opportunities for those with CERP/ICS responsibilities to improve their skills and maintain a level of proficiency. The most challenging of these is the Organizational Readiness Drill. This is a "table-top" exercise with a scripted scenario that typically escalates in complexity as the session progresses. The annual heat and storm drills represent examples. Objectives are sometimes customized to meet the needs of the region but, in theory, would include the following elements: establishing the Incident Command organization; participants performing their roles as they are described in the Comprehensive Emergency Response Program; setting up support groups i.e. Customer Count Teams or Municipal Liaisons; communicating with Public Relations; verifying the functionality of support systems i.e., ECS/STAR and WOLF; and responding appropriately as the event scenario unfolds.

These drills are sometimes observed by Emergency Management personnel, and the performance of each participating organization is evaluated. A post drill debriefing session follows where strengths and needs improvement areas are expected to be discussed.

V-F14 Training for the supporting roles in the Comprehensive Emergency Response Program has been significantly enhanced in the past few months. All either meet or exceed the basic requirements of the Plan.

Storm Process Overview Training[45] is provided to all employees that may be directly or indirectly involved in a storm restoration effort. It is a video-based program and provides general information about departmental roles, storm terminology, and communications.

Site Safety Training[46] has been developed for employees responsible for guarding potentially hazardous situations such as downed wires. This video-based training clearly demonstrates how a site safety person would approach a situation, protect themselves, and then secure the area to protect others.

45/ DR 309 Storm Process Overview Training module.

46/ DR 207 Excerpt from Emergency Management Newsletter.

The Overhead Storm Emergency Field Damage Assessment Manual[47] has been updated and recently re-issued. It is exceptionally well done, thus, enabling the Company to enlist an even greater number of employees to support the important field damage assessment process. It is a richly illustrated booklet that emphasizes employee and public safety as priority before moving on to explain the assessor's role and responsibilities. Photographs are used to great advantage to illustrate scenarios and to identify all the various pieces of equipment and attachments that may be found on a pole. Company employees with general knowledge of utility infrastructure would be able to perform site specific damage assessments after completing this training.

V-F15 Con Edison employee training records are well maintained and readily accessible.

Con Edison has Training Coordinator positions in each of its regions who work closely with a counterpart in The Learning Center. Coordinators play important roles as they not only schedule all training for their respective organizations, but they also perform equally important auditing tasks.

The amount of training provided Con Edison employees is impressive. Coordinators schedule and monitor five major categories of training,[48] each with many subcomponents and several with mandatory refresher intervals.

- Career Path - skill or job title specific training.
- Licensing – Commercial Driver's Licenses and driver's licenses for all employees.
- Testing – promotional exams, both written and demonstration.
- Environmental, Health & Safety – OSHA, Emergency Response, regulatory mandated.
- Miscellaneous – safety bulletins, near misses, procedural update, lessons learned, Corporate directives.

All employee training records are maintained in a common database. The Learning Center updates the database when employees successfully complete assigned training or pass promotional examinations. Each training module has an assigned number used for scheduling purposes and "alerts" when refresher training is due. The only updating by regional coordinators is for local employees trained by their organizations for temporary storm restoration assignments, i.e. Site Safety Representatives, Crew Guides, Field Damage Assessors, and Ladder Line Workers. Before any of these workers are released to work on a storm assignment, local coordinators will audit employee training records to ensure they are current. The Incident Command Structure designees' training records are all updated by The Learning Center staff.

47/ DR 295 May 2007 Overhead Storm Emergency Field Damage Assessment Manual.

48/ IR 235.

A May 31, 2007 Con Edison update on the status of recommendations[49] from the 2006 windstorms reported that 677 pre-designated ICS participants had completed their training assignments. Only four employees had yet to complete all their courses. This 99+% rate is most satisfactory. NIMS training had been completed by 626 employees with the remaining 18 employees scheduled for the training expected to be in compliance by the end of June. Storm Overview Training for new employees and bi-annual refresher course has been completed by 4420 employees. This training is ongoing.

V-F16 There is no formal ECS[50]/STAR[51] training.

Beyond The Learning Center numbered training modules for Incident Command System responsibilities, training is also necessary for systems that support ICS functions. The Lessons Learned list[52] from the September 2006 tropical storm Ernesto included thirteen references to ECS/STAR. Number 59 was the most specific - "*Formal classes in STAR and ECS are needed for new employees as well as refreshers for more experienced employees.*" Con Edison has made the commitment to install STAR in all regions to expedite the trouble analysis process. The software has lots of potential, but, like all applications new to an organization, it is not without its quirks. All members of the ICS staff and key support personnel would benefit from having improved competency with these systems. At the time of the Vantage interviews, ECS/STAR training was considered "off the books," meaning it was only available if you knew who to ask. "Off the books" also means that it has no tracking number, thus, it goes undocumented. The Learning Center was anticipating the need for this training and expected to have three of its instructors certified to provide ECS/STAR training, upon request commencing in June 2007.[53]

V-R6 Develop ECS/STAR training modules for ICS designees and those in supporting roles. (Refer to Finding V-F16.)

Vantage would encourage Con Edison to make this training (initial and refresher) a requirement for those management employees assigned to the Incident Command Structure Organization. Selected union employees in supporting roles would also be required to

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[49]/ DR 190 Summary of issues and recommendations from 2006 Westchester Storms, 5/31/07 update to DPS.

[50]/ Emergency Control System (ECS) is a mainframe-based computer system used to process, track and control trouble reports received from customers and other sources. (DR 287).

[51]/ STAR is a system that analyzes trouble and tracks jobs on the electric distribution system. It receives information from both customer calls and telemeter field equipment, and displays it on control center maps. By analyzing the information, STAR identifies the causes the of the 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. (DR 287).

[52]/ DR 255 "After Action Reviews" for 2006 events.

[53]/ IR 171.

maintain their proficiency with these systems. The training should be documented and periodically audited similar to other ICS training.

B. STAFFING

While Vantage has encouraged an holistic view of outage management, this does not change the reality that "getting the lights back on" is the focal point and the activity around which everything, and nearly everybody, revolves. The mobilization of hundreds of crews, with many perhaps drawn from hundreds of miles away, and the logistical support for those crews is a massive undertaking. That effort is usually complicated by the very factor (weather) that caused the emergency in the first place.

INTERNAL CAPABILITIES

V-F17 Con Edison has been aggressive in its pursuit of ways to expand its pool of internal resources to compliment the Comprehensive Emergency Response Program.

Consolidated Edison's internal capabilities have increased over the past eighteen months as they work to close resource gaps experienced during four major events in 2006. Some of the shortfalls have been addressed while others, more complex, may not be solvable in the near term.

To maintain its high level of readiness, Con Edison must continue with efforts to improve its Comprehensive Emergency Response Program (CERP), specifically, the timely deployment of its internal resources, compensate for the decreasing number of experienced workers in skill positions, and head off emerging labor issues.

Positive developments in the past year include the following.

- Adding Orange & Rockland (O&R) resources to those of Con Edison's. In 2006, to obtain O&R crews, Con Edison would request them through their mutual aid associations, in this instance, the New York Mutual Aid Group (NYMAG). Beginning in 2007, Con Edison requisitions these crews in the same process that reallocates its other internal resources. This speeds up the process and with O&R able to provide up to 16 of its own crews plus any contractors working for them, this represents a sizeable enhancement to the restoration workforce.
- Contractor crews have been added in Staten Island and Westchester to address load relief and public works projects. These crews are also re-assignable to restoration work at the Company's discretion.
- The Company has stepped up training efforts, particularly, for those individuals that may be assigned temporary duties such as Site Safety, Damage Assessment, STAR Analysis, Transformer Cooling and dry ice distribution. These larger pools of support personnel strengthen the regional restoration teams.
- All the new CERP Underground plans include a table identifying primary and secondary functions for its Network Departments' employees. For example, a distribution splicer's primary function is high voltage cable splicing. Secondary

functions could include low voltage checks, splicing secondary and service cables, and/or trouble shooting no light situations.[54] By formalizing these secondary assignments in advance, employees can be provided refresher training and/or related work tasks to assure their preparedness.

- As part of its planning for a coastal storm emergency and other full scale emergencies, the Company has developed a database that identifies an emergency assignment for each of its 12,000 plus employees. The System Emergency Assignment (SEA)[55] database creates a primary assignment and at least one secondary assignment for all employees, Management and Union. The current logic for assignment is based on a person's job title, work location, and organization. In time, employee work and training histories will be researched to further refine the database. Though intended for use during a full scale emergency, the information is accessible on the Company's intranet and provides easy access to additional internal resources.

The actual crewing for the four 2006 events provides a look at Con Edison's capabilities at those points in time and may be a helpful frame of reference for the discussions that follow. The following Exhibits provide details for the three overhead storm events in Westchester and the staffing details from the Long Island City (LIC) heat event. Vantage also looked at the storm activities in each area for years 2002 – 2006 to better understand the frequency of events large enough to trigger the activation of the Incident Command System.

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[54]/ DR 287 Section III F Heat event Primary Functions.

[55]/ IR 242. .

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Exhibit V-1
Westchester Overhead Storms-2006: Crewing

	Jan 19-22[56]	July 18-22[57]	Sept 2-8[58]
Storm Classification	3A	3A	3B
No. Cust's Affected	61,500	50,500	78,300
B/W OH Crews	43	30	35
B/Q OH Crews	20	7	27
SI OH Crews	12	6	12
Transmission	2		
B/W URD	3		
Con Ed Contractors	11	31	21
Mutual Aid Crews	205	117	93
B/W Trouble Shooters	35	24	38
B/Q Trouble Shooters			4
Ladder Line Crews-total	104	39	98
Line Clearance	45	39	58
Damage Assessors	200	100	240
Site Safety	500	115	213

[56]/ DR 105 Con Edison Part 105 Report, January Wind Storm.

[57]/ DR 242 Con Edison Part 105 Report, July Wind Storm

[58]/ DR 113 Con Edison Part 105 Report Tropical Storm Ernesto

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Exhibit V-2
July 2006 Long Island City Network Heat Wave: Crewing

	July 17-25[59]
Classification	Full Scale
No. Cust's Affected	25,000 (meters)
I&A Crews-total	166
MH UG Crews	68
B/W UG Crews	27
B/Q UG Crews	60
SI UG Crews	1
Maintenance Services UG Crews	21
Cable Crews-total	22
Flush Crews-total	33
MH Trouble Shooters	6
B/Q Trouble Shooters	27
B/W OH Crews	7
B/Q OH Crews	25
Excavation Contractor Crews	26
Mutual Aid Crews	130

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Exhibit V-3
Storm/Heat Events 2002-2006

	SI	B/W	B/Q	MH
2002[60]	6	11	na	
2003	5	11	na	
2004	5	4	na	
2005	9	8	na	7
2006	12	12	na	4

[59]/ DR 178 Pg VIII-25 Con Edison Briefing Document for DPS Audit.

[60]/ DR 212 Incident Command Mobilizations in Response to Major Events.

V-F18 The Westchester storms of 2006 resulted in more damage than earlier storms but the frequency of events in the prime overhead regions, Staten Island and Westchester, was not particularly unusual.

As shown in the previous Exhibit, the frequency of storms in 2006 was not significantly greater than in previous years. The Incident Command Structures were mobilized 37 times on Staten Island and on 46 occasions in the Bronx-Westchester region during the five-year period 2002 – 2006.[61] The storms were typical in their nature, i.e., high winds, severe thunderstorms, heavy rains, etc.

V-F19 Con Edison has sufficient internal management resources to properly staff the Incident Command Structure and union resources to staff support functions.

Vantage reviewed the Emergency Response Organization charts and the staffing rosters for each region that is incorporated in the 2007 Comprehensive Emergency Response Program.[62] The individuals assigned to ICS positions have the requisite training[63], including NIMS training, and possess job titles appropriately aligned with their ICS assignments. The individuals have gained experience and confidence with each activation. In addition to actual storm events, the Company opted to activate the ICS structure on lesser storms to provide more realistic training for its storm response teams. Vantage consultants were able to witness first hand storm pre planning and storm management performance during the April 15 Nor'easter and the May 16 windstorm that struck the Westchester area this spring.

The numbers of represented employees are also sufficient to meet the minimum requirements of the regional staffing plans. Con Edison has done a good job of cross training employees to assist in emergencies, and they have been creative in mixing and matching skills to field temporary crews. What Con Edison appears to have lost sight of is the accelerating attrition of some of their most valuable employees.

Vantage has reviewed organizational data for each region and compared it to the staffing levels listed in their respective restoration plans in CERP. It became clear early on that there were sufficient numbers of employees to fill all positions with the possible exception of Overhead Line Workers, Underground Workers, and Trouble Shooters. The analysis that follows is focused on these three job titles.

Gaining a clear picture of Con Edison's Organization below the Section Manager level was more difficult than normally would have been expected. An employee summary[64] provided to the DPS in October lacked important information, specifically, how many employees

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[61]/ DR 212.

[62]/ DR 287 2007 Comprehensive Emergency Response Program.

[63]/ DR 279 Two years of training records of management employees associated with ICS.

[64]/ DR 167 10/18/06 Con Edison response DPS inquiry PDE-8. Crewing titles, locations and numbers.

were considered qualified and how many were trainees. This is important because it gives a truer picture of the number of employees that can actually perform the higher skilled jobs necessary to affect timely and quality repairs.

After a series of requests, Con Edison did provide organization charts for their Electric Construction and Operations Departments. These charts, though differing in style and content, provided more of the data and are the ones referenced in the tables that follow.

The CERP establishes the criteria for classifying storms and heat events. The Overhead classification matrix[65] and the Underground classification guidelines[66] are critical parts of the plan as it is the event classification level that triggers a series of pre-planned actions. Common to both matrices is the premise that local crews will handle Level 1 or Upgraded events; Level 2 or Serious events would likely require other Con Edison resources; and Level 3, or Full Scale events, would require assistance from non-Con Edison resources.

Note: The regional staffing matrices provide differing levels of detail on sources of Overhead and Underground Workers for Level 2 and Level 3 events. Bronx-Westchester's staffing plan is complete indicating where it expects to obtain crews. Other plans roll all crew needs into one number and do not indicate sources, e.g., other regional crews, contractors, or mutual aid. Where the detail was available, it is included in the tables that follow. This Section is focusing on internal capabilities so it is the Level 1 and Level 2 storm staffing requirements that were of greater interest.

65/ DR 287 III C. CERP Typical Overhead Storm Classification Matrix.

66/ DR 287 V C. CERP Summer Heat Event Classification.

V-F20 <u>There are sufficient local and Con Edison regional resources to meet or exceed the minimum requirements of the Comprehensive Emergency Response Program in the Staten Island Region.</u>

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Exhibit V-4
Staten Island Staffing Plan

Staten Island

Population	464,573
Customers (non-network)	168,625
Service Territory	58 sq. mi.

CERP Staffing Matrix	Level 1	Level 2	Level 3
Trouble Shooters-OH	4	6	9
Overhead Crews	0	8	30
Underground Crews	6	6	14

Actual Staffing (people)[67]	Qualified	Trainees	%Qualified
Trouble Shooters-OH	12	0	100%
Line Workers	26	21	55%
Underground Workers	14	7	67%

Staffing in this region, though adequate for the basic overhead events of their plan, is compromised by its diminished pool of qualified OH Line Workers. This is offset to some degree by having a fully qualified corps of OH Trouble Shooters. Storm damage sometimes is lighter here because of the fewer tree related outages and restoration faster because of the more compact nature of the region; 58 sq.mi. Nonetheless, it will be especially important that Con Edison quickly shifts other regional resources to Staten Island for any storm that has an estimated restoration time approaching 24 hours or when there are delays in assembling local crews. Twenty Six Line Workers and twelve Trouble Shooters can only do so much.

67/ DR 240 Staten Island Electric Operating Organization Charts. Note: Generally minimum staffing is per shift and two qualified people are needed to make a qualified crew.

V-F21 <u>Analysis shows that there is sufficient local and Con Edison regional resources to meet or exceed the minimum requirements specified in the 2007 Comprehensive Emergency Response Program for the Bronx-Westchester Region.</u>

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Exhibit V-5
Bronx-Westchester Staffing Plan

Bronx-Westchester

Population		
	Bronx	1,357,589
	Westchester	940,807
	Total	2,298,396
Customers		
	Bronx, network	315,000
	Bronx, non-network	32,405
	Westchester, network	88,896
	Westchester, non-network	310,504
	Total	746,805
Service Territory		
	Bronx	41 sq. mi.
	Westchester	310 sq. mi.

CERP Staffing Matrix	Level 1	Level 2	Level 3
Trouble Shooters-OH	12	16	16
B/W Overhead Crews	0	27	27
Other Region OH Crews	0	10	0
Mutual Aid OH Crews	0	0	25-100
Trouble Shooters-UG	0	0	0
Local & Regional UG Crews	27	27	35
Mutual Aid Crews	0	0	40

Actual Staffing (people)[68]	Qualified	Trainees	%Qualified
Trouble Shooters-OH	39	0	100%
Line Workers	71	41	63%
Trouble Shooters-UG	12	8	60%
Underground Workers	40	80	31%

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[68]/ DRs 239 & 248 Bronx-Westchester Construction and Operations Organization Charts. Note: Generally minimum staffing is per shift and two qualified people are needed to make a qualified crew.

Staffing in this region has been adequate for the smaller and localized overhead storm events. Problems arise during wide spread and severe storms like those experienced in 2006. This region's staffing matrix remains conservative in forecasting the number of crews it projects for the early stages of an event. The characteristics of the region, tree density, larger geographical area and complex infrastructure, more typically require workers to cut, clear and make safe facilities before they can commence with actual repairs. Thirty nine qualified Trouble Shooters aid in these endeavors while Forty one Line Workers in training impede it. Their current plan suggests that major repairs will be addressed by Mutual Aid crews in Level 3 storms, (Reference V-F18 below). As in Staten Island, decidedness in reallocating crews to the area to commence repairs is very important. Once in the area, crew productivity must be maximized. This should include logistical support equivalent to Mutual Aid workers including lodging.

The region's Underground Heat and Winter staffing plans call for 27 Splicers for both Level 1 and Level 2 events. There are 40 qualified Splicers to draw upon to make up the necessary crews. There is little margin in regional resources should the event escalate or continue for an extended period. This will be mitigated in time as more of the trainees advance to qualified status.

V-F22 Bronx-Westchester has made a radical change in its Overhead staffing matrix for 2007.

Their 2007 Plan no longer calls upon other Con Edison regional resources for Level 3 storms, instead it relies on large numbers of mutual aid crews. However, the change to the Bronx/Westchester Overhead staffing matrix for 2007 is not intended to eliminate the potential deployment of other regional resources to Bronx/Westchester region during Level 3 events when those resources are available. The staffing matrix guide reflects the Resource Plan that can be employed when Level 3 conditions prevail throughout the Company's service area and the Orange and Rockland service area when all regional and O&R crews are responding to conditions in their home regions. In those conditions, regional resources would not be available to Bronx/Westchester and mutual aid resources would be deployed to the Bronx Westchester region. The matrix provides the option for Bronx/Westchester to plan in advance of predicted Level 3 events to deploy mutual aid resources with the assumption that resources from other regions will not be immediately available.

Mobilization of Mutual Aid crews is dependent upon factors outside Con Edison's control. Large storms often impact, or at least threaten, other nearby electric utilities. Until these companies are confident that they can meet their own storm restoration obligations, crews will not be released to assist other companies. Con Edison's practice in recent storms has been to deploy internal resources first then supplement its needs with foreign crews. Failure to follow this staffing protocol would, first, be contrary to internal policy and second, create a significant resource gap in the critical early stages of the restoration effort.

V-F23 There are sufficient local and Con Edison regional resources to meet or exceed the minimum requirements of the 2007 Comprehensive Emergency Response Program in the Brooklyn-Queens Region.

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Exhibit V-6
Brooklyn-Queens Staffing Plan

Brooklyn-Queens Population		
	Brooklyn	2,486,325
	Queens	2,241,600
	Total	4,727,925
Customers		
	Brooklyn, network	762,911
	Brooklyn, non-network	97,248
	Queens, network	534,777
	Queens, non-network	182,317
	Total	1,577,253
Service Territory		
	Brooklyn	70 sq. mi.
	Queens	108 sq. mi.

CERP Staffing Matrix	Level 1	Level 2	Level 3
Trouble Shooters-OH	n/a	n/a	n/a
Operating Crews	0	40	50
Trouble Shooters-UG	14	18	24
Underground Crews	24	36	96
Actual Staffing (people)[69]	Qualified	Trainees	%Qualified
Trouble Shooters-all	62	19	77%
Line Workers	52	32	62%
Underground Workers	85	151	36%

Overhead distribution facilities represent a small percentage of the infrastructure in this region. The number of local Overhead Workers combined with those in adjacent regions are sufficient to address all but the more serious storm scenarios. Like all regions, the number

[69]/ DR 308 Brooklyn-Queens Electric Operations Organization Chart. Note: Generally minimum staffing is per shift and two qualified people are needed to make a qualified crew.

of Line Workers in training is high which in turn reduces the Company's options to address local and out of region restoration work as rapidly as it might prefer.

The region's Underground staffing matrix specifies 16/24 Splicers for Level 1 Heat and Winter Storm events respectively,24/36 Splicers for Level 2 scenarios. With 85 qualified workers there are sufficient numbers to meet this basic staffing projection. With major repair and construction work ongoing in the region, particularly in the LIC Network, and other work in the planning stages, it will be in all parties' best interest to increase the percentage of qualified High Voltage Splicers in this region. A 36% qualified rate is low.

V-F24 There are sufficient local and Con Edison regional resources to meet or exceed the minimum requirements of the 2007 Comprehensive Emergency Response Program in the Manhattan Region.

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Exhibit V-7
Manhattan Staffing Plan

Manhattan	
Population	1,593,200
Customers, network	694,318
Service Territory	23 sq. mi.

CERP Staffing Matrix	Level 1	Level 2	Level 3
Trouble Shooters –UG	6	8	10
Underground Crews	12	16	30
Mutual Aid Crews	0	0	30

Actual Staffing (people)[70]	Qualified	Trainees	%Qualified
Trouble Shooters-UG	28	26	52%
Underground Workers	102	146	41%

Manhattan has the numbers to field qualified crews for the staffing triggers in their Plan. Unique in this region is the lower number of qualified UG Trouble Shooters. As primary first responders to trouble these are a particularly critical asset. The percentage of workers in training is also high in this region. This staffing anomaly could become problematic during widespread events such as an extended heat event or salt storm. Customers will benefit when the workforce matures and stabilizes with a higher percentage of qualified workers.

[70]/ DR 308 Manhattan Electric Operations Organization Charts. Note: Generally minimum staffing is per shift and two qualified people are needed to make a qualified crew.

V-F25 <u>The percentage of qualified workers, especially Underground Workers, is dangerously low.</u>

Vantage's review of the Company's internal capabilities as they relate to the Comprehensive Emergency Response Program brought to light other issues that potentially impact restoration work. While the total number of workers is adequate to meet the requirements of the CERP, the numbers that are currently fully qualified are below an acceptable level

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Exhibit V-8
Staffing Summary-Key Positions

Staffing Summary-key positions
Q=qualified
T=Trainee

	OH-Q	OH-T	UG-Q	UG-T	TBL-Q	TBL-T
SI	26	21	14	17	12	0
B/W	71	41	40	88	51	8
B/Q	52	32	85	151	62	19
MH	__	__	102	146	28	26
Totals	169	94	241	392	151	53
% Q		64%		38%		74%

V-F26 <u>Con Edison's succession planning efforts for key field positions, specifically Overhead Line Constructors and Underground Workers, has been inadequate.</u>

Con Edison's employment level averaged 12,882 employees from 1996 through 2006.[71] The low was 12,314 in 1998 and the high was 13,901 in 1996. The headcount in 2006 was 13,441. Individual department staffing level information was not available, however, the totals do suggest that the Company has been conservative about replacing positions and/or creating new ones, i.e., advance filling key positions.[72]

[71]/ DR 210 New York City Report Table 5-5 Selected Statistics.

[72]/ It should be noted that there was a substantial effect on headcount from the sale of most of the Company's generating facilities (power plants) as part of the PSC's electric industry deregulation plan. Plant divestiture led to nearly 1000 employees leaving the company in 1999.

During interviews with long tenured management employees in Westchester[73] and Manhattan,[74] all expressed a deep concern about the loss of experienced workers. In Westchester the concern was about fewer Line Constructors in total and the loss of experience. The Planner there estimated that the region's staff of Overhead Line Constructors is half of what it was in the 1980s. He noted the closing of Work Out locations in Yonkers, Mount Vernon, and Buchanan as one factor. He also acknowledged that the work has changed over the years with the additions of new tools and equipment which were reasonable justifications for some staff reductions. In the late 1980s he estimated that there were 325 Line Workers. Today in Bronx-Westchester there are 151 positions in total inclusive of Trouble Workers and Qualified and Trainee Overhead Workers. Of the 151 positions, 110 are listed as qualified, however, many are new in their jobs…thus lacking experience. This lack of experience often is a restricting factor when making work assignments during storm restoration work. Planners use great care to ensure crews have the necessary skills and experience to handle their assignments safely.

In the interview with the Manhattan Planner, the staffing level was not the concern but the rapid erosion of experience was. It was his experience that jobs have been replaced once there was an opening. He observed that in the late 1980s and early 1990s the workforce was reasonably stable and a high percentage of employees were at the top of their job series and experienced. In the mid 1990s this changed with vacancies occurring much more frequently. A workforce of mostly skilled workers was rapidly evolving to one with more trainees. Today in Manhattan it is estimated that just 41% of the Underground Workers are considered qualified. The percentages are no better in Brooklyn-Queens or Bronx-Westchester.

This theme of losing experienced workers was a major concern in all interviews of Supervisors, Planners, <u>and</u> Union employees. Though Vantage did not conduct a detailed analysis of the Organization the assertion by such a cross section of management and represented employees that this was an issue combined with the findings of the high percentage of trainees suggested that this concern had to be brought forth.

V-F27 <u>Excessive overtime is impacting the callout response rate.</u>

A second observation from the interviews with first line management and union employees, was that Construction crews are working nearly unlimited amounts of overtime. Much of the overtime is scheduled for load relief and public works projects with critical in-service dates. Many employees are working an additional 20 plus hours per week and have been doing so for an extended period of time. This overtime policy may expedite the completion of some important projects, but it also takes a toll on its workforce. Callout response rates drop dramatically according to Supervisors as overtime hours accumulate. Supervisors and Planners all had anecdotal remarks about delays in assembling crews because workers were not accepting calls. This was not their experience with major storms as they felt that their

[73]/ IR 246

[74]/ IR 249

workers took much pride in their roles in these events and, thus, made all reasonable efforts to respond. However, in the more routine scenarios, where only a few crews may be required, the callout response rate is much lower. In Rye, a core group of 6-9 workers accept most of their calls. In Staten Island, it was estimated that only 20% of the employees routinely take callouts. As these estimates were provided by the Supervisors assigned on call duty and responsible for assembling crews, Vantage believes the percentages to be reasonably representative.

V-F28 There are unresolved issues in some workout locations that are impacting the callout response rate.

In some Workout locations it was suggested that "other issues" were further reducing callout response rates. The longer commutes for newer employees was a universal concern. Many, if not most, workers either cannot afford, or prefer not, to live in the areas where they work. With the long commutes, extra money coming in from scheduled overtime, and the increased family focus of today's workforce, employees are less incented to take a great number of callouts.

There was less specificity about other reasons for the reluctance of some workers for not taking callouts. Implied were outstanding grievances regarding the closing of workout locations and pushback on some management directives. In the latter category, a management action effecting Staten Island resulted in a three week protest with employees electing not to work scheduled overtime. The precipitating directive originated in a corporate department and was not the result of an action by the local management. From the employees' perspective, management's methods of presenting the changes was as controversial as the change itself.

V-R7 Review succession planning process for key field positions and implement plans to increase the number of qualified employees in the Line Constructor and Underground Worker series. (Refer to Finding V-F27.)

V-R8 Evaluate the impact of high levels of overtime on the workforce as it relates to callout response rates. (Refer to Finding V-F28.)

V-R9 Consider negotiating a new clause in future Labor Agreements that establishes a minimum callout response rate for certain job classifications. (Refer to Finding V-F29.)

As agreed to with the Supervisors Vantage talked to during the project, specific interviews will not be cited for the following observation. Supervisors of Overhead and Underground workers across the board expressed displeasure with the Company's management overtime policy, and inequities in conditions of employment for what are perceived as equivalent positions. The straight time overtime rate for storms, especially when out of town on mutual aid, was the most controversial. Union employees are typically being paid at a double time rate while Supervisors receive straight time and work even longer hours. Issues about disparity in on-call duty and the inconsistency with the assignment of take home privileges of Company vehicles were also cited.

The relationship to the Company's internal capabilities may seem obscure here, but it is issues like compensation and benefits disparities that, left unaddressed, impact the morale of a workforce which in turn subtly impacts other facets of an employee's performance.

V-F29 Con Edison's succession planning for its regional engineering workforce has been inadequate.

Engineering Technicians and Designers support the Control Center, Trouble Analysis, Unit and Damage Assessment functions during major storms. In their normal day roles they are responsible for the design and preparation of important load relief and reinforcement projects. During Vantage's organizational assessments, the low percentage of qualified Designers was noted in Staten Island, Manhattan, and Bronx-Westchester. No information was provided for Brooklyn-Queens. For the three regions reporting, only 44 of 106 positions have attained Designer or higher job titles. This 42% qualified statistic is all too similar to what was observed in the Overhead and Underground worker job titles.

The Engineering Manager in Bronx-Westchester expressed this concern during his interview[75] and how it was having an impact on his work plan. Twenty Six of the 41 positions are Junior Designers, all relatively new to the department. If this is occurring in Bronx-Westchester it is reasonable to conclude that other regions face Designer staffing problems. Though this experience gap does not directly affect CERP, it does compromise the number and quality of design packages going into the field for construction. The premise being that the more reinforcement and load relief work that gets completed will translate into fewer and shorter interruptions for Con Edison's customers.

V-R10 Review the succession planning process for Engineering Designers and Technicians and implement plans to increase the number of qualified employees. (Refer to Finding V-F30.)

CONTRACTOR SUPPORT

V-F30 Con Edison has sufficient numbers of Line Clearance contractor crews available to meet or exceed the staffing matrix requirements of the CERP.

Con Edison employs contractors for all of its line clearance/tree trimming work. These contractors, therefore, become a critically important resource during overhead storm events. The three regions with overhead facilities, Bronx-Westchester, Brooklyn-Queens, and Staten Island, hire contractor services for annual maintenance trimming, clearing for new construction, and assisting with storm restoration work. There is a sufficient amount of tree trimming work, especially in Westchester, that line clearance crews are working in the service territory year round. Bronx-Westchester has added approximately $2,000,000 in funding for an enhanced tree maintenance program in years 2007 thru 2009[76] increasing the

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[75]/ DR 123 and IR 123.

[76]/ IR 232

total funding to $18,500,000 for the three-year period. Added contractor crews will serve to deepen the pool of workers for storm restoration work.

Tree contractors are managed much like other Con Edison resources during storms. Crew availability is addressed in planning meetings, and the crews are deployed at the Company's discretion. Once in storm mode the contractor crews are assigned work by Con Edison supervisors who report to an Overhead Branch Director. Other Line Clearance supervisors pre-check jobs and monitor contractor activities in the field.

Vantage consultants reviewed line clearance crew staffing for the three 2006 and the May 2007 storm events each caused substantial tree damage in Westchester County. All four storms were classified as Level 3A, (up to 40,000 customers affected for 1-2 days). In the latest version of the Bronx – Westchester Overhead Storm Staffing Matrix,[77] a minimum of 30 line clearance (tree) crews are specified.

The actual numbers of contractor tree crews deployed during each of these events were:

January 18-22, 2006 [78]	45 crews;
July 18, 2006[79]	39 crews;
September 2-3, 2006[80]	58 crews;
May 16-19, 2007[81]	50 crews.

There were no indications during interviews or in research that the numbers of line clearance crews were anything less than adequate.

V-F31 <u>Con Edison is effectively utilizing Overhead Line Contractors to complete selected capital improvement projects and to supplement in-house crews during major storms.</u>

Con Edison announced its intentions in November 2006 to add overhead contractor crews in the first quarter of 2007 to address system reinforcement and load relief obligations.[82] In

[77]/ DR 287 Comprehensive Emergency Response Program Section 3 ID, Minimum Staffing.

[78]/ DR 105 Con Edison Part 105 Report, January 18-22, 2006 Wind and Rain Storm.

[79]/ DR 242 Con Edison Part 105 Report, July 18, 2006 Severe Thunderstorm.

[80]/ DR 113 Con Edison Part 105 Report, September 2-3, 2006 Tropical Storm Ernesto.

[81]/ DR 311 Con Edison Crewing Report for May 2007 Windstorm.

[82]/ DR 177 Con Edison response to DPS inquiry PDE – 17, Westchester staffing.

2006 the Company averaged 19 overhead line contractor crews Company wide.[83] In 2007 there are at least 25 crews in Bronx-Westchester in addition to the contractor crews in Brooklyn-Queens and on Staten Island.

Overhead Line Contractors have become a necessity for many utilities as they lose qualified workers to retirement while simultaneously construction workloads increase. That is also the case at Con Edison. Aging infrastructure, steady load growth, and an ever increasing number of public works projects have resulted in a workload that exceeds Con Edison's internal resources. To compensate, Con Edison has added contract crews. Of course, the more overhead line crews working for Con Edison means that there are more to assist during storms. Service Agreements with these contractors are clear that crews may be reassigned to restoration work at the Company's discretion. During storms these crews become part of an Overhead Restoration Division and are typically assigned to large repair projects.

Unlike line clearance contractor crews that represent Con Edison's only in-house resource, overhead contractor crews <u>supplement</u> the regions' workforce. The regional overhead storm staffing matrices do not specify any minimum number of contract line crews. More typically the minimum staffing number will represent Con Edison crews <u>plus</u> contractor crews. In effect, line contractors' crews are a staffing bonus.

Vantage looked at how overhead contractor crews were utilized in the same storms that were reviewed for tree crew utilization. The Level 3A events would mandate Bronx-Westchester to field a minimum of 27 crews, which could be a combination of local, other region, and contractor crews. The actual numbers of overhead line contractor crews used to supplement Con Edison crews in these four events were:

January 18-22, 2006	11 crews;
July 18, 2006	31 crews;
September 2-3, 2006	21 crews;
May 16-19, 2007	25 crews, all from Bronx-Westchester.

Contractors represent the next best alternative to Con Edison's own in-house workforce. They are capable, available, and readily assignable.

V-F32 <u>Con Edison's management and oversight of Line Clearance and Overhead Line crews is satisfactory.</u>

Bronx-Westchester presently utilizes the most contractors. To better supervise this expanding workforce, they have created a manager level position that will be responsible for both Line Clearance and Overhead Contractors. Positions will be added to the

[83]/ DR 167 Con Edison response to DPS inquiry PDE – 6, Contractor Crewing.

department to better plan and supervise contractor activities.[84] These same supervisors will work with contractors during storm restoration assignments.

Con Edison has also formed a new Quality Assurance group that focuses on specification compliance.[85] Field audits by QA will compliment the efforts of the supervisors working with contractor crews on a day-to-day bases. Environmental, Health & Safety supervisors also audit contractor crews to insure their compliance with environmental and safety procedures.[86]

Adherence to specifications, timely completion of work, availability for storm restoration work, safety, and environmental compliance are all factors when evaluating the performance of contracting entities. A sub-par evaluation could result in a firm's removal from the Purchasing Department's approved contractor's list. A plus for having large amounts of work available is that many of the established and well managed contracting firms pursue these projects.

Logistical support for contractors is less burdensome than for in-house and mutual aid crews. Contractors work independently and are responsible for just about all support functions except materials. Equipment, vehicle repairs, fuel, housing, meals, and marshalling areas are examples of items arranged for by the individual contractor entities.

V-F33 Con Edison is appropriately utilizing contractors to support the operations of its Underground Construction Department.

Con Edison employs a variety of contract services to support day-to-day operations in all parts of its business. In network areas the Company utilizes excavation contractors for manhole, vault, and duct line work. They also use other contractors to pull cable and for traffic control/flagging services. These services are readily available in the New York City area providing services on an as needed bases and typically at a net savings to the Company.

These contractors become valuable resources during network emergencies. They were effectively utilized in the July 2006 Long Island City event and are available today to assist with emergency load relief and cable/duct replacement work.

[84]/ IR 141.

[85]/ DR 207 Emergency Management Action Plan Newsletter.

[86]/ DR 243 CEP 12.03 EH&S Qualifications For Contractor Procurement.

C. LOAD REDUCTION PROGRAMS

V-F34 Con Edison has a voluntary load reduction program in place that has adequate detail and information available to be effective when used.

V-F35 The Load Reduction Model that went live on June 1, 2007, should be an effective tool in monitoring the impact various load reduction programs have on a given network.

V-F36 The application of the Voltage Reduction Program could exacerbate the network loading situation.

The following processes, activities, and initiatives are applied to reduce load during an emergency and mitigate the impact the emergency has on the reliability and integrity of the distribution system:

Audit of Con Edison Outage Management

Exhibit V-9
Load Reduction Program Matrix

Load Reduction Program	Anticipated Load Reduction (MW)	Actual Load Reduction (MW)	Networks Impacted
Emergency Demand Response Program (EDRP): The EDRP, a voluntary program, is activated as a response to power shortages or other emergencies as declared by the New York Independent System Operator (NYISO). It is intended to incent high load customers who can shed or redistribute at least 100kw of power to a lower demand period of the day or replace that amount by an emergency generator. During an emergency the Con Edison will contact the program participant and request a voluntary curtailment of power. An interval meter with a telephone line will be utilized to verify the load reduction. Incentives to offset the cost of the interval meter include either 65% of the interval meter cost or $2,000, which ever is less. Incentives for the participant include a $.45 per kilowatt-hour curtailed, or 90% of the price of energy in the real-time Locational-Based Marginal Price, which ever is larger for event exceeding four hours or longer. Participants will be compensated at a different rate for emergencies less than four hours.	TBD from recently developed Load Reduction Model	15.05	
Distribution Load Relief Program (DRLP) The DLRP is designed to incent participants to reduce the electric load on the transmission and distribution system during periods of heavy	TBD from recently developed Load Reduction Model	83.43	TBD from recently developed Load Reduction Model

Load Reduction Program	Anticipated Load Reduction (MW)	Actual Load Reduction (MW)	Networks Impacted
demand when Con Edison declares a localized emergency, but when no system wide power emergency has been declared by the NYISO. The DRLP has resulted in an impact of 83.43mw. During an emergency Con Edison will contact the program participant and request a voluntary curtailment of power. An interval meter with a telephone line will be utilized to verify the load reduction. Incentives to offset the cost of the interval meter include either 65% of the interval meter cost or $2,000, which ever is less. Incentives for the participant include a $.50 per kilowatt-hour curtailed, or the real-time Locational Based Marginal Price less the retail rate, whichever is larger. To be eligible for payment, participants must provide the minimum load reduction for four continuous hours during an emergency.			
Installed Capacity Program (ICAP) The ICAP is a special case resource program under the NYISO to incent participants who can reduce electric load by at least 100kw by using their generators or other means of curtailment without meeting the daily bidding and scheduling requirements. When the NYISO anticipates that the reliability of the State's transmission and/or distribution system could be compromised or load could exceed available supply, the NYISO may declare an emergency. Con Edison will then contact the program participants with a request to invoke an ICAP curtailment twenty-one hours in advance of the required reduction followed by a notice two hours before the event. Participants will receive payment for load reduction based on a	TBD from recently developed Load Reduction Model	7.61	TBD from recently developed Load Reduction Model

Load Reduction Program	Anticipated Load Reduction (MW)	Actual Load Reduction (MW)	Networks Impacted
capacity rate that varies depending on the capability period and whether they are located in City or in Westchester County. Participants will also receive an energy payment that equals the higher of the real time Locational-Based Marginal Price adjusted for losses or the amount specified on the participant's application, but no more than $.50 per kilowatt-hour.			
Direct Load Control Program The Direct Load Control Program is designed to achieve load reduction during a NYISO declared emergency by Con Edison directly removing a predetermined customer load (packaged and split air conditioning systems and central air conditioning systems) without prior notification. This is achieved using radio frequency control device to either interrupt electric power to the air conditioning unit or raise the thermostat set point. These devices will also be used to restore the normal operation of the air conditioning unit at the end of the high load emergency. Participants will receive an incentive equivalent to $9 per effective kw of controlled load per month during the four month summer billing period, June through September. Participants electing the less effective duty cycle control (15 minutes off - 45 minutes on per hour) or dual set point thermostat control will be paid an incentive equivalent to $2.25 per kw per month during the summer billing period.	TBD from recently developed Load Reduction Model	26.58	TBD from recently developed Load Reduction Model
Steam Air Conditioning Program The Company provides steam service to Manhattan customers south of 96th Street. The Steam Air Conditioning Program will encourage	TBD from recently developed Load Reduction Model	TBD from recently developed Load	TBD from recently developed Load Reduction Model

Load Reduction Program	Anticipated Load Reduction (MW)	Actual Load Reduction (MW)	Networks Impacted
customers to reduce the conventional electric air conditioner load by replacing these units with steam powered units. The program provides a monthly discount of $2.00 per 1000 pounds of steam for existing large commercial and residential steam customers who install new or replacement steam air conditioning systems.		Reduction Model	
Voltage Reduction Program Voltage reduction has become another option for utilities to reduce demand. However, only the resistive portion of the load responds to the reduction in voltage to reduce aggregate demand. Loads such as incandescent lights and heater coils will use less power as the voltage is lowered. On the other hand, induction motor loads are unaffected by the reduction in voltage, because the current simply rises to account for no change or even a slight increase in power consumption. Even some resistive loads provide only short term benefits. A phenomena known as load diversity plays a role in voltage reduction and can counteract its effects. The concept of load diversity can most easily be explained with an example. In your neighborhood, it is unlikely that all of the home water heaters are on at the same time. Particularly during non-hot water usage hours (morning and evening showers), when your hot water heater is on, your neighbor's may be off. Due to the distributed and non-coincident nature of these loads, the aggregate peak can remain relatively constant. However, if the voltage is reduced to all of the resistive elements in the water heaters, the elements will not be able to heat the water as quickly. While an immediate reduction in the power demand will be recognized upon initial voltage reduction, over time water heaters will need to be on longer to achieve the thermostat set water temperature. Thus, more	TBD from recently developed Load Reduction Model	from recently TBD developed Load Reduction Model	TBD from recently developed Load Reduction Model

Load Reduction Program	Anticipated Load Reduction (MW)	Actual Load Reduction (MW)	Networks Impacted
water heaters will be on at the same time. This will cause the aggregate peak to increase substantially. Therefore, with respect to thermostat controlled resistive loads, the benefits of voltage reduction can be short lived and may occasionally end up increasing the aggregate load demand. Con Edison procedurally applies voltage reduction as a method of load reduction. Based on the Company's reports an 8% reduction in voltage will result in a 5.2% reduction in short term demand.			

As outlined in the LIC Report, the customer's response to the above load reduction programs has been difficult to quantify and monitor.[87] Action Item 10A commits the company to develop an information system to track and report the results of the load reduction actions. In addition, Action Item 10B commits the Company to establish a Demand Response position in the Distribution Engineering Command Post and CERC. In July 2007 Con Edison provided an update to the DPS Staff detailing the Load Demand Model. The Model is currently under review by the Staff.

As detailed in the previous table the current voltage reduction program, which is typically utilized for an extensive periods, may exacerbate the load reduction problem and may also result in extensive damage to customer's electric motors.

V-R11 <u>Review the current voltage reduction program of load reduction to ensure its effectiveness when applied for an extended period. They should also ensure that the level of voltage reduction will not result in damage to customer's motors and other voltage sensitive loads.</u> (Refer to Finding V-F35, 36 & 37.)

D. RESTORATION PERFORMANCE EFFECTIVENESS

Systems play a vital role in outage management and overall restoration performance. Systems are critical to understanding the geographic extent of the outage, identifying customer and device problems, and, of course, tracking troubles and ensuring closeout. System restorations are too complicated to be completed successfully without an integrated series of reliable system tools. Vantage reviewed the system tools used by Con Edison with particular emphasis on their effectiveness for outage restoration going forward and on the status of previously identified system enhancements. The analysis is broken into systems used to manage outages and those used for troubleshooting or engineering evaluation.

Outage Management Systems

Con Edison uses several key systems to manage outages. The key systems are:

- System Trouble Analysis and Response (STAR);
- Emergency Control System (ECS);
- Outage Manager.

Of course, these systems interface with a number of other systems as described in the following Section.

Troubleshooting and Engineering Systems

These systems include:

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[87] / DR 118, page 6-6

- Polyvoltage Load Flow (PVL);
- World Class Load Flow (Wolf);
- Remote Monitoring System (RMS);
- PQ Nodes (PQN);
- Reactance to Fault (RTF);
- Network Trouble Indicator (NTI).

STAR

System Trouble Analysis and Response (STAR) is a computer system that analyzes problems and tracks jobs on the Con Edison electric distribution system displaying the work graphically and in tabular form. STAR is an Oracle-based product that was initially installed at Con Edison in 1999. STAR works by analyzing information received from customer calls. STAR uses the information to identify the causes of system trouble and attempts to predict what devices and customers may be affected on the non network distribution system. STAR then creates jobs for corrective work and allows operators to prioritize and track these jobs through completion. Con Edison plans enhancements which will also enable STAR to receive SCADA information on the status of field equipment and display it graphically. Originally used only in B/W, it has since been made available to all control centers.

STAR is an electrical model which "understands" where customers are connected to the distribution system. When problems on the system affect customers, Con Edison uses this information to quickly identify the number and names of all customers affected on Con Edison non-network systems. STAR has additional functionality to assist the operators in quickly identifying the number and names of customers affected in network areas. STAR is a high availability system in that it has processes in place to fall over to the backup server.

ECS

The Emergency Control System (ECS) is a home grown, on-line IMS mainframe system designed to provide features for monitoring and processing work created for emergency calls displayed on format screens.

The system provides a structured method of dealing with these calls allowing inquiry by priorities based on the type of call, rapid dispatch of crews, and a continuing history of response to the calls. Work may be entered into the system from either the Customer Information System (CIS) or directly into ECS. Work is created by the entry of a trouble code, which is translated by the system into job, a location, and the date and time of the call.

When a trouble report is received in the system, the system analyzes the job to make sure the report is not a duplicate of work already in the system. Until the deployment of STAR, the ECS Feeder database checked to see if a relationship to other work or a probable cause could be determined. Work created in ECS is processed through a series of special screens which allow rapid access to emergency calls and a prioritizing of work. Operators can analyze the jobs and record the dispatch to crews, record the numbers of customers affected, restoration times, and report repairs made.

ECS interfaces with the Customer Information System (CIS) on the front end with STAR and with outage manager.

OUTAGE MANAGER

Outage Manager is a web-based application used for tracking, viewing, and reporting. Outage Manager does not manage work or trouble reports. Outage Manager enables the viewing and reporting of information from STAR and ECS

OUTAGE MANAGEMENT SYSTEM SUMMARY

There are three primary outage management systems used in non-networked distribution system, each with a distinct function in the outage management process.[88] There remains some confusion over which of the systems performs what function. The following is a basic summary of the systems and their functions.

- STAR- modeling of the outage, analysis, grouping and graphics.
- ECS- work control, dispatching, ETRs, trouble type grouping.
- Outage Manager- reports on the data within ECS.

The primary feeds to these systems are:

- CIS- customer interface (inbound and outbound), initial trouble tickets, receives ETR from ECS and communicates to customers, provides ECS with the initial trouble report;
- SCADA- provides STAR with device data to use along with trouble reports from ECS.

V-F37 Con Edison implemented the staff priority recommendations to STAR.

Con Edison has made STAR available to all regions as per the Staff priority recommendation.

V-F38 Con Edison has continued to experience problems with STAR, but these have been minor and corrected on an ongoing basis.

During the audit, Vantage team members were able to observe first hand the operation of Con Edison during an outage event including the operation of the outage systems. On April 14, 2006, a Nor'easter resulted in declaration of a level 2.b emergency. Con Edison then experienced a category 3a event in Bronx-Westchester on May 16 and 17 as a line of severe thunderstorms with high winds crossed the area. In both events the outage systems seemed to perform well overall with some minor issues identified by Con Edison in STAR. STAR was found to have been incorrectly combining outage and non-outage work which could lead to merging of jobs and the subsequent deletion of lead outage jobs from system

[88]/ DR 304.

memory. Con Edison obtained coding fixes from Oracle for these problems. The code fixes have been tested and applied.[89]

STAR and all of the outage management systems will continue to require modifications, fixes and enhancements. This is totally acceptable and should be anticipated. Rather than wait for problems to be uncovered by Staff or auditors, Con Edison should proactively report to the Staff when known problems have been identified with the planned corrective action and an anticipated completion date for the fix. Any self reporting mechanism such as this requires some degree of subjective interpretation. The suggestion is that the trigger point be any modification that is visible to either customers or users and that does not involve routine upgrades be placed in the reporting category.

POLY VOLTAGE LOAD FLOW (PVL)

Poly Voltage Load Flow (PVL)[90] is a balanced three phase modeling program capable of providing design and operating characteristics of primary, and on a limited basis for secondary, network to designers manually running trials. A database of circuit connectivity provides base conditions including all conductors, transformers, and interconnections. Historical or manually assigned data from circuit monitoring current and voltage sensors, RMS reporting, and customer usage profiles are utilized by the model. Output provides guidance regarding system adequacy and possible reinforcement designs. This is an extremely complex and potentially powerful tool with, unfortunately, major shortcomings in its present state.

PVL requires an accurate representation of the connectivity model in order to provide quality output. The LIC network connectivity model was shown, in the Incident Investigation Committee (Donohue) Report, to contain incorrect data regarding the installed system making computations potentially unreliable. Also, "*When Brooklyn/Queens region conducts an analysis of underground secondary mains loading, overhead ties are not included in the connectivity model. Customer loads are represented as point loads at the manhole riser location. This distorts the real electrical flow and can affect the accuracy of the results. It also is an issue when restoration is attempted as the overhead secondarys provide a path for load pickup. There were several cases where overhead fires were encountered during the restoration efforts as secondary supply was re-introduced into an area.*" [91]

" *…the computer generated analyses rely almost exclusively upon various tables as well as data from the remote monitoring system (RMS) being utilized in the algorithms and calculations performed by PVL. These results are then reported to the designers on an exception basis. This means that the results of the analysis are typically not printed out for*

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[89]/ DR 189.

[90]/ Incident Investigation Committee (Donohue) Report pp 99 – 103.

[91]/ IR 211.

review by the designers unless the PVL study indicates there is an overload condition. Unless specifically requested, the designer will only see overloaded results reported. However, reports can be configured to provide various output options. The results are provided in tabular form and the output stated in percentage of rating. The designers rely on these tools, accept the results, and infrequently test the results with other information to verify them. However, the results are not always correct. The assignment of load cycles is an example." [92]

"*The nature of the output reports is not intuitive. The Committee observed confusion by staff as to the meaning of the columns displayed in PVL. They needed to research what the codes and values represented by looking at a variety of specifications and also talking directly with developers of the program*". [93]

"Con Edison's Poly Voltage Load Flow (PVL) application is a balanced three-phase load flow application for secondary networks." "Win_PVL is the core planning and design tool used by regional and customer engineering sections to forecast and identify system limitations or deficiencies and develop reinforcement designs. PVL is complex and contains hundreds of thousands of individual pieces of modeling information for underground structures and feeders including cable connectivity, cable sizes of primary feeders, secondary mains, and service maps, and utilizes cable ratings provided by Central Distribution Engineering."
"An integral element of PVL is the connectivity model. The model is where the various elements of data are associated together to actually simulate the system. The model requires accurate definitions of the feeder components and equipment such as cable sections, joints, transformers, and other related equipment. In some cases, associated operational parameters also need to be taken into account (such as equipment age and type, temperature ranges, etc.) in order to apply proper operational ratings."

"The connectivity model also drives other applications used to determine the risk of feeder and network failure, and it is also used to establish which are the closest (electrically) near-bys to a particular transformer. Errors in this model can impact the operation of engineering applications dependent upon accurate system representation. The Committee found errors imbedded in the secondary connections represented in the most current version of the PVL model provided by Brooklyn/Queens engineering and in daily use by the various departments in Brooklyn/Queens who rely on it for planning and operations. "

An example provided was relative to the vicinity of the secondary cable fire said to have been the initiating occurrence of the LIC event. The connectivity model was found to include connections between service box 30111 and manhole M11711, no connection between the manhole and service box 30112. "*In reality, six sets of cable are connected between M11711 and service box 30112, and while there are ducts that connect between M11711 and 30111, no cable is physically laid in the ducts*."

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[92]/ DR #211, pg 31.

[93]/ DR #211, pg103.

"A secondary load flow analysis the Committee had conducted of the immediate area surrounding M11711, with the connection errors included, predicted a possible overload on the section of cable between service boxes 30111 and 30112. These errors would not allow an accurate portrayal of overloads in the secondary analysis of the area surrounding this manhole. However, this is the area of the initiating Long Island City event, starting with a secondary cable fire."

"There are inherent limitations in the secondary PVL model created by how individual customer loads are represented within the model." "An ongoing project is developing a method to spot individual customer loads at service points but this was not available for use during the Long Island City event. The Committee believes that the secondary PVL model constrained the ability to dynamically analyze secondary load flows and could have been a contributing factor to the difficulties experienced in managing the event. With customer loads spotted at transformers and connectivity inaccuracies, the PVL model will not accurately identify secondary mains overloads for tactical situations."

WOLF

"WOLF, World Class Operation Load Flow,[94] is a binary-based subset of PVL used in real-time load flow analysis environments. It was developed in order to analyze entire networks quickly including results for the current (base) case and all "next worse" cases of feeders which are currently in service. WOLF is run manually by the user while Auto-WOLF runs automatically for every network feeder event (loss or restoration of each feeder), and that report is quickly available to the regional control room operators." A visual/graphic output is presented via Visual-Wolf which allows operators to visualize base cases without the need to pore over tabular data output. *"The tool was used by CERC but not the region during the Long Island City network event."*

While the primary feeder circuitry has adequate load flow information for modeling purposes via CTs, PTs, and RMS, the load flow in secondary mains is far less capable of being modeled accurately. The models provide data at network transformer secondaries only, and customer loads are represented as lumped between transformers. Con Edison's Comprehensive Report[95] stated that some 80% of secondary mains, predicted post-event to have probably sustained thermal damage, were found upon inspection to be unaffected. No indication was given of the number of secondary conductors actually damaged not predicted as at risk.

World Class Load Flow (WOLF) is a real time variant of PVL utilizing the same suspect connectivity model and real time circuit characteristics to analyze present and next worse case scenarios. WOLF is manually run, Auto-WOLF runs automatically upon any loss or restoration of a feeder, and Visual WOLF is the graphic display of results available to the regional control room operators. The identical problem of incorrect base data applicable to PVL afflicts WOLF. Additionally, the reliable operation of WOLF is dependent upon a high percentage, some 85% minimum, of RMS units reporting. It appears that these load flow

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[94]/ Incident Investigation Committee (Donohue) Report pp 103 – 105

[95]/ DR 118.

programs were not designed to provide functional output under conditions of higher multiple feeder contingencies. During the LIC event, WOLF failed to converge above the 4th contingency levels. Another problem, identified in the Incident Investigation Committee (Donohue) Report, is the automatic substitution of historical circuit characteristics when real time data, as from non-reporting RMS units, is insufficient. No indication of the source of computational data is provided to the user, who would rationally believe the output is based upon real time circuit conditions. The report states that:

> *"In Brooklyn/Queens, this exception report combined with the reports generated from using Engineering Workstation provides the necessary information to determine the 'next worst feeder' outage. It is noted in the WOLF methodology that the user should not use the secondary mains portion of the report as the model it is based upon is incomplete."*

> *"Part of the Brooklyn/Queens engineering contingency analysis methodology involves a summer outage contingency rapid response. The summer outage contingency rapid response, done correctly, as per Brooklyn/Queens analysis documentation, should generate a quick and concise report of current network status in response to a network contingency. An "as fast as possible response" is characterized as within 10 to 20 minutes. It relies on a correct connectivity model from PVL through WOLF. It also depends upon the availability of RMS."*

> *"In a fast moving event such as the Long Island City network event, even with an accurate connectivity model, it is not clear the contingency analysis reporting would be fast enough or accurate enough to be effective in advanced multiple contingencies (i.e. a 6th contingency and beyond), but it would certainly help the operators to assess the situation."*

NETWORK TROUBLE INDICATOR (NTI)

The NTI is a predictive network monitoring tool utilized to project the number of customers that may be affected by an outage event. It is an enhancement to the Distribution Information System (DIS) that provides a view of the network loading for each area and the status of the feeders within each network. It also has links to other systems providing supplemental information such as critical customers, banks off, and major accounts. The NTI projected number of affected customers is graphically displayed by network and Main and Services (M&S) Plates with outputs from the STAR system. The color-coded display indicates that a problem on a given feeder or network exists and operator action is required. The NTI has proven to be an effective anticipatory tool for regional operators and engineers.

REMOTE MONITORING SYSTEM (RMS)

V-F39 Presently utilized computer simulation and modeling programs do not provide reliable results relative to the network secondary main load flows.

V-F40 The LIC network connectivity model has been shown to be unreliable. No reason exists to believe that the accuracy of other network's connectivity models are better.

V-F41 PVL and WOLF provide no indication of the confidence level of their computational output, based upon source quantity, and historic vs. real time quality.

V-F42 The default output of PVL reports only calculated present or forecast overload conditions providing a false sense of security to designers. Load conditions near the threshold levels are not typically revealed.

"There are approximately 25,000 network transformers on the Con Edison system." "Each transformer has a remote monitoring system (RMS)[96] *transmitter that monitors the load on each of the three phases of the transformer and the status of the network protector. The RMS transmitter sends the information in near real time to a receiver in the substation, where the data is gathered and forwarded to a central network data receiving system for the company…"*

The first generation of RMS transmitters, representing 58% of total installations, provide basic phase load readings and associated network protector status. Second generation transmitters, 38% of total, are internally mounted in network protector enclosures. They provide improved signal strength and additional data in regard to phase voltages. The newest, third generation, of transmitters adds readouts for tank pressure, top oil temperature, and oil level to the data stream.

"The remote monitoring system for the Long Island City network is unique because of the number of transformers." "Since the number of transmitters exceeds the design limit for the standard receiver; transmitters are connected to different phases. This effectively increases the number of transmitters that can function within the network. The Committee believes this complexity was responsible for at least ten transformers not properly reporting to the RMS system after being transferred from another feeder as part of summer preparation work. Several of these transformers are located in the vicinity of the initiating event on July 17th."

"Due to the harsh underground street environment in which transmitters are required to work, their annual failure rate has been about 6%." "For various reasons, the monthly availability of RMS in the Long Island City network has ranged from 81% to 90% since 2002. For the first six months of 2006 its availability averaged 83%. Just before the event started, its availability in the Long Island City network was 77%." "Overall, the reporting rate of the modules with temperature sensors is at 89.23%."

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[96]/ Incident Investigation Committee (Donohue) Report pp 106 – 112.

"As part of the summer preparedness, diagnostics were performed in March on the feeder pick-up coils for the Long Island City network. Four were identified as needing replacement to permit full signal sensitivity and resolve some of the units not reporting on feeders 1Q02, 1Q11, 1Q20 and 1Q21. Replacement of these coils requires an outage to the feeder. One of the feeder pickup coils was replaced (1Q20) prior to the Long Island City network incident. The three remaining coils were not replaced, although records indicate that these feeders had been taken out for scheduled work at least once before July 17, 2006."

Following the LIC event, it was discovered that replacement of individual RMS transmitter units could not be tracked due to the absence of any records kept of ID numbers for that purpose.

A complicating factor of non-reporting RMS units is the automatic substitution of estimated or historic data by WOLF for real time data without the knowledge of the operator. Decisions made on the basis of unidentified data can prove costly when the expectation is that real time characteristics are the source of calculations. *"Con Edison Information Resources (IR) estimates the usable RMS availability requires a threshold at 85%. The Committee has been informed that a study is being conducted to more precisely determine the threshold value."*

"Limited actual RMS data combined with flawed connectivity models in PVL, have the potential to develop seriously flawed analyses when used in a critical operating situation or for summer preparation activities and capital investment option analysis. The Committee believes that the state of the PVL model, combined with the overall reporting rate in RMS, contributed to the secondary problems encountered."

V-R12 Develop and implement changes to PVL and WOLF that lead to improved results and greater confidence. (Refer to Finding V-40, 41, 42 & 43.)

Specific actions considered, should include:

- Concentrate on implementation of method(s) to gain real time readings at a sufficient number of secondary main locations to provide programs such as WOLF reliable data to supplement presently utilized historical data;
- Con Edison should establish a group with sole responsibility to check, verify, update network connectivity model databases in each region;;
- Con Edison should prioritize modifications to PVL & WOLF to include the degree of confidence, possibly in the form of a calculated error function, associated with output groupings;
- Default output for PVL should be revised to provide output revealing load conditions above, say 90% of ratings for emergency modeling and 70% of normal ratings for feeder reinforcement design.

PQ NODES

PQ Nodes is an EPRI developed and supported implementation of high speed waveform recording equipment at substation bus locations to allow analyses of quality of power delivered. Voltage and current waveforms are recorded and retrievable subsequent to an event such as a feeder fault or CB operation. Typical access of the recorded waveshapes via PQ View requires identification of the precise time of the event as listed on an event recorder display or printout and then searching the appropriate PQ Nodes database timeframe for observation of the associated waveshapes.

The time, approximately one hour, associated with retrieval of PQ Nodes data makes it a valuable analysis tool subsequent to an event of interest but not typically for immediate utilization in the midst of an emergency such as the LIC network occurrences of summer 2006. Con Edison's response to City and DPS Staff recommendations indicated all Area substations in the Bronx, Queens, and Manhattan now have PQ Nodes installed and RTF tuned for the networks served.

The present intention is to replace substation feeder breaker protective relaying with microprocessor based relays which are said to be capable of immediate waveshape retrieval.

NETWORK TROUBLE INDICATOR (NTI)

V-F43 <u>The value of the NTI is dependent on the integrity of the input data. The RMS utilizes a relatively dated power line carrier technology to transmit RMS data to the DIS. In addition the RMS transmitters have experienced high failure rates due to high moisture problems in the manhole. The loss of this critical data will significantly reduce the effectiveness of the NTI.</u>

The Distribution Information System (DIS) is an intranet-based system that consolidates and displays information about the entire electrical distribution system. The Network Trouble Indicator (NTI) system is an enhancement to DIS that uses an algorithm to establish a means for projecting the number of customers that may be affected by an outage event. NTI analyzes data from the Remote Monitoring System (RMS) and from customer calls via Emergency Control System (ECS) trouble tickets. NTI will trigger alerts when predetermined thresholds are exceeded providing operators and engineers with an early awareness of network problems and potential customer impacts.

The NTI utilizes an algorithm that projects the number of customers out based on pre-defined levels, the affected network(s) and M&S (Mains and Services) Plate(s). A color coded alert is displayed on the DIS display and is integrated with the STAR display.

Algorithms have been developed to establish a means for projecting the number of customers that may be affected by an outage event. These algorithms use a regression analysis equation where '*y*', the resultant value, is the function of several input variables:

$$y = aX1 + bX2 + cX3 + dX4.$$

X1 = customer outage calls and miscellaneous problems (e.g., flickering lights) weighted to reflect severity of the call type and the customer density of the relevant M&S Plate. For example, an 'No-light Area' (NLA) () call is rated with a *Severity Factor* of 2 while an 'No-Light' (NL) call is rated with a *Severity Factor* of 1.

The *'Customer Density'* of the plate was also incorporated by dividing total number of customer outage calls received by the total number of customers associated with the plate. Consequently, X1 is higher when the call types are more severe and when a higher percentage of customers on the plate are calling to report an outage.[97]

X2 = the weighted physical damage on the plate. This component is determined by the number of *'Physical Damage'* calls, again rated with a *Severity Factor* and again scaled to the total number of facilities on a plate. For example, an 'MHX' (Manhole Explosion) call is rated with a *'Severity Factor'* of 2 while a 'Smoking Manhole' (SMH) call is rated a 1. The actual impact is then scaled by dividing the total number of physical damage calls received by the total number of facilities on a plate.

X3 = Banks-Off, from the *'Banks-Off'* data base. This term is expressed as the percentage of banks that are de-energized at the time the calculation is being performed. This should be *near-real time* data.

X4 = Fuses-Open, from RMS or system monitoring which indicates open protectors or open connections to the secondary network.

A weighting factor based on either the summer or winter season is applied to each variable.

Based on interviews with the Regional Control Center Operators, the NTI has proven to be an effective tool, which has enabled the operator to improve more quickly analyze a given network problem and dispatch crews to address the associated problem. Corporate IT is continuing to improve the graphics and visualization capabilities to make the NTI more user friendly.

Longer term planned enhancements to the NTI include:

- the ability to drill down into an M&S Plate to the city block level;
- the incorporation of additional inputs to the algorithm including transformers, open mains, and others.

V-R13 Improve the primary sensors, transmitters and signal transfer technologies to increase the integrity of the RMS data. (Refer to Finding V-F44.)

Utilization of the Network Reliability Predictor, the Jeopardy System

V-F44 The current load flow input to the Jeopardy system Poly Voltage Loadflow model is overly complex, dated, and is based on an inaccurate connectivity model.

To assist the distribution engineer in making complex decisions associated with the dynamics of the distribution network, the Company has developed a computer based

[97]/ DR 173.

analytical tool referred to as Jeopardy. The system utilizes a broad data base of network component data and ratings from several sources including: CAJAK, a database of component failure history; the Poly Voltage Loadflow (PVL) models (i.e., pick-up, shift factors and ratings); the Geographic Information System (GIS) database (i.e., feeder cable sections, derived joints, and transformers); and other related sources of information (e.g., temperature) as a basis for integrating the real time physical conditions associated with a given feeder. The Remote Monitoring System (RMS) provides the raw source of data for the network analytical systems. The Jeopardy program is an anticipatory tool utilized for determining the impact a switching operation, load transfer, or a heat wave has on a network feeder.[98] It includes the following sub-programs.

- The "Contingency Program" is a planning tool utilized to predict the anticipated reliability of the networks over an extended period (20 years). The Program runs up to 10,000 iterations of a 20-year simulation in order to achieve a convergence. The program is typically utilized by the distribution engineer when making more long term decisions associated with the pending modifications to a given feeder.
- The "Monitor Program" is a more short-term anticipatory tool utilized to predict the reliability of a given feeder over a seven day period as experienced during a heat wave. Actual feeder outages and the forecasted temperatures for the pending heat wave are inputted. The program then runs a 7 day simulation for up to 1,000 iterations. The program output is utilized by the distribution engineer in support of the regional operator's process for implementing switching changes or load transfers.

Various failure indices were established for cable sections, joints, transformers, and related equipment and further defined according to age and vintage patterns, heat waves, temperature ranges, and voltage levels. If the program predicts that a given network or section of a network is at risk of failure, in jeopardy, other alternatives can be applied or resources can be dispatched to mitigate the likely failure.

The Jeopardy program has proven to be an effective tool for predicting potential network problems especially during summer heat waves. The system currently utilizes the PVL system for load flow input data. The PVL program is extremely complex, cumbersome, and difficult to ensure accuracy. In addition, due in part to its age and inherent complexity, the PVL connectivity model has been found to have many errors. To address the concerns associated with the PVL program, the Company has developed the World Class Operation Load Flow (WOLF) and Auto-WOLF systems. They were developed to quickly analyze an entire network including the current base case and the next worst case feeders, which are currently in service.[99] To maximize the accuracy of the Jeopardy system, the load flow analysis input is provided by the WOLF and Auto-WOLF systems.

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[98]/ DR 194.

[99]/ DR 191.

Improved Weather Forecasting and Modeling System

V-F45 The Deep Thunder micro-weather modeling system has the potential to provide a more accurate and detailed forecast of weather events in the Con Edison region. Integration of Deep Thunder data with the STAR system could enhance the Company's response to a weather emergency and reduce the impact this event will have on interruption durations.

By nature of Con Edison's and most, if not all, electric distribution system designs, the system is continually exposed to a variety of extreme weather conditions including high wind events, thunder storms, heavy snow and ice storms, heat waves, heavy rain and flooding, and tornadoes and hurricanes with the associated storm surge. Recognizing that the local and national weather forecasts are historically inaccurate and lack specificity, the Company is evaluating a contract for services of IBM to develop a more accurate model for predicting the weather with a higher level of resolution and specificity.

The micro-weather modeling system, called Deep Thunder, is currently under development. It is being designed to complement the forecasts produced by the National Weather Service (NWS) and other weather services. Weather will be predicted by gathering observations from sensors on the ground, in the air, and from satellites, which are inputted into a complex mathematical model. Utilizing the processing capabilities of a supercomputer, the resultant model will present a three dimensional model of the weather event moving through the region. It is anticipated to provide a high resolution forecast for the Con Edison region and adjoining areas with a prediction resolution as fine as a square kilometer.

The system will integrate information associated with the status of the distribution system and assist in predicting the impact a weather event is likely to have on that section of the system. The manner in which the data is represented is being designed to be highly customized to visualize the specific weather elements of concern such as severe thunderstorm direction. It is envisioned that the Deep Thunder system will accurately predict the path of a weather event and enable emergency response crews to concentrate their mobilization activities to better anticipate the associated damage and reduce the duration of an interruption.

The Company has been monitoring the correlation of the Deep Thunder system and the conventional NWS and local weather forecasting techniques. Through the past year, the Deep Thunder system has tracked the conventional weather forecasting techniques with a high level of accuracy. Based on these favorable results, the Company is considering integrating the Deep Thunder results with the System Trouble Analysis Response (STAR) system as a tool for the electric operation emergency response management group.

V-R14 Complete the assessment of the Deep Thunder micro-weather modeling system and integrate it with either the STAR system or another emergency response program. (Refer to Finding V-F46.)

Since this could be an important tool for evaluating the extent of storms impact, it should be thoroughly evaluated, and, if functional and cost effective, should be implemented.

Network Preparedness Program

V-F46 <u>The 2007 Summer Network Preparedness Program was behind schedule at the time of this Report.</u>

Specific high priority areas of maintenance, repair/replacement as identified in this Program were not completed as planned, which could negatively impact the reliability of the network this summer. The Con Edison network is designed to the second contingency (N-2). The resultant reliability, which is inherent in this network design, is compromised by a variety of factor including the following.[100]

- Failures of aged Paper Insulated Lead Covered (PILC) cable stop joints.
- Failures of cable splices.
- Network transformer failures.
- Failures of solid dielectric network cables.
- Miscellaneous connector failures.

During extreme load conditions, typically during summer heat waves, all components in the network are stressed. Based on historical information coupled with a given network's short term operating history (experienced a recent auto open event), feeders are selected for either proof testing, repair, or relief. In anticipation of the high load conditions during the summer season, Con Edison has implemented a 2007 Summer Preparedness Program. [101] The program includes the following categories.

- Feeder Relief.
- Network Transformer Relief (new unit installation).
- 4kV Substation Relief.
- Spring Hi-pot Testing.

Many of the specific areas identified in the Preparedness Program were not completed as planned.

Reactance To Fault (RTF) Program

The Reactance To Fault (RTF) Program was started in 2005 as an anticipatory tool to determine the location of a given electrical cable fault, better direct repair groups, and reduce the duration of network feeder interruptions. The system monitors the area substation voltage and current and resultant phase angle during a fault to determine the location of the fault. RTF has proven to be extremely accurate in locating a typical single phase fault.

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[100]/ DR 128.

[101]/ DR 128.

Reactance To Fault (RTF) is an implementation incorporated with PQ Nodes to determine the approximate location of a fault on a given feeder. Fault specific phase angles, X & R values, are utilized to estimate the fault location, to within several structures (vaults, manholes). The value of such fault location is the greatly reduced time requirement for field crews to effect repairs by limiting the extent of searching for faults to a relatively small area and number of structures.

E. LIC NETWORK OUTAGE

The failure of the Long Island City network has been studied by many parties and involves a great deal of complex technical activities, analysis and conclusions. Parties differ on the scope, cause, and options available relative to this outage. Vantage, did not conduct a comprehensive evaluation, however, our scope did include reviews of all of the reports prepared, and more importantly, an analysis of the processes in place for assessing outages, collecting data, and responding to the circumstances.

This section of the report reviews the decision making process regarding shutting down the LIC network. A great deal of additional detail is provided in Appendix 2C, where we provide a scenario of the circumstances that occurred before, during and after the event.

V-F47 Con Edison's decision not to shutdown the LIC network, and the impact that an alternate course of action would have had, has become the subject of several reports and a prudence investigation.

To the best of our knowledge, no comprehensive study has been conducted to determine what an alternate course of action and results might have been. However, the following points are supportive of an alternative course and raise issues about efficacy of the Company's decision making processes during the event.

- An opportunity to apply lessons learned was provided by the Washington Heights network event of 1999 which was an occurrence of primary distribution system overload. Primary feeders were overloaded, the substation bus caught fire, and the network was shut down. Nineteen hours later the network was reenergized and power restored to the bulk of its customers.

- Engineers with responsibility for system design made recommendations during the early stages of the LIC outage to shut it down in order to avoid secondary damage. According to interviews and depositions, associated with Vantage's audit and the DPS Staff's investigation, these concerns were either not forwarded to senior management or were ignored.[102]

[102]/ IR 231 & Staff's Prudence Filing, pg 17

The LIC event of July 2006, in contrast, was characterized by numerous primary feeder outages, to the N-10 level[103] twice, creating excessive load pockets in the secondary network. None of the feeder outages was caused by overload conditions while six were caused by secondary main fires. "…*3 primary feeder OA's and 2 CIOA's resulted from damage occasioned by secondary burnout and secondary fires and an additional feeder OA resulted from a manhole fire.*"[104] The initiating factors of LIC appear to have been localized overloading of secondary mains due to failure of overloaded transformers,[105] The extensive secondary network damage was the result of continued operation under extreme primary contingencies.

While it is easy, in retrospect, to question high stress decisions, the course taken in continuing operation of the LIC network ultimately proved extremely costly to Con Edison and to the community. With the situation spiraling out of control, the result of continuing operation could well have been an even greater level of damage, ultimately, forcing shutdown and potentially resulting in even longer customer outages.

V-F48 Con Edison exhibits an excessive tendency to rely upon the "robust" nature of networks resulting in an insufficient sense of urgency regarding seemingly routine network component outages and related maintenance requirements.

V-F49 An argument can be made that had failed transformers been replaced promptly, the secondary main fire "initiating" the LIC network event might never have occurred.

V-F50 At the initiation of the LIC event, some 7% of network transformers were not providing power to the network for a variety of reasons, the network transformer remote monitoring system (RMS) was operating below the Company's operational standards and had been for several months, and the Company's ability to remotely change substation transformer taps to enable emergency voltage reductions was also compromised because of deferred maintenance.

Evidence has been provided in a number of reports and in interviews with Con Edison personnel that there were a number of events prior to the heat wave that, as a minimum, contributed to the outage. Vantage did not do an independent assessment of this outage, but in auditing the process Con Edison follows for performing maintenance and responding to outages, we provide the following factual summary.[106]

- June 29, 2006, the transformer at VS5447 – four blocks from the initial network secondary fire location – failed.
- July 11th the transformer at V9426 – one block from the fire site – failed;

[103] / N-10 level indicates that ten of the 22 feeders were out of service at one time.

[104]/ DR 226, pg 5.

[105] / DR 226. pp 146, 147

[106] / Incident Investigation Committee (Donohue) Report, pg 49

- July 16th transformer at TM1007 at 25th Ave & Steinway St. recorded with 150% normal load – two blocks beyond VS5447.
- In the early afternoon of July 17th the secondary fire caused fault in feeder 1Q17 and subsequently 1Q16.
- July 17th transformer at V7813 – midway between VS5447 and V9426 failed – it is questionably described as the first transformer failure of the LIC event.[107]
- An attempt to lower voltage by 8% was delayed due to a problematic potential transformer (PT) – known at least two months in advance.
- RMS sensor coils, long known to require replacement remained in place through multiple scheduled feeder maintenance outages.

The tendency of Con Edison's reports and personnel to often refer to the "robust" nature of its network systems appears to identify a corporate mindset minimizing the urgency of the necessity to restore failed network components at the earliest possible time.

The following map provides a visual sense of where major failures occurred that were related to initiation of the LIC network outage. [108]

[107]/ DR 211, pg 46-53.

[108]/ DR 191, Modified pg 48 from Donohue Report.

Audit of Con Edison Outage Management

Exhibit V-10
LIC Secondary Mains

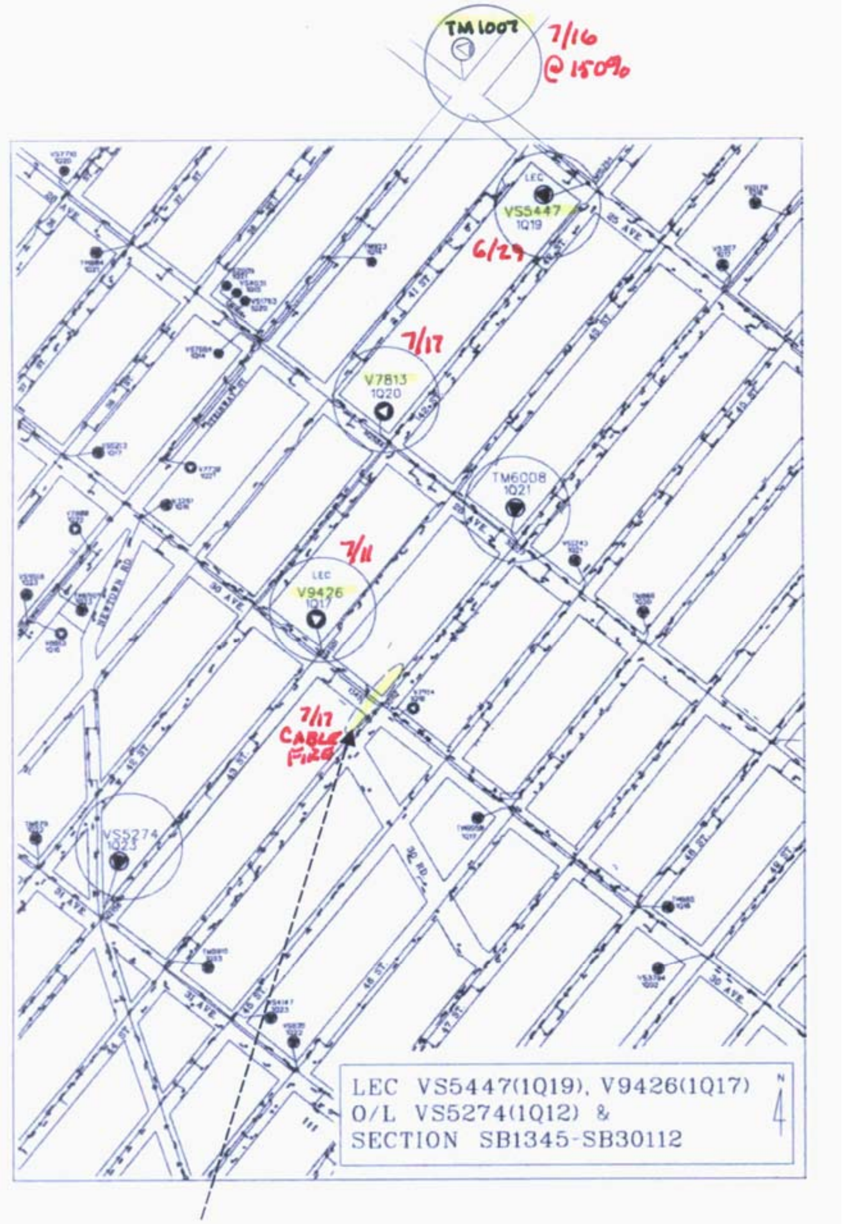

Figure 4: Secondary Mains / VS 5274 (1Q23) / V 9426 (1Q17) / VS 5447 (1Q19) / TM 6008 (1Q21) / V 7813 (1Q20)

V-F51 Many of the occurrences contributory to the cascading nature of the LIC network event could have been avoided if Con Edison was more proactive regarding systems, engineering, operations, and maintenance.

In considering the extent of modifications to systems and procedures as a result of the LIC event, the apparent lack of prior actions seems apparent. Continuing operations on a reactive basis following major emergencies and occurrences should not be the mode of continued business.

The following are cited as examples of unnecessary contributors to the LIC event outage and duration:

- Failures of feeder circuit breakers to trip in response to fault condition due to improper installation of upgrade of sliding contact blocks.
- Failure to identify inoperability of Circuit Breaker (CB) supervisory circuitry prevented the alerting of operators to the inability of CB operation under fault condition.
- Failure to replace potential transformer transducer in timely fashion delayed the voltage reduction process.
- Failure of communication regarding system modifications resulted in nuisance trips upon feeder energizing due to improper relay settings.
- Unreliable data in the LIC connectivity model rendered results provided by WOLF and PVL suspect.
- Inability of the load flow programs, WOLF and PVL to converge at elevated contingency levels made for difficult estimation of system state.
- Exclusive reliance upon modeling software to estimate secondary main load flows is synonymous with a lack of reliable information.
- Operability of RMS units well below the required 95% reporting level further impacted the reliability of information provided to engineering during the event.
- 7% of LIC network transformers were not providing power to the secondary upon initiation of the event for a variety of reasons, impacting secondary main load flows.

V-R15 Reconsider the guidelines regarding network shutdown in EO-4095, and make the decision process more defined and less subjective. (Refer to Finding V-48-53.)

V-R16 Place a higher priority on replacement of failed or nonfunctioning network systems components including transformers, network protectors, and RMS transmitters immediately prior to and during the summer months. (Refer to Finding V-F52.)

TRANSPORTATION CONSIDERATIONS AND NETWORK SIZE

Two major design considerations also need to be addressed as the network of the future is considered. These include provisions for backup power of transportation systems and limits on network size. These are two major issues that are under considerations part of current Research and Development programs, specifically the 3G program. This program is discussed in Chapter VIII.

Transportation Feeders

V-F52 Hesitancy to shut down the LIC network appears to be related to the impact upon public transportation systems.

Public transportation systems were afforded exceptional consideration during the LIC event, therefore, negatively impacting other customers and network components. It is desirable to, where possible, isolate the normal range of customers on a network distribution system from being impacted by the unique requirements of a public transportation customer. Sacrificing the relative long term service to the bulk of network customers in favor of avoiding a relatively short term disruption to mass transit should not be a decision for which a Con Edison is forced to take responsibility. Costs attendant to providing alternate sources of supply/on-site backup generation to any customer, however, should not fall upon a utility. Process industries, for example, often have alternate feeds from a utility, at additional cost, commensurate with the additional reliability and costs of providing same.

V-R17 Consider secondary feeds to high profile customers such as the MTA and Long Island Rail Road when reconfiguring or modifying future networks. (Refer to Finding V-F52.)

Network Size

V-F53 The size of the LIC and other networks may be too large and inflexible to meet the established goals of reliability. Smaller networks with shorter feeders and fewer connected loads are inherently more stable.

The report, On Reliable Networks,[109] speaks of splitting the LIC network into not two, but three or four, individual networks to achieve optimal reliability. The planned Newton Substation is apparently needed not only for future load growth but essential to establishment of suitable reliability for the area.

The report On Reliable Networks recommends the installation of numerous isolation switches in network primary feeders to enhance flexibility and afford the capability to shut down/isolate smaller sections of a feeder. The resulting lower rate of disruption equates to higher reliability.

Also recommended was the application of network feeders such that peak loads are less than 70% of normal ratings for avoidance of higher failure rates during first and second contingencies.

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[109]/ DR 226.

V-R18 Continue development of G3 research on future networks and integrate with long-term Strategic Plan as identified in Recommendation II-R3. (Refer to Finding V-F53.)

F. PREVENTATIVE MAINTENANCE PRACTICES

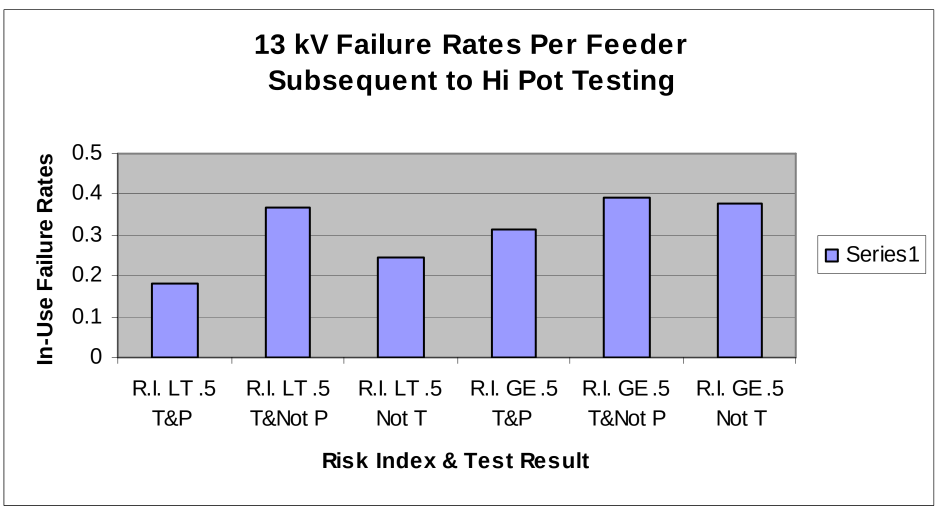
PROOF TESTING OF NETWORK FEEDERS

V-F54 Con Edison's program for Hi Pot testing of medium voltage network feeders appears to be a useful and reasonably effective method of proof testing a suspect network but may result in the premature failure of cable and splices.

Con Edison has an ongoing preemptive program utilizing Hi Pot testing of selective medium voltage underground network feeders during the months of October through May. The intention of the program is to identify by faulting and replacing those components which have seriously degraded insulation capabilities so as to prevent excessive failures and resulting outages during the peak load/peak temperature summer months. The program is said to have a correlation ratio of one avoided summer open auto (OA) circuit breaker operation for each fifth failure on test (FOT) occurrence.[110]

The graph below summarizes an analysis of 13KV failure rates per feeder subsequent to Hi-Pot testing.[111]

Exhibit V-11
Feeder Failure Rates 13kV

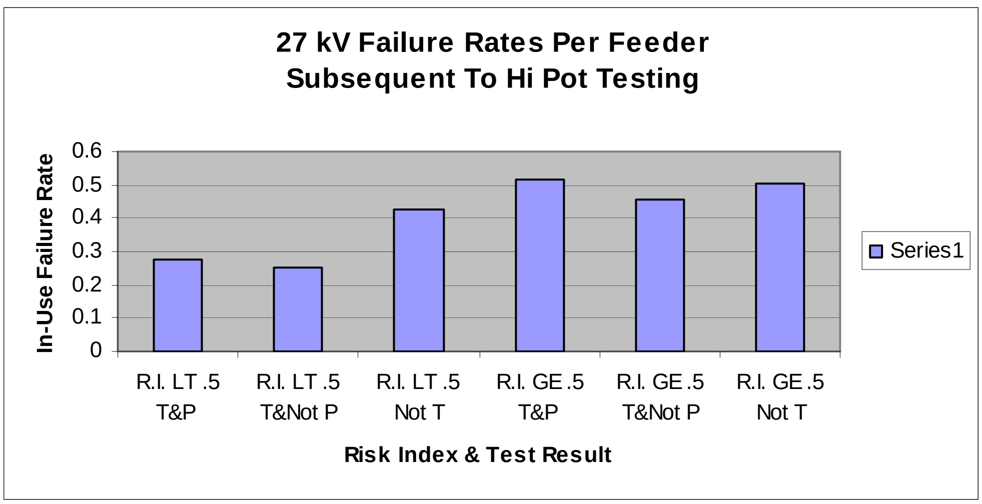


[110]/ IR 242.

[111] / DR 262

Summer failure rates relative to prior Hi Pot testing results demonstrate the relative efficacy of the program. For 13 kV feeders, above, the lowest summer failure rates are found in feeders with a relatively low risk index, i.e. less than .5, and have passed the testing sequence. A higher rate of failures appears for those feeders not subjected to testing, and highest failure rates occur for feeders tested and ultimately returned to service prior to completion of the testing protocol. Results charted above show similar patterns for those feeders with risk indices greater or equal to .5. It should be noted that repetitive test & repair iterations on a given feeder may be required to be considered "passed." Reasons for return to service while "not passed" would include a feeder demonstrating test leakage considered unsatisfactory, but it necessitated reenergizing prior to completion of test & repair sequence due to operating constraints. Both 13 kV and 27 kV feeder failure rates indicated are reflective of the five year period ending in summer 2006.[112]

Exhibit V-12
Feeder Failure Rates 27kV



Relative failure rates for 27 kV feeders are similar to the 13 kV results, however, with some anomalies. Those feeders with lower relative risk indices show lower failure rates as expected. The performance of the "tested & passed" feeders may be an indication of the limitation of DC Hi Pot to force certain degraded components to failure within the bounds of the testing protocol.

It should be noted that the anticipatory practice of utilizing DC High Pot testing to proof test a previously installed network feeder is in excess of industry standards and beyond the cable manufacturers testing recommendations as well as latest IEEE standards .

The VLF square wave AC technology is in the mature stages of study and refinement for 13 kV feeders and somewhat mid-stage for 27 kV feeders. VLF is inherently more effective at forcing compromised insulation to fault under test than is DC Hi Pot testing. Assuming

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112 / DR 262

VLF testing ultimately replaces DC Hi Pot, it is anticipated that an improved method of identifying components with seriously compromised insulation will have been implemented and result in a reduced number of summer OA's.

V-R19 Continue feeder testing with Hi Pot methods as currently practiced until such time as Con Edison completes its evaluation and refinement of the program for VLF testing and determines whether/how to implement same. Continuation of exploration of other non-destructive technologies suitable for the network environment should continue. (Refer to Finding V-F56.)

PREEMPTIVE MAINTENANCE

V-F55 Delayed attention to maintenance and replacement of failed components appears to have been causative in the initiation and continuation of the LIC network event.

V-F56 Feeder modifications without review of Relay Protection Engineering and a lack of sufficient oversight of substation circuit breaker modifications may also have been contributory.

Similar to the Hi Pot program, Con Edison endeavors to perform as much maintenance, replacement, and reinforcement work on network systems as possible during the off-peak months. The intention is to limit such maintenance outages to those absolutely necessary during the times of highest system stress. As stated elsewhere in this Report, such lack of timely attention to required maintenance appears to have been contributory to the cascading LIC network failures during July 2006.

Some 7% of LIC network transformers were not supporting the network load immediately prior to the initiation of the outage event. Network transformers, in the immediate vicinity of the initial secondary main fire of July 17, failed on June 29, July 11, July 17. A nearby transformer was monitored at 150% rating on July 16, (See Exhibit V-3).

RMS receiving sensors were not replaced during multiple feeder maintenance outages. A MV feeder voltage transducer, known faulty for two months, was not replaced during prior feeder maintenance outage(s) resulting in the inability to reduce system voltage for hours after the initial attempt.

It is recognized that the demands of system operation can impact the length of maintenance outages, and result in delayed completion of some activities as is the case with Hi Pot testing. The cited examples appear to represent the 'tip of the iceberg', known only due to the resulting impact upon the LIC outage event.

Mishandled upgrade of substation feeder CB contact blocks resulted in nonfunctioning trip and elevation from 2nd to 5th contingency. Additionally the CB control circuitry, unmodified upon upgrade from stationary to drawout style, provided no supervisory indication of inability to trip under fault conditions. Failure to clear a fault resulted in operation of an upstream bus CB, raising the contingency level from 2nd to 5th.

EO-2147 dated March 07 now requires Regional distribution engineering departments to notify Central Engineering/Relay Protection Engineering of any change in primary feeder configuration that could impact protective relay settings. (See also V-F6 and associated discussion)

V-R20 Enhance the program for maintenance scheduling prior to and during the summer peak periods to ensure that all possible work is completed during any scheduled feeder shutdown. (Refer to Finding V-F57-58.)

CIRCUIT BREAKER UPGRADE PROGRAM

V-F57 The handling of the circuit breaker contact block upgrade and failure to upgrade the associated supervisory circuit appear to indicate a lack of management encouragement of curiosity by employees and a casual attitude of acceptance of long-standing implementations without question.

The circuit breaker contact upgrade modifications at the North Queens area substation were handled in a casual fashion lacking engineering documentation, specification, or sufficient oversight. Lack of adequate rigor in completing the upgrade is also demonstrated by failure to review and modify circuit breaker control supervisory circuitry. A result was failure to notify control center operators of the breakers' inability to trip when called upon for an OA operation. Reliable control and supervisory monitoring circuitry is the hallmark of any utility substation implementation. Lessons learned resulted in tightened procedural requirements for any such activity and requiring the issuance of acceptance drawings and specifications. Sign-offs are now required of the Project Manager, User Group, and Engineering Inspection.[113]

G. MUTUAL AID

V-F58 Con Edison has a well developed plan in place for the requisitioning, administration, logistical support, and management of mutual assistance crews.

V-F59 The initiative being demonstrated by Con Edison to expand the Mutual Aid resources for dealing with a major underground event is commendable. Their continuing leadership of this endeavor will enhance Con Ed's restoration plans and also those of others.

Vantage had the unique opportunity to witness first hand Con Edison's handling of its mutual aid option in two relatively minor storms. The first event was on April 15, 2007, when a dangerous Nor'easter was predicted to impact the service territory.[114] Con Edison prudently included mutual aid resources in their pre storm planning. NYMAG was alerted and a conference call schedule prearranged should the need for crews arise. In this case, the

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[113]/ IR #228.

[114]/ Vantage Consultant Notes.

winds were lighter than predicted and the Company had sufficient resources in place to deal with the storm damage, mostly flooding related. A May 16, 2007 windstorm did require mutual assistance crews.[115] This storm was not predicted to be as damaging as it turned out to be. Con Edison had done its normal preplanning based on weather forecasts and mutual aid was not expected to be required. After the storm hit and then regenerated itself over portions of Northwest Westchester County, it became obvious that this area had sustained some serious damage. There was little hesitancy in making the call for mutual aid which resulted in crews commencing repairs less than 24 hours after the storm hit. This early call for help and the timing of the second wave of workers is a very positive indicator that improvements are being made in the Plan and its execution.

The plan for obtaining mutual aid support at Con Edison has recently been reworked and improved. Con Edison has had more experience as a provider of crews than as a requestor. They have a well written guideline[116] in place when they release crews to others which is consistent with their management practices for their own storms. They use their Incident Command Structure on these out of town events as well. Of course, that all changed January 19, 2006, when the first in a series of four[117] events struck the service territory resulting in Con Edison importing crews versus exporting them.

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Exhibit V-13
Mutual Aid Level by 2006 Event

Dates (2006)	Customers (meters)	Mutual Aid Crews
Jan 19-22	61,500	205
July 18-22 (OH)	50,500	117
July 17-25 (UG)	25,000	106
Sept 2-8	78,300	93

The Company was reminded that each event is unique, and if you are the requesting utility, you will need to be flexible and decisive simultaneously. Companies cannot release crews until they are confident that their customers are not in harm's way. Utilities holding their crews were a factor in the January and September storms and the July heat event. A second issue is the timing of the storm. If it hits unexpectedly or during a holiday period, crew assembly and deployment takes longer. This combination of circumstances hindered restoration efforts in September.

115/ Vantage Consultant Notes.

116/ DR 301 "Guidelines for Release of Company and Contractor Personnel to Provide Mutual Assistance to Outside Utilities".

117/ DR 178.

Con Edison learned from each of these events and has made several changes in their mutual aid planning process. Most of the elements are documented in their May 15, 2007 Comprehensive Emergency Restoration Program (CERP).[118] This updated Program was put to an early test when an afternoon thunder shower escalated into a more serious wind and lightening event.[119]

Audit of Con Edison Outage Management

Exhibit V-14
Mutual Aid Response to May 2007 Storm

Date	Customers (meters)	Mutual aid Crews
May 16-19, 2007	29,402	29

Changes that are already yielding benefits include the following.

- Orange & Rockland crews are now treated like other regional Con Edison crews versus a mutual aid entity. O&R now participates directly in preplanning activities, and their crews, along with other Con Edison and contractor crews, can be deployed as needed.

- Communication with Mutual Aid providers has improved throughout the year becoming more timely in both the planning phase and when actually requesting crews. In January the mutual aid request decision took about a day to make. In the July overhead storm, requests were timelier but did not start with NYMAG or MAMA which may have slowed the response some. The need for mutual aid underground workers in Queens caught everyone by surprise. The Company had no option but to work with their associations and put together a plan on the fly. Mutual aid crews started arriving four days into this event. Planning was better for the September tropical storm with mutual aid dialog commencing six days in advance. Unfortunately for Con Edison's customers, the storm made a radical change in direction in the 11th hour so a crisis that was expected to be averted turned into a major storm event. It took until day three for mutual aid crews to start arriving.

- Increasing the number of knowledgeable crew leaders to work with mutual aid supervisors has proven to be effective. To expand its pool of qualified crew leaders, Con Edison has researched work histories and training records of

[118]/ DR 287

[119]/ IR 240

current employees who had previously held supervisory positions in overhead or underground and those of recent retirees.[120] This effort identified 50 current employees and 25 retirees with overhead experience and 75 current employees and 100 retirees with underground experience that potentially could close the gap of crew leaders. Retirees from overhead were used in the May 2007 storm and feedback from mutual aid supervisors was very positive.

- A plan for underground mutual aid has been developed and is included in the May 15, 2007 CERP document. It is understood that this is a starter plan with much more work to be done. Credit is due to Con Edison for taking the initiative to create the forum for these discussions and to continue on in a leadership role. The Company realized after the July heat event that the pool of qualified underground workers is small when compared to that of overhead workers. In December 2006 they hosted a first of its kind Mutual Aid Conference that attracted twenty companies from around the country. The primary conference theme was about forming an underground mutual aid alliance. Formalizing an agreement will take time as there are regulatory and corporate hurdles to clear. In the short-term however, positive things have happened: a) Companies expressing interest have jumped up to thirty; b) Fifteen companies have exchanged resource lists, including Con Edison, and have expressed a willingness to provide assistance if needed; c) Resource lists[121] incorporate agreed upon definitions of skill sets and equipment which expedites getting the best prepared crews on the job; d) Most encouraging is that all parties are demonstrating active participation in the project with follow-up meetings anticipated.

V-F60 The Mutual Assistance Unit is an effective means to manage the influx of utility workers as was demonstrated in the May 16-19 storm. The minor glitches reported (delayed safety briefings and accommodation issues) have been noted and will be addressed in advance of future events.

The new CERP Overhead Plan has streamlined the decision making process for requisitioning Mutual Aid crews. For single region storms or when the Distribution Engineering Command Post (DECP) is not open, the Electric Operations Emergency Management Director now has the authority to make the request for crews. Even if this simple change just expedites the decision by a few hours, that timing can be crucial. On May 16th the call for mutual aid went out within six hours of the storm's arrival, and crews were beginning restoration work less than 18 hours later.

120/ IR 241.

121/ DR 203

An Operations Mutual Assistance Unit[122] has been formalized and added to the Plan. This group's sole purpose is to manage out-of-company mutual assistance crews during a storm or system emergency. Once a company has agreed to release crews this unit takes over. It manages all aspects of the visiting crew's deployment from mobilization, administration/finance, food/hotel/fuel, materials, technical advice, work assignments, and de-mobilization. The Mutual Aid Unit is staffed by experienced Planners, Supervisors and support personnel including crew guides and crew leaders (% retirees). This organization provides a single point of contact for the mutual aid crews, and that is just what they are looking for. Mutual Aid crews are typically very motivated, and they just want to get out there and get the lights back on. This unit will help get crews to jobs faster, their work will be better planned, delivery of materials more coordinated, communications strengthened, and start-of-day and end-of-day delays minimized.

Con Edison is very specific, strict actually, in its requirements that all foreign crews work in compliance with its standards and practices. Upon arrival all crews receive a 15 page booklet, "Electric Emergency Management Mutual Assistance Guide".[123] The booklet, in a very straight forward and organized way, spells out the "musts" for compliance with Con Edison and OSHA safety rules, work practices, and dealing with environmental hazards. It has sections on the OSHA required Job Briefing, accident reporting, and Con Edison's "Time Out Procedure." Administrative questions are addressed and important telephone numbers included. Lots of good information for supervisors and crews is included.

The Company's planning for logistical support of mutual aid crews is excellent. Hotels have been pre identified and agreements are in place to accommodate and feed emergency workers. This would include local Con Edison crews and regional crews if necessary. When practical, workers are dispatched directly to jobs from their hotels. Vehicles are fueled on site and off shift to eliminate that delay.

The logistics plan covers everything from simple storm kits issued to crews upon arrival to the bulk materials they will need for repair work. Reserves of storm materials are set aside at Astoria and East View. Some of the smaller Work Out locations have PODS set aside with basic materials to be used in the early phase of a storm. New marshalling areas have been established to relieve congestion at Work Out locations. A host of other services have been lined up to aid crews throughout their stay. Much effort has gone into this part of the plan, and it is obvious that the planners have taken lessons learned to heart and have listened to the clients that they serve.

Performance evaluations of responding Mutual Aid organizations are part of the post event lessons learned process. The Mutual Aid Section Chief would typically provide this feedback. Any problems with individual crews, i.e., safety violation, would be dealt with on the spot by the Crew Leader and Supervisor. In the rare case where there would be problems, i.e., overall performance with a group of crews or a responding company, that

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122/ DR 301.

123/ DR 326.

would get bumped up to the leads of the Mutual Aid organizations to handle. Presently Con Edison has no preferred (or excluded) Mutual Aid provider companies. Basically, whoever has crews that can get there the fastest are tapped to assist. With more experience with different providers this could be refined over time.

Con Edison, as an EEI member, is signatory to its Mutual Aid Agreement[124] and is governed by the principles covering emergency assistance between Edison Electric Institute member companies. Membership in EEI provides Con Edison access to a national network of investor owned utilities that have agreed to render assistance.

On the regional level, Con Edison is a member of the New York Mutual Aid Group (NYMAG) and cooperates with neighboring mutual aid organizations which includes the Mid-Atlantic Mutual Aid Committees (MAMA). NYMAG has seven members and MAMA has ten.[125]

When a major event is forecast or a storm does more damage than was expected, conference calls are set up, often jointly, with NYMAG and MAMA Representatives. The agenda for these calls is standard and efficient. The level of cooperation between companies is quite extraordinary. Each representative on the call realizes that it may be their company that desperately needs help the next time around so they set good examples. Of course, the most important part of the call deals with the specifics of the request. Dependent upon the nature of the storm, different resources will be requested. There is not an extensive menu of resource options, but it does cover generic requirements. The more specific a company can be with its request the more effective the crews will be once they arrive on site.

NYMAG holds two conferences each year. Both conferences are hosted by one of the member companies on a rotating schedule and provides the opportunity to compare notes on storm preparation plans check out storm operations centers and any new tools, i.e., STAR, meet with experienced storm managers, and, of course, see what the work environment is like in that area. In the Company's service territory the dense and apparently weakened forest is an obvious concern, but there are other things too that might help better prepare crews when traveling to Con Edison. For example, a) Poles are very congested with multiple open wire circuits including high voltage cables. b) Pole top transformers are larger and some, especially the three phase single tank units, could exceed the lifting capacity of some material handler vehicles. c) Con Edison distribution poles are taller and higher class (heavier) than those used by some other utilities. Pole trailers may not accommodate the poles or there may be local restrictions for hauling poles like those on Staten Island. d) Crewing suggestions have come out of lessons learned that warrant discussion For example, one line clearance crew per mutual aid supervisor would be very helpful, especially in Westchester; the responding utility should bring its own mechanics to work on lift and derrick equipment; clerical support would help expedite the hotel check-in

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124/ DR 299.

125/ DR 300.

process for their crews and assist with time and expense reports; and Safety Specialist should be present to monitor and advise their own crews.

Con Edison is scheduled to host the second 2007 NYMAG conference. This provides the Company with the unique opportunity to solicit feedback on their restoration planning and performance in 2006 and 2007 and how they might make improvements in the future.

Agenda items to consider include:

- an inventory of skill sets and equipment, similar to that done as part of the Underground Mutual Aid Conference;
- invite Planner/Supervisor's that may have participated in any of the 2006 overhead events/the May 2007 event to share their experiences of what worked well at Con Edison and what needs improvement;
- review the substantive changes made to CERP and solicit feedback;
- address the specific challenges of working in the Con Edison environment and explore ways that these could be mitigated some way in advance.

H. SAFETY

V-F61 Con Edison's Comprehensive Emergency Response Program incorporates relevant safety directives and references throughout and exceeds expectations.

The mission statement for the 2007 Comprehensive Emergency Response Program (CERP) makes clear that there can be no compromises when it comes to ensuring the safety of the workforce and the public.

> *"Our mission is to execute an appropriate emergency response plan commensurate with the forecasted or realized emergency with the objective of restoring electric service to our customers as promptly and as safely as possible. To achieve this mission our continued focus will be on the safety of our operating personnel, the public, and the environment and the timely information to our customers, public officials, and the media."*[126]

Judging whether electric service was restored promptly can be subject to much debate as evidenced by this and many related reports. Safety performance, on the other hand, can be evaluated much easier, often with the answer to a single question. Was anyone injured, yes or no? Con Edison's safety data for the four major events in 2006 succinctly summarizes their performance.

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[126]/ DR 287 Comprehensive Emergency Response Plan Section I-1.

> *"There were no public or employee injuries or accidents directly related to the January 18-22,[127], July 18,[128], September 2-3,[129], 2006 Westchester overhead storm(s)."*
>
> For the Long Island City emergency: *"Between 7/17 – 7/25 2006, two Company employees were reported injured…and there were no public injuries."*[130]

Exceptional safety performance during major emergencies is more the norm than one might expect. After all, the many risk factors that can lead to errors and accidents are present and amplified. Examples include complex repairs, abnormal circuit configurations, restricted access, working with new personnel, public and media pressure, and of greatest concern, worker fatigue. Even with all these risks present, rarely do they compromise worker or public safety? The most common reason cited for this anomaly is the event itself. Large storms bring out the very best in the field workforce. Workers take pride in what they are doing, often feedback is personal and positive, everyone is focused on a common objective, employees are constantly looking out for the unexpected to protect themselves and co-workers, and teamwork abounds. Sustained excellence in safety is due, in part, to this storm mentality, but it is also due in part to good planning and execution of those plans. Storm management, worker focus, and public awareness are all areas that Con Edison is constantly striving to improve.

Planning

V-F62 <u>Con Edison's regional and system restoration plan documents are consistent in their approach to safety.</u>

Safety is not just one over arching generalized goal, rather, it is the sum of many fully integrated parts. Examples: Preparatory tasks are spelled out; recovery priorities clearly stated; safety plans are event specific; safety compliance is monitored; worker/public incidents are meeting agenda topics; 'safety as priority' is incorporated in all communications; key assignments are on checklists of the responsible persons and the senior supervisors' in ICS; and all these elements are blended seamlessly into all documents.

Supervisory positions in the Incident Command Structure (ICS) organization must complete additional training to ensure their responsibilities regarding the health and welfare of the workforce and the public. An excerpt from one segment of Incident Commander Training helps to underscore the impact decisions can have. "…Failure to follow the Emergency

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[127]/ DR 105 Con Edison Part 105 Report, January 18-22, 2006 Severe Wind and Rain Storm.

[128]/ DR 242 Con Edison Part 105 Report, July 18, 2006 Severe Thunderstorm.

[129]/ DR 113 Con Edison Part 105 Report, September 2-3 Tropical Storm Ernesto.

[130]/ DR 118 Con Edison Part 105 Report, Power Outages in Northwest Queens July 2006.

Response Plans can have the following consequences: injury/death to personnel, or contamination of personnel, equipment and the environment."[131]

Restoration planning documents also dictate priorities for ICS staff. Top on the Incident Commander's checklist are the recovery priorities. Number one is public safety. "Live Wires Down, in conjunction with municipal officials, down wires will be cut and cleared to eliminate hazards and allow restoration up to the service break."[132] Checklists are hardly needed to remind managers about the priority of public safety. This is already well embedded across the Organization. The checklists are there for those that opt to use them however.

Other items addressed right up front on that checklist include:

- individual customers dependent upon Life Support Equipment are given a high restoration priority;
- critical customer outages such as hospitals, water supply and sewage treatment facilities, nursing homes, police and fire stations, telephone facilities, radio and television stations, and public transportation are to be addressed prior to commencing general repairs;
- ensure Environmental, Health & Safety Officer coordinates Safety Briefings and Tailgate Talks and that they are conducted for all field crews;
- review the Safety Plan;
- ensure Refresher Training for employees who will be doing other than their normal work is provided.

Employee and public safety directives are equally clear for the Operations Section Chief.[133]

- Ensure Pre-Job Safety Briefings and Emergency Tailgate Talk are conducted for all field employees.
- Ensure the following prioritization of Municipal Tickets is followed:
    - immediate safety concern: Wire down and burning –PD or FD standing by;
    - environmental;
    - transformer on fire – PD or FD standing by;
    - sewage/water treatment or schools – no power;
    - wire down hindering traffic - PD or FD standing by;
    - public safety risk: tree on wire, low wire, leaning pole – PD or FD standing by;

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[131]/ DR 134 SAF 3001, Incident Commander Training.

[132]/ DR 327 CERP Position Checklists.

[133]/ DR 327 CERP Position Checklists.

- traffic signal out.

Section 6 of the Comprehensive Emergency Response Program provides standard agendas for the various meetings and telephone conference calls mandated by the Programlan. Safety is appropriately a part of those communications. For example, in the Command and General Staff meetings held every 3-4 hours, the EH&S Officer reports on the following.

- Number of industrial accidents and details.
- Number of vehicle accidents and details.
- Number of environmental spills.
- Safety Incident Action Plan update and points of emphasis.

Section 7 of the CERP provides a list of important safety materials for ICS staff and field supervision's reference. The documents are easily accessed and serve as reminders to supervisors and employees to be alert to signs of worker fatigue. Topics included:

- Fatigue and Driving Safety Talk;
- Inability to Concentrate;
- Slower Reaction Time;
- Impaired Judgment;
- Being Easily Distracted;
- Drifting Out Of Lanes;
- Missing Traffic Signals;
- Tailgating;
- Calling a Time Out.

Inclusion in departmental business plans is another method that Con Edison employs to maintain focus on safety results and the initiatives that support those goals. Key goals, such as the OSHA Injury Rate, influence annual compensation of senior officers and managers.

Electric Operations 2007 Business Plan[134] includes the following Public and Employee Safety programs/initiatives. (Note that several have subcomponents and not all are part of the Management Variable Pay Plan.)

- Stray Voltage Mitigation.
- Overhead System Safety.
- Manhole Events.
- Transformer Events.
- Quality Assurance.
- Shunt Removal.
- Damaged Poles.
- Streetlight Repairs.
- Employee Training.

[134]/ DR 183 Electric Operations 2007 Business Plan.

- Employee Injuries.
- Vehicle Safety.
- Communications.
- Event Analysis.
- Union – Management Safety Committees.
- Field Compliance Audits.
- Recognition Programs.
- Implementation of New Initiatives.

Workforce

V-F63 Con Edison continues to make every reasonable effort to ensure the safety of all its emergency restoration employees.

Keys to working safe are many, but no two are more important than training and maintaining employees' focus. Con Edison is aggressive in its efforts to address both in its day-to-day operations and when in storm recovery mode.

Con Edison's internal workforce receives some of the best training in its industry. Overhead Line Workers must complete a rigorous apprenticeship and pass numerous written and practical examinations before becoming certified to perform the highest level work, which includes trouble restoration. Underground Worker training also includes documentation of work experiences and written and hands on testing. The 13-week splicing lab/school is nationally recognized and is particularly challenging. Just 70% of its students successfully complete this program.

Training is a career long endeavor for Con Edison employees. Skills are constantly being updated with On the Job Training modules, OSHA refresher training, safety training, and lessons learned bulletins. This investment in training pays its biggest dividend by teaching employees how to work safe and how to protect co-workers and the public.

Vantage consultants reviewed Corporate Safety Procedures and General Safety Rules and Regulations. Environmental, Health & Safety (EH&S) staff are responsible for issuing new or updated procedures, developing or reviewing training programs with The Learning Center, and acting as Subject Matter Experts for EH&S issues. Local EH&S supervisors are responsible for administration of programs, ensuring compliance, investigating accidents, and generating lessons learned or near miss reports.

The most common safety manuals found in the field were the Overhead Work Rules, (referred to as the Green Book), General Electric Work Rules (Blue Book) and the EH&S Environmental Rules (White Book). The longer range goal (3-5 years) is to have computers in all field vehicles that will allow immediate access to all the latest safety rules, procedures, guides, etc.[135] Trouble Shooters and selected field supervisors have already been issued these computers.

Items reviewed included the EH&S plans on file for contractors Welsbach, Hawkeye, Island Technology and Asplundh and Corporate Safety Procedures CSP 01.00 thru CSP 29.00. This series of Corporate Safety Procedures were mostly regulatory mandates covering a wide range of topics. Issue or revision dates were typically within the last three years and content was current.

Con Edison gives equal attention to employees that may be working in temporary assignments. Site Safety Representatives, Damage Assessors, Crew Guides, and Crew Leaders all receive initial and refresher training that places its emphasis on worker and public safety. The introduction of the Overhead Storm Emergency Field Damage Assessment Manual[136] illustrates the universal safety messages that these employees receive.

"The Way We Work is Safely"

> "Always remember that everything we do should be governed by these concerns in our damage response.
>
> - Concern for the safety of ourselves, our coworkers and the public.
> - Concern for the environment.
> - Concern for the needs of our customers and the public at large."

"Five Safety Smarts"

- DO NOT TOUCH any fallen wires or any objects in contact with fallen wires.
- Keep yourself and the public away from water or metals that may be in contact with a fallen wire.
- Avoid hazardous substances that may be released when equipment is damaged.
- Report adequately dressed for the weather conditions.
- Always maintain a high level of awareness in a shifting environment.

Line and tree contractor crews are typically early responders during major storms. Contractor employees are required to have similar skills and safety training as Con Edison employees. Contractor pre-qualification procedures require training documentation and disclosure of safety statistics. Contractors are closely monitored and are given special safety briefings[137] before commencing with restoration work. Key elements include the following.

Time Outs

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[135]/ IR 170.

[136]/ DR 295 Con Edison Overhead Storm Emergency Field Damage Assessment (training) Manual.

[137]/ DR 244 Electric Operations Safety Talk for foreign crews.

If you believe that a safety or environmental hazard exists and you cannot resolve it with your supervisor, then state that you are **Calling a Time Out** and call the EH&S Desk (914-925-XXXX). The work will stop until the issue is resolved.

Job Briefings

Ensure that a Job Briefing which covers Hazards, Procedures, Precautions, Energy Source Controls, and PPE is conducted before the start of every job and whenever a job changes.

- Personal Protective Equipment.
- Work Area Protection and Hazards.
- Basic Systems Information.
- Basic Electrical Precautions:
  - Treat All Downed Lines as Alive;
  - Verify By Testing;
  - Back Feed- assume there is a back feed from a customer premise, treat everything as alive.

Mutual Aid crews are provided detailed briefings[138] containing all the information contractor crews receive but with added emphasis on the Con Edison work environment, i.e., operating voltages, construction standards and practices, and its mandate that all foreign crews must work to the highest of two safety standards, Con Edison's practices or the responding company's, whichever provides the greater amount of protection for the worker.

I. FACILITIES

V-F64 Con Edison facilities adequately support the requirements of the Incident Command Structure (ICS) organization as it is described in the Comprehensive Emergency Response Program (CERP).

Vantage Consultants toured the Control Centers and major Work Out Locations in each region. All locations were prepared to accommodate an Incident Command organization and its supporting staff per CERP guidelines.[139] CERP requires certain groups in the Emergency Management Center (EMC) to work in close proximity to each other. Ideally the Incident Command Area (ICA), Emergency Information Center (EIC), Control Center (CC), and the Engineering and Planning Area (EPA) would all be contiguous. The Control Center Managers, working with Facilities, have areas pre-identified for each of these functions and have ensured the availability of support equipment, i.e., extra telephone lines, computer

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[138]/ DR 326 Electric Emergency Management Mutual Assistance Guide.

[139]/ DR 287 Comprehensive Emergency Response Plan, Section X.

docking stations, and monitors. Manhattan has taken the extra step of including office area layouts in its Underground Plan.[140]

The other three Incident Command Structure sections, Administrative/Finance, Logistics, and Operations are more typically located in others areas. Administrative/Finance often utilizes its normal work areas while Logistics and Operations set up off site. These arrangements are consistent with CERP.

It is the Operations Section that presents the most challenges to Facility planners. The Operations organization for large storms is established at a pre-designated Work Out location. For example, in the Bronx-Westchester plan, storm restoration is managed from the East View service center; in the Staten Island plan, Victory Boulevard is the designated location. Office space is limited so preparing areas for temporary use in emergency response situations required a lot of cooperation between departments. Like the Emergency Management Center layouts, Operations requires certain groups to be in close proximity, i.e., Line Clearance planners need to be near their counterparts in the Overhead Divisions and the Mutual Aid Unit. Work Out location inspections and interviews indicated much has been accomplished and that lessons learned are being considered as facilities continue to be upgraded to meet future needs. The Manhattan Underground Planner made it a point to share how much easier and faster it was to get his Ladder Line crews into the field when working in Westchester because of the changes/improvements they had made.[141]

V-F65 <u>Con Edison's Facilities are adequate to support Company and foreign crews during large scale emergency restoration efforts.</u>

Full scale storms, especially overhead events, require major increases in resources, particularly Line Workers. Added crews, with their vehicles and support equipment, along with incoming materials and supplies, can quickly exceed the capacity of most Company Work Out locations. The resulting congestion slows restoration efforts. Con Edison has effectively addressed its congestion issue by diverting field crews to alternate sites.[142] Initiatives include the following.

- Inbound crews, both from other regions or mutual aid entities, are being directed to job sites and are by-passing Work Out locations. This has resulted in repair work commencing faster and the reduction of congestion delays at service centers.

- Hotels for workers are doubling as assembly/marshalling areas. With 180 hotels around the service territory ready to accept restoration crews, this gives storm

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140/ DR 287 Comprehensive emergency response Plan, Section 4, Appendices 1 & 2.

141/ IR 249.

142/ IR 168.

managers more options to keep crews away from Con Edison facilities.[143] Note: Two issues surfaced during interviews with out of area Con Edison crews and Mutual Aid workers that were passed along to the Company for quick resolution. Vantage was assured both would be addressed. The first was the practice of having crews check-in and check-out of rooms each day. Granted, this may be appropriate as a storm wraps up but as a common practice it is disruptive. The second issue was management's reluctance to notify out of region crews in a timely manner if they would be housed locally or required to commute back and forth from their own work centers. Commuting time can certainly delay restoration work and any measures the Company can implement to keep its workforce focused benefit all parties.

- In addition to hotels, 20 stand alone marshalling areas have been identified for use on as needed bases. These sites can be used for secure vehicle/equipment storage, material depots, vehicle fueling, and more.

- Five of these sites are considered "mega sites"; Landmark, Valhalla, Camp Smith, Play Land and Yonkers Raceway. Each of these sites can handle up to 600 crews should a major disaster, like a coastal or ice storm, strike the area. Note: Con Edison has prudently secured marshalling areas capable of handling the large workforce that would be needed to deal with a catastrophic event like a Katrina coastal storm. They are aware that internal resources would not be adequate to provide the logistical support required for all five sites. The Company has determined that, with good planning, they could support two 'mega sites.' They are in discussions with vendors that offer logistical support services and, as part of their ongoing planning process, expect to have options available for this support in the near future.

All of these measures help reduce stress on Con Edison operating facilities which in-turn makes restoration efforts more efficient.

V-F66 <u>Con Edison has upgraded its Mobile Field Command Center units and expanded its fleet of Customer Outreach Vans</u>.

Con Edison has three Mobile Field Centers (MFC) designed to support corporate and system emergencies.[144] The units vary in size and are targeted for use in different level events. The smallest van would be useful in a site specific event, supplemental Customer Out Reach vehicle or as a dispatch center for mutual aid crews. The mid-size unit could be similarly deployed. What the units share in common is their ability to operate as a stand-alone facility. All three have generators on board, communications equipment, computers, monitors, copiers, facsimiles machines, and roof mounted air conditioning/heating units.

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143 / During one flooding event in the spring of 2007, there was a shortage of hotels, but according to Con Edison, hotel rooms are generally adequate.

144/ DR 160 CFS 1-2, Corporate Emergency Field Center.

Vantage Consultants toured the newest and largest of the three, nicknamed the "Blue Bus." New phones, computer docking stations, LCDs and enhanced external video monitoring represented some of the recent upgrades. The vehicle easily accommodates eight workers, i.e., an Incident Commander and staff and has a video conferencing area that could accommodate 15 individuals for short duration meetings. This is an impressive vehicle that certainly enhances the Company's ability to manage a variety of emergency scenarios effectively.

Customer Operations added the second of two new Out Reach vans in June 2007. They now have three vans which have been strategically placed around the service territory for fast deployment during emergencies. Like the 'Blue Bus', they have wireless communications systems, roof mounted AC/heat units, on board diesel generators, computers, printers, docking stations, and a public address system.[145]

V-F67 Con Edison has adequate resources to operate and maintain those facilities utilized to support its Comprehensive Emergency Response Program's regional storm plans.

Good planning and preparatory efforts by the Construction Field Organization has mitigated facility related risks to restoration programs. Advance work such as modifying office layouts and adding cables for new telephones and computers has been beneficial. Facility Operations have detailed plans in place to protect, operate, and maintain Con Edison properties. Like other responding departments, employees are deployed to key locations to make repairs and maintain systems as required. Contracted services such as janitorial, waste management, and security are all put on alert to be prepared to add staff or extend hours to support the effort.

The Facilities section in the Coastal Storm Plan[146] provides much site specific detail applicable to either a system wide emergency or a large regional event. Efforts to update and improve that plan have improved the department's capabilities to support and assist during lesser but more frequent regional events.

VI. COMMUNICATION

This Chapter of the Report addresses the work most related to customers, municipalities, and other agencies with whom Con Edison must interface. Topics include:

145/ DR 190 Long Island City Event-Internal report Recommendation #15B. Updated 5/10/07.

146/ DR 209 Coastal Storm Plan.

- Customer Information and Call Center Operations;
- Media Relations;
- Public Officials; and
- Department of Public Service.

A. CUSTOMER INFORMATION AND CALL CENTER OPERATIONS

During an outage event, the flow of information from and to customers is crucial. The flow of information to customers is governed primarily by Customer Service Procedure 2-0-1, Customer Operations-General.[147] The procedure describes the actions that Customer Operations will take to ensure that customers and Customer Service Representatives (CSRs) receive consistent, timely, and accurate information during the course of a corporate event.

However, a key component of the restoration process is for customers to contact Con Edison. Customers are able to contact Con Edison by calling 1-800-75-CONED. This number has been heavily advertised throughout the Con Edison service territory - in the media, local billboards, subway and bus posters, on company vehicles, and customer bill inserts.

When a customer calls the 1-800-75-CONED number, they access an interactive menu. Options include:

- <u>reporting service problems or </u>finding out the status of service problems that may be impacting them;
- paying bill;
- checking account balance;
- meter reading schedule;
- requesting a billing statement;
- bill paying options;
- requesting to speak to an agent.

VI-F1 <u>Con Edison's customer information effectiveness has been improved in response to the 2006 outages and implementation of subsequent recommendations.</u>

During the events of 2006, some customers received busy signals when attempting to report outages. Also, in some instances the automated system took up to three minutes to report an outage.[148] In response, the following changes were made.[149]

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[147]/ DR 154 – Customer Service Procedure.

[148]/ DR 103 – DPS Report on LIC Outage.

[149]/ IR 105.

- The number of '800' number phone lines into the Con Edison system was increased by more than 60% (from 400 lines to 650).
- The automated system was modified so that outages could be reported in 90 seconds, down from the 3 minutes previously experienced by several customers.
- Voice Response Unit (VRU) capacity was increased by 47 percent from 204 to 300 lines.

> The VRU is an electronic means of answering and handling phone calls of callers who are reporting service problems or checking the status of problems previously reported . It enables customers to initiate a trouble ticket. Also, the system will automatically call customers back when the system is updated with an estimated restoration time or to indicate that service is restored. In lieu of using the self-service menu options, customers can choose to speak to a live representative to report a service problem. CSRs have been trained to handle electric emergency calls and use a desktop system designed to lead them through the process of asking customers questions to determine the appropriate trouble report. CSRs have access to the Emergency Desktop Application which allows them to input trouble tickets for service problems and to keep apprised of the status of an outage .[150]

To educate the CSRs on the new applications, Con Edison has developed an enhanced emergency call handling training program. The training also explains the need to be empathetic with customers experiencing an outage. In fact, the ability to display empathy and concern is one of the areas that CSRs are evaluated on monthly by their supervisors.[151] It is expected that these enhancements will make it easier for customers to report outages, to input the outage in the outage management system, speed the time for recovery of service, and encourage more customers to do report outages.

The enhanced training program also covers the claim process. During the 2006 events there was some confusion with regard to the claim process. Part of the confusion related to the fact that customers were assured of claims made in response to the network outage, however, claims related to storm outages were not allowed.[152] The goal of the training is to make certain that CSRs are familiar with the claims process and that they not mistakenly provide assurances for claims when those claims may not be covered. The CSRs are also informed of how a customer can make a claim so they can respond to customers' inquiries.

The Communications Management Group (CMG) is staffed around the clock. CMG is responsible for the tracking and monitoring of call center data and for providing a variety of reports that assist in evaluating call center activities and performance. CMG is also responsible for preparing call volume estimates that assist in manpower planning at the call

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150/ IR 176.

151/ IR 176.

152/ IR 150.

center. Staffing levels are designed to meet the speed of answer objective while providing customers with the responses and information they need.[153]

During emergency situations, CMG monitors the call volumes and has the capability to activate a 'storm mode' that advises callers of system emergency conditions. The 'Storm mode' prioritizes and routes all emergency phone calls to available representatives while advising non-emergency callers to call back at another time due to emergency conditions in the service territory.[154]

VI-F2 Con Edison has enhanced the outage information available to its CSRs so it can more accurately inform customers of the status of the outage and estimated time of restoration.

During the course of an actual event, it is important to provide accurate and timely information to customers. Con Edison has made recent enhancements to enable its CSRs to provide outage information. The most significant of the enhancements is to supply CSRs with a screen that displays the latest outage information and estimated time of restoration (ETR) as provided through Con Edison's System Trouble Analysis and Response (STAR) system.[155] STAR is one of Con Edison's primary systems for managing outages. The STAR system is described in more detail elsewhere in this Report. However, with its interface to customer information, it can provide the CSRs with valuable customer information to report during calls.

VI-F3 The impact of Con Edison customer operations improvements during major outage events will only be truly tested during a major event.

As noted, Con Edison has made a number of enhancements in customer operations. However, the combined impact of these improvements cannot be fully judged until Con Edison experiences the next major outage event. Subjectively, various elements of the trouble reporting and call center operations have been improved, but the actual testing of the complete process will only come from the next major event.

VI-F4 Con Edison still needs to improve on communications with customers as to the need for customers to report individual outages.

One of the most misunderstood aspects of utility storm restoration is that the utility somehow is aware of all customers who are without power. At the present time, it is impractical for any utility to have monitoring capacity at the individual customer level. This leaves customer outage reporting as one of the primary tools to assess the magnitude of outages and to be certain that all customer outages have been cleared following an event. This is especially true of storm-related events on overhead lines where feeders may be

[153]/ IR 177.

[154]/ IR 177.

[155]/ IR 176.

restored, but individual service connections can still be without power. Con Edison has made a number of improvements in the reporting process and in communications with customers who have reported outages. However, despite extensive advertising in local media, subway and bus posters, on Company vehicles and customer inserts, the message that a customer needs to report their outage is still not achieving the success desired. This is especially critical for a utility with a significant portion of its distribution systems configured as a network.

VI-R1 Increase emphasis on the need for customers to report outages to Con Edison. (Refer to Finding VI-F4.)

Con Edison should make the need to report outages more prominent in its advertising and customer outreach. This message does not need to be elaborate or complicated nor does the message delivery mechanism. Simple enhancement to the web sites and additions to bill inserts could do much to raise the recognition among customers of the need to report all outages.

VI-R2 Con Edison should test the new capabilities of the Call Centers under a major outage scenario. (Refer to Finding VI-F3.)

While the only true test of the call center capability in an outage situation will come from the next event, Con Edison needs to test the robustness of the Call Center prior to that time and provide assurances to staff that past problems have been resolved. At a minimum, a mathematical simulation should be run to determine call center answer times under various scenarios such as escalating call volumes. The impact of outsourced overflow answering of calls should also be assessed.

VI-F5 Con Edison has expanded its presence in areas affected by outages through the use of its corporate vans.

The Customer Operations Outreach Department provides a corporate face in the areas affected by outages through its corporate vans. The fleet of vans was recently expanded to four. During an outage, the vans are dispatched to the affected area to respond to customer inquiries. The vans are equipped with computers to allow the Con Edison personnel to have access to the latest outage information. The personnel can also provide more specific outage related information regarding certain neighborhoods or customers. Con Edison personnel can also respond to questions about how to file claims. Information about the location for getting dry ice can also be disseminated to the community via personnel on the van.[156]

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[156]/ IR 150.

VI-F6 Con Edison has made significant improvements in communicating job-specific ETRs to its customers, , however, the period to generate a global ETR is too long.

During an outage, the expectation of Con Edison's customers are high, and they expect to see Con Edison responding to the problem. Customers want to know when their power will be restored. They want to see Con Edison trucks working on the problem. These expectations increase the need to provide the customer with timely information on the status of the restoration.

In response, Con Edison has attempted to speed up its damage assessment process. It now tries to provide job-specific ETRs within 24 hours after the end of the storm.[157] The job-specific ETRs are updated daily. Customers now receive an automatic call back when an ETR has been assigned or modified.[158]

The global ETR is Con Edison 's best estimate of when all jobs caused by the outage have been completed. The current commitment is to provide a global ETR within 12 hours after the end of a storm. This commitment is found in the 2006 Comprehensive Emergency Response Program.[159] In other words, customers would not know until 12 hours after the storm has ended when is the latest that they could expect power to be restored.

Despite this commitment, during the interview process there was reference to generating a global ETR 24 hours after an event has ended.[160] It appears that these references were with regard to larger storms affecting more than 40,000 customers. Although it may be reasonable to expect a longer period to generate a global ETR for larger events, it is inconsistent with the current CERP.

Con Edison believes it should provide the public with the most accurate global ETR it can. In order to do this, a detailed damage assessment is needed.[161] While Con Edison is doing its assessment, customers are left wondering how long they are going to be without service. Obviously, a customer's plans will vary depending on the length of the outage. This lengthy period of uncertainty adds to customer frustration.

While one can appreciate Con Edison's desire to be as accurate as possible in its estimate of when service will be restored, the added tension it creates between the Company and its customers seems unwarranted.

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[157]/ IR 109.

[158]/ IR 177.

[159]/ DR 119 – 2006 Comprehensive Emergency Response Program.

[160]/ IR 109.

[161]/ IR 109.

VI-R3 Develop a methodology based on previous outage experiences to provide customers a global ETR on a more timely basis than the current commitment. (Refer to Finding VI-F6.)

Con Edison should commit to issuing a global ETR sooner than 12 hours after the end of a storm. Customers are entitled to a stronger commitment than Con Edison has made to-date. Con Edison certainly has sufficient outage experience to know within a short period after the passage of a storm a reasonable range of time that will likely be needed to restore power. Based on this experience, Vantage believes that Con Edison can issue a reasonable global ETR with a message that clearly qualifies the estimate. For instance, a message could indicate that although the damage assessment has not been completed and its ETR may be revised as more information becomes available, storms of similar magnitudes have resulted in outages of a range of x hours or days. Vantage believes that this approach would relieve some of the frustration that customers currently experience.

Vantage makes this recommendation cognizant of the conflict between generating a more timely global ETR and providing an accurate estimate. To prepare the most accurate estimate possible, Con Edison would prefer to complete its damage assessment prior to generating a global ETR. However, customers cannot be expected to wait this long. Consumer-oriented utilities strive to provide the most accurate ETR to the customer as soon as possible. Con Edison comes up short on both fronts. It takes too long to generate a global ETR and the accuracy of its estimates need to improve. The accuracy of Con Edison's ETR estimates is discussed further in the Best Practices Section of this Report.

VI-R4 Determine if the commitment in the CERP to generate a global ETR in 12 hours is reasonable for all events and if not revise the Programlan accordingly. (Refer to Finding VI-F6.)

Con Edison must determine if the 12-hour commitment to generate a global ETR is reasonable for larger storms regardless of the severity of the event. Con Edison may want to consider using a matrix approach where the period to generate a global ETR is dependent upon the severity of the event. If it is determined that this is a more reasonable approach, then the CERP must be modified to reflect this change.

VI-F7 Con Edison has made a concerted effort to identify its Life Sustaining Equipment (LSE) customers as well as its at-risk locations in order to maintain effective communications with these groups both before and during outage events.

In order to perform effectively during an event, good preparation is required. One group of customers that it is imperative to communicate with prior to an event includes the LSE customers. Con Edison makes a concerted effort to identify its LSE customers in advance of an outage and to specially code these customers in its customer records. Con Edison attempts to identify its LSE customers through several means including:[162]

[162]/ DR 282 and 283 – May/June 2007 Customer News and LSE mailings.

- annual appeals in the Customer News;
- mailings to owners and managers of master-metered buildings;
- mailings to healthcare providers; and
- mailings to medical equipment distributors.

In addition to developing a database of its LSE customers, Con Edison provides information about what customers should do in preparation for an event as well as during an event. The primary message is for the LSE customer to contact Con Edison as soon as possible when an outage occurs.

Through the use of the LSE customer database, Con Edison is able to alert LSE customers of potential events prior to their occurrence.[163] This is accomplished by having ready an automated outbound call which can be sent to all registered LSE customers to warn them about an imminent major storm, heat wave, or other event. CMG activates these calls when appropriate.[164]

Con Edison also identifies its 'at-risk locations.' These include hospitals, nursing homes, senior housing complexes, and other housing developments that have been identified by municipal agencies such as the New York City Department for the Aging and Westchester County. The names and phone numbers of a responsible person for each of these locations is maintained in the information systems of Electric Operations and Energy Services personnel so that they can be contacted immediately in the event of an outage.

VI-F8 Con Edison has enhanced its web site and the provision of outage information

Customers have increasingly chosen to contact Con Edison via the internet.[165] In order to satisfy these customers, Con Edison has improved its web site to enable customers to report an electric service problem or to check on the status of a previously reported service outage. Customers are able to report an outage or check the status of a previously reported outage by simply providing either their account number or by entering the phone number linked to their account and verifying the address of the location of the outage.

Further enhancements to the Con Edison web site include the following.

- During major outages, information such as news releases, company statements, location of outreach van and dry ice, and claims information, is provided.
- The web site includes a Storm Central section that provides storm preparation information.
- Additional information on handling dry ice is posted.

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[163]/ IR 151.

[164]/ IR 177.

[165]/ DR 322 – Outage Reports for May 16, 2007 outage.

- Most importantly, customers can use the Internet to notify Con Edison of electric service problems, including partial lights, dim lights, flickering lights, or no lights. Customers who have reported electric service problems via telephone or the Internet can obtain an estimated time of restoration (ETR) via the Internet.

VI-R5 Continue to expand the information and communication provided through the Con Edison web site. (Refer to Finding VI-F8.)

Although Con Edison has recently expanded the use of its corporate web site to provide customers with useful information and to receive important outage information from customers, the web site's effectiveness could be easily expanded. For instance, during an outage Con Edison could post pictures and videos of the outage situation and their efforts to restore service. As noted earlier, Con Edison's customers are very demanding, however, if the customers better understood the problems that Con Edison is confronted with during an outage, they may be more patient and sympathetic.

Vantage deliberately stops short of dictating exactly what and how Con Edison should display on the web site. However, as cited, there are numerous examples of other utility outage web sites with varying degrees of content and quality. Con Edison should at least strive to provide content equal to peers.[166]

Public Safety

VI-F9 Con Edison continues to seek ways to help prepare its customers and general public for emergency events and to protect them when they occur.

The Storm Page on its web site, www.Coned.com, provides all sorts of relevant information. There are storm preparation recommendations, safety precautions for individuals and property, instructions on how to report outages, answers to common questions, and links for related information. During storms, real time information is provided such as restoration progress and locations where dry ice is available. Many of these topics are also included as bill inserts or special mailings to customers.

> Communicating with customers[167] dependent upon Life Support Equipment (LSE) is a high priority for the Customer Service Organization. The list of LSE customers is updated in real time as new LSE customers who are screened for qualification are added to the CIS system; the list is also updated as LSE accounts are removed from the CIS system after appropriate approvals are received from the Public Service Commission Staff . During emergencies these customers have a higher restoration priority, and Customer Service Representatives make extra efforts to keep these customers informed about recovery efforts.

166/ For example, see the Ameren Illinois Web site at http://www.ameren.com/Outage/ADC_IllinoisOutageInformation.asp.

167/ Residents who are not customers of Con Edison can also apply for inclusion in the LSE program.

Critical customers such as hospitals, nursing homes, and public works facilities all receive special attention. Contact lists of key personnel are maintained, early alerts of pending major storms are passed along, portable generators may be deployed in certain scenarios, and all will receive priority in restoration assignments.

Often the most urgent need for protecting the public is the guarding and repair of downed wires. Con Edison has been very proactive when it comes to eliminating the potential hazards that damaged electrical equipment can present. In overhead events, Site Safety Representatives are immediately dispatched to identify, protect, and report back on any trouble report suggesting a hazard(s) exists. In the 2006 Westchester storms, hundreds of Con Edison employees where utilized to safeguard downed wires and other damaged infrastructure. In the January 18-23 Wind Storm, 500 Site Safety Representatives were working in the field. The numbers of these 'wire guards' decreased in subsequent events as Con Edison's efforts to make improvements in this part of their storm restoration process were implemented.

B. MEDIA RELATIONS

Con Edison serves in an area that many consider the media capital of the world. Due to the close media scrutiny that an outage event has for Con Edison, it is crucial that there be a clear and consistent message to the media regarding the outage. Two important elements to Con Edison's efforts to accomplish this are its Corporate Policy Statement – Public Affairs Crisis Communications Plan and Customer Service Procedure 10-0-2, Public Affairs – General.[168]

VI-F10 <u>Con Edison has implemented appropriate policies and procedures to provide a consistent message to the media during outage events in a timely fashion.</u>

The Corporate Policy Statement indicates that Con Edison's intention is to provide timely and accurate information to the public through the media on system events that could or have affected electric, gas/steam service, disrupt municipal services, have an impact on the environment, or otherwise have an impact on customers or when issues or events have affected or could affect Con Edison. The policy statement also specifies roles and responsibilities of various Con Edison personnel in the media relations function. A corporate spokesperson is identified and that person's role is specified as the only individual authorized to provide press interviews. The clear intent is to avoid any mixed messages to the media.

In an effort to help the media better understand the storm restoration process, Con Edison invites the media to its Learning Center for a tutorial on outage fundamentals. This

[168]/ DRs 152 and 153 – Corporate Policy Statement and Customer Service Procedure 10-0-2.

provides Con Edison with an opportunity to educate the media on the various components of the system and the work required to restore electric service.[169]

> In accordance with enhanced procedures, Media Relations will have daily news briefings during significant outages. In addition, Media Relations will continue its standing practice of conducting individual interviews for all journalists who request them.

In addition, the recent enhancements to the Con Edison web site, noted elsewhere, benefit the media. The Con Edison web site includes information about service restoration priorities, safety advice, claims, and general system descriptions for the media's use.

C. PUBLIC OFFICIALS

Communications with public officials during an outage event is a difficult task for any utility. However, Con Edison is confronted with the unique challenge of dealing with the public officials of one of the largest utilities in the country as well as the 43 municipalities of Westchester County. Con Edison's contact lists of public officials includes all elected municipal, county and state officials, local police, fire departments, highway and public works departments. The challenge to provide timely, consistent and accurate information to this entire group while dealing with a dynamic situation tests the skills of any organization. The following attempts to explain how Con Edison attempts to cope with this challenge.

During an outage event, communication responsibilities with public officials is coordinated through the ICS Information Officer. Those responsibilities include providing restoration and safety updates as well as pertinent customer information to the public. Public Affairs is also responsible for media monitoring and correcting incorrect information that may be reported. During an event, the department follows CPS 810-2, Public Affairs Crisis Communications Plan.[170]

Con Edison's Public Affairs organization consists of the following departments. Media Relations, Government Relations, Employee Communications, Creative Services, Strategic Partnerships, and Economic Development. In addition, there are local Public Affairs offices serving each of the Company's six operating areas. During large-scale company events, Media Relations and Government Relations serve as Con Edison's primary communications arms.

Government Relations is responsible for communications with federal, state, and local elected officials as well as with local community boards. The department is staffed with employees who have had significant experience working with and for elected officials at all

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[169]/ IR 121.

[170]/ DR 152 – Public Affairs Crisis Communications Plan.

levels of government. Throughout the year, Government Relations assists elected officials and their staff with a wide range of energy related issues.

VI-F11 <u>The roles of the Con Edison personnel dealing with the various public entities have been clearly defined.</u>

In response to the events of 2006, Con Edison re-emphasized the Municipal Liaison Group (MLG) which had originally been formed in 1996.[171] The purpose of the MLG is to establish a working relationship with local municipal officials in order to better respond to the needs of municipalities during storms. When directed, Municipal Field Liaisons (MFLs) will report to their assigned municipality and provide personal assistance in the prioritization of work to ensure public safety and to facilitate restoration of electric service. The MLG is established during any level two or higher event (i.e., service interruption to 7,000 or more customers). This group receives calls from municipal officials, police, fire, and public works departments and prepares trouble tickets on the Company's Emergency Control System for recording the condition and tracking the Company's response. The MLG Supervisor prioritizes municipal tickets by criteria that address public health and safety issues, the need to relieve municipal resources, and traffic flow concerns. The MLG Supervisor confers with the municipal planner desk in the electric control room to dispatch Company forces in response to these situations. In addition, every four hours, the MLG provides the affected municipality a specific status report on the Company's recovery effort in the municipality area.[172] During outage events, daily teleconference calls are conducted to inform municipal leaders of the restoration progress.

VI-F12 <u>Con Edison has worked diligently to establish effective communications with the numerous public entities that it deals with during outage events.</u>

Each year, Con Edison sends municipalities a notice describing the function of the MLG and provides a telephone number for direct access to the MLG. Whenever the MLG is activated, the Company alerts each municipality by a fax notice that includes the direct telephone number.

In response to the 2006 events, Con Edison has trained additional MFLs and has established six teams of eight liaisons that are continuously available on a rotating basis for assignment to the field. MFL training covers the Company's recovery plan, incident command structure, emergency control system and trouble tickets, and MFL field responsibilities.

Westchester County 60-Control, located in Valhalla, NY, is a centralized emergency communications center operated by the Westchester County Department of Emergency Services (WCDES) that provides primary dispatch for 37 Fire Departments and emergency medical dispatch for 18 EMS agencies in Westchester County. Con Edison and WCDES established a process for dispatching a MFL to 60-Control for any event involving 12,000 or

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171/ DR 164 – Municipal Assistance Crewing Plan.

172/ DR 167 – Requests from Staff's Inquiry.

more customer outages. The liaison is responsible for communicating public health and safety concerns to the MLG. The liaison officer works with MLG to prioritize the Company's dispatch of resources to these incidents, to communicate the Company's estimated time of response to the location, and to track the response until completed.

The Westchester County Office of Emergency Management (OEM) coordinates emergency response and recovery activities that exceed the capabilities of local government(s).[173] The County Executive activates the county's Emergency Operations Center (EOC) bringing together local and regional safety experts to deal with emergency situations. For any event involving 15,000 or more customer outages, the EOC is activated and a liaison officer is dispatched to EOC.

At the outset of an event, the Public Affairs Director notifies elected officials and community organizations generally by fax or e-mail, and as necessary, by telephone. During the event, updates are provided on a timely basis. The updates include information on the number of customers interrupted, number of customers still out of service, municipalities and districts affected, number of crews working, available estimated restoration time, and dry ice locations.

In Westchester County, Con Edison now conducts a daily telephone conference call for public officials during the days that service restoration is ongoing. The Company notifies public officials of the time and the call-in number for the conference call. During the telephone conference, the Company will provide the latest status on service restoration including the number of customers interrupted, number of customers still out of service, municipalities and districts affected, number of crews working, available estimated restoration time, and dry ice distribution locations. If the call is not feasible, daily phone contacts with elected officials in the affected areas will be made.[174]

In addition to daily briefings for elected officials in the affected areas during an outage, public affairs staff will ensure both the local and Washington offices of federal officials are contacted. At the same time, all contact information will be updated twice a year, and a liaison program aimed at partnering with elected officials and community organizations in order to expand the dissemination of information during an outage will be developed.

VI-F13 Con Edison provides valuable training for municipal officials and includes its liaisons in the training.

Con Edison provides training for municipal officials with a focus on Westchester County.[175] The training of municipal personnel and internal municipal liaisons is important for the effective management of an emergency response. Accordingly, the process of training both internal municipal liaisons and municipal officials has been initiated. Bronx-Westchester

[173]/ DR 164 – Municipal Assistance Crewing Plan.

[174]/ IR 142.

[175]/ IR 142.

Electric Operations, Electric Emergency Management, Public Affairs, and Energy Services have started a series of meetings with municipal officials. The municipal liaisons are actively involved in these sessions. Training sessions are tailored to the nature of the organization taking the training, i.e., fire departments, police departments/public works administrators. The training sessions also cover communication procedures to be used during emergency conditions involving Con Edison's overhead system. The training includes a description of the role of the Municipal Liaison Group, the Municipal Field Liaisons, the Company liaison with Westchester County Department of Emergency Service's 60-Control Emergency Communications Center, and the Company liaison with the Westchester County EOC.

This training is available to municipal organizations upon request. Con Edison notifies the municipalities annually to encourage their participation in this program and provides scheduling information. Since the events of 2006, Con Edison has increased its outreach to the municipalities to encourage their participation in the training.

This training is available to municipal organizations upon request. Con Edison notifies the municipalities annually to encourage their participation in this program and provides scheduling information. Since the events of 2006, Con Edison has increased its outreach to the municipalities to encourage their participation in the training.

VI-F14 Recent enhancements to the communications process with public officials are expected to improve relations.

As a result of the 2006 outages, Con Edison was provided several recommendations to improve the effectiveness of its communications with public officials. These recommendations included:

- reviewing the "best practices" of other utilities regarding communication methods and outage management systems;
- meeting with the Westchester County Municipal Managers Association to discuss ways to improve communications;
- updating the contact list of municipal and public officials and emergency personnel on a bi-annual basis; and
- expanding the news media contacts to the contact list.

Con Edison has implemented each of the recommendations and the expected result is a continuation in the trend toward improved communications and relations with public officials.

VI-F15 The Municipal Liaison Group provides an effective means of communicating with local government organizations.

One of the most effective measures has been the establishment, in 1996, of the Municipal Liaison Group (MLG)[176] during Level 2 or higher events, (7000 or more customers interrupted). When activated, municipal officials such as police, fire, and public works departments have direct access to field experienced Con Edison Planners who will prioritize and expedite these important repairs. During large events Con Edison will dispatch trained Municipal Liaisons to municipal locations to serve as on site points of contact. In the field, Con Edison dedicates crews to respond to these requests in what they call their Municipal Assistance Crewing Plan.[177] This commitment of resources expedites the clearing of hazards, reduces the demands on the Site Safety workforce, and better coordinates restoration activities of Con Edison and its municipal partners.

Con Edison has offered Electrical Hazards Awareness training for Westchester County municipalities for some time. These programs are tailored to address the needs of specific departments such as police, fire, and public works administrators. The Company continues to reach out to these groups encouraging them to schedule initial or refresher training. With the lessons learned from 2006 and the enhanced communications protocols as agenda items, both parties benefit from the sessions.

D. PUBLIC SERVICE COMMISSION

The Public Service Commission is another important stakeholder in the communications process during an outage event. It is crucial for Con Edison to provide the Commission with timely and accurate information that is consistent with the information provided to both the media and public officials to make certain that there is a universal understanding of the nature and extent of the outage.

IV-F14 Con Edison meets its outage reporting requirements.

Con Edison's outage reporting requirements are governed by Commission rules and regulations as stated in 16 NYCRR Part 97 as well as other Commission directives such as Commission Order in Case 04-M-0159. The requirements include informing the Commission of its storm preparation and system restoration efforts related to significant outages. For outages of 5 minutes or more, written reports are required.

The Order in Case 04-M-0159 requires Con Edison to notify the Commission of the following events on its system.

- System Control.
- Loss of Electric Service.

[176]/ DR 129 Con Edison Update to DPS reference Recommendation #2, January 2006 Storm.

[177]/ DR 164 Con Edison Report on Municipal Liaison task Force Initiative.

- Personal Injury Accidents.
- Shock Incidents and Motor Vehicle Accidents.
- Security.

In the event of a loss of electric service, which is the most germane to this study, Con Edison is to provide the following information in its notification to the Commission.

- The approximate territory affected.
- The date and time of the incident causing the interruption..
- The expected duration of the interruption.
- If restored at the time of the call, the date and time of restoration.
- The number of customers affected and the amount of load involved.
- A listing of any critical services affected.
- A description of the incident and its cause..

Any follow-up actions planned.

In an effort to ensure consistency and accuracy of the information provided to the Commission, the notifications are coordinated and disseminated through Con Edison's Central Information Group. The Commission has provided each of the utilities in the state a list of individuals at the Commission to contact for each type of event. Based on discussions with Commission Staff, Con Edison meets its outage reporting and notification requirements.

In addition to the formal reporting and notification requirements, Con Edison is responsive to Staff questions and inquiries. In some cases, Con Edison anticipates a potential issue and advises the Commission as a precaution. Much of this communication is accomplished through phone calls and emails. It should be further noted that during the course of a significant event and Staff is present at the Con Edison facilities, there is informal communication occurring. The technical staff at Con Edison will provide the technical staff of the Commission with further explanations or concerns that may arise. This exchange between the technical experts helps provide the Commission with a fuller understanding of the situation and the problems that Con Edison is dealing with at that time. As long as these exchanges do not interfere with the restoration effort, Vantage applauds Con Edison's efforts to keep the Staff informed and encourages these types of communications to continue as they benefit both parties

VII. RELIABILITY

A. TREE TRIMMING PRACTICES AND PERFORMANCE

Tree Trimming (or more broadly vegetation management) is one of the more important aspects of almost any electric utility's reliability program. This is especially true in certain areas of the Con Edison territory. The Con Edison tree trimming program has come under considerable scrutiny in light of the impact on the Westchester area distribution system from tree damage in recent storms. The extent to which trimming at Con Edison, or any utility can impact reliability relates directly to a combination of several rather obvious factor.

- The type, density and overall health of the vegetation.
- The distribution system (overhead, underground, looped/radial).
- The type of weather events encountered by the utility. (ice, tornados, wind).
- The aggressiveness of the utility trimming program in terms of frequency and clearances.

Tree trimming also has a direct impact on another system reliability nemesis - animal contact. Utilities often find that animal contact outages are reduced when the clearances are increased.

Con Edison Tree Trimming

VII-F1 <u>Con Edison does a good job within the framework of its existing tree trimming program, but the program does not go far enough.</u>

Con Edison has taken a number of positive steps in regards to the tree trimming program. These include:

- proactively contacting landowners prior to trimming;
- increased direct communication with community leaders;
- new written material available on tree maintenance;
- a commitment to forestry professionals (3 of 4 Con Edison Supervisors are now ISA Certified Arborists);
- increased clearances;
- inspections prior to trimming by a Con Edison supervisor along with the Contractor Supervisor.

All of these efforts will absolutely have a positive impact on reliability and community relations. The Vantage position is that they stop short of what is optimum. Most importantly, Con Edison has yet to undertake a comprehensive study of the overall health and condition of the urban forest. Second, other than trimming the worst performing circuits, the tree trimming program has no clear direction other than merely 'expanding the clearances on all sides or "making the hole bigger". The trimming program needs clear direction as to how it fits in an overall reliability program (discussed in more detail below). In fact, more trimming may not be the most cost effective means of improving reliability.

Con Edison represents an unusual utility situation in that the vegetation issues are primarily related to one geographic section of the system. For all intents and purposes, tree contact has only been an issue in Bronx/Westchester Division of Con Edison. This is not only the primary forested area of Con Edison's service territory but also contains mostly overhead structure. Staten Island also contains considerable tree cover but has not experienced the problems of Bronx/Westchester. For this Report, the Bronx/Westchester district is where Vantage focused its review of the tree trimming efforts of Con Edison.

Westchester County Urban Forest

Even a cursory view of the Westchester county portion of the Con Edison system shows an extremely dense urban forest comprised primarily of mature hardwoods. Many of the trees appear to be of a similar age in that the canopy is relatively consistent in height. There appears to be a large number of dead trees mixed in although no widespread deaths which would indicate disease or insect infestations. Combined with the dense mature forest is the fact that the area has a rocky substrata very near the surface and is prone to flooding. Vantage cannot emphasis enough that these observations are based on brief tours of the area. As discussed in the findings section, a significant problem is that no scientific studies have been performed to make an objective determination of the age, health, and potential problems posed by the urban forest in Bronx-Westchester.

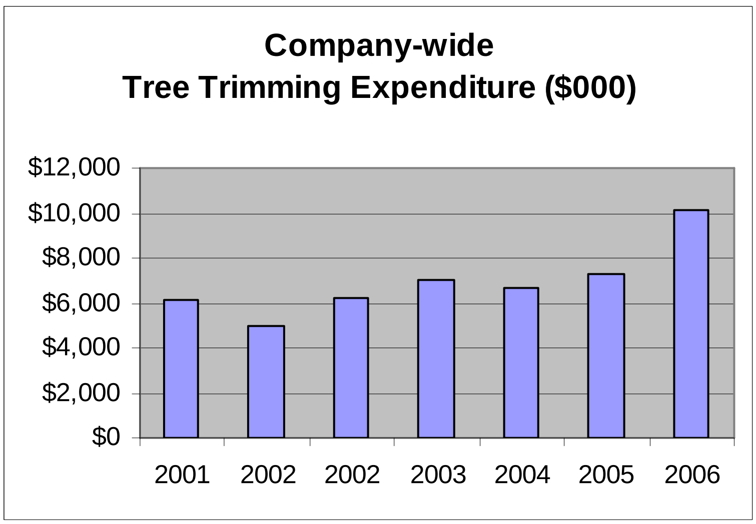
VII-F2 The tree trimming expenditures for Bronx/Westchester increased significantly in 2006 from previous years.

An analysis of actual tree trimming expenditures from 2001-2006 reveals that while Con Edison did indeed increase Bronx/Westchester expenditures from an average of about $4 million per year to $7.2 million per year.[178]

[178]/ DR 188

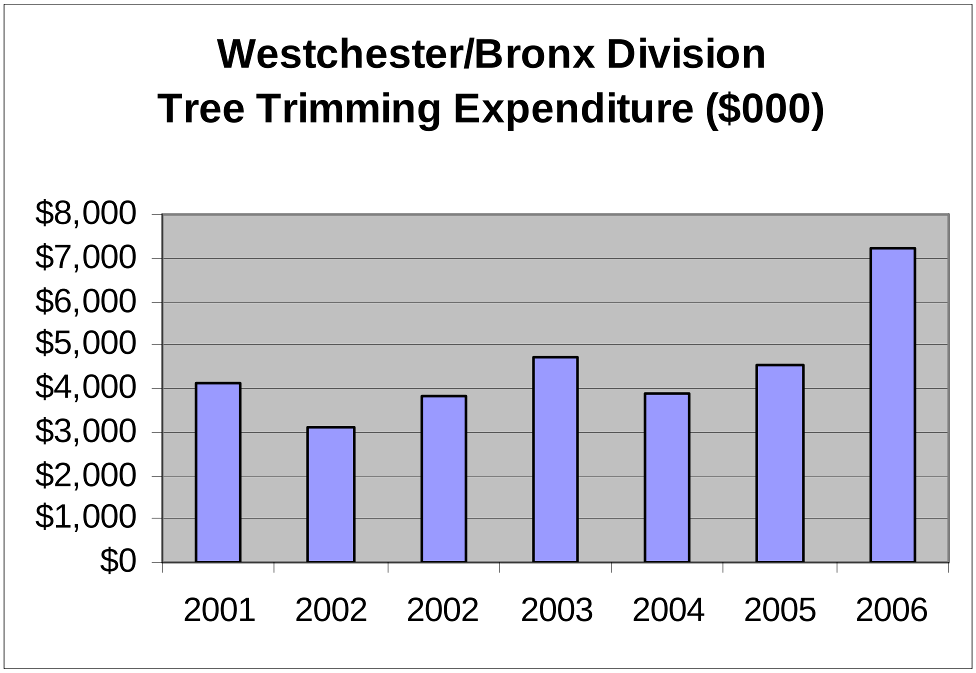
Exhibit VII-1
System-Wide Tree Trimming - 2001-2006

System Wide Tree Trimming (Year End Actual ($000))					
Year	Brooklyn/ Queens	Manhattan	Bronx / Westchester	Staten Island	Total
2001	$1,362	$0	$4,114	$694	$6,171
2002	$988	$0	$3,133	$833	$4,954
2002	$1,684	$0	$3,840	$723	$6,246
2003	$1,529	$0	$4,728	$748	$7,005
2004	$1,959	$0	$3,866	$874	$6,699
2005	$1,804	$0	$4,564	$916	$7,284
2006	$1,898	$0	$7,211	$983	$10,092



Audit of Con Edison Outage Management

Exhibit VII-2
Westchester Division Trimming - 2001-2006



VII-F3 <u>The increase in the trimming budget may not even be sufficient to maintain the three-year cycle due to the increased trimming standards and new pole heights.</u>

Con Edison increased its tree trimming standard in 2007 to 10 feet to the sides and below and 15 feet above.[179] This increased the cost of tree trimming on a per unit basis. In light of the increased costs, Con Edison bid the new contract for only one year in hopes of negotiating better terms after completion of the first years trimming cycle where contractors and Con Edison would have better information on what the new standards would mean in terms of work effort and equipment.

In addition to increasing the line clearances, Con Edison has been increasing the pole height in certain circumstances in order to accommodate more circuits, spacing and phone/cable access. [180] In some circumstances, this can mean cutting an entirely new clearance at the

[179]/ DRs 165 and 206. IRs 113, 154, and 225.

[180]/ IR 226.

newer height or expanding into a previously untrimmed area. There is also additional area which must potentially be trimmed on sides due to the increased height.

Both the increase in clearance and the higher poles increase trimming costs. It is unclear as to whether the budget increase of $2.0 million per year will be sufficient to cover the incremental costs. This will likely not be resolved until new bids are let for the 2008 and 2009 trim cycles.

VII-F4 The new trimming standards, while helpful, will do little to prevent large scale outages during significant storms.

As noted, Con Edison has expanded the line clearance standards used in their tree trimming program. However, the major tree related outage problem was, and is, out of Right of Way (ROW) trees and large overhanging branches which are often outside the new standard clearance.[181] The Company recognizes this concern and has proposed a 'Danger Tree Elimination' program in its current electric rate case. Neither of these problems will be impacted by the new trimming standards. The new standards also allow quite a bit of flexibility. For example, Con Edison does not cut a 10x10x15 hole everywhere based on Vantage observations. If a limb is healthy, Con Edison may leave it overhanging even though standards, taken literally, require its removal.[182] From a community relations standpoint, this is an understandable practice but leaves lines vulnerable during major storms to the overhanging limbs.

Trimming also does not address the significant issue of damage from out of ROW trees. The trimming contract provides for removal of dead or diseased trees in the ROW, but even these tree removal efforts can be contested and protected by property owners. Out of ROW trees are for the most part not taken down unless they are a clear and obvious danger(already leaning) and landowner permission can be obtained.[183]

Based on Vantage observations many of the large, mature trees which have caused damage in recent storms would not have even been flagged for removal. The consultants observed numerous, otherwise healthy appearing, trees which had fallen into lines. In most cases these had very small root balls characteristic of urban forests where root systems are constrained by pavement and other construction.

VII-F5 It will be impossible for Con Edison to fully address the tree problem without more cooperation from municipalities and the community.

Despite cooperation from many municipalities, Con Edison faces a situation common to practically every utility in the U.S. Ratepayers and community leaders seek (and often demand) improved reliability yet resist in various degrees any efforts to increase tree

181/ Vantage field inspections.

182/ IR 226.

183/ IR 226.

trimming and removal. This is despite the fact that tree trimming and the removal of dead and dying trees in and out of ROW are generally a very cost effective and efficient means of reducing storm related vulnerability. This situation is exacerbated at Con Edison by the fact that in Westchester County there are 43 different municipalities which must be considered in addition to the individual homeowners and associations. Even after recent storms and the widespread tree related outages, some communities are still resisting Con Edison tree trimming. Just four days after the May 16, 2007, storm, power was again knocked out to Con Edison customers and the Westchester River Communities Tree Trimming Oversight Committee sponsored an event to investigate getting more control over the Con Edison program.[184] This effort appears to be aimed at preventing Con Edison from aggressively pursuing its new program standards.

VII-F6 Despite recognition of the need to examine tree health from a broader perspective, Con Edison has yet to move forward with any scientific studies to examine the actual health and problems of their area forest.

Con Edison has recognized the need to evaluate the overall tree health in their service territory. There is also no question as to the acceptance of problems associated with the mature urban forest. Con Edison has already received a 'Conceptual Proposal' to assess the Westchester urban forest that addresses many of the macro concerns that Vantage comes away with from this review.[185] In fact, the final paragraph of the Conceptual Proposal says it very well.

"An effort to quantify the risk to Con Ed's energy delivery from Westchester County's urban forest is essential. An assessment is necessary not only to identify the risk but more importantly to identify the scale and scope of the problem. Insight and information gained will be useful in developing effective risk assessment and risk mitigation strategies.[186]"

Yet, to date, no formal RFP has been let to conduct a study.

The implications for Con Edison are substantial. In addition to storm damage, disease can wreck havoc on mature forests making them extremely vulnerable to storm damage. For example, the Emerald Ash Borer has killed over 10 MILLION trees in Michigan alone since it was first discovered in 2002.[187] The ash borer has now spread into Ohio , Ontario, and Indiana. Such an infestation in the heavily canopied mature forest of Con Edison would produce significant problems even absent storms.

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[184]/ http://www.thejournalnews.com/apps/pbcs.dll/article?AID=/20070521/NEWS02/705210342/1018/NEWS02.

[185]/ DR 249.

[186]/ DR 249.

[187]/ http://ohioline.osu.edu/for-fact/0059.html.

VII-R1 Undertake a study using outside resources to determine the actual health status of the forest in Con Edison's service territory. (Refer to Finding VII-F6.)

As noted, Con Edison has already laid the groundwork for a comprehensive review of the forest health yet has not acted. Merely continuing to trim trees more aggressively is not the solution to the Con Edison tree-related reliability problems. A much broader, longer term, and more scientific approach is required. A scientific tree health survey is the first step.

The specific steps that need to be undertaken have already been laid out.

- Generally characterize the urban forest in Westchester County using existing data sets that are available in the public domain, as well as those that may be available within Con Edison. A limited field assessment would also be conducted. Condition would be inferred through the use of standard mortality profiles.

- Characterize the urban forest in Westchester County through statistical sampling using field assessments.

- Complete a comparative analysis of urban forests in Westchester County and another suitable locale(s). This would require conducting field sampling in both areas.[188]

The study should include an assessment not only of current conditions but must look forward and give an assessment of the potential dangers resulting from:

- Climate Changes;
- Diseases;
- Overall age of the urban forest (natural decline).

Finally, and most importantly, specific actions must be planned to address the results of the study and define clearly measurable objectives. It will not be sufficient to merely increase the trimming budget and clearances (size of the hole).

VII-R2 Evaluate the effectiveness of the current tree trimming and clearing program relative to other reliability measures associated with vegetation management. (Refer to Finding VII-F2-4)

Rather than merely increasing the dollars spent on tree trimming, Con Edison should develop a broader vegetation management program that considers more of the reliability variables and defines specific reliability goals and objectives including:

- is the $2.0 million additional annual funding sufficient for larger clearances?
- is three year cycle appropriate? Should it be the same for all areas?

[188]/ DR 249.

- is tree trimming the most effective reliability improvement or would money be better spent on removal of dead vegetation in the ROW or other maintenance programs?
- as a result of the recommended vegetation study, are there areas where trimming efforts should be refocused?
- is there the likely potential for widespread tree deaths from disease, infestation or age? Is this threat in particular areas and should it be addressed as such?

B. O&M AND CAPITAL SPENDING

CONSTRUCTION PLANNING PROCESS

Vantage did not perform a comprehensive assessment of budgets requirements, capital and O&M expenditures over an extended period, but did address major categories for both Capital and O&M budgets to determine the potential impact the associated spending has on emergency response and system reliability.

While spending for reliability increased in the last few years, Vantage did not determine if it is adequate and directed in the most appropriate manner.

CAPITAL BUDGETING PROCESS

VII-F7 Con Edison's Capital Budgeting process follows a traditional utility process and addresses major categories associated with system reliability.

Major classifications for capital spending are defined below.[189]

Project Classification

a. Load Relief/Capacity Improvement. These projects are for new facilities or the expansion of existing facilities to meet load growth or to provide for greater output or new functions (e.g., new business, new generating station, or substation or related expansion, or new transmission line).

b. Facility/Obsolescence. These projects are associated with the replacement of equipment with new components having equivalent capability and/or for failed or deteriorated facilities. Typical replacement projects would include cable burnouts, generating/substation equipment replacement, rearrangement of existing facilities, and replacement of corroded gas mains.

c. Reliability/Availability. These are system betterment projects generally required to increase reliability/availability of a facility or a Company function. Typical facility betterment projects would include distribution system reinforcement, plant or

[189]/ DR 183, Corporate Instruction on Capital Budget Process

substation instrumentation and relay upgrades, system operations control systems, transformer replacements, rebuilding of existing facilities, and employee facilities' rehabilitation.

d. Environmental. These projects are initiated to correct, improve, or enhance environmental performance. Typical projects would include projects that result from regulatory requirements stemming from environmental regulations (e.g., ground water contamination). Projects for which 80% or more of the cost is directed at environmental improvement should be included in this category (e.g., oil spill prevention, lead cable replacement, and leak detection).

e. Safety/Government Regulatory Requirement. These projects are the result of specifications or directives of regulatory agencies of the various levels of government. Typical regulatory requirements would include public improvement and interference projects, safety projects (OSHA), and projects required by the Departments of Transportation and Energy, the Public Service Commission, and other regulatory agencies.

f. Cost Savings/Operations Improvement. These projects are instituted to reduce or avoid costs by improving operating techniques, adding economic improvements for ratepayers, reducing manpower, or decreasing maintenance. Typical projects would include the conversion of manual operations to automatic and installation of local fueling facilities to reduce time lost in travel.

g. Retirement. These projects are initiated in accordance with the Company's planned retirement of facilities no longer required for system operations. Budget submittals should indicate whether the facility is to be retired-in-place or retired and removed. Typical projects might include the retirement and removal of equipment in a substation or generating station.

h Other. These projects are required for the routine operation of the Company or for advance planning. Typical projects might include the purchase of general equipment.

4.1 Capital Budget Process

The Capital Budget Process is composed of the following.

- Project Authorization.
- Project Appropriation.
- Increase/Decrease of Authorization/Appropriation.
- Capital Budget Status Reporting.
- Validation In Advance of Appropriation.
- Funding Control.

O&M BUDGET PROCESS

VII-F8 <u>O&M reporting reports and budget projections provide significant detail on programs competed and budgeted.</u>

O&M CATEGORIES ASSOCIATED WITH RELIABILITY

The following detail is excerpted and paraphrased from Con Edison's "Annual Report on Electric Service and Power Quality" dated March 21, 2007, which was published and submitted to the Department of Public Service, Office of Electricity and Environment on March 30, 2007. This 330 page report provides extensive detail on Capital and O&M expenditures, overall system performance, momentary interruptions power quality, and details on performance in each division. Many of the exhibits in this section of the report are from the last six annual reports. [190]

Electric Service Reliability

Con Edison's report states that in 2006, it invested:

- $270 million in improvements for its electric distribution system including $155 million for load relief and $115 million for reliability;
- reliability expenditures included, $10 million for tree trimming;
- $16 million for overhead inspection and maintenance;
- $15.4 million on CINDE;
- $8.7 million for underground inspections and repairs; and
- $5.2 million for the Stray Voltage program.

Relief Programs

Area Substations - The following planning criteria are used to determine load relief requirements for area substations. For load areas in Manhattan, the system is planned and designed to supply the anticipated area substation independent peak loads, based on design weather temperature conditions, without exceeding equipment capabilities during an outage of any two transformers or their supply feeders. For load areas outside Manhattan, a first contingency design is used such that the system is planned and designed to supply the anticipated area substation independent peak loads, based on design weather conditions, without exceeding equipment capabilities during an outage of one transformer or its supply feeder.

Primary Feeders – Distribution feeders are reinforced when they are projected to operate above 100% of their ratings for both normal (all equipment in service) and contingency (any two feeders out of service) conditions during the summer peak load periods. Reinforcement projects may include cable replacement, transferring load between feeders, balancing load on a given feeder, bifurcating an existing feeder, and establishing new feeders.

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[190]/ DR 188

4 kV Substations - The 4 kV unit substations exist in Westchester and all boroughs except Manhattan. The following planning criteria are used to determine load relief requirements for the 4 kV unit substations Brooklyn, Queens and the Bronx utilize a second contingency design while Westchester and Staten Island are designed for first contingency operation. A load relief plan is developed for those 4 kV substations that are projected to surpass 100% of their emergency loading while under design contingency conditions. The 4 kV substation summer peak loads are analyzed in order to develop the 4 kV Substation Ten-Year Load Relief Plan in which the stations that are most in need of load relief are identified and recommended for expansion.

4 kV Feeders – Open wire and underground cable feeders are reinforced when they are projected to operate above 100% of their rating. It is targeted to the 4KV non-network system. This program involves replacement of 4kV feeders, associated poles, legs of overhead wire and sections of underground cable. This program also involves relieving 4KV feeders by replacing lower rated equipment with higher rated components or transferring load to a higher rated feeder.

Transformers and Secondary –Network transformers are relieved when they are projected to operate at greater than 100% of their normal ratings (all equipment in service) and greater than 125% of their contingency ratings. Reinforcement projects include installing new transformers, reconnecting existing transformers to different feeders, replacement of transformer network protectors, and reinforcing secondary mains.

Reliability Programs

Reliability is one of the continuing focal points in the distribution system work. The following is a description of Con Edison's 2006 major capital and maintenance reliability activities.

Spring Hi-Pot – Con Edison tests selected network feeders in the spring to identify components that are approaching or at their failure threshold so they may be scheduled for replacement prior to the critical summer load period.

Oil Minders - The oil minder was developed to prevent the pumped discharge of oil from network type transformers into the sewer system. In addition to preventing these discharges, the system will send an alarm to the local control center whenever oil is detected.

PILC Program – This program is designed to replaces paper-insulated lead-covered cable (PILC) with new solid dielectric (EPR) cable in addition to replacing temperature sensitive stop joints.

Vented Manhole Cover Program - The installation of vented covers helps to reduce the buildup of combustible gases generated by electrical equipment and cable faults. Consequently, damage to underground equipment is less severe during an event and the possibility of a potentially dangerous cover dislodgement is decreased. EPRI testing results has indicated success of vented covers in terms of cover dislodgement.

Underground Secondary Reliability Program – The system-wide Underground Secondary Cable Replacement Program is designed to increase overall system performance reliability, reduce electric shocks, manhole fires, and manhole explosion incidents. The program targets the replacement of secondary cables in service for 45 years or more.

Remote Monitoring of Network Transformers - All 25,000 network transformers are remotely monitored. In addition to the real time monitoring benefits, load and status information is fed into computer modeling software that assist operators with predicting how systems would respond to next worst case scenarios.

Targeted Primary Direct Buried Cable (DBC) Replacement - Targeted primary and secondary DBC cables are being replaced with Cable-In-Conduit (CIC) to improve reliability of Underground Rural Distribution (URD) customers.

Overhead Reliability - The following initiatives represent the major components of Con Edison's overhead reliability program.

- **Auto Loop Reliability** - Auto Loop Automation, also known as the Distribution Automation System (DAS), is the vehicle for real-time monitoring and control of field components on the overhead electrical distribution system. DAS provides the status of switches and the functionality to remotely open and close these components. Load currents, primary voltage, and phase angle data are easily accessible by Control Center operators. Auto Loop Automation plays a major role in protecting electric distribution system components, facilitating timely customer restorations, and increasing reliability. The purpose of the project is to replace the existing Itron overhead distribution automation network and remote terminal units (RTUs), and to modify all overhead distribution switches for two-way communications.
- **Osmose** - The program looks to extend the life of in-service poles through remedial ground line treatment of reinforcement, increase the reliability of the pole population by identifying problem poles before they become a problem, and ensure the structural integrity as defined by the National Electric Safety code. During the inspection and treatments program, a contractor performs a ground line inspection to determine the structural integrity of a pole based on code requirements. The pole is then treated with a preservative agent to delay the decay process. Poles that do not pass inspection are either labeled as a restorable reject (with C-Truss), or non-restorable reject and prioritized for replacement. The schedule, as outlined in EO 10.345 'Inspection and Ground Line Treatment of Standing Wood Poles', specifies that all poles be inspected on a 12-year cycle.
- **Aerial Cable Replacement** – This program targets overhead cable in Westchester that was manufactured by Okonite in the early to mid 1970s. The program is to replace all sections of this cable type in a three-year period.
- **#4, #6 and Self Supporting Wire** – This program is designed to replace deteriorated #4 and #6 copper overhead primary conductors with wire that is stronger and with increased load carrying capacity. Eleven percent of the 4KV conductors in Westchester consist of these vintage conductors. Self Supporting

Cables (SSC) on the 4KV and 13KV non-network distribution system are also being replaced to enhance reliability.

- **ESCO Switch Replacement** - This Program is a 4kV Automatic Load-Break Switch Replacement Program to increase system performance reliability and to eliminate safety and environmental problems. The Program is to replace the remaining antiquated single-phase oil filled automatic load-break switches (also known as the ESCO Switch) on the Con Edison 4kV System with electronically-controlled single-phase vacuum re-closers.

Selected 2006 Maintenance Programs

Tree Trimming - Tree trimming continues generally on a two-year cycle for 27 kV and 33 kV circuits and 3 years for 4 kV and 13 kV circuits.

Overhead Facilities - Periodic visual inspection and infrared scanning of the overhead wires, switches and connections continues along with the Program for periodic inspection and treatment of wood poles. Infrared scanning (thermography) is an established technology for detecting heat rise in electrical components which often signals that failure is imminent. Patrol, or visual inspections, focus on any and all abnormal conditions which may put the distribution infrastructure at risk. The value of these inspections correlates directly with the experience and knowledge of the inspector. Poles, pole hardware, equipment, services, wire clearances, congestion and traffic exposure are just a few of the items addressed as part of a quality inspection. The schedule for these infrared and patrol inspections are annually for 13/27/33KV distribution lines (including aerial cables) and every 3 years for 4KV distribution circuits. The previous year's worst performing (SAIFI) 4KV feeders are inspected annually in addition to their 3-year cycle.

CINDE Inspection of Network Distribution Equipment - CINDE is the Computerized Inspection of Network Distribution Equipment system for tracking inspection and maintenance of network transformers and network protectors. In 2006, the inspection cycle was changed from 10 years to 5 years. Also in 2006, four new transformer mitigation programs began to improve transformer performance and public safety.

- **DGOA Program** - The results of DGOA (Dissolved Gas in Oil Analysis) testing shows the types and amounts of the gas in the transformer oil, and each gas or combination of gasses can be used to identify a type of electrical fault. The level of gas in the oil can be used as an indicator of an incipient transformer failure.
- **Anode Installation Program** – Anodes are being installed on transformers in sidewalk vaults and manholes to address transformer corrosion. Corrosion is the number one cause for transformer failure.
- **Remote Monitoring Sensors/Pressure, Temperature, and Oil Level** – Additional transformer sensors are being installed that will monitor real time transformer oil temperature, pressure, and oil level.
- **Vault Flushing Program** - The program schedules the cleaning of equipment vaults on a five year cycle. Debris and dirt is removed from the transformer, associated equipment and its structure. Removing debris and other degrading material from the vault improves transformer and associated equipment

integrity.

Underground Inspection / Repair Program – The "Order Instituting Safety Standards" from Commission Case 04-M-0159 requires that electric utilities develop a program to inspect all of their underground electric facilities once every five years. To comply with the Safety Standards, Con Edison developed and implemented an inspection program for its underground electric distribution facilities. Repairs that are identified during the inspection process are classified in three categories.

- *"Tier 1A – Repair Immediately"* includes stray voltage, cable in contact with cover, and open secondary ends. Each of these cases is a public safety concern and is repaired at the time of discovery.
- *"Tier 1B – Schedule for follow-up repairs"* includes damaged neutral cables and connections, defective sump pumps, and damage to the structure cover. These repair items can be initiated at the time of discovery or scheduled for a follow-up repair.
- *"Tier 2 – Replace as part of the Secondary Rebuild Program"* is used to identify items such as secondary main replacement, service replacement, and structure conductor upgrades (SCU). These items are capital improvements to the secondary system that will be scheduled and prioritized based on the overall performance of all structures on the associated M&S plate. EO-10315 (Quality Assurance of the Stray Voltage and Periodic Distribution Structure Safety Inspection Programs) ensures that the underground structure inspections are performed in accordance with the Safety Standards and Con Edison's specifications.

Stray Voltage Program - To comply with the Commission Order published in 2005, Con Edison developed and implemented an annual requirement testing all publicly accessible transmission and distribution facilities and metallic streetlights & traffic signals located on the public thoroughfares in the five boroughs of New York City and Westchester for stray voltage to ensure public safety. Distribution facilities include approximately 730,000 subsurface structure covers, overhead wooden poles, and metallic streetlights & traffic signals; 230 unit substations. Transmission facilities include approximately 1,700 underground transmission structures, approximately 1,200 transmission towers, and 57 area substations.

VII-F9 <u>The 2007 Con Edison Distribution Business Plan identifies major reliability related projects that are being undertaken in 2007.</u>

The following excerpts describe specific objectives and programs planned for 2007 that will address reliability.[191]

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[191]/ DR 183 – Excerpts from 2007 Distribution Department Business Plan

RELIABLITY RELATED PROGRAM

Distribution System Relief Program

Con Edison stated that as part of its continuing effort to Sustain Energy Reliability, the Load Relief Program will invest in reinforcing the electric distribution system. This Program is aimed at Con Edison's Electric System critical banking, financial, medical, transportation and cultural institutions. It should be noted that the loss of a network load area or a non-network load area in excess of 70,000 customers for more than 3 hours will result in a $10 M penalty.

Distribution Feeder Relief

Con Edison's states that distribution system feeders will be modeled, studied and reinforced to supply full load on a peak design day under both normal and contingency operation within their normal and emergency ratings.

Distribution Transformer Relief

All normal network transformers will be modeled and studied. Overloads greater than 100% and all contingency overloads greater 115% will be relieved by upgrading existing equipment or constructing new installations to supply area loads.

Distribution Reliability Program

PILC Program

Paper Insulated Lead-jacketed Cable (PILC) and thermally sensitive PILC stop joints have been identified as a high-failure rate component during critical high load / high temperature periods. To eliminate these failure prone components and the potential environmental issues that involve PILC, Con Edison will continue the current Program to proactively remove PILC cable from the system before failure. The Program will place emphasis on making maximum improvement in Jeopardy ranking, which should demonstrate improved reliability.

Five-Year Inspection Program & Secondary Rebuild Program

Based upon the new five-year inspection program, Con Edison Electric Operations crews will be inspecting all structures on the system. Work identified on these inspections will be prioritized, and required work performed as part of the Secondary Renewal Program or in some instances work will be incorporated with other planned work such as Burnout Repair or New Business.

De-Bifurcation Program

To minimize the number of transformers impacted by a feeder fault the Program to improve network reliability through the de-bifurcating of existing heavily loaded network feeders will continue. This Program will utilize existing substation switch positions wherever available and have additional substation switch positions added to the bus section runs wherever practical.

High Potential Test Program

To eliminate incipient faults on network feeders in advance of each summer's high load period the high potential proof test program will continue. While traditionally on the Con Edison system high potential tests are DC, we will continue to investigate the development of new technology and the application of AC High Potential Tests.

The Hi Pot test list has been distributed to the regions. The same feeder component data was used with the Jeopardy Program to identify the best feeder candidates for "Backbone" (most reliable) status, requiring total removal of their PILC and stop joints. I n addition to Hi Pot testing, the regions will also be working to establish backbone feeders in their least reliable networks.

A study conducted in conjunction with Columbia University for feeder susceptibility is being evaluated against actual summer 2005 performance. This study provided significant information for additional development, testing, and validation. One result of the analysis has been the evaluation of the load pocket analyzer as a contributor to the susceptibility index. It has been noted that the summarized load pocket values have a high correlation with susceptibility only at high levels of network load. Therefore, the load pocket analyzer will be improved by incorporated additional transformer conditions such as load, voltage, and temperature. This is anticipated to improve the accuracy of the susceptibility index.

Non-network System Improvements

Staten Island Electric Operations will be creating a new three-recloser autoloop to relieve the 5R19/5R29 autoloop. They will also create an emergency tie between 33 kV Feeders 33R02 and 33R12 to provide emergency pick-up of Terrace 4 kV Multi-bank Substation. The estimated CAIDI improvement is 24,000 customer hours based on 4,000 customers for 6 hours.

Efforts will continue to develop a more accurate non-network and 4 kV network load flow analysis to handle single-phase load analysis. In 2006, the 4 kV and VRS SCADA control was migrated to the GE Swift Platform to provide a higher speed 4 kV breaker control and improved station and VRS remote controls.

On the 4 kV System, there is a program to eliminate aging sections of rubber cable installed between the years 1960-1970. Priority feeders will be identified by the worst performing feeders, the number customers impacted by a failure, the estimated impact on average restoration time by eliminating a failure, and the cost to eliminate sections of cable.

The Osmose Inspection Program will continue to identify and correct poles with structural integrity issues.

Reduce Feeder Restoration Times

Fault Locating

To further reduce feeder processing time, Distribution Engineering and the Power Quality group working with the Regional Control Centers will continue to develop the Reactance to Fault (RTF) locating software. This program was initiated in Manhattan and has reduced fault-locating time by targeting the location of single-phase faults, determining the distance to a fault based upon its reactive impedance calculated from substation PQNode data. Manhattan achieved a ½ hour summer and 1 hour non-summer improvement in fault locating times, and similar results are projected in the other regions when the system is fully deployed and enabled. Enhancements are underway in 2006 including extension of the software to calculate for multi-phase faults, an improved accuracy based on feeder specifics, a refinement in the target range calibration, and an improved operator graphical interface. In 2007 Con Edison plans further enhancements, including an automated fault type/signature recognition feature and improved accuracy for distorted fault waveforms, which is an issue for some faults.

To-date 46 area substations are equipped with the PQNode Fault Locating capability. A project to equip the remaining 11 substations was appropriated in January 2006 with work projected for completion in 2007.

Engineering Modeling Enhancements

Work to improve the accuracy of the secondary system models will continue in 2007. Secondary network load flow models will be based on data from the mapping systems and loads will be modeled at customer service points using the CuFLink program. The enhancements will be associated with the Windows PVL application environment.

To further improve the accuracy of the network system models a new HTV-RMS capability will be introduced to provide accurate real-time high-tension load. This will improve the accuracy of the real-time load analysis and improve the system monitoring capability. An improvement in RMS reporting rates will also decrease the O&M man-hours required to field visit non-reporting RMS units in advance of feeder outages or as a result of feeder contingencies.

Achieve Target for CAIDI and SAIFI

Failing to achieve the system-wide reliability performance targets for the number of customers interrupted per year (SAIFI) and interruption duration (CAIDI) will result in a combined $18 million in penalties. The penalties are $8 million per year for customer interruption duration performance ($4 million for network system duration and $4 million for non-network system duration), and $10 million per year for customer interruption frequency performance, ($5 million for network system frequency and $5 million for non-network system frequency).

The programs listed above including the Distribution System Relief Program, Network and Non-network System Reliability programs, enhancements to Reduce Feeder Restoration

Times, enhancements to Modeling systems, the 5-year Inspection Program and the Secondary Rebuild Program will all contribute to reducing the number of customers interrupted and lowering the average customer interruption rate (SAIFI).

Initiatives that will reduce average customer outage duration (CAIDI) include the new positions of Distribution Splicer and Distribution Mechanic titles within the UWUA Local 1-2 contract providing a larger pool of qualified personnel to respond to customer outages, enhancements in the overhead system allowing greater flexibility for emergency ties, the purchase and use of mobile generators to restore isolated network and non-network customers and support non-network system, and the utilization of more overhead contractors to respond to storm emergencies.

EXPENDITURE BREAKDOWN AND ANALYSIS

Reliability Expenditures for 2001-2006 – Total for all Divisions.

VII-F10 Expenditures for relief projects far exceeded those on reliability until 2005 and 2006 with as little as 6% of capital being spent on reliability in 2003.

VII-F11 A significant proportion of reliability monies were allocated to network systems.

Capital expenditures that impact overall reliability are categorized primarily by relief or reliability related as defined earlier in this Chapter. An analysis of data, as provided in the following two page Exhibit VII-3 shows that from 2000 to 2004 total expenditures for both O&M and capital categories were relatively stable.[192] The total of reliability capital and O&M expenditures varied from a low of $22 million in 2003 to a high of $40 million in 2004. This increase from 2003 to 2004 was due almost solely to a new program called Secondary Inspection Program which cost $17 million in 2004 and $9 million in 2005.[193]

While these total expenditures were stable, reliability ranged from a high of 21% in 2001 to a low of 6% and 8% in 2003 and 2004 for this four-year period.

In 2005 and 2006, expenditures on reliability, as seen on the second page, increased dramatically with a number of new capital and O&M programs (with heavy emphasis on network programs) being instituted including the following

Capital Expenditure Changes.

- Paper Cable – increased $2.6 million to $21million from 2004 to 2005.
- Secondary Cable - went from less than $10 million to $28 million for 2005.
- General Improvements - increased from $1 million in 2004 to $24 million in 2005.

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[192]/ DR 140 – Annual Report on Electric Service and Power Quality (Reports 2000 to 2006)

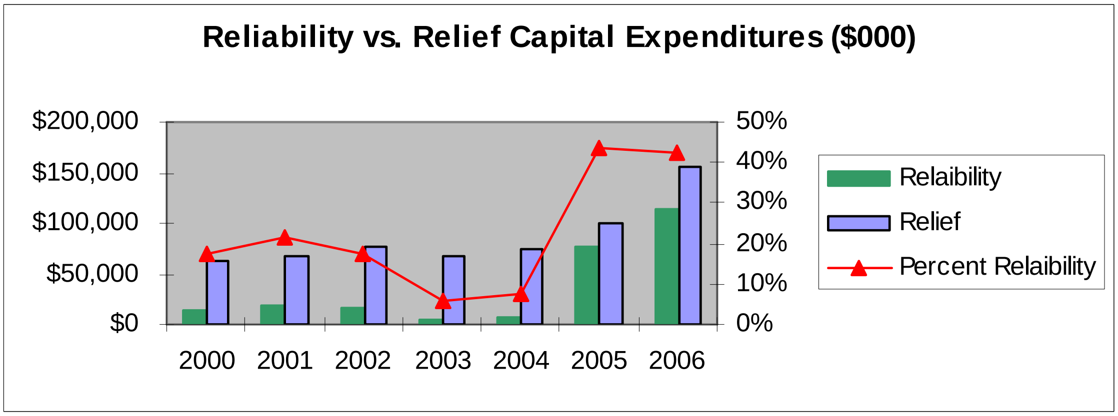
[193]/ DR 188 – 2004 Report - Secondary Inspection Program.

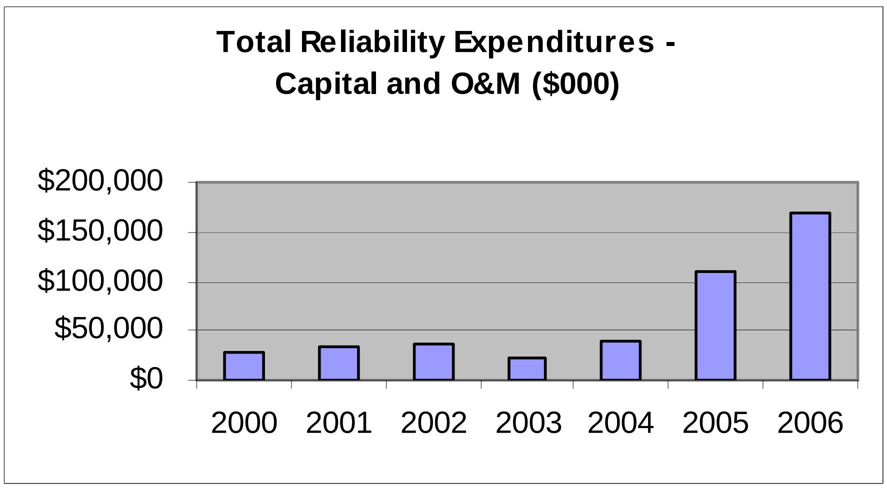
O&M Expenditure Changes.

- CINDE - increased significantly beginning in 2006.
- OH Inspection & Maintenance – increased from $1 million in 2005 to $16 million in 2006.
- Secondary Inspection Program – as stated above was almost $25 million spent in 2004-05
- Underground Inspection Program – was initiated in 2006 at a cost of $4 million.
- Underground Repair Program – was initiated in 2006 at a cost of $4 million.
- Stray Voltage Program – was initiated in 2006 at a cost of $5 million.

Exhibit VII-3
Reliability Related Expenditures

	2000	2001	2002	2003	2004	2005	2006
Reliability Related Capital Expenditure							
Paper Cable	10190	$8,181	$9,399	$1,237	$2,659	$21,969	$23,818
Remote Monitoring NWP	67	$61	$143	$63			$7,423
Multibank Retirement	0	$335	$137			$69	
Isolation Devices	16	$475	$339	$135	$2		
Secondary Reliability	0	$10	$34	$27	$91	$28,884	
Defective Aerial Cable	0	$765	$76				
Hi-Pot Program	2521	$2,562	$1,924	$779	$2,381	$2,124	$4,544
General Improvements	128	$6,136	$4,318	$1,893	$966	$24,034	$2,229
Intelligent Layout					$1		
Vented Manhole Covers							$7,380
Underground Secondary Reliability Progra							$59,414
Targeted Primary DBC Replacement							$5,810
Overhead Reliability							$4,296
Total Reliability	$12,922	$18,525	$16,370	$4,135	$6,100	$77,081	$114,915
Total Relief	$62,074	$68,337	$76,000	$66,529	$74,916	$100,533	$155,572
Total Capital Expenditres	$74,996	$86,862	$92,370	$70,664	$81,016	$177,614	$270,487
Percent Reliability	17%	21%	18%	6%	8%	43%	42%
Maintenance Expenditures							
Tree Trimming	1362	$4,954	$6,246	$7,005	$6,699	$7,284	$10,092
CINDE	2839	$5,054	$9,589	$7,330	$8,451	$13,225	$15,446
CIMOES	361	$1,834	$2,438	$2,446			
OH Inspection & Maintenance	737	$2,719	$2,266	$1,532	$1,311	$1,367	$15,904
Secondary Inspection Program					$17,504	$9,654	
Underground Inspection Program							$4,379
Underground Repair Program							$4,288
Stray Voltage Program							$5,296
Maintenance Expenditure Total	$14,560	$14,561	$20,539	$18,313	$33,964	$31,530	$55,405
Total Reliability Related Capital and O&M	$27,482	$33,086	$36,909	$22,448	$40,064	$108,611	$170,320





VII-F12 <u>A contingency fund of $5 million is made available for unanticipated O&M expenditures that arise due to storms and other outage related causes.</u>

This money is above and beyond normal budgets that do anticipate some level of outage expenditures. In 2006, the $5 million was exceeded by a significant amount.

VII-F13 <u>Vantage conducted an analysis of budget to actual expenditures for each Region's O&M, Expenditures for the 2003 to 2006 period indicate that except for 2004 and 2006 Con Edison would have under spent its budget in the last four years.</u>

While an exact analysis cannot be conducted within the context of this study, it is apparent from analysis that if Bronx/Westchester had not had a $29 million overrun in 2006, the Company would have under-spent in two of the last four budget years. In fact, when Emergency Response funding is removed from the Bronx/Westchester FCAT budget, it indicates that the actual budget level for 2006 would have been significantly lower than

2005. It is appropriate to caution that 2006 was the first year in which this category was provided, therefore, a definitive conclusion cannot be made.[194]

VII-F14 An analysis of capital commodity trends for the period of 1996 to 2011 shows an increase in spending through 2006 and then a gradual reduction over the next five years.

The analysis in Exhibit VII-5 provides a glimpse at past and projected capital spending for distribution system related commodities. While it demonstrates that annual expenditures increased significantly from 2003 to 2006, it also shows a projection that reduces expenditures annually through 2011.

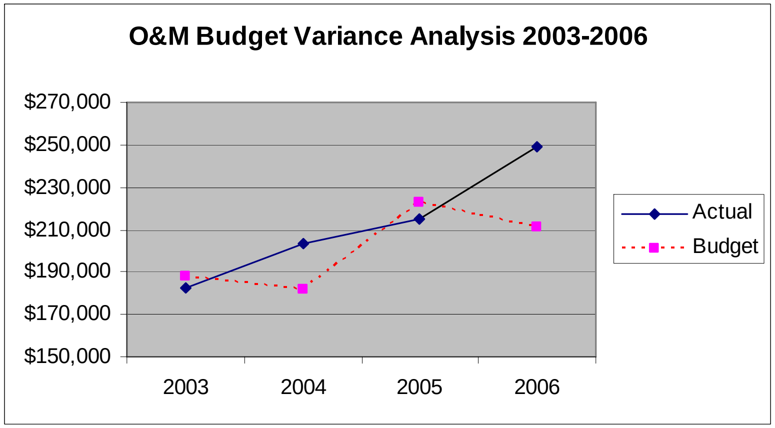
[194]/ DR 206 – Annual Budget Analysis Spreadsheets .

Audit of Con Edison Outage Management

Exhibit VII-4[195]
O&M Budget – Electric Operating Region by FCAT

O&M Budget - Electric Operations Region by FCAT ($000)												
	2003 Actual	2003 Budget	2003 Variance	2004 Actual	2004 Budget	2004 Variance	2005 Actual	2005 Budget	2005 Variance	2006 Actual	2006 Budget	2006 Variance
Bronx/Westchester Total	$52,767	$52,595	$172	$59,454	$52,294	$7,160	$52,779	$52,453	$326	$82,382	$52,688	$29,694
Brooklyn/Queens Total	$70,011	$70,060	-$49	$82,638	$69,765	$12,873	$71,470	$73,620	-$2,150	$76,139	$71,999	$4,150
Manhattan Total	$50,253	$47,080	$3,173	$54,779	$46,551	$8,228	$42,978	$44,352	-$1,374	$48,327	$42,896	$5,431
Staten Island Total	$12,276	$11,741	$535	$14,007	$11,868	$2,139	$18,445	$16,207	$2,238	$18,154	$15,154	$3,000
Engineer. & Planning Total	$9,598	$11,280	-$1,682	$10,700	$10,747	-$47	$16,197	$14,683	$1,514	$10,373	$9,109	$1,264
Energy Services	$14,218	$16,973	-$2,755	$12,979	$13,164	-$185	$13,837	$15,363	-$1,526	$13,525	$13,989	-$464
Transformer Install. Credits	-$26,983	-$26,579	-$404	-$31,423	-$27,636	-$3,787	-$337	$825	-$1,162		$5,000	-$5,000
Storm Contingency	$0	$5,000	-$5,000	$0	$5,000	-$5,000	$0	$5,000	-$5,000	$0		
	$182,140	$188,150	-$6,010	$203,134	$181,753	$21,381	$215,369	$222,503	-$7,134	$248,900	$210,835	$38,075

[195] / DR 206 – Electric Operations O&M Budget Performance

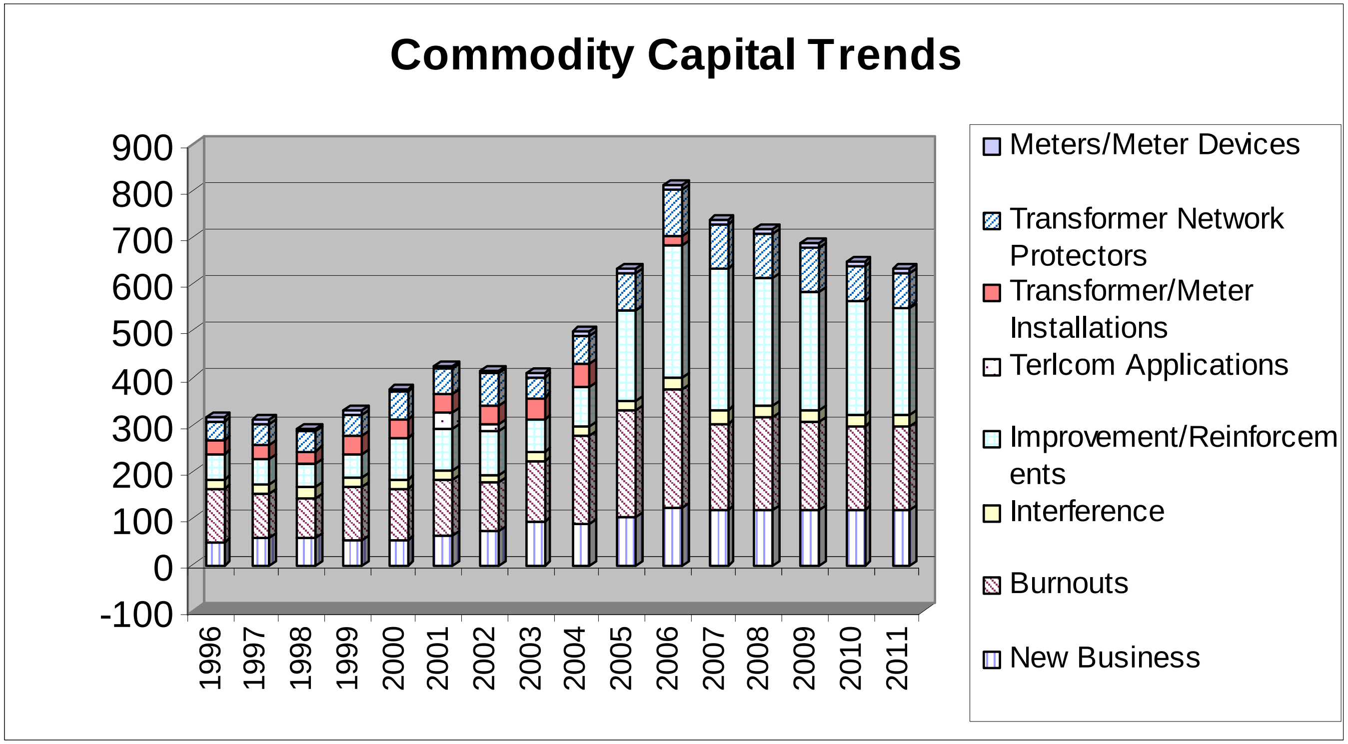


O&M Budget Variance Analysis 2003-2006
$270,000
$250,000
$230,000
$210,000
$190,000
$170,000
$150,000
2003
2004
2005
2006
Actual
Budget

Audit of Con Edison Outage Management

Exhibit VII-5
Commodity Capital Trends 1996 - 2011

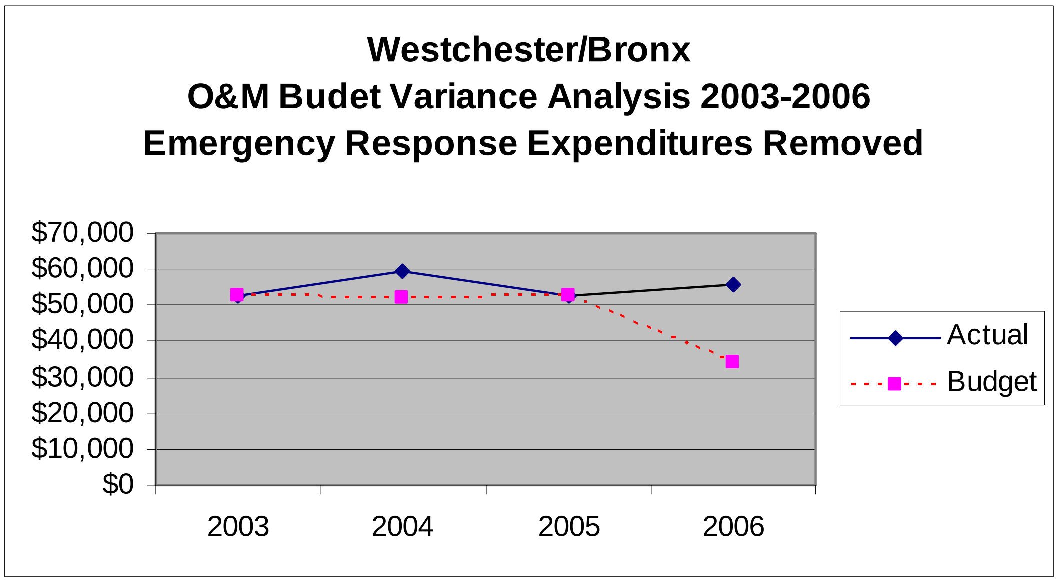
	Consolidated Edison Company of New York, Inc.															
	Commodity Capital Trends 1996 - 2006 Actual, 2007 - 2001 Forecast															
	($ Millions)															
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Forecast	Forecast	Forecast	Forecast	Forecast
Electric																
Distribution																
New Business	50	59	58	51	51	64	72	92	88	101	125	117	117	117	117	118
Burnouts	110	95	86	115	110	117	103	131	188	230	249	184	197	187	180	177
Interference	21	18	21	22	23	21	19	17	21	21	27	31	25	25	25	25
Improvement/Reinforcements	54	54	50	50	89	87	93	71	81	193	282	300	272	253	240	230
Terlcom Applications	0	0	0	0	0	38	14	-2	-3	0	0	1	2	1	1	1
Transformer/Meter Installations	32	31	29	39	38	37	40	47	53	0	18	0	0	0	0	0
Transformer Network Protecotrs	38	45	40	46	57	55	67	42	59	78	101	94	94	94	74	74
Meters/Meter Devices	11	8	8	8	8	8	8	8	8	11	11	12	12	12	10	10
	316	310	292	331	376	427	416	406	495	634	813	739	719	689	647	635



Commodity Capital Trends
900
800
700
600
500
400
300
200
100
0
-100
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Meters/Meter Devices
Transformer Network Protectors
Transformer/Meter Installations
Terlcom Applications
Improvement/Reinforcements
Interference
Burnouts
New Business

Exhibit VII-6
Bronx/Westchester O&M Analysis

	O&M Budget - Electric Operations Region by FCAT ($000)											
	2003 Actual	2003 Budget	2003 Variance	2004 Actual	2004 Budget	2004 Variance	2005 Actual	2005 Budget	2005 Variance	2006 Actual	2006 Budget	2006 Variance
Bronx/Westchester Total	$52,767	$52,595	$172	$59,454	$52,294	$7,160	$52,779	$52,453	$326	$82,382	$52,688	$29,694
Remove Emergency Response										-$26,886	-$18,555	-$8,331
	$52,767	$52,595	$172	$59,454	$52,294	$7,160	$52,779	$52,453	$326	$55,496	$34,133	$21,363



VII-F15 Vantage conducted an analysis of the 2006 Electric Operations Capital and O&M Expenditures. Performance reveals that Con Edison exceeded its overall Capital Budget by 23% for the year on a corporate-wide basis and O&M Budget by 18%

This analysis, which is summarized below, shows the increased spending committed to capital improvements in 2006. Burnouts accounted for the largest capital overrun, 43% of the original budget.

The vast majority of O&M overruns were in Bronx/Westchester and amounted to almost $30 million of the total $38 million overrun.

Audit of Con Edison Outage Management

Exhibit VII-7

Electric Operations - 2006 Capital Budget Performance

($1,000)

Electric Operations - 2006 Capital Budget Performance			
Functional Summary by Region			
	Year To Date		
	Actual	Budget	Variation
Regional Organizations			
Bronx / Westchester			
New Business	21,164	16,430	4,734
Burnouts	64,601	35,128	29,473
System Reinforcement & Improvements	73,961	62,995	10,966
Meter Installation	3,346	2,089	1,257
Total	**$ 163,072**	**$ 116,641**	**$ 46,430**
Brooklyn / Queens			
New Business	52,398	39,646	12,752
Burnouts	98,450	71,541	18,041
System Reinforcement & Improvements	106,253	94,304	(8,009)
Meter Installation	9,487	6,765	2,722
Total	**$ 266,588**	**$ 212,257**	**$ 25,507**
Manhattan			
New Business	46,312	41,271	5,041
Burnouts	80,602	65,500	15,102
System Reinforcement & Improvements	63,846	70,296	(6,450)
Meter Installation	4,746	3,056	1,690
Total	**$ 195,506**	**$ 180,123**	**$ 15,383**
Staten Island &Shops			
New Business	4,638	4,282	356
Burnouts	5,690	2,293	3,397

System Reinforcement & Improvements	11,541	10,888	653
Meter Installation	122	195	(73)
ED2 Transformers	100,604	74,000	26,604
ED3 Meters	10,800	12,078	(1,278)
Total	**$ 133,395**	**$ 103,737**	**$ 29,658**
Engineering & Planning			
Distribution Substation Projects	10,798	9,400	1,398
System Reinforcement & Improvements (ED1 Projects)	26,587	21,705	4,882
Total	**$ 37,385**	**$ 31,105**	**$ 6,280**
Total Regional			
New Business	124,512	101,629	22,883
Burnouts	249,343	174,463	74,880
System Reinforcement & Improvements	282,188	260,188	22,000
Meter Installation	17,701	12,105	5,597
ED2 Transformers	100,604	74,000	26,604
ED3 Meters	10,800	12,078	(1,278)
ED1 - Total	**$ 785,148**	**$ 634,463**	**$ 150,685**
Construction Management			
Electric Interference	27,385	21,900	5,485
Total Electric Interference	**$ 27,385**	**$ 21,900**	**$ 5,485**
Subtotal Electric Distribution	**823,331**	**665,763**	**157,569**
Telecommunications Applications	28	1,000	28
Electric IT Projects	3,412	6,542	(3,130)
Total Electric IT Projects	**$ 3,412**	**$ 6,542**	**$ (3,130)**
Grand Total Electric Operations	**$ 826,771**	**$ 673,305**	**$154,466**
Note: Includes Long Island City capital expenditures			

Exhibit VII-8
Electric Operations - 2006 O&M Budget Performance

Electric Operations 2006 O&M Budget Performance					
Regions by Functional Category					
($000)					
			Year to Date		
			Actual	Budget	Variation
Bronx/Westchester					
	Emergency Response		$26,886	$18,555	$8,331
	Maintenance Associated with Capital		6,886	4,848	2,038
	Transformers (Insp & Repairs)		5,954	5,376	578
	Structures/(manholes, Svc Box/URD)		3,948	3,015	933
	OH Equipment		14,985	765	14,220
	Tree Trimming		7,211	4,400	2,811
	Street Lights		876	969	(93)
	Meters & Other Customers Eqt		4,143	3,970	173
	Field Ops/Unit/Other O&M		6,338	5,427	911
Subtotal - Distribution Field Operations			**$77,227**	**$47,325**	**$29,902**
	Engineering		2,933	3,115	(182)
	Financial Planning & Operations Analysis		696	728	(32)
	Environmental, Health & Safety		1,168	1,146	22
	V.P. & Staff		358	374	(16)
	Total Bronx Westchester		**$82,382**	**$52,688**	**$29,694**
Brooklyn/Queens					
	Emergency Response		$29,956	$27,388	$2,568
	Maintenance Associated with Capital		3,623	3,708	(85)
	Transformers (Insp & Repairs)		8,450	7,227	1,223
	Structures/(manholes, Svc Box/URD)		5,640	5,603	37
	OH Equipment		515	849	(334)
	Tree Trimming		1,898	1,915	(17)
	Street Lights		654	888	(234)
	Meters & Other Customers Eqt		7,894	6,996	898
	Field Ops/Unit/Other O&M		9,914	9,102	812
Subtotal - Distribution Field Operations			**$68,544**	**$63,676**	**$4,868**
	Engineering		4,724	5,096	(372)
	Financial Planning & Operations Analysis		1,031	1,295	(264)
	Environmental Health & Safety		1,531	1,550	(19)
	V.P. & Staff		309	372	(63)
	Total Brooklyn/Queens		**$76,139**	**$71,989**	**$4,150**
Manhattan					
	Emergency Response		$18,326	$16,009	$2,317
	Maintenance Associated with Capital		1,988	3,012	(1,024)
	Transformers (Insp & Repairs)		12,565	10,266	2,299
	Structures/(manholes, Svc Box/URD)		3,126	1,262	1,864
	Street Lights		445	482	(37)

	Meters & Other Customers Eqt		5,162	5,761	(599)
	Field Ops/Unit/Other O&M		1,576	1,182	394
Subtotal - Distribution Field Operations			**$43,188**	**$37,974**	**$5,214**
	Engineering		3,607	3,195	412
	Financial Planning & Operations Analysis		493	665	(172)
	Environmental Health & Safety		737	762	(25)
	V.P. & Staff		302	300	2
	Total Manhattan		**$48,327**	**$42,896**	**$5,431**
Staten Island and Electric Services					
	Emergency Response		$5,951	$4,095	$1,856
	Maintenance Associated with Capital		1,133	940	193
	Transformers (Insp & Repairs)		1,021	630	391
	Structures/(manholes, Svc Box/URD)		973	625	348
	OH Equipment		403	105	298
	Tree Trimming		983	970	13
	Street Lights		665	452	213
	Meters & Other Customers Eqt		464	331	133
	Field Ops/Unit/Other O&M		2,500	2,040	460
Subtotal - Distribution Field Operations			**$14,093**	**$10,188**	**$3,905**
	Engineering		960	1,056	(96)
	Financial Planning & Operations Analysis		429	540	(111)
	Environmental Health & Safety		499	515	(16)
	V.P. & Staff		237	263	(26)
	Sub-Total		**$2,125**	**$2,374**	**($249)**
	Meter Shop		1,125	1,546	(421)
	Transformer Shop		811	1,046	(235)
	Sub-Total		**$1,936**	**$2,592**	**($656)**
	Total Staten Island & Electric Services		**$18,154**	**$15,154**	**$3,000**
	Total Regions		**$225,002**	**$182,727**	**$42,275**
Engineering and Planning					
Distribution Engineering			$2,375	$2,370	$5
Public Safety Mitigation Programs			4,592	3,200	1,392
Financial Planning & Executives & Staff			3,406	3,539	(133)
	Sub-Total		**$10,373**	**$9,109**	**$1,264**
Energy Services					
	Business Services		$9,579	$9,341	$238
	Marketing & Sales		3,946	4,648	(702)
	Sub-Total		**$13,525**	**$13,989**	**($464)**
	Total Engineering and Planning		**$23,898**	**$23,098**	**$800**
	Sub-Total O&M Electric Operations		**$248,900**	**$205,825**	**$43,075**
Storm Contingency			**$0**	**$5,000**	**($5,000)**
	TOTAL O&M - Electric Operations		**$248,900**	**$210,825**	**$38,075**

	Notes:
	Total CECONY LIC O&M cost of $38 million not included above.
	Emergency Response formerly identified as Burnouts
	Three categories (Operations, Transformer Installation, and Other Maintenance) have been re-defined and expanded to provide a more accurate depiction of five work functions - Transformer Inspection & Repairs, Structures, Overhead Equipment, Streetlights, and Field Operations/Unit/Other

VII-R3 Evaluate long-term commitment by Con Edison to both Capital and O&M expenditures by category. (Refer to Finding VII-F11-15.)

Vantage performed a cursory review of these subjects in order to get an overriding sense of how Con Edison responded to deteriorating reliability identified in 2004 and the outages of 2006. It is clear that expenditures increased. What cannot be discerned is whether these levels of spending will continue, or whether they were a short-term response.

C. RELIABILITY ANALYSIS

SAIFI, CAIDI HISTORY AND MEASUREMENT

The following definitions are provided for the reader and are used throughout this Section of the Report.

SAIFI - System Average Interruption Frequency Index. The average number of times that a customer is interrupted during the year, including all outages, e.g., prearranged, etc.

SAIFI = Total number of customers interrupted X 1000 Total number of customers served

CAIDI - Customer Average Interruption Duration Index. The average interruption duration time (customers-hours interrupted) for those customers that experience an interruption during the year, including all outages, e.g., prearranged, etc.

CAIDI = Sum of customer interruption durations Total number of customers interrupted

Reliability - The degree to which electric service is supplied without interruption.

SAIFI Feeder Performance Report - A listing of the non-network feeders for a particular operating area ranked in order of SAIFI performance, worst to best.

CAIDI Feeder Performance Report - A listing of the non-network feeders for a particular operating area ranked in order of CAIDI performance, worst to best.

Momentary Interruption – A loss of electric service for less than five minutes, for one or more customers.

On a monthly basis, the Distribution Engineering Department prepares and distributes a report entitled “Electric Distribution System Performance.” The Report measures how the distribution system fared during the month. The Report focuses on two performance statistics: System Average Interruption Frequency Index (SAIFI) and Customer Average Interruption Duration Index (CAIDI). The performance measures are calculated for the network system and non-network system. Thus, there are four measures that are tracked: SAIFI, network; SAIFI, non-network; CAIDI, network; and CAIDI, non-network. To provide some context for these indices, Con Edison compares the monthly values to the value for the same month in the previous year as well as the 5-year monthly average. Similarly, the monthly value is ranked relative to the monthly value reported in each of the last 20 years.

In addition, Con Edison tracks the monthly SAIFI and CAIDI values relative to the pre-established penalty targets that were agreed upon in the 2005 Electric Rate Case. The targets are for the non-network system as a whole for the year and the network system as a whole. There is a $5 million revenue adjustment assessed for missing the SAIFI target and a $4 million penalty for missing the CAIDI target. The annual revenue adjustment could be as high as $18 million if all four targets are missed. The performance measures are also tracked against internal Company goals that are part of the Company's Performance Indicators. Finally, the measures are also compared to the minimum standards that the Commission has established for all electric utilities in New York.

The monthly reports also provide a description of any outage that involves 500 or more customers. These descriptions identify the location of the outage, the number of customers affected, the average duration of the outage, the likely cause of the outage, and the details of the equipment involved. The Company should learn from each outage with the intention of preventing similar outages or minimizing the time of the outage.

VII-F16 <u>Con Edison's monthly distribution system performance reports indicate that reliability has deteriorated over recent years and continues to worsen.</u>

Vantage's review of the monthly reports led to some valuable observations.[196] One of the more surprising observations is reflected in the following quotations taken directly from the monthly reports. First, with regard to the year-end SAIFI, non-network, the "performance was the 19th worst year out of the last twenty." The second quotation concerns the year-end CAIDI, non-network. The report states, "performance was the 17th worst year out of the last twenty." The surprise is that these quotations are not taken from the year-end December 2006 report but from the December 2005 Report.[197]

There was certainly an unusual sequence of events in 2006, and all of the best planning may not have mitigated the damage and interruptions they caused. Yet, the quotations above clearly indicate that there is likely an underlying problem that needs to be sorted out and corrected. The numbers provide some additional illumination as to the basis of the problem.

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[196]/ DR 238 – Monthly Distribution Performance Reports from January 2005 to current.

[197]/ DR 238 – Electric Distribution System Performance Report, December 2005, page 1.

VII-F17 Annual reports of network and non-network SAIFI and CAIDI that were reported to the DPS since 1996 as well as adjusted and non-adjusted raw data since 1987 show historical changes in reliability.

Reliability performance measures began to deteriorate in Con Edison's distribution system in recent years. The following table presents the SAIFI - non-network system, CAIDI – non-network system, SAIFI – network system, and CAIDI – network system. For the last three years, all four of the measures have increased. In 2006, all four measures surpassed the penalty target.

It is important to keep two things in mind when reviewing the performance indices. First, they are adjusted to remove the impact of major storms which affect more than 10 percent of the customers or last longer than 24 hours. Second, the Long Island City outage in 2006, although it occurred during a heat wave, cannot be removed from the calculations, and as a consequence it has very deleterious impact on the network performance measures. Nevertheless, the trend is clear. All of the performance indices have increased since 2004. All of the performance indices exceeded the appropriate penalty target in 2006, and both of the CAIDI indices exceeded the penalty target in 2005.

VII-F18 A twenty year history of reliability data, included in the 'Electric Distribution System Performance' internal report was discontinued after December 2004.

A review of historical reports was conducted and a review of 'Gross Customer Interruption Statistics - All Outages' and 'Adjusted Customer Interruption Statistics – Major Storms Excluded' from the December 2004 'Electric Distribution System Performance Report' was reviewed.[198] These two tables provided an excellent visual representation of performance for a twenty year period. These tables were not included in later reports. This internal reliability reporting has changed so that the 20-year analysis that would have straight forwardly portrayed Con Edison's decline.

These two tables are included and updated for 2005 and 2006 data below as Exhibits VII-10 and 11.

VII-R4 Develop a comprehensive set of performance indicators that, when tracked, will permit Con Edison, DPS and other stakeholders to understand performance of all relevant measures associated with reliability, emergency response management and customer satisfaction against both targets and over time. (Refer to Finding VII-F17& 18.)

This recommendation addresses issues broader than simply CAIDI and SAIFI. It is intended to measure overall reliability, emergency response management, and the level of customer satisfaction during outages in a manner that permits all stakeholders to measure whether Con Edison is improving performance to an appropriate level.

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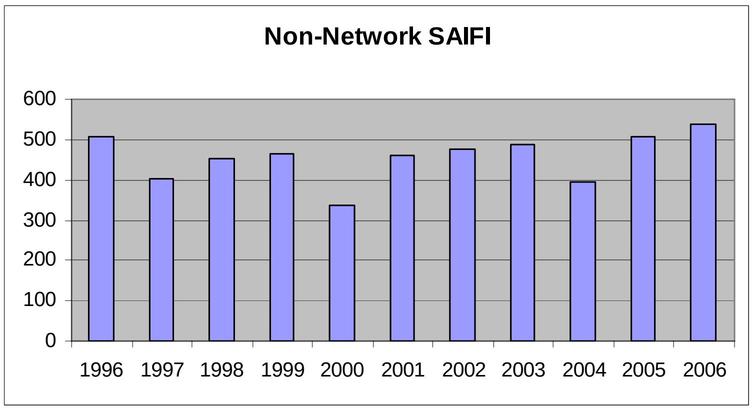
[198]/ DR 187, pages 23 and 24

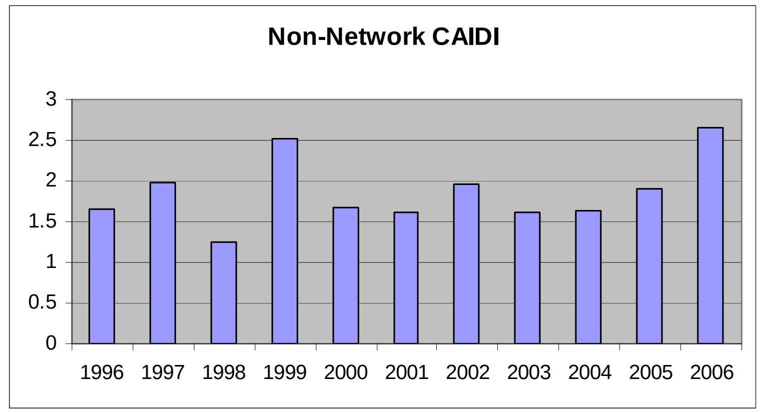
As a minimum the following categories should be included.

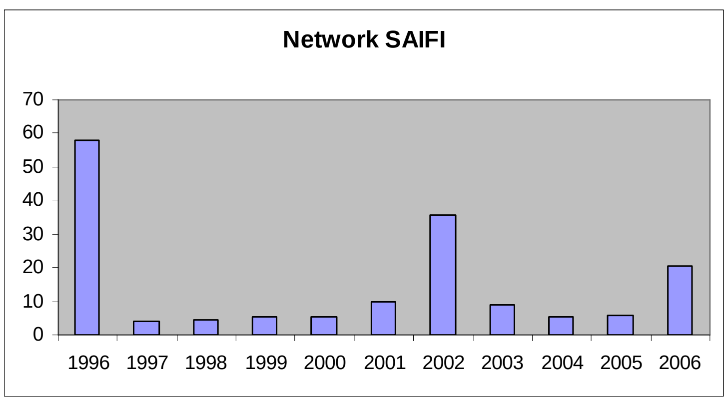
- Continues measurement by system, Over Head and Underground and by Division of SAIFI and CAIDI.
- Develop new measures that address broader issues such as momentary outages (MAIFI).
- Include measures associated with management of outages, including accuracy of:
  - Estimated Time to Restore (ETR);
  - Number of customers (and people) impacted;
  - Timeliness of response effort, including timing and number of internal, external and Mutual Aid crews;
  - Time to respond to requests from municipalities for assistance.
- Customer Service issues such as Call Center performance during outages.
- Customer complaints during and after outages.
- Response time versus schedule for implementation of recommendations resulting from outage assessments and this review.

Exhibit VII-9
Historical SAIFI and CAIDI Results (Adjusted)

Con Edison Historical SAIDI and CAIDI (Adjusted For Storms)												
		1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Non- Network	SAIFI	509	404	451	466	336	461	476	486	393	507	540
	CAIDI	1.66	1.99	1.25	2.51	1.68	1.62	1.97	1.61	1.64	1.91	2.66
Network	SAIFI	58.03	4.2	4.35	5.4	5.55	9.6	35.6	8.8	5.3	5.8	20.7
	CAIDI	2.37	2.3	2	3.72	3.78	4.08	6.5	3.29	3.64	4.44	60.81







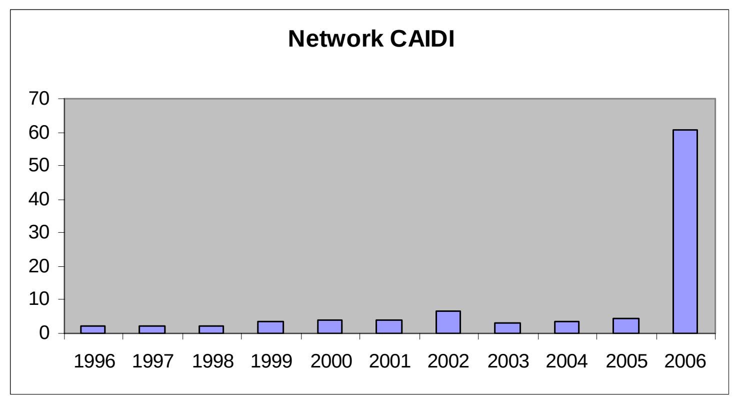


Exhibit VII-10
Historical Reliability Raw Data (Adjusted)

Annual Results									
Adjusted Customer Interruption Statistics - Major Storms Excluded									
	NON-NETWORK			**NETWORK**			**OVERALL**		
YEAR	Interruption Rate	Average Duration	Minutes per Customer	Interruption Rate	Average Duration	Minutes per Customer	Interruption Rate	Average Duration	Minutes per Customer
	Inter/1,000 Cust.	Hr.	Min./Cust	Inter/1,000 Cust.	Hr.	Min./Cust	Inter/1,000 Cust.	Hr.	Min./Cust
1985	451.58	1.38	37.32	6.66	3.05	1.22	124.46	1.44	10.78
1986	322.95	1.35	26.12	6.26	3.21	1.20	89.82	1.44	7.78
1987	378.51	1.41	32.01	9.31	3.45	1.93	107.35	1.54	9.92
1988	479.65	1.87	53.56	35.89	2.11	4.91	154.68	1.91	17.77
1989	419.72	1.36	34.21	6.06	2.65	0.96	115.25	1.41	9.74
1990	259.82	1.14	17.74	6.47	12.40	4.81	73.42	1.87	8.23
1991	277.84	1.38	22.97	10.64	1.61	1.03	81.26	1.40	6.82
1992	229.15	1.02	14.02	4.48	2.21	0.59	63.21	1.08	4.10
1993	307.39	1.63	30.03	7.54	2.86	1.29	85.46	1.71	8.76
1994	355.60	1.48	32.38	10.15	3.15	1.92	103.50	1.60	9.92
1995	299.00	1.41	25.29	6.21	2.63	0.98	83.09	1.48	7.36
1996	508.61	1.66	50.69	58.03	2.37	8.27	176.39	1.83	19.41
1997	404.09	1.98	47.91	4.20	2.30	0.58	109.83	1.99	13.09
1998	450.85	1.23	33.30	4.35	2.00	0.52	122.97	1.25	9.23
1999	466.06	2.51	70.12	5.40	3.72	1.21	127.76	2.55	19.51
2000	335.06	1.68	33.79	5.55	3.78	1.26	92.96	1.77	9.87
2001	461.27	1.82	44.79	9.61	4.08	2.35	129.97	1.75	13.66
2002	475.54	1.97	56.27	35.61	6.50	13.88	152.62	2.75	25.15
2003	485.94	1.61	46.89	8.79	3.29	1.73	136.20	1.69	13.79
2004	392.72	1.64	38.56	5.26	3.64	1.15	108.22	1.71	11.09
2005	506.78	1.91	58.08	5.78	4.44	1.54	139.23	1.99	16.62
2006	539.52	2.66	66.11	20.72	60.81	75.60	156.68	8.23	77.37

Exhibit VII-11
Historical Reliability Raw Data (Un-Adjusted)

Gross Customer Interruption Statistics - All Outages									
	NON-NETWORK			NETWORK			OVERALL		
YEAR	Interruption Rate	Average Duration	Minutes per Customer	Interruption Rate	Average Duration	Minutes per Customer	Interruption Rate	Average Duration	Minutes per Customer
	Inter/1,000 Cust.	Hr.	Min./Cust	Inter/1,000 Cust.	Hr.	Min./Cust	Inter/1,000 Cust.	Hr.	Min./Cust
1987	378.51	1.41	32.01	9.31	3.45	1.93	107.35	1.54	9.92
1988	479.65	1.87	53.86	38.89	2.11	4.91	154.68	1.91	17.77
1989	419.72	1.36	34.21	68.94	3.21	13.27	161.53	1.94	18.80
1990	259.82	1.14	17.74	6.47	12.40	4.81	73.42	1.87	8.23
1991	277.84	1.38	22.97	10.64	1.61	1.03	81.26	1.40	6.82
1992	299.25	1.81	32.54	4.48	2.29	0.62	81.54	1.83	8.96
1993	307.39	1.63	30.03	7.54	2.86	1.29	85.46	1.71	8.76
1994	365.60	1.48	32.38	10.15	3.15	1.92	103.50	1.60	9.92
1995	322.23	2.26	43.75	6.21	2.63	0.98	89.19	2.28	12.21
1996	613.40	3.60	132.50	58.03	2.37	8.27	203.91	3.34	40.90
1997	510.19	5.78	176.87	4.20	2.30	0.58	137.85	5.70	47.16
1998	496.00	2.50	74.36	4.35	2.00	0.52	134.97	2.49	20.14
1999	597.65	4.78	171.49	36.61	20.34	44.67	185.64	7.04	78.36
2000	374.38	2.51	56.43	5.55	3.78	1.26	103.13	2.56	15.86
2001	489.59	1.89	55.55	9.61	4.08	2.35	137.52	2.00	16.53
2002	568.10	3.07	104.57	35.61	6.50	13.88	177.24	3.57	38.00
2003	1681.34	10.59	1068.07	1012.80	19.36	1176.36	1191.31	16.05	1147.44
2004	399.33	1.67	40.01	5.26	3.64	1.15	109.98	1.74	11.48
2005	556.64	2.26	75.48	5.78	4.44	1.54	152.51	2.32	21.23
2006	807.85	8.87	429.94	20.72	60.81	75.60	230.04	12.31	169.91

2006 MOMENTARY INTERRUPTIONS

The following information and data is taken from the 2006 Annual Report on Electric Service and Power Quality that is provided to the DPS annually. This was the first year that Momentary Interruptions were reported in this Report.

The reporting is in accordance with the State of New York Public Service Commission Cases 02–E–1240 and 02-E–0701, Sections 4(e) and 5(d) of the Service Reliability and Quality Standards Applicable to Class A Electric Corporations

Section 4e – Power Quality Objectives

Each company shall develop and maintain a program for recording the number of momentary interruptions per circuit. The data shall be arranged by voltage class and compiled on a company-wide and operating division basis. An exemption may be requested from the Director of the Office of Electricity and Environment for circuits not included in Supervisory Control and Data Acquisition (SCADA) systems or other extenuating circumstances.

Section 5d - Annual Report

A description of the Company's power quality programs, including data on the number of power quality complaints received during the year and the number of momentary interruptions recorded on a company-wide and operating division basis. The Report shall also identify the number of power quality investigations conducted during the year and findings as discussed in Section 4.

2006 MOMENTARY INTERRUPTIONS

The following is the first summary listing of the 2006 Bronx/Westchester and Staten Island autoloop feeder momentary interruptions. In 2006, Con Edison began upgrading the communication hardware on the SCADA System which now allows for the momentary operations to be accurately recorded. Through 2006, 30 loops were upgraded in Staten Island and 89 were upgraded in Bronx/Westchester for which data has been collected and provided. Brooklyn/Queens upgrades will be done in 2007. The data provided is from the moment the equipment was installed and started reporting. Therefore, the data may not be representative of the entire year.

Audit of Con Edison Outage Management

Exhibit VII-12
2006 Report on Momentary Interruptions

Division	Number of Momentary Interruptions
Westchester	1536
Bronx	125
Staten Island	114

D. RELIABILITY IMPACTS ON MANAGEMENT COMPENSATION

Management employees at Con Edison operate under a Management Variable Pay Plan (MVP). The intent of the Plan is to link a manager's compensation with job responsibilities and individual performance. At the outset of this discussion, it should be noted that Con Edison considers the information contained in the MVP to be confidential. Accordingly, this discussion will be broad and presented at a high level.[199]

The key performance indicators (KPI) that Con Edison uses in its MVP include: SAIFI and CAIDI for both network and non-network; safety; customer satisfaction surveys; budgets; and other operational variables that are outage related. In addition, selected corporate financial results are included in the MVP.

VII-F19 <u>The performance indicators used in the Con Edison MVP are typical for the industry and minimally appropriate for the Company.</u>

The performance indicators that Con Edison has included in its MVP are similar to those used by many other utilities. They certainly are intended to promote the appropriate management focus on important operational issues for Con Edison.

Initially, during the review for this project, there was a concern regarding potential conflict between performance indicators. For instance, if there is an outage in Bronx/Westchester and help from Brooklyn/Queens is requested, there was a concern that the negative budget impact in Brooklyn/Queens would experience may limit their interest in helping Bronx/Westchester. To better understand this potential conflict, the matter was discussed

[199]/ DRs 208 and 280 – Management Variable Pay Plan.

in several interviews.[200] The response was loud and clear, the Electric Operations personnel were focused on only two issues during an outage – safety and restoration of service.

[200]/ DRs 111, 112, 131, 136, 141 and 143.

VIII. BEST PRACTICES

Part III of this Con Edison Audit is the performance of a 'Best Practices Assessment.' A summary of the tasks performed included:

- the development of a comprehensive list of areas in which best practices should be implemented for emergency preparedness purposes;
- an assessment of whether Con Edison is operating with best practices;
- to provide a brief description of each best practice currently in effect;
- review 'best practices' of the electric industry that are relevant to Con Edison's emergency response planning, response, restoration, and communications;
- develop a list of best practices that address the areas identified for which Con Edison does not currently meet a level of best practices; and
- develop a baseline summary of what actions Con Edison should take to move toward best practices in areas where there is a deficiency.

A. BACKGROUND

The term 'best practice' can mean different things to different people. Vantage started with the following definition.

> **Best Practice** is a management idea which asserts that there is a technique, method, process, activity, incentive, or reward that is more effective at delivering a particular outcome than any other technique, method, process, etc. The idea is that with proper processes, checks, and testing a desired outcome can be delivered with fewer problems and unforeseen complications. Best practices can also be defined as the most efficient (least amount of effort) and effective (best results) way of accomplishing a task based on repeatable procedures that have proven themselves over time for large numbers of people.[201]

As a result, Vantage sought to identify areas where Con Edison clearly leads the way among its industry peers to develop, support, advance, or implement processes and technologies which are state of the art/are clearly best practices.

Vantage also sought to identify those practices, processes, and technologies in which Con Edison performance was not a best practice and clearly failed to maintain even a level of excellence that could be considered 'Below Expectation.'

This investigation strove to assess whether the Con Edison corporate culture was attuned to continuous improvement and total quality management.

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[201]/ Internet site **Wikipedia**

There is an adage that says, "Don't let the *perfect* get in the way of the *good*." This best practice assessment of Con Edison's emergency preparedness and response did not hold Con Edison against a standard of perfection but one of effectiveness, ingenuity, commitment to quality and continuous improvement.

PROCESS

Unfortunately, there is no single source of reference to define or benchmark each of the tasks that goes into Con Edison's or any other electric distribution company's emergency response and restoration process, that can definitively label a process or technology as a 'best practice.' For this assessment the following tasks were conducted to help identify those processes, practices, and technologies which could be reasonably considered as either a best practice or, in contrast, one that was below expectations and in need of improvement.

- Performed interviews which sought to identify from Con Edison practices that Con Edison's own staff could identify as best practices.
- Studies, surveys and benchmarking programs that supported Con Edison's best practice areas.
- Queried the other Vantage consultants to identify best practices.
- Performed extensive literature research on electric utility distribution planning best practices.
- Attended a national conference on best practices in emergency preparedness and storm restoration.
- Interviewed other electric utility experts responsible for emergency preparedness including those from other regulatory commissions and major electric utilities.

The following is a list of areas Vantage consultants sought to verify as best practices.

- Weather micro-forecasting to predict location and impact of storms.
- Call center performance during outages.
- Crew mobilization response time reduction during outages.
- Restoration project optimization after large outages.
- Anticipation of network failure potential.
- Optimization of communications with, Customers, Politicians, Emergency responders.
- Collection and analysis of routine and storm related outage data.
- Accuracy of Estimate Time to Restore (ETR) capability.
- Data quality and collection, power quality nodes.
- Communication links and backups.
- Outage management organization.
- Outage management software.
- Outage management preparation, drills.
- Utilization of O&M and Capital Budget.
- Other including Research and Development.

B. EMERGENCY PREPAREDNESS AND STORM RESTORATION BEST PRACTICES

Vantage has performed a thorough internet search including the checking of many state commission web sites as to Emergency Preparedness and Storm Restoration rules and procedures, post-outage investigation, lessons-learned assessment, and best practices. Vantage also made direct contacts with commission staff and utility representatives responsible for Emergency Preparedness and Storm Restoration. Vantage consultants also interviewed the project managers from two of the most extensive distribution industry benchmarking programs, one managed by a southeastern electric utility and one managed by a neighboring electric and gas utility in the northeast. The following is a summary of the findings.

BENCHMARKING

VIII-F1 Con Edison has failed to participate in several highly respected distribution system-related benchmarking programs whose goal is to identify best practices including those within the areas of emergency planning and storm restoration. Because Con Edison views itself as a highly unique electric utility due to its extensive underground network system, it has created an artificial barrier for which Con Edison is missing opportunities for identifying and implementing best practices associated with emergency preparedness and restoration.

It is expected that Con Edison should approach performance management as a process for continuous improvement. Applying best practices to every operation or process is an unreasonable expectation given the pace in which processes and technologies advance and the rate of change that can economically and feasibly be supported. However, it is reasonable to expect that Con Edison has a well defined process for:

- linking its business strategies to performance;
- using benchmarking to assess comparable practices;
- identifying and assessing performance gaps;
- integrating benchmarks with performance based targets;
- developing business plans to address and close gaps using identified best practices;
- integrating initiatives and results with performance incentive plans.[202]

The key to the successful identification and assessment of best practice applications is a comprehensive benchmarking program to identify strengths and weakness of the peer group and assess what are the root causes for success/failure. From this assessment, benchmarking participants are offered the opportunity to identify, first hand, which practices are best in class and where and why gaps in performance among the peers group occur.

[202]/ "An Integrated Approach to Improve Business Performance" presented at the Canadian Electric Association Workshop by PSEG, June 4 – 8 , 2007.

While Con Edison has indicated that it participates in several benchmarking activities, including an international group of large urban utilities, none of the benchmarking programs included a comprehensive assessment of peer group performance, but rather:

- a summary response to selected informational surveys; or
- periodic on-site visits to observe a specific utility's on-going practices, (for example, Con Edison participated in on-site visits to Florida Power & Light following the 2005 hurricane season).

The electric (and gas) utility industry has several national benchmarking programs that Con Edison has chosen not to participate in. Both the Southern Company and Public Service Electric and Gas manage distribution-related benchmarking programs involving, in total, over 45 major electric utilities. Listed below are the members of PSE&G's electric utility peer group.[203]

- Allegheny Power.
- Baltimore Gas & Electric Company.
- Commonwealth Edison.
- Dominion Virginia Power.
- DTE Energy.
- FirstEnergy.
- Georgia Power Company.
- Hydro One Networks.
- Kansas City Power & Light.
- Massachusetts Electric Co.- National Grid.
- Narragansett Electric Co.- National Grid.
- Niagara-Mohawk- National Grid.
- NSTAR Electric & Gas Corporation.
- Oncor Energy Delivery.
- Orange & Rockland Utilities.
- Pacific Gas & Electric Company.
- PECO Energy.
- Potomac Electric Power Company.
- PPL Electric Utilities.
- PSE&G.
- Southern California Edison.
- United Illuminating Company.

Vantage interviewed Southern Company's Director of the Southern Company Distribution Benchmarking Project, who also serves as the manager of Georgia Power's Storm Restoration function. This benchmarking initiative has grown from an initial 12 utility participants invited to join the program some five years ago to over 43 companies in 2007.

[203]/ The names of Southern Company peer group members are confidential however total over 46 utilities in 2007.

Since the membership grew to approximately 24 members several years ago, Southern Company stopped soliciting new participants. However, as this benchmarking program is considered one of the best for distribution system design, operation, and maintenance including storm restoration best practices, its growth has been linked to its apparent value and success.[204]

During 2006, both the Southern and PSEG benchmarking groups focused on emergency preparedness among other distribution issues. Furthermore, given the heightened attention to emergency preparedness (i.e., 9/11 and Katrina), the PSEG group prepared a special report on emergency preparedness benchmarking and best practices.[205] Similarly, for the 2006 peer review, the Southern Company participants also focused on emergency preparedness at its annual review meeting.

It is Vantage's understanding that Con Edison has been invited over the years to participate in both benchmarking programs but has decided against such participation due to its perceived uniqueness as a large urban underground network system.

C. BEST PRACTICE ASSESSMENT OF CON EDISON

VIII-F2 Con Edison was average or 'as to be expected' within 11 areas of the fifteen specific areas that Vantage investigated for Best Practices. For one area, Accuracy of Estimated Time of Restoration (ETR), Con Edison was found to be 'Below Expectation' and for three areas, including the ICS Organization, Con Edison was found to be ''Above Expectation.''

The scope of this management review included a ''best practice' assessment of 15 specific functional areas (plus an added "other" category) associated with emergency preparedness and response. Within the fifteen areas, Vantage evaluated over 35 specific practices, procedures, and systems that support the assessment of whether the broader functional areas were performing below expectation, as expected, or above expectation. The following Exhibit provides a summary of this assessment, including the ranking of best practices. The following is a statistical analysis of this best practice assessment.

204/ It should be noted that Southern Company or one of its affiliated distribution companies have won a total of 11 EEI Emergency Response Awards since 2004. EEI noted when Georgia Power was honored in 2001 with the Emergency Response Awards:
"A key factor in Georgia Power's successful efforts was the effective deployment of its Storm Evaluation Restoration Procedures (SERP), which cover five functional areas of responsibility: Storm Director, Manpower, Intelligence, Logistics and Communications. The company had added several new and innovative techniques to this protocol, which resulted in a successful and award winning recovery." (EEI news release 1/11/2001).

205/ This Report is confidential and only available to the PSEG Peer Group. While Orange and Rockland Utilities, a subsidiary of Con Edison is a peer member, Con Edison may not be even aware of it as the Company failed to provide Vantage with a copy when asked to provide all related benchmarking studies.

- Of the 15 functional areas, 11 were considered 'Within Expectation'', 3 ''Above Expectation' and 1 'Below expectation'''.
- The 3 areas "Above Expectation" included:
  - Outage Management Organization (ICS);
  - Anticipation of Network Failures;
  - Collection & Analysis of Routine & Storm related Outage Data.
- The single area of 'Below Expectation'' was the Accuracy of Estimated Time of Restoration (ETR).
- Within the 35 specific areas, Con Edison faired somewhat better with 15 above, 16 within, and 4 below expectation.

It is also interesting to note that Con Edison was given several opportunities to identify and demonstrate best practices. Verbally, at several briefing meetings and interviews, it was clearly noted that because of the DPS's specific directive for Vantage to identify best practices, it was in Con Edison's own best interest to use this opportunity to identify and demonstrate its best practices. Several interrogatories also sought this same information. Yet, Con Edison's written responses failed to either identify or demonstrate any such practices.

Best Practice Areas Reviewed	Comment	Below Expectation	Within Expection	Above Expectation	Reference
Weather Micro Forecasting			**X**		
Deep Thunder - IBM Mirco Weather Forecasting	Deep Thunder may be a BP, but Con Ed has yet to partiticipate	**X**			Q. No. 71
Call Center Performance			**X**		
Emergency Control Center	Used with Star & Outage Mgr. - upgrade under review		**X**		Q. No. 46
Crew Mobilization			**X**		
Inter-Utility Meeting: NYMAG/FP&L onsite review	Met with FP&L to review restoration practices			**X**	
STAR (see below)			**X**		
Restoration Project Optimization			**X**		
Outage Manager Intranet	Internal online outage monitor		**X**		Q. No. 47
Emergency Operating System (EMOPSYS)	To be updated		**X**		Q. No. 48
The Learning Center	Cable Splice Lab. & Cold Shrink Splices innovative			**X**	Interview 171
Anticipation of Newtwork Failure Potential				**X**	
Jeopardy/Auto Wolf	Jeopardy uses failure rates and CDD to estimate numbers of network failures. As a predictive tool, networks can be ranked by probability of failure.			**X**	Interview 179
Poly Voltage Load Flow (PVL): also WOLF (World Class Load Flow)	PVL is a balance 3 phasr load flow analysis used for network secondary distribution systems. Also feeds system information into WOLF.			**X**	Q. No. 58
STAR	STAR is used to analyze & track system problems with both graphical & tabular displays. Is used to identify the name and location of non-network customers out of service. Upgraded in 2006.		**X**		Q. No. 45
Power Quality Nodes (PQN)	PQN at substations & end of feeders provide excellent data to Control Center engineers to better detect network feeder faults.			**X**	Joe Lenge Interview
Reactance to Fault (RTF): single phase fault locator	Started in 2005 as an anticipatory took to determine location of a given fault, better direct repairs and reduce feeder interruptions. RTF has provent to be extremely accurat for typical single phase faults.			**X**	Interview 217
Optimize Communication with Customers, Politicians, Emergency Responders, etc.			**X**		
Communications Research Associates' survey	Completed after Washing Heights; no update or status report	**X**			Q. No. 34 (DR 149)
STAR: Reports and Tracks Outages	To be upgraded in 2007		**X**		Q. No. 45
Power Quality Program	Direct meetings with 300-400 customers			**X**	Interview 217

Collection & Analysis of Routine & Storm Related Outage data				**X**	
Distribution Information System (DIS)	Intranet system used to consolidate and display information for entire distribution system.			**X**	DR 49
Network Trouble Indicator (NTI)	NTI is an algorithm that is used to estimate number of customers out based on feeder outage.		**X**		DR 49
Distribution Fault Anticipator (DFA)	Used for overhead system		**X**		Q. No. 152
Sarnoff Vehicle	Detects stray voltage & makes repairs proactive			**X**	Make B notes
Accuracy of Estimated Time of Restoration Capbility		**X**			
ETR Best Practice Recommendation: Use of Remote Metering	Plans to add remote meters		**X**		DR. 129, Rec #6
Benchmarking Study of ETR	Generally, Con Ed about the same as other 19 participants, Con Ed however does not monitro accuarcy of job specific ETRs while most others do.	**X**			Q. No. 17
Data Quality & Collection, Power Quality Nodes			**X**		
GPS System: Vision - Electric & Gas Distribution mapping	Consistent with sound distribution engineering practices		**X**		DR 51
IDMS - Automates mapping in Brooklyn			**X**		DR 51
EDFIS - Mapping on Staten Island			**X**		DR 51
Communication Links & backups			**X**		
Communication Procedure Review	CRA benchmark found Con Ed "very similar to others in message approval and dissemination"		**X**		Q. No. 27
Outage Management Organization				**X**	
ICS complies with National Incident Management System (NIMS)	Claim based on Con Ed's perception			**X**	Q. No. 14
ICS Not benchmarked	Con Ed claims no other like theirs, yet other benchmarking studies do address ICS	**X**			Q. No. 11
Outage Management Software			**X**		
Energy Management System	New system developed by GE			**X**	Interview 173
Outage Management Preparation & Drills			**X**		
Distribution Engineering Workshop (DEW)	What-if analysis of outages in Staten Island			**X**	Interview 172
Utilization of Operation & Maintenance & Capital			**X**		
DOCS software: used for project cost estimation	Appears to useful for cost estimation and budget analysis		**X**		Interview 172
Other including related Research & Devlopment			**X**		
Distribution System Design - G3	Group studying distribution designs of the future		**X**		Interview 214
International Benchmarking	Benefits not apparent		**X**		Interview 214
Engineering Exchange	Has produced some benefit;e.g., Feeder ID by tracer signal at S/S			**X**	Interview 214; Interview 1
Electrical Cable Testing Network (ETCN)	Has produced solid results			**X**	Interview 174
NETRACK	Established program at Georgia tech.			**X**	Interview 174

X = rating of a specific fuction X = rating for the functional area

VIII-F3 Even though Vantage found that Con Edison's Incident Command System (ICS) design is a best practice (i.e., above expectation), during 2006 Con Edison failed in its overall execution of its emergency restoration responsibilities.

The above finding is consistent with the more comprehensive assessments made in the previous sections, namely that while Con Edison has developed a sound ICS organization and has invested in tools to help it prepare for and respond to emergency outages, its performance has been declining and management has failed to memorialize within the operational and strategic planning process that:

- reliable service is a paramount corporate objective;
- such declining performance is intolerable; and
- there is a comprehensive strategy to identify, address, and correct root causes so that this trend is reversed.

The one major area that Con Edison failed to achieve an 'At' or 'Above Expectation' was the ETR Accuracy. ETR is a critical component to the restoration process. From the consumer's perspective, it provides families and businesses with the necessary information they need to cope with the outage. From Con Edison's internal perspective, the ETR is a gross measure of exactly what needs to be done to restore the system to full recovery, what the priorities are for system repair, and how to best allocate limited resources to minimize the actual time for recovery.

Equally as important, from a public perception, inaccurate ETRs generate distrust and foster the general belief that the Company does not have a handle on the situation. Regardless of how sophisticated the ICS organization or how advanced the computer and engineering models which both received ratings of "above expectation," if Con Edison fails in its communication with the public, it leaves them no choice but to assume a level of incompetence or, worse, a loss in the public's trust whether deserved or not.

The above findings were based upon the review of Con Edison's data responses and the Vantage interviews of Con Edison management and staff. Each member of the Vantage team was asked to address best practices during the interview process. A survey instrument was provided as a guide for each interview. The following comments are drawn from the interview findings as they relate to this best practice evaluation. These findings, along with the interview notes, were used to develop the above Best Practice matrix.

- **Crew mobilization response time**: Essentially implemented for most network feeders is the Reactance To Fault (RTF) application. The resulting capability to identify the location of feeder faults to within several structures (vaults & manholes) provides a gross reduction in search & repair time requirement for field crews.
- **Anticipation of network failure potential:** Presently existing, Jeopardy's Monitor and Contingency applications utilize the CAJAC database of component failure history and weather (temperature) conditions/forecasts to predict and rank the various network feeders relative to probability of failure. Reportedly,

only a limited staff is capable of effectively running the applications.[206] This appears to be in keeping with best practice.

- **The Hi Pot testing program** in place exposes higher risk network primary feeders to DC testing during the non-summer periods. The intention is to force failure of greatly compromised component insulation and repair/replace prior to peak load & temperature periods. Indications are that approximately one summer fault is averted for each five failures on test (FOT) occurrences.[207] A square wave Very Low Frequency (VLF) test protocol in process of study and refinement appears to be more effective in identifying incipient failures than DC testing.
- **Accuracy of Estimate of Time to Restore**: Application of STAR to the network environment was incomplete and unreliable at the time of the LIC network event of Summer 2006. The completion & implementation of functional 'business rules' was to be completed by June 2007 to allow STAR to automatically predict ETRs for network customers. It remains to be seen whether STAR can actually be effective in a network environment dependent upon customer complaint calls to establish affected locations.
- Enhanced knowledge of **load flows in secondary network main conductors** appears dependent upon real time data acquisition in place of simulation programs based upon primary data and historical customer demands. A program of the category of SUNDAS to report actual current and voltage conditions on secondary mains was an indication of Con Edison's knowledge of the limitations and shortcomings of predictive modeling. The AMI/AMR pilot project may be a first step in providing useable real time data for determining secondary network load flow conditions. It appears that any implementation providing actual reading data for network secondary mains would be a gross improvement in design and operational decisions.
- **Data Quality & Collection**: Programs such as PVL and WOLF rely upon the quality of the connectivity model, committed by Con Edison to be corrected by June 1, 2007, for the seven worst networks by Jeopardy ranking. All networks are scheduled to be addressed by December 2009. Reliability of program output must be considered suspect until completed and maintained. Staff solely dedicated to connectivity model check, verification, and maintenance would improve reliability of PVL, WOLF. Additional measures are necessary to update connectivity model during emergency repairs to reflect typical reinforcement at such times.
- **PQ Nodes**, recently installed on a research program basis have been extended to area substations supplying networks in Bronx, Brooklyn, Queens, and Manhattan. PQ Nodes is a valuable, if late, implementation to all substations of a mature technology said to be pioneered by Con Edison

[206]/ DR 211, pg 166.

[207]/ IR 242.

- **The Reactance To Fault (RTF) Program** was started in 2005 as a tool to determine the location of a given fault, better direct repair groups, and reduce feeder interruptions. The system monitors the area substation voltage and current and resultant phase angle during a fault to determine the location of the fault. RTF has proven to be extremely accurate in locating typically single phase faults.
- **Remote Monitoring System (RMS)** is an implementation of real time data transmittal of network transformer operating data. Three versions of transmitters differ in the number of data points transmitted, reliability, and signal quality/magnitude. Quality and reliability appear to have improved with each upgrade of transmitting units. Likewise, RMS receivers are subject to failure and require periodic replacement. A program to install five receivers on secondary grids is in place with installation scheduled by the end of June 2007. The reliability of RMS is crucial to the capability of PVL and WOLF to provide useable models.
- **Cable Center** splice training, failure analyses, testing, and evaluation programs appear to fully qualify as best practice.
- **The Learning Center (TLC)** provides multifaceted training and testing of the range of employees within Con Edison. Outdoor overhead facilities, switchgear, pad mount transformer, and switch exposure, etc. provide real world hands-on training exposure. There are currently some 80 E-Learning programs in use by employees, and classroom attendance is required for specific areas. Promotional testing is performed at TLC for both union and management personnel. Union to supervisory transitions are aided by the Team Program. Similar advancement for college graduates is conducted via the Gold Program and includes three 6 month assignments in various categories.
- Separately, within TLC, **Protective Systems Testing Training Lab** is equipped with multiple simulators for training, proficiency maintenance of calibration technicians, and substation operators. Simulators are constructed with a cross section of actual installed relays, instruments, operating displays, panels, etc. In essence, the continuing proficiency training of technicians is necessitated by the inherent reliability of latter day microprocessor relays and equipment. Substation operators get annual block training on shutdown/reenergize cabinet and under frequency load shedding panel. The Protective Systems Testing Training Lab is well equipped with apparently rigorous training programs.
- **Control Systems Engineering** management regularly participate in the Northeast Power Control Council (NPCC). The NPCC provides and maintains industry standards via participation with the organization to promote the reliable and efficient operation of the interconnected bulk power systems in Northeastern North America through the establishment of criteria, coordination of system planning, design and operations, assessment of compliance with such criteria, and the development of reliability criteria.
- **Engineering Exchange Program** is benchmarking with other international and domestic utilities to maintain knowledge of other's effective practices. One identified benefit is the implementation of tracer signals for downstream identification of individual feeder conductors acquired from French utility, EDF.

The net benefit is reduction of time required to verify identification of individual feeder conductors.

- **The R&D Program** encompasses a multiplicity of research, pilot projects, investigations and computerization projects. Utilization of outside research & development facilities including Columbia University, appears extensive, as doe's correlation with EPRI in various programs. Programs under evaluation/consideration include IBM's Deep Thunder micro weather forecasting and EPRI's Distribution Fault Anticipator for overhead systems. Several machine learning programs are in development for electric planning and other categories.
- **Overhead auto-loop distribution** could well qualify as best practice with reduced outages and downtime versus standard radial distribution typical elsewhere.
- **The Power Quality Group** works closely with EPRI to apply the latest "Best Practice."
- On 5/1/07 Con Edison established a **3G System Development Manager** position with a team of 9 individuals charged with the development of the 3G System. The group reports to the Central Engineering Department.
- **The 3G Distribution System of the Future** is in the conceptual phase and will either replace or augment the current 2G system. Functional criteria includes:
    - maintain the reliability the network customers are accustomed too.
    - increase asset utilization, utilize spare capacity;
    - reduce street congestion;
    - improve operating flexibility;
    - reduce or defer costs;
    - utilize latest technologies.
- **International benchmarking**, which meets twice a year and includes representatives from:
    - England;
    - Paris;
    - Tokyo;
    - China.
- To monitor for **stray voltage**, Con Edison has developed the Sarnoff vehicle. Plans are to utilize this tool to monitor for stray voltage and make repairs on a proactive basis.
- **The Network Trouble Indicator (NTI)** system has proven to be valuable. Further work must be done to customize and integrate it on a given network. Improvements in the programs graphics and visualization capabilities would add to its value.
- As a best practice, the **Distribution Engineering Department** – Cable Section hosts a monthly 'Underground Cable Committee.' Attendees include representatives from the Field Operating Groups, Operations Management, QA, Engineering, the Cable Shop, R&D, and cable and equipment suppliers.
- **The Cable Shop** maintains an Industry Wide Data Base (IWDB) of in excess of 80,000 cable and splice failures. The Con Edison Cable Shop is recognized as an excellent source for analyzing a cable or splice failure and providing feedback to all participants.

- **NETRACK** is a collaboration of members Companies that utilize the lab facilities at Georgia Tech. to analyze common material and process problems.
- **SCADA** simulator is utilized to train operators.
- Con Edison is installing a new **Energy Management System (EMS)** this year and has selected General Electric as their EMS provider. They purchased their base system and customized it to support their unique processes. They purposely attempted to minimize any customization. The EMS review process allowed them to review various best practice options and remain ahead of the technology curve.
- **Protective System Test Training Programs, Simulators @ TLC**. Extensive availability of simulators provides hands-on training experience.
- Con Edison is undertaking a review, with an outside firm, which will address increasing **underground installation of services** in the Westchester Division. [208] In interviews, however, management indicated that under-grounding was extremely difficult and expensive due to the rocky nature of the land and the density of large trees in typical ROW paths.

STRATEGIC PLANNING

VIII-F4 The Con Edison corporate culture, as fostered by senior management, throughout the strategic and business planning process, clearly fails to recognize emergency response planning as a top priority or institutionalize continuous improvement via benchmarking or best practice assessments.

For example, the 2007 Electric Operations Business Plan fails to demonstrate management's commitment to continuous improvement and makes little or no reference to the significant outage events that occurred during 2006. In fact, in some cases, the Company has simply lowered the bar for 2007 when compared to the goal set in the 2006 Business Plan.

Con Edison prepares an annual Electric Operations Business Plan, which enumerates management's corporate mission as well as its perspective of its operation goals and objectives for the forthcoming year. Such a business plan process is typical for electric utilities, especially the size of Con Edison. Also typical for a strategic and business planning process is the routine assessment of the organizations strengths and weaknesses, opportunities and threats (often referred to as a S.W.O.T. assessment). The SWOT facilitates management's self assessment of areas needing improvement as well as threats or risks associated with a changing business environment. The SWOT assessment is a prerequisite to continuous improvements, for without such a candid self-recognition of the company's needs, it would be extremely difficult to:

- assess the Company's current situation;
- identify and prioritize strategic initiatives;
- manage and control gaps between stated objectives and actual performance.

[208]/ DR 324.

Con Edison's Electric Operations Business Plan does not address the Company's SWOTs and fails to address tactical measures to make performance improvements. Furthermore, there are several observations which suggest that Con Edison does not consider the planning process as a serious endeavor for identifying, prioritizing, and assigning tactical measures that address the Company's near term needs. For example:

- Given the outage events that occurred during 2006, it would have been reasonable to expect that the 2007 Electric Operations Business Plan would have taken, head-on, the issue of Con Edison's restoration experiences in Westchester and its network requirements in Long Island City. Yet, the 2007 Business Plan was virtually void of any recognition or reference to the 2006 events. In fact, the 2007 Electric Operations Business Plan was literally a verbatim copy of the 2006 Business Plan except for very minor revisions;
- The 2007 Business Plan addresses Emergency Response in two small sections of less than a page in length, which are identical to the verbiage in the 2006 Business Plan (except for the fact that the two sections are consolidated under a new heading called 'Emergency Response.' There is absolutely no recognition of the four major outages, the four DPS investigations, or any other reference to the 2006 outage events;
- While Vantage requested the Business Plans for years 2004 through 2007, the consultants always received plans marked "DRAFT." Even the 2007 Plan, also marked DRAFT, supposedly developed during the later half of 2006, was received by Vantage in May 2007. Unless Con Edison routinely failed to provide Vantage with the final version, it appears as if Con Edison's planning process stalls after the preparation of the draft business plan. As a result, it is difficult to assess whether the goals and objectives were ever vetted by management, whether the following year's budgets were based on the Business Plan or whether senior management ever provided its final blessing to the Plan;
- As a final observation, the 2007 Electric Operation Business Plan not only failed to recognize weaknesses identified during 2006 or set new or more aggressive goals for performance achievement it actually reduced or eliminated reference to specific goals implicitly lowering the bar. Examples included:
  - the 5-Year Inspection Program removed reference to numbers of expected inspections and repairs;
  - for the Mobile Stray Voltage Detector, the goal of 20% inspection was removed;
  - the Transformer Vault Ladder Removal eliminated the 2007 target;
  - the Transformer Failure Root Cause Analysis target for additional units tested was removed;
  - the Employee Injury Target was lowered from a 20% Reduction Goal to simply maintaining the historic trend;
  - the Vehicle Safety goal was lowered from 20% Reduction to the two year average level.

RESEARCH AND DEVELOPMENT

VIII-F5 Con Edison funds an array of research and development programs for which Vantage identified a number of potential best practices should they become commercialized. However, the adequacy of senior management's ongoing support, from both a financial and prioritization perspective, raises the question as to whether these R&D projects will ever reach commercial fruition in time to meet Con Edison pressing needs.

Vantage reviewed Con Edison's research and development (R&D) program with an expectation that the Company's intermediate and long term needs were clearly enumerated and that the emphasis and direction of the R&D program assigned priorities based on those needs. What Vantage found was an impressive array of interesting projects, but what was missing was a clear picture of priority and timing. For example, Con Edison is a major sponsor of the 3G project whose goal is to develop the distribution system of the future. Vantage expected that, given Con Edison's current situation, namely an aging and congested network system with over taxed substations and high levels of ground fault impedance, the R&D program would be more focused on means to relieve congestion, reduce ground fault current, and expand the use of renewable distributed generation.

It is hard to fault Con Edison for funding important research, as many electric utilities have withdrawn from EPRI and reduced their own R&D programs. However, Con Edison's technological needs are significant and solutions must be forthcoming sooner rather than later. Vantage found on several occasions, a lack of senior management support via direction or funding that limited the R&D program's ability to expedite commercialization of promising and emerging technological solutions. For example:

- The IBM Deep Thunder project was touted by Con Edison management as a micro-level weather model that would significantly improve the Company's ability to predict storms and ultimately outage impacts in Westchester. Yet, when asked to provide some detailed information on this project, Vantage was informed that Con Edison was only considering a proposal to perform a feasibility study of the IBM Deep Thunder project.[209] When asked why a contract had not been signed with IBM, Vantage was told that prior budget restrictions caused the delay in approval;
- Con Edison funds a number of research projects with the Columbia University Machine Learning Center. In particular Vantage reviewed a project to enhance the prediction of future feeder failures. During 2006, the system was tested at the Manhattan Energy Control Center and found to be successful with potential system-wide applications. However, considering the early success of this test, it might have been expected that Con Edison would have expedited its commercial roll-out during 2007 at least to the extent of adding a higher degree of predictive capability. It is our understanding that no such strategic initiative is

[209]/ DR 171.

forthcoming.

D. REGULATORY OVERSIGHT

VIII-F6 Regulatory oversight of electric utility emergency preparedness and storm restoration is considerably more extensive and proactive in nature in regions routinely affected by hurricanes and tornadoes. However, there are several regulatory practices and procedures that the New York Public Service Commission should consider as an adjunct to its current annual review of each utilities' CERP filing and ad hoc post-outage investigations.

While the Vantage research of regulatory practices as they relate to emergency preparedness and response, reviewed a wide range of state commissions, two stood out for their proactive approach toward ensure best practices. Florida, a state often hit by severe hurricanes, has initiated a multi-year collaborative process to address emergency preparedness and system hardening. Missouri, often hit by tornadoes, has created a best practice check list for which they evaluate a utility's storm restoration practices. A summary of each follows.

FLORIDA

The state of Florida is among the regions most affected by hurricanes, flooding, and wind damage and, as a result, has initiated an aggressive program for improving its electric utilities' storm preparedness functions. In January 2006, "the Florida Commission staff conducted a workshop to discuss damage to electric utility facilities resulting from recent hurricanes and to explore ways of minimizing future storm damages and customer outages."[210] As a result of this workshop, the Florida Commission issues the following directives.

- All Florida electric utilities, including municipal utilities and rural electric cooperative utilities, would provide a 2006 Hurricane Preparedness Briefing at the Internal Affairs on June 5, 2006.
- Staff would file a proposed agency action recommendation for the April 4, 2006, Agenda requiring each investor-owned electric utility to file plans and estimated implementation costs for ongoing storm preparedness initiatives.
- A docket would be opened to initiate rulemaking to adopt distribution construction standards that are more stringent than the minimum safety requirements of the National Electrical Safety Code.
- A docket would be opened to initiate rulemaking to identify areas and circumstances where distribution facilities should be required to be constructed underground.

210/ Florida Public Service Commission Memorandum on Docket No. 060198-EI – requirement for investor-owned electric utilities to file ongoing storm preparedness plans and implementation cost estimates, dated August 17, 2006

In the docket dated April 25, 2006, the Florida Commission issued Order No. PSC-06-0351-PAA-EI requiring the investor-owned electric utilities to file plans and estimated implementation costs for ten ongoing storm preparedness initiatives on or before June 1, 2006. The ten ongoing initiatives included:

- a Three-year Vegetation Management Cycle for Distribution Circuits;
- an Audit of Joint-Use Attachment Agreements;
- a Six-year Transmission Structure Inspection Program;
- hardening of Existing Transmission Structures;
- a Transmission and Distribution Geographic Information System;
- post-Storm Data Collection and Forensic Analysis;
- collection of Detailed Outage Data Differentiating Between the Reliability Performance of Overhead and Underground Systems;
- increased Utility Coordination with Local Governments;
- collaborative Research on Effects of Hurricane Winds and Storm Surge; and
- a Natural Disaster Preparedness and Recovery Program.

To help the participants focus on the Florida Commission's critical interests, the following issues were identified and addressed by the active parties.

- **Issue 1:** Are each of the investor-owned electric utility plans for vegetation management for distribution equivalent to, or better than, a three-year trim cycle in terms of cost and reliability for purposes of preparing for future storms?
- **Issue 2:** Does each investor-owned electric utility's plans for auditing its joint-use attachment agreements include pole strength assessments and attachment verification?
- **Issue 3:** Is each investor-owned electric utility's plan for a transmission structure inspection program equivalent to a six-year inspection cycle methodology in terms of cost and reliability?
- **Issue 4:** Is each investor-owned electric utility's plan for hardening existing transmission structures adequate for purposes of preparing for future storms?
- **Issue 5:** Are each investor-owned electric utility's plans for a transmission and distribution geographic information system, post-storm data collection, and forensic reviews, and assessing performance of overhead and underground systems adequate for purposes of improving its storm restoration activities and evaluation of its storm hardening options?
- **Issue 6:** Are the utility plans for increased coordination with local governments adequate to foster better communications between utilities and the cities and counties they serve, not only prior to and immediately after a storm, but year-round to identify and address issues of common concern?
- **Issue 7:** Is each investor-owned electric utility's plan for collaborative research on effects of hurricane winds and storm surge adequate to further the development of storm resilient electric utility infrastructure and technologies that reduce storm restoration costs and outages to customers reasonable?
- **Issue 8:** Is each of the investor-owned electric utility's natural disaster preparedness and recovery plans adequate?

- **Issue 9:** Should the Florida Commission authorize staff to monitor and report on the investor-owned electric utility storm hardening plans?
- **Issue 10:** What information has been provided to the Florida Commission regarding each municipal electric utility's and each rural electric cooperative utility's ongoing storm hardening plans?

Since the start of the Florida Commission's emergency response assessment, two additional reports have been prepared, both of which demonstrate a commitment to best practice, quite candidly, which has been missing at Con Edison.

Report on *Collaborative Research for Hurricane Hardening* prepared by The Public Utility Research Center at the University of Florida dated February 26, 2007. As an initial step, the parties held a workshop in June 2006 "to provide a forum at which utility managers and hazard research professionals could discuss means to prepare Florida's electric infrastructure to better withstand and recover from hurricanes." Among several invited experts was Dr. Rachel Davidson of Cornell University. Four areas of further research were identified including:

- wind research, such as might be provided by the hurricane wind lab and wind measurement devices;
- materials development and analysis that could provide, for example, poles that are cheaper and easier to install during storm recovery efforts;
- cost-effectiveness of possible hardening solutions including undergrounding and vegetation management;
- how joint use loads affect storm damage and recovery.

Report on the *Workshop for Best Practices in Vegetation Management* sponsored by Florida's Electric Utilities, held on March 5-6, 2007. As an outcome of this workshop, the participants identified 63 areas of 'best practices' and offered the following ten insightful observations.

- It is impractical to eliminate all tree-related outages during hurricanes or high-wind events. Some trees will fail at high winds, and there is no vegetation management method that can prevent this from happening.
- Every storm has its own unique story. During 2004, hurricanes Jeanne and Frances were slow moving, albeit not as intense, storms that subjected infrastructure to a sustained pounding with heavy rains while Wilma in 2005 was a fast moving, much higher-wind event.
- Communication with and education for the public on all aspects of vegetation management as it relates to reliable utility operations is crucial. It is important for customers and municipalities to understand how vegetation management enhances reliability and can maintain aesthetics with the proper planning and cooperation.
- Vegetation management programs must have access to adequate and consistent financial resources. Unfortunately, vegetation management budgets seem easy to cut as the reliability results from them may not always be immediately tangible.

- Need for training, recruiting, and retaining highly qualified, skilled tree crews. During one group discussion, the members believed this was the biggest problem facing utility vegetation management programs.
- Eliminate overhanging tree limbs where possible to reduce outages. The standard for line clearance is 10 feet from the line. However, branches even 10 feet above the line that fall may take the line out of service, whereas branches 10 feet to the side falling to the ground would likely do so harmlessly. Industry standards and codes discourage set footage clearance. Rather, species-specific and condition-specific clearance standards are promoted. Many utilities promote directional trimming which encourages growth away from lines.
- Monitor and patrol critical distribution facilities such as major feeders and feeders that serve critical infrastructure such as hospitals, police, and fire/rescue. Many utilities report a constant monitoring and patrolling of these facilities and, in some cases, even trim around these facilities each year prior to hurricane season.
- Storm preparation and restoration logistics cannot be overlooked. Utilities discussed how they prepare staging areas, line-up contractor tree crews, prepare maps and important contact information for out-of-town crews, and pair grounding, tree, and line crews together to help speed up restoration and make efficient use of the resources they have.
- Cooperation between utilities and government at multiple levels is important. This cooperation can range from getting tree ordinances or trimming ordinances passed to coordinating with EGCs during storm preparation and restoration.
- A dedicated tree forensic program can help provide data to make better use of resources in the future. It has been suggested that dedicated teams of foresters or arborists collect data on why trees are failing (e.g., dead, diseased, damaged already, high winds) and what species of trees are failing so as to better target vegetation management resources to enhance reliability to the extent possible during extreme wind events or afternoon thunderstorms.

MISSOURI

In response to two major storm related outages on the AmerenUE system (St. Louis area), the Missouri Public Service Commission Staff (MO PSC) issued its report on the Company's Storm Outage Planning and Restoration Effort.[211] Missouri Staff's report examines AmerenUE's planning for major storm outages and their execution of that plan. Unfortunately, this is the third consecutive year AmerenUE has experienced major outages from severe thunderstorms. Each of these past restoration efforts has come with lessons for the future. In this investigation, Missouri Staff started its review by looking at other state commission storm examination reports as well as literature on storm restoration planning and execution.

[211]/ Report on AmerenUE's storm Outage Planning and Restoration Effort Following the Storms on July 19 and 21, 2006, Case No. EO-2007-0037, November 17, 2006, MPSC.

One of the documents used by Staff in its analysis was *Mercer Management Consulting's Improving Storm Restoration Performance© 2006*. Another document used by Missouri Staff in its analysis was Transmission and Distribution World magazine, August 2005 edition, article titled *Hurricane Restoration at Its Finest* by Ellen Parson. Both articles were obtained and reviewed by Vantage Consulting, Inc.

A review of common best practices from these documents and others yields the following primary categories of major storm restoration planning and execution activities.

System Storm Center & Operations

- Having a robust Crisis Management Plan & sticking to it.
- Employees are trained & ready to respond in their roles.
- Storm Tracking & Notification System.
- Damage assessment & repair teams trained & ready to respond.
- Strong Mutual Assistance Agreements - tree trimming & lineman.
- Continuous effective communications (hardened facilities).
- Continuous prioritization of restoration focus.
- Repairing health, safety, Fire, Police, water and sewer facilities quickly.
- Repairing backbone systems.
- Identifying and 'making safe' downed lines.
- Scheduling of necessary personnel in operations.
- Maintenance & Replacement Programs for critical infrastructure.
- Holding regularly scheduled, but brief, update meetings to discuss status and goals.
- Maintain flexibility for changing circumstances.
- Presence at Emergency Operations Centers in affected areas.

Staging & Logistics

- Equipment inventory, re-supply provisions & distribution.
- Advance preparation of equipment supply chain.
- Identify potential Pinch Points and address them.
- Crew safety and system orientation training.
- System mapping and restoration procedures.
- Meal planning and distribution.
- Truck fueling and security.
- Soiled clothing pick-up, laundry, and return.
- Staging site agreements with shopping centers, hotels, schools, and airports.

Corporate Communications

- Pre-storm checklist for customers.
- Consistent message with best available information.
- Regular communications with all media.
- Arrange press tours of damaged areas.

- Educate consumers of reasonable expectations.
- Specific communications with large customers.
- Web site information for those with access to computers.
- Call-Center people having access to current status information.
- Generator use safety notifications.

Community & Customer Relations

- Up-to-date contact information and keep state and local officials in loop.
- Listen to local government and county agency priority needs.
- Work closely with local officials in communicating status.
- Conduct regional community disaster response workshops.

Looking Back & Looking Forward

- Corporate culture that seeks feedback on what went well and what didn't.
- Root cause analysis of major problems and assessment of ways to improve in the future.
- Look for ways to reduce future storm impacts on system.
- Workforce recognition and recovery.

After reviewing the above list of primary elements of major outage restoration plans, Missouri Staff reviewed AmerenUE's Restoration Plan. Missouri Staff stepped through each of the items identified in the list above and found that AmerenUE's EERP, or other procedures, include all of the identified major elements. This observation does not mean that all elements were carried out flawlessly, only that AmerenUE's EERP does compare favorably with other best practices documents.

Staff notes that even the best restoration plan does not ensure a good restoration outcome following a major storm outage. To assess outcomes, it is necessary to perform comparative studies of AmerenUE's restoration effort to other past restoration efforts. A document that was helpful in Missouri Staffs investigation in this area was Edison Electric Institute's (EEI) Utility Storm Restoration Response by Brad Johnson, an independent energy advisor, issued in January 2004. Vantage obtained and reviewed this report which examines utility responses to forty-four major storms between 1989 and 2003.

The Missouri PSC Staff found that in order to bring all of the electric utilities in Missouri up-to-date on best practices regarding storm restoration planning and execution, it made the following recommendation.

"Recommendation: Staff should conduct a roundtable with all of the electric utilities in Missouri to discuss best practices in restoration planning and execution".

This recommendation is similar to Florida's approach using the workshop concept which Vantage found as a best practice .

The review of the Florida and Missouri regulatory approach toward emergency preparedness and storm restoration produced three key observations that have generic application in New York.

- Emergency Preparedness and Storm Restoration should be a statewide, collaborative all-utility process. By engaging all affected utilities[212] including natural gas and telecommunications, emergency planning becomes a broader master plan in which all available resources can be committed to those areas most affected by an outage.
- The Commission's directive for a 'best practice' standard sets the tone for utility participation and compliance.
- Emergency Preparedness should be proactive creating a better understanding of utility responsibilities and expectations. This should lessen the degree of emphasis on post-outage investigations.

E. BEST PRACTICE RECOMMENDATIONS

VIII-R1 Expand participation by Con Edison in utility sponsored, industry-wide emergency preparedness and major outage event benchmarking programs. (Refer to Finding VIII-F2)

The Southern Company and Public Service Electric and Gas Benchmarking programs are two examples of programs that Con Edison should consider joining. Given each program's recent review of emergency preparedness, it appears as if Con Edison is missing several opportunities to gain intelligence on other applications and best practices. The DPS should direct Con Edison to actively participate in either or both benchmarking programs or else provide an explanation of what other plans the Company has to advance is knowledge base for best practice applications.

VIII-R2 Consider, through the DPS Staff, implementation of a collaborative program including all of the electric, gas and telecommunications utilities within its jurisdiction to develop best practice emergency preparedness and major outage restoration programs. (Refer to Finding VIII-F6)

The Staff could serve as the facilitator and consider inviting a range of other stakeholders including the New York State Energy Research and Development Authority, the New York Power Authority, the Long Island Power Authority, the Consumer Protection Board and other consumer advocates, as well as independent power producers .

212/ Including the invitation to public power systems to participate.

IX. IMPLEMENTATION STRATEGY

A. APPROACH TO IMPLEMENTATION

The Vantage review is the latest in a seemingly endless string of examinations of the Company and, to some extent, the Company seems to have treated the review within that context. This raises the prospect that the Vantage recommendations will be treated in the same manner as the prior recommendations. Our consultants have been critical of that prior implementation process and we would view such an outcome as a failure for Con Edison, its customers and Vantage. It is therefore incumbent on all parties to do whatever possible to preclude that result and maximize the value of this work.

The Department of Public Service Staff has rightly challenged Vantage to suggest a new approach to accomplish just that.

Guiding Principles

Our suggested approach revolves around several basic principles.

First, neither the DPS nor Vantage can bring about the long-lasting improvements that can and should be implemented. Only Con Edison's management has the power, skill, and capability to achieve that goal. If management does not take on that commitment, all is lost. Any successful implementation approach must start with Executive Management. However, Executive Management will be unable to make a sincere and effective commitment unless they are convinced of the value. They must be able to internalize the importance of responding to the sea change and the degree and breadth of the effort required.

Second, and similarly, employee buy-in to the new priorities is essential. Con Edison management runs the real danger of this simply being viewed as a new 'program of the month' or the latest regulatory directive. Management direction will not be enough. An effective marketing effort based on a real commitment by executive management will be necessary.

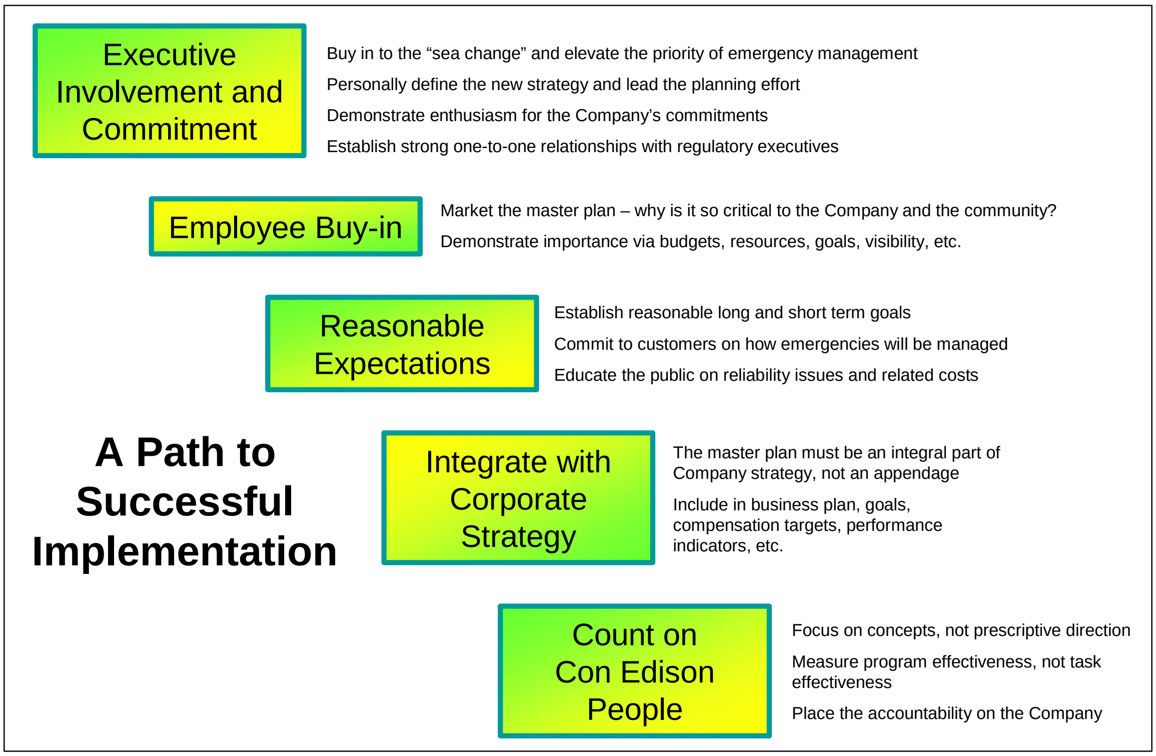
A corollary element, and third principle, is the notion that when it comes to outages the Company and its employees just cannot win, and that is not a particularly good motivator. The public demands high electric reliability in the Con Edison service territory, and the sea change has only heightened those demands. Vantage does not seek to lower public expectations, yet the reality that 100% reliability is neither attainable nor affordable must be better understood. With that understanding will come a more rationale measuring stick and the enhanced motivation of attainable targets.

Fourth, the recommended holistic plan (to be developed) must be assimilated as an integral, ongoing part of the Company's operations, and not an appendage. It must be directly linked to corporate plans, performance measures and compensation systems, just as other critically important day-to-day activities.

And fifth, prescriptive recommendations from Vantage or any other entity will not provide optimum value at this point. Vantage can help Con Edison greatly by providing concepts and improvement areas, as well as guidelines and criteria for success, while allowing the people most capable (management) the flexibility to design their own solutions. Coincidentally, with that comes responsibility, ownership, and accountability. Turning loose the creativity and commitment of Con Edison's people within the framework of a properly designed program is the single most valuable strategy that can be implemented.

These principles can form the basic design of an improved and "guaranteed to work" implementation scheme.

An Implementation Framework – Five Steps to Success



An enthusiastic commitment to these five principles by DPS and Con Edison is the next step and a prerequisite to effective implementation. It is Vantage's recommendation that each of the recommendations be addressed in a manner similar to the following.

- Con Edison should review and comment on all recommendations. Where they disagree, a detailed factual argument should be provided for consideration.

- Con Edison should prepare an Implementation Plan. This Plan should be reviewed with the DPS Staff modified to address their concerns and priorities.

- The Implementation Plan should be submitted to the DPS for approval and then implemented with a fixed timetable and reporting schedule.

APPENDIX 1 - LIST OF REPORT RECOMMENDATIONS

The following recommendations are taken directly from Chapters II to VII of this report. Each recommendations refers to the specific findings that support it. Please note that the number of total findings is 159 while only 62 support recommendations. The difference in this number reflects the fact that in many cases Vantage found that Con Edison is doing adequate or better at the area reviewed and no recommendation is warranted.

III. EMERGENCY RESPONSE, POLICY AND ORGANIZATION

III-R1 Highlight the role of senior management in communicating and implementing vision and priority for the Company's approach to reliability and emergency management. (Refer to Finding III-F1 & F2.)

III-R2 Define and communicate policies regarding the importance of emergency management that are proportionate to the unique circumstances surrounding Con Edison's service territory and the sea change in expectations that has transpired in recent years. (Refer to Finding III-F4.)

III-R3 Develop and implement a coordinated strategy and Master Plan for reliability and outage management. (Refer to Finding III-F3 & 4.)

III-R4 Emphasize the holistic nature of reliability and outage management and communicate that notion to employees as part of the Integrated Plan. (Refer to Finding III-F6.)

III-R5 Include specific measures for maintaining preparedness and the priority of emergency management including appropriate policies, oversight and controls in the revised Plan. (Refer to Finding III-F8.)

III-R6 Integrate the implementation of recommendations through the new coordinated strategy. (Refer to Finding II-F3, 4 & 5.)

III-R7 Restructure the key organizational functions in support of the Plan and in accordance with sound design principles. (Refer to Finding III-F8.)

III-R8 Consider the creation of a central, core group of emergency management professionals with the management of that group responsible for technical excellence in the field of emergency planning and management as well as technical direction and professional development of the EM personnel. (Refer to Finding III-F16.)

III-R9 Consider, in designing a new organizational structure, a hybrid approach that assigns EM professionals to operating organizations on a matrixed basis as a means to achieve the technical benefits of a centralized group while maintaining Con Edison's culture of accountability to the operating organizations. (Refer to Finding III-F16 & F17.)

III-R10 Consider, locating the EO EM group, or its successor, to the group reporting to an organization that spans all of EO, such as the VP-Engineering and Planning. (Refer to Finding III-F9.)

III-R11 Responsibility for management of Con Edison's overall emergency programs should be clearly assigned, and the responsible entity should be charged with the various program management functions now contained in CI 260-4. (Refer to Finding III-F9.)

III-R12 A corporate oversight function for emergency management should be added that is charged with ensuring that all organizations are aligned with corporate priorities and principles. (Refer to Finding III-F9.)

III-R13 Ensure that the recommended organizations restructuring acts firms up roles and relationships, minimizes gray areas, and resolve procedural inconsistencies. (Refer to Finding III-F13 and F15.)

III-R14 Ensure assignment of all elements of the Master Plan and the allocation of corresponding resources to those elements in order to prevent inappropriate domination by local preferences, "program of the month," or other transient priorities. (Refer to Finding III-F8 and F13.)

III-R15 Redefine the role of Distribution Engineering in emergency preparedness and response to make it consistent with ICS principles and Con Edisons current and future needs. (Refer to Finding III-F14.)

III-R16 Add resources to the Corporate EM group, or its successor in any new structure, so that the resources align with its substantial and broad responsibilities. (Refer to Finding III-F11.)

III-R17 Defer the pending expansion of the EO EM group until a new organizational structure is defined and staffing for EO EM, or its successor, is evaluated within the context of that new structure and the new Master Plan. (Refer to Finding III-F12.)

III-R18 Develop a sound staffing plan and supporting commitment, as part of the new recommended strategy development, to ensure staffing is adequate and justified and that management commitments do not ebb and flow as they have in the past. (Refer to Finding III-F10 and F11.)

III-R19 Revisit the question of resource typing after the issuance of new FEMA software. (Refer to Finding III-F20.)

III-R20 The refinement of ICS accountabilities should be a subject of continuous improvement with particular focus on those positions for which descriptions are complex and for different positions that contain similar concepts or overworked phrases (such as 'information,' 'communication,' 'prioritization of work,' etc.). (Refer to Finding III-F26.)

III-R21 Redefine the purpose and expectations for IAPs for the benefit of emergency managers, and Incident Management Assistance Teams (IMATs) should assist in ensuring a reasonably consistent application. (Refer to Finding III-F26.)

III-R22 The IMATs should assume a full role in drills to act as an in-process helper to the IC and other managers and should also take an aggressive facilitation role (consistent with IC needs and expectations) in emergencies. (Refer to Finding III-F28.)

IV. COMPREHENSIVE EMERGENCY RESPONSE PLAN (CERP)

IV-R1 Clarify the role and purpose of the CERP, for internal management purposes, with the objective of replacing or repairing the document where it does not effectively serve the needs of the organization. (Refer to Finding IV-F3.)

IV-R2 Standardize distribution of the CERP and provide a clear explanation for any changes that take place. Further, where changes are significant, employees should receive a briefing to ensure full awareness. Also, at the time of distribution, managers should be reminded of their responsibilities concerning the use of the document. (Refer to Finding IV F4 & F5.)

IV-R3 Assist Con Edison managers and improve their effectiveness under emergency conditions by creating a more useable structure for important documents and providing managers with easy-to-use guides for accessing those documents. (Refer to Finding IV -F6.)

IV-R4 Improve the presentation of the CERP material so that it can be easier to read and thus of greater use to managers. (Refer to Finding IV-F7.)

IV-R5 Redefine which managers should have responsibility for approving emergency planning documents and then hold them responsible for meeting that commitment. (Refer to Finding IV-F8.)

IV-R6 Define expectations for the use of checklists and implement improvements where the quality of the checklists limits their use. (Refer to Finding IV-F9.)

IV-R7 Establish a clearly defined and structured set of criteria and assumptions that establish the bases for the Plan, define the environment in which the Plan must operate, and set a foundation and framework around which to build the Plan. (Refer to Finding IV-F20.)

IV-R8 Construct an improved framework and process for the development, documentation, and management of planning thresholds that: includes a matrix, for the benefit of managers and emergency planners; that summarizes all of Con Edison's emergency classifications as well as the actions they trigger; provides for a possible simplification recognizing that ease of use will lessen confusion and improve uniform application; and requires analysis and testing of planning thresholds periodically. (Refer to Finding IV-F22.).

IV-R9 Elevate the priority of resource planning within the emergency planning framework. (Refer to Finding IV-24, 25 & 26).

V. EMERGENCY RESPONSE PERFORMANCE

V-R1 Document the lessons learned process (after action reviews) from drills to achieve the payback from drills that should be realized. (Refer to Finding V-F4.)

V-R2 Revamp the drill program in line with the proposed new strategy and organization. (Refer to Finding V-F5 & F6.)

V-R3 Prepare and communicate an integrated annual drill schedule and plan including information on each planned drill, before the start of the year. (Refer to Finding V-F7.)

V-R4 Include external parties (municipals, customers, press, elected officials) in major drills. To the extent direct participation might be unwieldy or ineffective, simulated participation might be appropriate. (Refer to Finding V-F8.)

V-R5 Research the cause of incomplete job packages and trouble assessments originating in the Engineering and Planning Area which are then forwarded to the Operations Section for assignment. (Refer to Finding V-F12.)

V-R6 Develop ECS/STAR training modules for ICS designees and those in supporting roles. (Refer to Finding V-F16.)

V-R7 Review succession planning process for key field positions and implement plans to increase the number of qualified employees in the Line Constructor and Underground Worker series. (Refer to Finding V-F27.)

V-R8 Evaluate the impact of high levels of overtime on the workforce as it relates to callout response rates. (Refer to Finding V-F28.)

V-R9 Consider negotiating a new clause in future Labor Agreements that establishes a minimum callout response rate for certain job classifications. (Refer to Finding V-F29.)

V-R10 Review the succession planning process for Engineering Designers and Technicians and implement plans to increase the number of qualified employees. (Refer to Finding V-F30.)

V-R11 Review the current voltage reduction program of load reduction to ensure its effectiveness when applied for an extended period. They should also ensure that the level of voltage reduction will not result in damage to customer's motors and other voltage sensitive loads. (Refer to Finding V-F35, 36 & 37.)

V-R12 Develop and implement changes to PVL and WOLF that lead to improved results and greater confidence. (Refer to Finding V-40, 41, 42 & 43.)

V-R13 Improve the primary sensors, transmitters and signal transfer technologies to increase the integrity of the RMS data. (Refer to Finding V-F44.)

V-R14 Complete the assessment of the Deep Thunder micro-weather modeling system and integrate it with either the STAR system or another emergency response program. (Refer to Finding V-F46.)

V-R15 Reconsider the guidelines regarding network shutdown in EO-4095, and make the decision process more defined and less subjective. (Refer to Finding V-48-53.)

V-R16 Place a higher priority on replacement of failed or nonfunctioning network systems components including transformers, network protectors, and RMS transmitters immediately prior to and during the summer months. (Refer to Finding V-F52.)

V-R17 Consider secondary feeds to high profile customers such as the MTA and Long Island Rail Road when reconfiguring or modifying future networks. (Refer to Finding V-F52.)

V-R18 Continue development of G3 research on future networks and integrate with long-term Strategic Plan as identified in Recommendation II-R3. (Refer to Finding V-F53.)

V-R19 Continue feeder testing with Hi Pot methods as currently practiced until such time as Con Edison completes its evaluation and refinement of the program for VLF testing and determines whether/how to implement same. Continuation of exploration of other non-destructive technologies suitable for the network environment should continue. (Refer to Finding V-F56.)

V-R20 Enhance the program for maintenance scheduling prior to and during the summer peak periods to ensure that all possible work is completed during any scheduled feeder shutdown. (Refer to Finding V-F57-58.)

VI. COMMUNICATION

VI-R1 Increase emphasis on the need for customers to report outages to Con Edison. (Refer to Finding VI-F4.)

VI-R2 Con Edison should test the new capabilities of the Call Centers under a major outage scenario. (Refer to Finding VI-F3.)

VI-R3 Develop a methodology based on previous outage experiences to provide customers a global ETR on a more timely basis than the current commitment. (Refer to Finding VI-F6.)

VI-R4 Determine if the commitment in the CERP to generate a global ETR in 12 hours is reasonable for all events and if not revise the plan accordingly. (Refer to Finding

VI-F6.)

VI-R5 Continue to expand the information and communication provided through the Con Edison web site. (Refer to Finding VI-F8.)

VII. RELIABILITY

VII-R1 Undertake a study using outside resources to determine the actual health status of the forest in Con Edison's service territory. (Refer to Finding VII-F7.)

VII-R2 Evaluate the effectiveness of the current tree trimming and clearing program relative to other reliability measures associated with vegetation management. (Refer to Finding VII-F5, F46, & F6.)

VII-R3 Evaluate long-term commitment by Con Edison to both Capital and O&M expenditures by category as part of the ongoing rate case and other investigations. (Refer to Finding VII-F13-17.)

VII-R4 Develop a comprehensive set of performance indicators that, when tracked, will permit Con Edison, DPS and other stakeholders to understand performance of all relevant measures associated with reliability, emergency response management and customer satisfaction against both targets and over time. (Refer to Finding VII-F18 & 19.)

VIII. BEST PRACTICES

VIII-R1 Expand participation by Con Edison in utility sponsored, industry-wide emergency preparedness and major outage event benchmarking programs. (Refer to Finding VIII-F2)

VIII-R2 Consider, through the DPS Staff, implementation of a collaborative program including all of the electric, gas and telecommunications utilities within its jurisdiction to develop best practice emergency preparedness and major outage restoration programs. (Refer to Finding VIII-F6)

APPENDIX 2 - DISCUSSION OF 2006 OUTAGES

This chapter provides the reader with background information on the major outages of 2006, the reports and analysis that were performed relative to each event and a glossary with key definitions and acronyms.

A. SUMMARY OF 2006 MAJOR OUTAGES

This study was precipitated by the four major outage events experienced by the Con Edison System in 2006. Three were overhead storms that did extensive damage to the mature urban forest of Westchester County. One event occurred in the midst of a heat wave[213] resulting in extensive outages in Northwest Queens because of its impact on the Long Island City secondary network, one of 57 such networks that Con Edison maintains in New York City.[214]

The table below and most of the following descriptions and maps were prepared by Con Edison in a briefing book given to employees prior to this audit. Consequently, it reflects Con Edison's view and summary of the details of each major outage in 2006. [215]

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[213]/ Vantage asserts later in this chapter, that the LIC was not directly caused by a heat wave, but by system design, philosophy of operations, maintenance practices, financial decisions and other man made decisions.

[214]/ Con Edison Comprehensive Report.

[215] / DR 200, Con Edison Briefing Book

Exhibit -1
2006 Outage Details

Event	January Wind & Rain Storm	July Thunderstorms	July LIC Outage	Ernesto
Dates	January 19-22	July 18-22	July 17 - 25	September 2-8
Cause	Wind & Rain	Wind & Lightning	Excessive Heat and overload of electric system	Remnants of Ernesto
Peak Wind Gusts	55-65 mph	55-60 mph	n/a	45-48 mph
Storm Duration	15 hours	8 hours*	8 days	21 hours
Customers affected	61,500	50,500*	25,000	78,300
Restoration Duration (after storm ends)	3 days, 16 hours	4 days, 9 hours	n/a	4 days, 2 hours
Company OH crews and contractors	91	74	n/a	95
Mutual assistance OH crews	205	117	n/a	93
Troubleshooters and ladder line crews	64	63	n/a	140
Tree trimming crews	45	39	n/a	58
Damage assessors	200	100	n/a	240
Site Safety personnel	500	115	n/a	213
Primary wires down (spans)	1,170	950	n/a	1,400
Secondary wires down (spans)	782	609	2000	900
Service wires down	482	350	n/a	500
Poles damaged or down	148	82	n/a	105
Transformers damaged	98	68	n/a	71
Transformer oil spills	36	25	tad	36

* The initial storm on the July 18 lasted 8 hours and affected 35,000 customers. Then, on the 21-22, another series of storms hit briefly, affecting an additional 15,500 customers.

B. 2006 OVERHEAD OUTAGE REPORTS

WESTCHESTER COUNTY WINDSTORM EVENTS-2006

Three separate storm events inflicted heavy damage to Con Edison overhead electric infrastructure in Westchester County in 2006. Common to all three events were that thousands of customers lost service, many for several days; infrastructure damage was wide spread and significant; and the in-house workforce had to be supplemented with contractor and mutual aid crews. Con Edison had not experienced storms of this magnitude in many years.

High winds were the primary cause of most of the damage in each instance. Heavy rains, severe lightning, radical temperature shifts, and extended storm durations also added to the damage in some events as well. Factors affecting the duration of the outages included untimely weather updates, access problems due to blocked roadways, extraordinary number of trouble calls that led to some analysis and dispatching delays, and the lack of immediately available mutual aid crews. The latter was the result of the wide spread nature of the storms and, in the September situation, reduced crew availability because of the Holiday weekend. Mutual Aid companies prudently had to cover their own emergency restoration staffing demands prior to releasing crews to Con Edison.

Each of the three events has been well documented. Con Edison has filed the requisite Part 105 Reports for each, and the Commission has issued their Performance Reports.[216]

All of the above reports included recommendations for improving restoration planning, preparedness, effectiveness, and internal/external communications. The bulk of the recommendations were generated by the DPS Staff. Most recommendations address processes rather than physical infrastructure. An exception would be Con Edison's stated commitment to a three year $18.5 million enhanced tree trimming program. This more aggressive plan, that includes an improved trimming specification for Westchester specifically, should yield immediate reliability benefits.

Three other important reference documents capture the progress being made on Con Edison Lessons Learned and the DPS recommendations.[217]

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[216]/ DR 105 Con Edison Part 105 Report – Westchester County Severe Wind and Rain Storm Jan 18-22,2006 – Mar 23, 2006. DR 106 Commission Report – January 2006 Windstorm. A Report on Con Edison and NYSEG Electric Restoration and Communication Efforts – June 2006. DR 129 Con Edison Report on Implementation of recommendations made in Staff's Report on Jan 06 Windstorm – August 1, 2006 DR 109 Con Edison Part 105 Report – July 18-22 Thunderstorms – Sept 21, 2006. DR 113 Con Edison Part 105 Report – Westchester County Tropical Storm Ernesto September 2-3, 2006 – Nov 7th, 2006. DR 113 Commission issues – July and September 2006 Severe Storms, A report on Con Edison's Performance – February 2007.

Sixty recommendations in total were generated. Twelve specifically address the January storm and the remaining forty eight the July and August storms and common items. Con Edison has accelerated its efforts since 4Q 2006 to respond to and implement recommendations. As of July 3, 2007, of the 60 recommendations regarding the January, July and August storms, implementation of two of the recommendations is still in progress. The other 58 are either completed, submitted to Staff for final sign-off, or have been deferred to other Commission proceedings.

The service territory of Con Edison includes the five boroughs of New York City and most of the county of Westchester, New York, which includes 42 municipalities. Almost all of the territory served at distribution voltages in the five boroughs is served by underground facilities, usually secondary networks. Most of Westchester County is served by overhead facilities from the distribution substation to the load areas with underground residential distribution in some subdivisions. For this reason, outages caused by wind, lightning, trees, and the accumulation of ice are basically limited to the overhead system, which is predominantly in Westchester County.[218]

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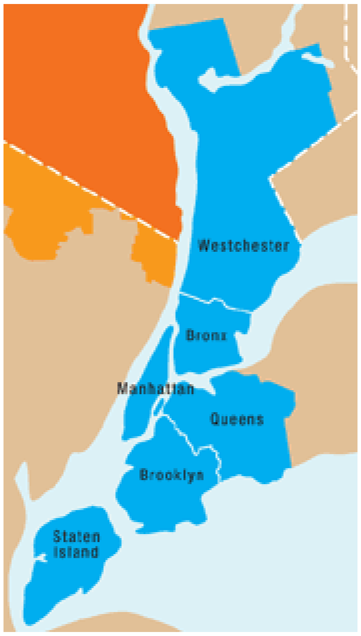
[217]/ DR 178 "NYSPSC Audit of Con Edison's Emergency Response Briefing Document-Final Draft. March 2, 2007." DR190 February 2007 "Westchester July/September DPS Staff Report Recommendations; Con Edison's Implementation Actions". DR 129 Con Edison progress report on DPS January 2006 storm recommendations.

[218]/ Con Edison Comprehensive Report.

Audit of Con Edison Outage Management

Exhibit -2
Map of Con Edison's Boundaries



Heat storms, i.e., extended heat waves, can cause problems for any system but can be particularly troublesome for underground secondary networks because the cables in the conduits increase in temperature due to the higher loads from customers' air conditioning. These system problems are further compounded by increased resistive losses due to higher temperatures, and the higher ambient temperature in the surrounding earth. The increase in ambient temperatures can further be attributed to reduced heat dissipation from the duct systems to the surrounding earth.

JANUARY WIND AND RAIN STORM

On Tuesday evening, January 17, as light rain began and maximum winds were in the 15-20 mph range, system conditions were normal.[219] There were no customer outages, and one

[219]/ Con Edison's Part 105 Report on the January Westchester Wind Storm.

feeder had been taken out of service to replace a defective section of cable and replace a potential transformer.[220]

The Company's weather service predicted increased winds through the night with the windiest and gustiest period expected Wednesday afternoon, however, at that time, the expectation was for frequent gusts to remain at or below 35 mph.

On Wednesday morning, January 18, the forecast called for 20-30 mph sustained winds with frequent gusts as high as 30-35 mph starting at 6 a.m. through 12 p.m. with significant gusts and continuing through midnight. Actual sustained winds for the period from 6 a.m. on Wednesday through approximately midnight were registered at 25-30 mph with peak wind speeds of 55-65 exceeding the forecasted gusts by 20 mph and causing extreme damage throughout Westchester County.[221] Rain began late on Tuesday night and became heavy at times Wednesday morning before tapering off in mid-afternoon for a total accumulation of about 1.5 inches.

In addition, this storm ushered in an extreme temperature change of about 30 degrees, up to the low 60's, and caused significant damage in the form of uprooted trees. It is conjectured that the rain and a change in soil temperatures caused muddy, softened ground that further compromised tree root stability that had been weakened during a snow and high windstorm just three days earlier.[222]

The overhead system sustained severe damages due, in large part, to uprooted trees and downed tree limbs. Falling trees and limbs damaged primary and secondary wires, poles, and transformers.

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[220]/ Feeder 8W83 was taken out of service on January 17 at 1724 hrs to transfer load to 8W62 and 8W68, replace a defective section of cable, and replace a potential transformer. This feeder does not supply an auto-loop.

[221]/ The actual weather data is from Con Edison's weather services provider, Fleet Weather, and from Con Edison's weather station in Rye, New York.

[222]/ During the overnight hours from late night January 14 through the early morning hours of January 15, the region experienced a snow and windstorm in which the wind gusted frequently to 40-45 mph and the maximum wind reached 50-60 mph.

Audit of Con Edison Outage Management

Map of Con Edison's Long Island City Network Boundaries -3

According to Con Edison's reporting, during the week of July 16, 2006, New York City experienced an extreme heat wave with peak temperatures of 96 degrees Fahrenheit and a heat index of 102 degrees Fahrenheit.[223] Indeed, official peak temperatures at La Guardia Airport for that period, tracked by the National Weather Service, reached 100 degrees Fahrenheit on Tuesday, July 18, 2006. Starting on Monday, July 17, the Long Island City network began to experience the loss of primary feeders. By Tuesday, July 18, additional primary feeders failed with 10 of the network's 22 feeders out of service at the same time. The Company worked to restore feeders and reduce electric demand in order to stabilize the network.

[223]/ Con Edison's Part 105 Report on the July LIC Event

JULY THUNDERSTORMS

On Tuesday evening, July 18, 2006, at 7:00 p.m., Con Edison's weather service reported possible strong to moderate thunderstorms through midnight with the greatest chance for strong storms between 5 p.m. and 8 p.m. and moderate storms between 8 p.m. and midnight.[224] In fact, no adverse impacts were experienced in the 5-8 p.m. period making it look as though the threat had passed. At 9:50 p.m., Con Edison received a new report that indicated that scattered strong thunderstorms with gusts to 40-45 mph and frequent lightning strikes were about to cross the Hudson River from New Jersey. Less than an hour later, at 10:40 p.m., the storm forecast was upgraded from strong to severe scattered thunderstorms with frequent wind gusts up to 55-60 mph, small hail, and frequent lightening strikes. The strongest of these storm cells was located in a line that extended from Yonkers, NY to Hawthorne, NY. The storms exited the Con Edison service area by about 11:30 p.m., but the wind conditions remained until about 6:30 the next morning.[225]

As a result of these thunderstorms, Con Edison's overhead electric system in Westchester County sustained severe damage due to lightning strikes, uprooted trees, and downed tree limbs. More than 1,700 trees were reported damaged or down.

On Friday, July 21, and Saturday, July 22, 2006, an additional series of thunderstorms impacted Westchester County. About 9,500 customers lost service on July 21 and an additional 6,000 customers lost power on July 22, 2006.[226]

On September 21, 2006, Con Edison filed its Part 105 report on the July thunderstorms. Staff issued a report in February 2007 that included both of the Westchester events.

SEPTEMBER COASTAL STORM (ERNESTO)

On Saturday, September 2, 2006, at the beginning of the Labor Day weekend, the remnants of Tropical Storm Ernesto struck Con Edison's service area and interrupted electric service in all operating areas with the greatest impacts in Westchester County.[227] On Thursday, August 31, and Friday, September 1, 2006, the National Hurricane Center forecast the storm to be quick moving and on a track to pass well west of Con Edison's service territory and into eastern Ohio. As late as 7:00 a.m. on Saturday, September 2, Con Edison's weather service issued a forecast indicating winds in the range of 25-30 mph and winds along coastal Westchester only as high as 30-35 mph. This pre-storm forecast indicated that the storm

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224/ Con Edison's Part 105 Report on the July Westchester Thunderstorms.

225/ The weather data is from Con Edison's weather services provider, Fleet Weather, and from Con Edison's weather station in Rye, New York.

226/ Approximately 600 customers lost power in The Bronx due to the same thunderstorms. A Part 105 report is not required for the customer outages on July 21 and July 22, 2006, because service was restored in less than three days.

227/ Con Edison's Part 105 Report on the September Coastal Storm (Ernesto).

would move through the service area in just 2 to 4 hours with no expectation of soaking rains.

Weather forecasts shared by the Southern Energy Exchange, Mid-Atlantic Mutual Assistance Group (MAMA), and New York Mutual Assistance Group (NYMAG) in the days leading up to September 2 were consistent with the forecast described above.

Instead, the storm quickly moved 250 miles east and stalled over the service area for some 18 to 20 hours, dropping nearly 2.5 inches of rain with sustained winds of up to 35 mph and gusts exceeding 45 mph.[228] The storm continued until 6:00 a.m. on Sunday, September 3, 2006.

The combination of the soaking rains and the high winds caused massive damage to the Westchester overhead system from uprooted trees and large fallen tree limbs. More than 1,000 fallen trees and limbs knocked down about 100 poles, 70 transformers, and 2,300 primary and secondary wires. Fallen trees and limbs entangled in electric wires and equipment blocked some 240 roadways in Westchester County. In Westchester, 76,000 customers and 2,300 Bronx customers lost power as a result of this storm.[229]

C. 2006 LONG ISLAND CITY NETWORK EVENT

INTRODUCTION

Commencing with the third week of July 2006, a period of high temperatures was experienced in the vicinity of New York City. A result of elevated temperatures is a corresponding rise in the utilization of electrical power and the probability of exceeding nominal ratings of components of an electrical distribution system.

Mid afternoon, Monday July 17, 2006, Con Edison experienced the first of a lengthy series of disruptions to the normal operation of the Long Island City (LIC) network. Restoration of electrical service to all impacted network feeders was not completed until Tuesday, July 25, 2006. "*It took up to nine days to restore service to all customers following this event*."[230]

Discussion of System Impact

The first 27 kV circuit breaker tripped removing one of the 22 feeders serving the LIC network from service. Within three hours of the original feeder first contingency outage (N-1), the problem progressed to the loss of a second feeder and then five feeders out of

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[228]/ The actual weather data is from Con Edison's weather service provider, Fleet Weather, and can be viewed in detail in the Part 105 report. A copy of a National Weather Service Statement for the date is shown in the Part 105 report.

[229]/ An additional 1300 customers were without service for a short period of time due to switching and safety related procedures for restoring customers.

[230]/ DPS Staff Final Report.

service (N-5). During the first five days of this power disruption event, as many as ten of the network's 22 medium voltage (MV) feeders were simultaneously inoperative (N-10) on two separate occasions. The design of the LIC network is intended to allow the system to operate normally under second contingency conditions (N-2), i.e. the loss of any two MV feeders without negative impact upon network components or customer supply.

While the MV feeders were out of service, the secondary – low voltage – network conductors and remaining transformers were subjected to severe overloading of conductors and components in multiple locations of the network. Manhole fires from overheated secondary components resulted in damage also to 27 kV feeder conductors in five instances, thereby, exacerbating the level and complexity of the restoration efforts.

As the known MV feeder problems were resolved and reenergized, circuit breakers tripped unexpectedly renewing the search for faults in the specific primary network conductors. At least one feeder splice failed immediately upon re-energizing the circuit raising the possibility of voltage transients as a cause. With numerous unloaded small transformers energized by a very lengthy insulated cable at 27 kV, ferroresonance[231] appears to be one viably possible cause of excessive voltage upon energizing. Had the components' insulation capability not been previously degraded by overload induced heating/exposure to incrementally damaging over voltages, the failure might not have occurred at that time. [232]

A variety of interacting conditions, component failures, malfunctions, and possibly 'heat of the moment' decisions appeared to create multiple cascading sets of emergencies within an increasingly desperate situation. "*Con Edison has reported that as of 1200 hours on July 17, 2006, there were 86 transformers within the Long Island City network that were not supporting the network – this represents more that 7% of the roughly 1,200 transformers in the Long Island City network.*"[233] Among the equipment malfunctions were instances of MV circuit breaker failure to trip under fault conditions, thereby, necessitating the trip of an upstream breaker. It took 1.73 seconds to clear the 10,400 amp single phase fault. The result was the loss not only of the first feeder, but two additional otherwise unaffected network feeders and a radial feeder. Conversely, circuit breaker trips upon reenergizing of previously repaired feeders created unanticipated extensions of outages as well as the negative impact upon other overloaded transformers and secondary conductors. Delays in scheduled maintenance of an erratically reporting potential transformer impeded the implementation of the automatic voltage reduction system, a decision which in itself is subject to question. Network

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[231]/ Ferroresonance refers to a condition in which an over voltage of up to 12 times the phase to ground source voltage is generated, which is typically initiated by opening a single phase device or when lightly or unloaded transformers are connected.

[232]/ Electrical insulation materials are subject to incremental degradation throughout the functional life of the material. Excessive operating temperatures for prolonged periods effectively lower the withstand capacity of the insulating medium. Similarly, excessive voltages for short durations have a degrading impact upon the ability of the insulation to withstand voltage surges from switching events and other causes. Failure occurs at that point in time when the voltage across the insulation exceeds the ability of the insulating material to withstand the level of stress imposed by that voltage.

[233]/ City of New York Report pg 64.

protectors failed to trip and clear secondary to primary back-feed instances, necessitating time consuming procedures to locate and manually open those units. Transformers overheated and two failed due to corrosion caused leaks of dielectric fluid. Remote monitoring units failed to communicate circuit data, and the WOLF real time load flow program was not fully functional.

Con Edison's reports refer to the origin of a fire in a wooden duct-bank containing secondary main conductors which resulted in the loss of the first medium voltage feeders as unknown and possibly due to prior damage. The Incident Investigation Committee (Donohue) Report documents[234] conditions in the vicinity of that initial fire. Transformers in close proximity failed on June 29 and July 11, 2006, and another nearby transformer's RMS unit reported it to be loaded to 150% of normal rating on July 16, 2006. There is little doubt that the local network main conductors were operating at elevated loads, and, therefore increased temperatures for a period of time prior to the initiating fire. Con Edison states that the conductor temperatures should not have been high enough to cause the fire, but there is no way of knowing, after the fact, what load individual conductors were carrying. The possibility exists that previously cleared cable limiters or a high resistance connections could have accounted for extreme overloading on the remaining conductors of that run.

It is inevitable that, given the size of the LIC network and the sheer number of components, failures of individual transformers, splices, conductors, and protective devices will on occasion fail. The number of component failures directly related to installation or maintenance delays gives cause to question the efficacy of the operations programs. Transformers not replaced/inoperative into the summer peak period, faulty installation of MV circuit breaker upgrades, RMS unit reporting percentages at a level far below specification, failure to replace known faulty MV feeder voltage transducers, and protective relay settings all had strong negative impact upon the sequence of events during July 2006. It appears that reliance upon the robustness of the network may have influenced an attitude of indifference to seemingly minor tasks that were delayed, resulting in an unexpected outcome.

Con Edison's investigation found that some 218 transformers were probably subjected to loads in excess of their second contingency ratings. Depending upon percentage over rating and duration, many more than the 13 lost transformers could have been compromised and may well represent weak links awaiting the next incident of elevated thermal stress to fail.

"*The (*North Queens*) substation supplies 22 primary (LIC) network feeders, totaling approximately 290 circuit miles in length, and 1,198 network transformers. These feeders and transformers supply electricity through and in an extensive underground system of 4,400 manholes, 11,000 service boxes, and 1,700 miles of secondary cable and an overhead system of 3,000 utility poles.*"[235] *"When compared with Con Edison's other distribution networks,*

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[234]/ Incident Investigation Committee (Donohue) Report pp 46 – 49.

[235]/ Con Edison Comprehensive Report pg 2-6.

the LIC network has the highest capacity and demand for a network and the highest connected capacity and demand per feeder. It also has the second highest number of customers and the third highest number of primary feeder cable miles."[236] It is not beyond the realm of possibility that such large networks are simply too complex to reliably model and control under adverse conditions as was true in July 2006. Con Edison commissioned a study to identify the maximum size of a reliable network. [237]

Con Edison states that the North Queens substation, which supplies the LIC network, has a capacity 122% of the forecast 2006 peak summer load. The actual peak LIC load that occurred on July 17th was some 96.5% of the forecast level. Con Edison was not surprised by any unforeseeable weather related aberration, and yet the LIC network and its customers suffered greatly in July 2006.

The LIC event was not the result of an "act of god" as is true of the impact upon overhead systems subject to the consequences of severe weather, but rather the direct result of man made decisions and actions. System design, philosophy of operations, maintenance practices, and financial decisions are all factors relating to past and future reliability, including the events of 2006.

Con Edison proudly touts the overall reliability of its systems, and specifically the robust nature of its networks, as well as the accuracy of its summer demand forecasting. It points to history of exemplary reliability statistics for its network systems, but questions must be addressed as to whether past is truly prologue or, is the LIC event an indication of future network reliability?

A network supplied by 22 feeders (now 24) has a far lesser requirement for N-2 primary and secondary robustness than, for example, a pair of networks fed by 12 feeders each under the same N-2 criteria. Plans for a new substation by 2015 to split the growing load to LIC and subsequent operation as a pair of independent networks is being reviewed. Also under consideration is the earlier splitting of the LIC network, prior to completion of the new substation, to allow more operational flexibility.

It might be possible that some mode of isolation or alternate modes of supply to mass transit systems from the network feeders would allow more flexibility in decisions regarding emergency response circumstances. An apparent strong motivation of the utility not to shut down the network was a hesitancy to negatively impact mass transit. The City of NY Report states, "*The planning of the Newtown substation, and the Sunnyside network, should be completed with a consideration for the impact service disruptions may have on critical customers, specifically MTA and LIRR. The Company should consider designing its networks so that MTA and LIRR can continue to operate in this geographic area, even if the Long Island City network or the Sunnyside network should be shut down or experience power outages in portions of their networks.*" [238]

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[236]/ Con Edison Comprehensive Report pg 2-6.

[237] / Dr. David Allen, "On Reliable Networks"

[238]/ City of New York Report pg 100.

A valid point of debate is whether a shutdown would have resulted in far less damage to the network secondary and afforded a much shorter time to total restoration. A possible lesson could have been learned from the Washington Heights network outage in 1999. There, a network shutdown allowed restoration in some 19 hours and prevented extensive damage to the secondary network. It appears that LIC could also have been restored in less than 24 hours had the network been shutdown, with far less consequential damage to the secondary network. It is all too easy in retrospect to second guess decisions made "under fire." Inevitably, some such decisions will be unquestionably correct, and some subject to critical review. Advance consideration should rationally be applied to adjustment of guidelines for future multi-contingency occurrences regarding shutdown decisions.

The ultimate question that needs to be addressed is whether the LIC event was an isolated anomaly – a perfect storm of sorts - or symptomatic of incipient problems threatening all of Con Edison's networks in the future.

Community Impact

The ensuing loss of electrical service to a great number of metered customers for such a prolonged period created an unprecedented level of disruption to the community. Con Edison's original reported estimates of customers impacted were a fraction of the true number, and the number of metered customers is a fraction of the number of ultimate consumers affected. Communications with the authorities, the media and the utilities own customer interface personnel were skewed by unreliable source information.

A primary source of Con Edison's outage information is the receipt of customer trouble calls reporting outages or anomalous events. Believing that the utility was aware of the extent of the problem, some residents of the affected area did not feel any necessity to call Con Edison to simply duplicate reports of neighbors. Grossly underestimated numbers of customers affected skewed the transmittal of information internally and externally. The Office of Emergency Management of NY City, misinformed regarding the extent of the outage, delayed implementing services to the community. *"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."*[239]

Residents were confused by the lack of good information, contradictory reports from the utility and media, and the absence of restoration estimates until the restoration was almost completed. A number of residents, upon calling the utility, were incorrectly told that their location was not impacted and advised to call an electrician. Persons calling to report outages or requesting information were subjected to lengthy recordings unrelated to their location and lengthy delays in reaching a representative.

A lack of reliable information regarding the extent of the outage, restoration estimates, and available support and services created an environment of confusion, gross inconvenience,

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[239]/ DPS Staff Report, Appendix C, pg 6.

and financial losses. Decisions and actions regarding options and care for the elderly and physically impaired were difficult at best.

Beyond inconvenience and discomfort, substantial financial losses were incurred by those impacted by the lengthy outage/low voltage conditions. Consumers were forced to lose time at work and businesses were incapable of operating. Perishable foodstuffs were lost, appliances and computers were reportedly damaged, and refrigerators and air conditioners destroyed. Consequential losses included basement flooding with no power for sump pumps. Most non-perishable losses were denied reimbursement by Con Edison.

APPENDIX 3 - POST-EVENT STUDIES, REPORTS

AUGUST 2, 2006 - CON EDISON INITIAL REPORT ON THE POWER OUTAGES IN NORTHWEST QUEENS IN JULY 2006

Also identified as the Mayor's Report, this 107 page document "… *focuses on the power outages that recently took place in the Long Island City (LIC) network, the process used to determine customer outages, and the factors evaluated in deciding to keep the network operating*."[240]

Overviews of Con Edison's system and the LIC network are presented. A section documents a basic sequence of events from initiation of the outage, Monday, July 17 through Friday July 21, 2006. MV Feeder outages are documented for that same time period.

The section titled Avoiding Network Shutdown provides some of Con Edison's insight into the system conditions perceived, restoration efforts, and actions of the control center.

A review of the problems associated with identification of network supplied customer power outages, the number of trouble calls received, and charts indicating the interpreted number of customers affected are provided. Alternate methods employed to provide a more accurate count of impacted customers are described.

Communications from and to customers, government agencies, regulatory staff, and news media are addressed. An complex block diagram of Incident Command System (ICS) staff under a Corporate Emergency Response Center (CERC) activation is presented. A listing of outreach methods during the LIC event is indicated.

Demand response programs are described and documented. Reference is made to a future report which "…*will also reach conclusions and make recommendations to improve service to the public*."[241]

AUGUST 4, 2006 - CON EDISON SUPPLEMENTAL REPORT ON SAFE AND RELIABLE OPERATION OF THE ELECTRIC DISTRIBUTION SYSTEM FOR SUMMER 2006

In response to DPS Staff request, the 69 page report, which details mutual aid and contractor utilization during the restoration effort, was signed by Louis Rana. Also provided is a schedule for inspection and repair/replacement of transformer, secondary main conductor, cable limiter, and network protector components.

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[240]/ Initial Report, pg 1-1.

[241]/ Supplemental Report pg 6-1.

The LIC Network Recovery Team organizational structure, responsibilities, and response plan are included.

The degree of preparation for the event, in relation to emergency response materials available, including cable and emergency generators is presented. Decisions regarding emergency operations during the event are defended.

SEPTEMBER 25, 2006 - CON EDISON PART 105 COMPLIANCE FILING BY CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. EVENT PREPARATION, RECOVERY, AND COMMUNICATION POWER OUTAGES IN NORTHWEST QUEENS JULY 2006

The Commission requires that the report be submitted within 60 days of an emergency event of three day's duration or longer. This 184 page document "*…reviews Con Edison's advance preparation for this event, its actions to restore the LIC network and customers to service, and its communications during this event.*"[242]

This report partially duplicates and expands upon the detail provided in the previous two reports.

OCTOBER 12, 2006 - CON EDISON COMPREHENSIVE REPORT ON THE POWER OUTAGES IN NORTHWEST QUEENS IN JULY 2006

A partial reiteration of the Part 105 Filing, this 606 page report adds finely detailed sequence of events and an extensive engineering and design analysis section. Appendices include chronologies of communications documented during the LIC event and descriptions of information systems in use.

In essence, Con Edison asserts the root cause of the extensive damage to the network, resulting in the lengthy outage, is embodied in three anomalous and unrelated occurrences. The first is an unexplained fire originating in a wooden duct containing secondary main conductors and causing the loss of an adjacent pair of primary feeders. Next was the malfunction of a substation circuit breaker failing to trip and clear a fault in a third feeder. The upstream breaker then tripped to clear the fault and in addition to the faulted feeder, removed two additional network feeders and a radial feeder from service. The third occurrence was the unexpected trip of a substation circuit breaker upon reenergizing a repaired feeder. Con Edison claims to have no history of nuisance tripping due to magnetizing inrush currents associated with transformers resulting in confusion and unnecessary delay regarding restoration of that feeder.

The engineering analyses conclude that the network design was appropriate and adequate for the forecast peak load with two feeders out of service, and the pre-summer reliability index and hi-pot testing appropriate for the purpose.

[242]/ Part 105 Compliance Filing pg 1-1.

"*The load-cycle analysis for the LIC network has confirmed that the projected load cycle for summer 2006 was accurate, and, therefore does not warrant a revision of the network loss factor*."[243]

The lack of full utility of the WOLF program, a dynamic real time load flow tool, is presented as inconsequential to the LIC event because several other monitoring tools were available for decision making. One of those sources of information, the Remote Monitoring System (RMS), was limited to slightly below 80% functionality of installed units at that time.

Bus diversity is stated as having no impact upon the LIC event.

Questions are raised in the analysis section in regard to possible voltage transients during fault, fault clearing, and switching operations. EMPT studies were performed by Siemens/PTI and results are considered inconclusive regarding possible degradation of insulation ratings.

An, as yet, unexplained occurrence on a pair of feeders remaining energized subsequent to fault clearing is surmised as due to a back feed condition. Records of 27kV transducer readings indicate 28 amp current, gradually falling to zero during a 15 minute period.

Network secondary main conductor loadings are not well modeled by the diagnostic tools at hand, nor are real time monitoring capabilities extensive. RMS provides transformer secondary currents but no indication of main conductor loading. In circumstances wherein one or more cable limiters are open, excessive currents could be carried, undetected, by the remaining parallel conductors. Post event modeling of cable sections predicted to have been subjected to overload damage were not born out by manual inspections in over 80% of cases. In those cases where primary feeders were determined to have been negatively impacted by secondary cable faults post event modeling reveals the probability of excessive overloads in those secondary main sections. In the analyses of those five instances, overloads as high as 193% of emergency ratings were modeled.

Alive on Back Feed (ABF) conditions, caused by failure of a network protector to trip, were described as possible due to mechanical or electrical malfunction, or low voltage. The older electromechanical relays were described as requiring a minimum of 60 V on all three phases to function. Solid state relays require minimum 50 V on B phase, while microprocessor relays are indicated as operational with as low as 13 V on any phase. RMS telemetry indicated instances of voltages as low as 26 V load side of closed network protectors.

The analysis indicates that 7 feeder cables, 15 splices, 2 terminations, and 13 transformers failed during the LIC event and concludes that "*no new programs specific to the LIC network or for the Con Edison system in general are required to address the reliability of those primary feeder components*."[244] Of the seven feeder failures, six instances were

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[243]/ Con Edison Comprehensive Report pg 5-6.

[244]/ Con Edison Comprehensive Report pg 5-52.

verified due to external causes, and none were found to have suffered insulation failure. One failed cable had no sample recovered for analysis.

"An analysis of the cable and splice failures leads to the conclusion that no new programs specific to LIC or the Con Edison system are required to address the reliability of these primary feeder components. Problems related to components, such as premolded disconnectable 2W-1W stop-joint splices, have previously been identified and are currently being addressed by existing programs. In addition, improved methods to protect primary feeders from external fire and heat would serve to increase feeder reliability."[245]

Two transformers nominally rated at 1000 kVA and eleven nominally rated at 500 kVA failed during the LIC event. The average age of the lost transformers was stated as 32 years vs. the 20.8 year average age for all 1198 transformers on the LIC network. Forensic analysis revealed that eleven of the failed transformers showed insulation deterioration/or excessive internal pressure due to the elevated temperatures commensurate with operation at extreme overloads. Typical loads documented or modeled were in the 140% to 200% of second contingency ratings.

RMS data indicated 175 transformers operated above ratings. Subsequent PVL modeling revealed 218 transformers were probably above ratings. BQ Engineering was described as having determined that 98 transformers required load mitigation and having addressed 73 units. Supplemental cooling was accomplished for 59 transformers during the event.

JANUARY 30, 2007
REPORT OF THE NEW YORK STATE ASSEMBLY QUEENS POWER OUTAGE TASK FORCE CONCERNING THE JULY 2006 POWER OUTAGE IN CONSOLIDATED EDISON'S SERVICE TERRITORY

This 56 page report "*approaches the issue from a broader, policy perspective.*"[246] Two (25%) of the findings and 15 (53%) of the recommendations are directed at regulatory or legislative categories and actions. This report is highly critical of apparent relaxed DPS Staff oversight of Con Edison's performance. The assertion is that insufficient monitoring is due in part to a revised regulatory philosophy and in part due to a 30% reduction in staff size during the past twelve years.

The Task Force expressed strong concern in regard to Con Edison's identification of impacted customers, dissemination of information, liability provisions, and loss reimbursement policies. Emphasis was placed upon the Attorney General's 1999 report regarding the prior Washington Heights network event and compliance with all of the recommendations contained therein.

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[245]/ Con Edison Comprehensive Report pg 5-101.

[246]/ NYS Assembly Report pg 2.

Establishment of a 'Network of the Future' pilot program with partial funding from NYSERDA, and emulating the proposed Ramsey, New Jersey RECO Smart Grid pilot project is urged for integration of 'Smart Grid Technology.' Also cited for R&D and deployment under the proposed program are targeted area incentives for distributed generation, advanced metering, superconducting distribution lines, and other high visibility demonstration projects.

In summary, the task force asserts *"in the 21st century, Con Edison must adapt to modern demands on the electricity grid, and not continue to run a 20th century system into the ground."*[247]

FEBRUARY 9, 2007 - 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

A clear and comprehensive 190 page report addresses all aspects of the event. Con Edison's performance is categorized in each category. An extensive list of corrective actions and specific reporting points is presented for response by the utility.

This report "*…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*."[248] Complimentary regarding the dedicated efforts of many employees, DPS Staff found the management of Con Edison to be lacking. "*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*." [249]

In sharp contrast to the initial Con Edison estimate of 2,000, which subsequently rose to 25,000 customers impacted, "*Staff estimates about 65,000 metered customers, equating to about 174,000 people, lost service or experienced low voltage*."[250]

"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."

247/ NYS Assembly Report, pg 51.

248/ Commission Staff Report, pg 1.

249/ Commission Staff Report, pg 9.

250/ Commission Staff Report, pg 2.

"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."[251]

Staff addresses the performance of Con Edison regarding communications internally and externally to customers, public officials, and media. If accurate information were conveyed to the NY City Office of Emergency Management, it could have mobilized early in the outage event to provide needed support to the community.

"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."[252]

"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. "The Company should provide daily or more frequent updates and conference calls for municipal and public officials."[253] Because many constituents turn to their elected officials for information, it is imperative Con Edison keep the offices of elected officials continually updated."

"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."[254]

251/ Commission Staff Report, pg 3.

252/ Commission Staff Report, pg 38.

253/ Commission Staff Report, pg 39.

254/ Commission Staff Report, pg 6.

FEBRUARY 12, 2007
LONG ISLAND CITY NETWORK JULY 17 – 25, 2006 INCIDENT INVESTIGATION COMMITTEE

Identified as the Incident Investigation Committee (Donohue) Report, this 176 page report commissioned by Con Edison is the result of a technical investigation of the event causes, and addresses recommendations to prevent recurrence.

Causes[255] of the extent of the event are attributed to: Secondary Cable Burnout resulting in the opening of six primary feeders; Circuit Breaker Failure to operate properly resulting in de-energizing of three primary feeders; Relay Settings exceeded by the level of energizing inrush currents resulting in delayed restoration of power to four primary feeders; Cable and Joint Failures causing or extending feeder outages; and Transformer Failures causing twelve open-auto operations on eight different feeders.

Evaluation[256]of decisions relative to the possible shutdown of the network refers to Con Edison Engineering Specification EO-4095, Section 10.2 'Distributed Network Contingencies'". Reviewing the guidelines provided in EO-4095, the conclusion reached was "*The Committee believes that the criterion in EO-4095 requiring consideration of shutting down the network is appropriate*." Evaluating the decisions during the event in compliance with EO-4095, the opinion provided was "*Based upon interviews conducted, and the subjective nature of the provision of EO-4095, the Committee concludes that Incident Command complied with this provision of EO-4095 because they were aware of and did considered feeder loads, manhole events, and transformer loads in their management of the event.*"

Conclusions reached include the probability that the size of the LIC network results in a higher level of complexity in accomplishing the goal of the design objective to maintain a "uniform and well-diversified intermesh of feeders and transformers."

Ratings and Load Cycles[257] of network components are described as primarily accomplished by utilization of the Poly Voltage Load Flow (PVL) program. *"The PVL program has a feeder rating feature that determines the load and rating for the limiting circuit component. It does so for normal operation and up to second contingency operating conditions for each feeder in a given network. The relationships between normal and emergency loads in the network are determined automatically by PVL, but only if the network is correctly modeled." "The quality of results from the PVL model is directly related to the quality of the network connectivity model. The connectivity model is defined as the database depicting the interconnection of all of the system components. The connectivity model and associated loadings must be kept accurate at all times to reflect the changing connectivity and additions that Con Edison makes to its distribution system. If not done, the quality of results from the PVL model (as well as other application that rely on the PVL model) will be degraded."*

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[255]/ Incident Investigation Committee (Donohue) Report, pp 16, 17.

[256]/ Incident Investigation Committee (Donohue) Report, pp 18 – 23.

[257]/ Incident Investigation Committee (Donohue) Report, pp 27 – 32.

" Long Island City network feeders in the Electrical Distribution System 2006 manual are all shown with forecasted normal and emergency summer loads below their normal and emergency ratings. However, the information indicates that 10 of 22 feeders or 45% of the Long Island City Network feeders will be operating at or above 90% of their normal rating on a peak day. In addition 18 of 22 or 82% of the Long Island City network feeders will be operating at 90% or above, of their emergency rating on a peak day during their worst contingencies. This suggests that the feeder cables – although within their ratings – will be at the high end of the allowable temperature range during emergency operation. There may be such a narrow margin that the risk of overload is heightened during contingencies above N-2. This suggests that relief might be appropriate when looking at the loading of adjacent feeder bands as well as for individual feeders."

"Likewise, normal and emergency ratings for transformers in the Long Island City network are being used which permit loadings that result in narrow capacity margins when operating above design conditions. Therefore, if there were pre-existing local conditions, such as open secondary mains or transformer banks off the system, a first or second network contingency could result in local facilities being highly loaded. In the case of the transformers being at or near their operating ratings during periods of high ambient temperature with concurrent high customers demand and contingencies beyond design, i.e. fourth or higher contingencies, it can be expected that these events may cause overloading. If not remedied, this may lead to cascading failures and infrastructure damage and customer interruption."

System designers are described as almost totally reliant upon computerized tools such as PVL and WOLF as well as remote monitoring system (RMS) output for analysis and operation decisions. *"However, the computer generated analyses rely almost exclusively upon various tables as well as data from the remote monitoring system (RMS) being utilized in the algorithms and calculations performed by PVL. These results are then reported to the designers on an exception basis. This means that the results of the analysis are typically not printed out for review by the designers unless the PVL study indicates there is an overload condition. Unless specifically requested, the designer will only see overloaded results reported." "The designers rely on these tools, accept the results, and infrequently test the results with other information to verify them. However, the results are not always correct."*

A case in point is identified wherein a set of three transformers, physically and electrically in close proximity have differing load cycles assigned. *"For all intent and purposes, these transformers may supply the same customer load and should exhibit the same load profile. The PVL model shows ratings for TM 5750 of 138%, 162%, and 170%, ratings for VS 8786 of 125%, 145%, and 170%, and ratings for VS 7981 ratings of 95%, 110%, and 120%. As can be seen, the three units under review were assigned three different load cycles. As these three transformers supply the same immediate load pocket, they need to be assigned the same load cycle. Likewise, the rating that is assigned to the secondary mains and street ties from each transformer that provides the interconnection between the two should match the same load cycles. The street tie cables are also an issue. The cables are four sets of four-500MCM and have a rating of 567kVA under normal operating conditions. As stated, the normal rating for two of the three transformers is 125% and 135% on normal for 626kVA or 675kVA respectively. For both cases, the street ties would be overloaded and do not match the ratings of the transformer. The street ties would exceed their normal rating once the transformer exceeded 113% of its normal rating."*

"Two conclusions come from this example. First, the ratings that are applied may not be representative of the infrastructure in place, and second, the tools that are used to analyze the infrastructure typically only report overloads and these mismatched ratings would not be observed."

Pre-Event Transformer Failures

On June 29, 2006, the transformer located at VS5447 failed with portions of that load subsequently supplied by the nearby transformers located at V7813 and TM1007. On July 11, the transformer at V9426 failed, again adding to the load supplied by V7813, which in turn failed due to overload on July 17th, 2006. V7813 is approximately midway between VS5447 and V9426. On the 16th of July the transformer TM1007 *"was already in a contingency condition and according to RMS data, was loaded to 150% of its normal rating during the peak on July 16th, 2006. This suggests that the secondary mains supporting the load from this transformer were already highly loaded and being thermally stressed."* The secondary cable fire, said to be the initiation of the LIC event, occurred one block south of V9426 on July 17th, 2006. "*The exact cause of the fire remains uncertain as the level of loading should not have been enough to cause the cable insulation to burn.*"[258]

Transformers and Secondary Mains Progression

The sequence of failures and feeder outages causing additional overloading and subsequent failures is documented. "*Overheating contributed to ten of the transformer failures. Two transformers failed due to corrosion and one transformer primary bushing failed.*"[259]

[258]/ Incident Investigation Committee (Donohue) Report p 49

[259]/ Incident Investigation Committee (Donohue) Report p 53 - 81.

Trouble Analyses

Engineering Support Applications Problems

Con Edison specification EO-10110, "Inspection and Maintenance of Network Type Distribution Equipment," requires that its operating Regions maintain the RMS system of each network to ensure that 95% of all units in the network are reporting properly. At the initiation of the LIC event, some 77% of the LIC RMS units were reporting properly. RMS is utilized to provide advance notice of overheating or overload conditions and provides input into the PVL and WOLF programs.[260]

"*The state of the RMS data and the condition of the PVL model, in part, complicated the response of Brooklyn/Queens engineering during this event. Prior to the event, on July 12, 2006, Brooklyn/Queens staff noticed incorrect overloads being reported by WOLF when running the software. Brooklyn/Queens engineers had attributed the errors to a PVL model version control issue and speculated that old versions of the model were in use and not appropriately updated*."

"*Early during the event, Brooklyn/Queens engineers tried to use the model but it would not converge. It converged to the 4th contingency. WOLF stopped working completely at the 6th contingency. The engineers started to get erroneous results on 4th, 5th, and 6th contingency scenarios. In addition, when Auto-WOLF was run during the event, the "feeders out" report generated incorrect data. The date and time reported were incorrect, and the total load was reporting lower than actual*."

"*As is discussed in the Ratings and Load Cycle section of this report, neither PVL nor NetRMS were consistently providing accurate or complete analyses of the event*." Lack of convergence in multiple contingency circumstances and the generation of erroneous data are known conditions of the modeling programs. "*The Committee was advised that the accuracy of the model was suspect even when using a revised PVL model and the engineers questioned the results of their analysis of the fifth contingency situation on the night of July 17*, 2006."

"*As feeders were restored and transformers live-end capped as part of the restoration process, the actual network connectivity changed, but the model can not be updated real time to reflect those changes. The feeders have different characteristics with the additional banks off. Generally, this difference is limited. However, errors built-up in the assessment of the situation as the number of transformers were removed from service increased during the restoration process. This condition was critical for local load pockets of high loads that were created and not observable through the engineering applications*."

Again, the exception based default reporting from analytical and modeling programs is related as a possible negative factor. "*For example, if a particular asset is operating near or at its assigned limit of its rating, it would not be reported*."

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[260]/ Incident Investigation Committee (Donohue) Report pp 91 – 93.

Data Presentation, Integration and Integrity

"The Committee observed several issues around the presentation and integration of operational data that is worth noting." "On two occasions while the Committee was investigating the event, it encountered instances of NetRMS showing differing data in the summary information window and in the transformer specific information window of the application. Also, RMS displays load data in chart or trace form that is sometimes not accurate." An example provided was one in which a transformer, physically disconnected from the system, was depicted by load traces as having a 45% load.[261] *"Another situation occurred when historical records were being sought for a particular feeder in the Con Edison ECC Information Warehouse Feeder Detail application. Two identical queries were run yielding two different sets of historical actions."*

Symbology was found to be inconsistent from one application to another creating the opportunity for confusion in interpretation of graphical representations. *"Yet another issue was observed with ratings data. Ratings information for a cable or transformer would, at times, be different in PVL or as displayed in some of the reporting options in NetRMS, but no explanation of why different ratings would be stored or displayed was found."*

Remote Monitoring System (RMS)

"There are approximately 25,000 network transformers on the Con Edison system." "Each transformer has a remote monitoring system (RMS) transmitter that monitors the load on each of the three phases of the transformer and the status of the network protector. The RMS transmitter sends the information in near real time to a receiver in the substation, where the data is gathered and forwarded to a central network data receiving system for the company…"

The first generation of RMS transmitters, representing 58% of total installations, provides basic phase load readings and associated network protector status. Second generation transmitters, 38% of total, are internally mounted in network protector enclosures. They provide improved signal strength and additional data in regard to phase voltages. The newest, third generation of transmitters adds readouts for tank pressure, top oil temperature, and oil level to the data stream.[262]

"The remote monitoring system for the Long Island City network is unique because of the number of transformers." "Since the number of transmitters exceeds the design limit for the standard receiver; transmitters are connected to different phases. This effectively increases the number of transmitters that can function within the network. The Committee believes this complexity was responsible for at least ten transformers not properly reporting to the RMS system after being transferred from another feeder as part of summer preparation work. Several of these transformers are located in the vicinity of the initiating event on July 17th, 2006."

"Due to the harsh underground street environment in which transmitters are required to work, their annual failure rate has been about 6%." "For various reasons, the monthly availability of RMS in the Long Island City network has ranged from 81% to 90% since 2002. For the first six months of

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261/ Incident Investigation Committee (Donohue) Report pp 105 – 106.

262/ Incident Investigation Committee (Donohue) Report pp 106 – 112.

2006 its availability averaged 83%. Just before the event started, its availability in the Long Island City network was 77%." "Overall, the reporting rate of the modules with temperature sensors is at 89.23%."

"As part of the summer preparedness, diagnostics were performed in March, 2006, on the feeder pick-up coils for the Long Island City network. Four were identified as needing replacement to permit full signal sensitivity and resolve some of the units not reporting on feeders 1Q02, 1Q11, 1Q20, and 1Q21. Replacement of these coils requires an outage to the feeder. One of the feeder pickup coils was replaced (1Q20) prior to the Long Island City network incident. The three remaining coils were not replaced although records indicate that these feeders had been taken out for scheduled work at least once before July 17, 2006."

Following the LIC event, it was discovered that replacement of individual RMS transmitter units could not be tracked due to the absence of any records kept of ID numbers for that purpose.

A complicating factor of non-reporting RMS units is the automatic substitution of estimated or historic data by WOLF for real time data without the knowledge of the operator. Decisions made on the basis of unidentified data can prove costly when the expectation is that real time characteristics are the source of calculations. "*Con Edison Information Resources (IR) estimates the usable RMS availability requires a threshold at 85%. The Committee has been informed that a study is being conducted to more precisely determine the threshold value." "…IR is concerned about validity of results when the compensating systems need to provide a large portion of estimated data*."

"Limited actual RMS data combined with flawed connectivity models in PVL have the potential to develop seriously flawed analyses when used in a critical operating situation or for summer preparation activities and capital investment option analysis. The Committee believes that the state of the PVL model, combined with the overall reporting rate in RMS, contributed to the secondary problems encountered."

North Queens Substation

The circuit breakers at the North Queens Substation[263] were originally 'fixed position' breakers in keeping with the 1950's original design. Lacking flexibility and with the availability of latter day implementations, the original Circuit breakers have been in process of replacement with rack-out style circuit breakers. Maintenance flexibility and the capability to install ground & test devices are the result of such upgrading.

Con Edison engaged a contractor to complete the replacement of the original draw-out contact blocks with sliding fingers to a preferable style with half moon shaped contacts.

During installation, apparently in at least two draw-out circuit breakers, a mechanical bracing component was not installed, thereby, allowing the contact block on the circuit breaker to partially rotate, resulting in misalignment of contacts when the breaker was racked into position. Upon the fault of a feeder phase conductor, the circuit breaker failed

[263]/ Incident Investigation Committee (Donohue) Report pp 117 – 123.

to trip necessitating the opening of the upstream bus breaker, thereby taking the LIC network from a second to a fifth contingency level.

A simultaneous circuit breaker control circuit problem prevented the supervisory indication of a non-functioning relay trip capability, and, in fact, provided a faulty indication of control circuit integrity. *"Field modifications were made at the time of the event when it was realized that the proper trip circuit did not exist."*

Relay Performance

"During the Long Island City network event, there were seven occasions where a feeder breaker was closed in an attempt to restore the feeder to service, and they immediately tripped out. The operation is referred to as a cut-in open-auto (CIOA) operation. There were four confirmed instances during the Long Island City network event during which "cut-in open-auto" can be attributed to inrush currents caused by the magnetizing current of the transformers connected to the feeders, and the levels seen were above the settings of the Phase Instantaneous relays. These conditions were confirmed by a review of the PQ Node data for those operations post event."[264]

"There was also a test performed after the event in which a recording oscillagraph was connected into the current circuits at North Queens Substation when feeder breaker 1Q02 was being returned to service on August 22, 2006, that confirmed that the magnitude of transformer magnetizing current was above the Phase Instantaneous settings of the relays."

"The Instantaneous Phase relay settings on the feeder breakers were all set at 4000 ampere pickup. These are the settings for most of the feeders on the system, the only exception are for some feeders in Manhattan with short feeder lengths."

" The phase instantaneous relays are set to be the expected tripping relay for all faults. There maybe some high impedance faults that will trip with time delay, but the majority of the faults are expected to clear instantaneously in order to reduce the energy released at the fault location, reduce the time that equipment and cable experience high fault currents, and to minimize power quality impact on the customers."

There were four confirmed incorrect relay operations on four different feeders during the Long Island City event.

- *1Q07 on July 17th at 19:09. This feeder connects to 64 transformers.*
- *1Q18 on July 18th at 23:55. This feeder connects to 50 transformers.*
- *1Q17 on July 19th at 08:49. This feeder connects to 52 transformers.*
- *1Q14 on July 23rd at 19:47. This feeder connects to 47 transformers."*

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[264]/ Incident Investigation Committee (Donohue) Report pp 123 - 125.

"Con Edison has revised the inrush current setting to a higher set point which would prevent the relay operation for inrush currents. It should be noted that the Long Island City network has the highest number of transformers per feeder."

Feeder Processing

The Report individually addresses the events during LIC in sequence, and summarizes status, actions taken, and results. The occurrences of cut-in open auto trips of feeder circuit breakers are documented and analyzed. Restoration efforts are discussed.

MARCH 2, 2007

INVESTIGATION BY THE CITY OF NEW YORK INTO THE NORTHWEST QUEENS JULY 2006 POWER OUTAGES

An intensively technical report of 250 pages covers the LIC event from a root cause, operations and maintenance, community impact, and communications set of perspectives.

Some 108 pages of appendices contain sequences of events of the primary and secondary network, analyses of component failures, dissertations regarding voltage reduction measures and moisture infiltration of paper insulated oil filled cables. Also included in the appendices are copies of 1995 through 2005 submittals of FERC. Form 1 covers electrical capital and O&M expenses, as well as the city's list of recommendations from the 1999 Washington Heights network power outage.

The Report is critical of Con Edison's reliance upon customer complaint calls to establish the extent of an outage and failure to utilize other available information in establishing the number of affected customers.

Failure of critical systems to perform as intended was noted. With RMS nodes operating at 79.5% of capability, the WOLF real time load flow program was not fully functional, and, in fact, as reported by Con Edison, WOLF may not provide meaningful results when the network is operated beyond the second contingency level. *"The Company also has lagged behind when it comes to examining and implementing new technologies into its operations. New forms of cable testing, predictive diagnostic tools, upgrades to the RMS, installation of voltage sensors, and automatic meter reading at select customer locations are all areas Con Edison could have more actively pursued to improve its aging system."*265

The efficacy of voltage reduction is questioned as a measure to reduce system currents and such action is stated to *have "contributed to the damage on the secondary network and adversely impacted customers for longer than was necessary*."[266]

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[265]/ City of New York Report pg 6.

[266]/ City of New York Report pg 6.

Ineffective oversight and verification of contractor completed work on substation circuit breaker upgrades is deemed contributory to the cascading problems encountered. Establishment of a dedicated engineering team is encouraged to deal specifically with network secondary conductor evaluation during multiple contingency emergencies.

The rationale for a temperature based system capacity assuming one excessive temperature event every three years is questioned. The temperature variable has been exceeded 15 times in the past 11 years, so the actual recent occurrence is some 2.2 times more frequent than accounted for. The net result is asserted to be a significantly higher level of stress on system and components.

The City Report states that not all of the recommendations arising out of the 1999 Washington Heights network outage have been implemented by Con Edison and calls upon the company to do so.

Failures of communications are identified, "*…until the morning of July 21, 2006, Con Edison was grossly underestimating the extent of customer outages in the Long Island City network. Until that point, the Company provided inaccurate information to all those impacted by the power outages, as well as affected regulators and responding agencies. Con Edison's failure to use its communications organization as a two way street contributed, in part, to the Company's underestimation of the customer count*."[267]

"Con Edison could have used its formidable communications network to better collect information from available sources (e.g., Company employees, third parties, City agencies), in order to correctly estimate the number of customers without service. Improving the customer call process as described in the Con Edison recommendations would significantly address one part of the problem. Nevertheless there is compelling evidence that during this event, Con Edison missed multiple other opportunities to investigate or revise the customer outage estimate."[268]

"While there are recommendations in this Report to improve communications, the Company does have in place appropriate communication organizations and did keep the public informed during the LIC Outage. The major factors that contributed to this success were Con Edison's own communication organizations had well defined roles; the on-site presence of critical agencies facilitated communication; its ICS structure centralized control of information to the incident commander, and, finally, the regular drills helped the participants understand their roles and the process."[269]

Analysis of LIC open auto circuit breaker operations and restoration times from 1995 to 2005 indicates potential cause for concern. *"The trend lines indicate an increase in the number of open autos and feeder-outage hours for this period. In 2005, the quantity of open-autos was 71, which is 73% higher than the quantity of 41 open-autos reported in 2000. Similarly, the quantity of feeder-*

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[267]/ City of New York Report pg 43.

[268]/ City of New York Report pg 46.

[269]/ City of New York Report pg 47.

outage hours in 2005 was 3,039, which is 179% higher than the quantity of 1,088 feeder-outage hours reported in 2002."[270]

Similarly, the trend of cut-in open auto operations shows the LIC network in an unfavorable light. The LIC occurrences went from ~0.2 per feeder in 2003 ~.55 in 2004 1.0 in 2005, to 1.5 in 2006. For the same time frame, the balance of Con Edison's networks remained at or below 0.2 average CIOA per feeder. [271]

Long Island City network is asserted to have among the lowest Jeopardy reliability ratings in Con Edison's system over the past five years. Ratings during that time frame have found LIC to be ranked in the bottom 9 networks, albeit showing slight improvement from 4th worst to 9th worst. [272]

Load growth of the LIC network is described as some 1.5% annually, totaling some additional 54 MW over the past ten years. "Con Edison has announced its plans to construct a new substation in Queens, called Newtown, in 2015. With the establishment of that new area substation, the Sunnyside network will be created. The Sunnyside network will be created from the southern portion of the existing Long Island City network. Con Edison estimates that 230 MW will be transferred from the Long Island City network to the Sunnyside network in 2015."[273]

"Engineering analysis should be performed to determine how the supplies from these networks to the MTA and LIRR can be configured to provide adequate power in the event either network is de-energized or experiencing power outages in the network. Switching actions or mobilization of emergency generators to continue the supply to MTA and LIRR should also be considered in the development of the new network plans and contingency plans. The Long Island City network presently serves 115,000 customers, which is the second highest number on the Con Edison system. When economically practical, the industry standard in electric power distribution engineering is to limit exposure, or the consequences of events, to as few customers or loads as possible. The construction of the Newton substation and the creation of the Sunnyside network will reduce the number of customers supplied by a single substation and a single network."[274]

A case is presented to have Con Edison modify its 86 degree temperature variable design criterion, *"As a relative comparison, the temperature variable at the time of the Long Island City network event's peak on July 17, 2006 was 83.8 degrees. The system's temperature variable design criterion of 86 degrees was not exceeded at any time during the event." "… a temperature variable of 83.8 degrees can be expected to occur approximately once every 1.5 years. From the perspective of*

[270]/ City of New York Report pg 93.

[271]/ City of New York Report pg 95.

[272]/ City of New York Report pp 97, 98.

[273]/ City of New York Report pp 98, 99.

[274]/ City of New York Report pg 101.

this temperature variable, the weather conditions experienced during the Long Island City network event were common."[275]

The comparison to the Washington Heights network event of 1999 and recommendations made for that prior occurrence is covered in depth. In summary, the following.

"The 1999 Washington Heights outage was described within the Executive Summary of the Con Edison report by their Corporate Review Committee as "…a series of previously unmatched load demands," and the Corporate Review Committee report concluded, "The events that led to the shutdown of the Washington Heights network, if taken separately, are not unique to Washington Heights. The unusual combination of these events, however, culminated in the network shutdown." The report further states that "The recommendations contained within this report, therefore, are not limited to Washington Heights but are applicable throughout the Con Edison distribution system." Almost exactly seven years later the 2006 Long Island City network outages are similarly described within the Executive Summary of the Company's October 12th Report as "….an extraordinary series of events," that were "precipitated by three unrelated events that combined to create an unprecedented set of circumstances and strain on the network system." In fact, what can be seen from Washington Heights and Long Island City is that events one might call "unique" or "unprecedented" do happen, and sometimes happen again, at which point they are no longer "unique" or "unprecedented."[276]

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[275]/ City of New York Report pg 106.

[276]/ City of New York Report pg 129.

APPENDIX 4 - REVIEW AND ANALYSIS OF OUTAGE REPORTS

The following analysis is intended to provide a number of perspectives. First, it provides a summary of all recommendations made for both the Overhead and underground outages discussed in this report. Second, it attempts to catalog the recommendations in buckets to get some type of perspective as to where recommendations are directed.

Organization	**Function**	**Specifics**	**Number of OH Recommendations**	**Number of LIC Recommendations**
1. Engineering & Operations	A. Outage	1. Procedure	4	28
		2. Damage Assessment	3	1
		3. Human Resources/ Training	8	10
		4. Systems & System Modification	8	13
		5. Equipment		6
		6. Demand Reduction/ Mobile Generation		9
		7. Other		16
	B. Maintenance	1. Procedure		33
		2. System/System Modification		25
		3. Equipment		29
		4. Other		36
	C. Communications	1. Number of Customers		8
		2. ETR/Status	2	2
	D. Other			1
Total Engineering & Operations Recommendations			**25**	**217**
2. Customer Operations	A. Call Center	1. Procedure	4	3
		2. Equipment	1	3
		3. Human Resources/ Training	3	
		4. Other	1	1

Organization	Function	Specifics	Number of OH Recommendations	Number of LIC Recommendations
	B. Communications	1. LSE	3	1
		2. Dry Ice	2	4
		3. Website	3	1
		4. ETR/Status	1	1
		5. Other	2	3
Total Customer Operations Recommendations			**20**	**17**
3. Public Affairs & Corporate Communications	A. Media		5	1
	B. Public Officials		7	6
	C. Website		1	3
	D. Customer Information		3	3
Total Public Affairs & Corporate Communications Recommendations			**16**	**13**
4. Regulatory	A. Oversight		1	22
	B. Compensation		1	9
	C. Other			2
Total Regulatory Recommendations			**2**	**33**

Evaluation of Con Edison 2006 Outage Related Recommendations				
Westchester Outages				
Report Source	**VCI #**	**Rpt. #**	**Recommendation Description**	**Bucket**
Con Edison Report	1		Enhance our ability to provide more accurate estimated times of restoration to customers, municipal officials, and the media.	1C2
Con Edison Report	2		Provide more frequent briefings and closer coordination with municipal officials, department of public works personnel, and emergency response organizations.	3B
DPS Staff Report - Jan OH	3		Con Edison should proceed with its proposed improvements for the System Trouble Analysis and Response System, Emergency Control and Outage Management Systems and should test these improvements to ensure that these three systems can provide accurate outage information at much higher call volumes.	1A4
DPS Staff Report - Jan OH	4		Con Edison should develop and implement comprehensive plans for coordinating its storm restoration activities, including eliminating hazardous conditions, and improving communications with municipal highway departments and officials. These plans should include details on enhanced communications with the departments and officials regarding its activities.	1A1
DPS Staff Report - Jan OH	5		Con Edison should assign additional trained personnel in future emergencies to act as liaisons to municipal highway departments and officials.	1A3
DPS Staff Report - Jan OH	6		For storm restoration, Con Edison should make optimal use of its own field crews from other operating areas.	1A3
DPS Staff Report - Jan OH	7		Con Edison should review its procedures for preparing work orders following major storms to ensure that they are managed effectively, including providing proper training and supervision.	1A3
DPS Staff Report - Jan OH	8		The company should review and analyze industry practices for estimating restoration times. The analysis should include an evaluation of how advanced metering might have been used to improve information available on customer outages. Based on this analysis, and a comparison with its own practices, Con Edison should assess and implement the best practice processes for its system.	1C2
DPS Staff Report - Jan OH	9		The company should review its procedures for training and supervising customer service representatives to ensure that proper sensitivity is used when dealing with customers.	2A3

DPS Staff Report - Jan OH	10		The company should take measures to better communicate emergency information to its customers and public officials. Actions should include oral, written, and web site communications that will: provide restoration prioritization information; provide restoration estimates; provide emergency actions for customers to take; provide location and times for dry ice distribution; enhance present education efforts to encourage customers to call in; and develop a more comprehensive program to educate customers or the dangers of downed wires	3D
DPS Staff Report - Jan OH	11		The company should, in future outages where the restoration period is expected to exceed one day, dispatch one or more mobile command center vehicles so that company personnel are available on-site to meet with customers. The company should include information about the location of the mobile command center vans in press releases, in information provided to customer service representatives, in briefings with public officials, and with other communications to the public.	2B5
DPS Staff Report - Jan OH	12		Con Edison should provide more frequent press releases and hold news conferences during restoration periods.	3A
DPS Staff Report - Jan OH	13		The company's contact list for the provision of information should include all elected officials at all levels of government (municipal, county, and state), as well as all appropriate municipal officials (e.g., police, fire, highway, public works).	3B
DPS Staff Report - Jan OH	14		The company should provide daily or more frequent updates and conference calls for municipal and public officials, as appropriate.	3B
DPS Staff Report-Westchester	15		Con Edison should conduct a review of predictive models available for its use in storm damage prediction. This review is to commence immediately, and monthly progress reports are to be provided to Staff. Implementation should be targeted for August 1, 2007.	1A4
DPS Staff Report-Westchester	16		Con Edison should do a complete re-evaluation of its staffing and storm emergency classification matrices for the Bronx-Westchester portion of its storm plan and file the revised matrices in an update to its plan by April 30, 2007.	1A4
DPS Staff Report-Westchester	17		Con Edison should develop a more formal survey procedure which can quickly gather preliminary damage information throughout the affected service territory, and that the storm manager(s) obtain first-hand knowledge of the storm's extent and restoration progress.	1A2

DPS Staff Report-Westchester	18		Con Edison should review the section in its storm plan concerning the use of helicopters for surveying the distribution system and modify the plan to reflect its actual practice.	1A2
DPS Staff Report-Westchester	19		Con Edison should study and implement technologies to make damage assessment, and other restoration processes, more efficient and effective. A report to Staff should be made within four months of this report outlining the technologies studied and implemented or slated for implementation.	1A2
DPS Staff Report-Westchester	20		Con Edison should require all employees that fill a position in the emergency response organization to be Incident Command System and National Incident Management System trained, and tested, to a level commensurate to their position. This training should be facilitated by the Company and completed no later than April 30, 2007.	1A3
DPS Staff Report-Westchester	21		Con Edison should provide guidance in its Comprehensive Emergency Response Plan for adjustment of its work force to be in line with, or better than, the durations called for in the matrices by April 30, 2007. (See recommendation #2)	1A3
DPS Staff Report-Westchester	22		Con Edison is to provide a plan of action, to be filed with and integrated into the next Comprehensive Emergency Response Plan update, for making optimal use of its own field crews from other operating areas.	1A3
DPS Staff Report-Westchester	23		Con Edison should maximize its ability to manage crews and use the number of crews commensurate to the most prompt outage restoration possible. The Company needs to inform Staff on the improvements it is making in logistical management.	1A3
DPS Staff Report-Westchester	24		Con Edison should provide accommodations for all emergency workers, and maximize available work hours for safe restoration.	1A3
DPS Staff Report-Westchester	25		Con Edison should fully communicate its estimated global restoration time through the press, media, and web outlets.	3D
DPS Staff Report-Westchester	26		Con Edison should expedite its search for tools to assist in planning restoration work.	1A4
DPS Staff Report-Westchester	27		Con Edison should continue to integrate its transmission and distribution telemetry system with its outage management system to increase its accuracy, timeliness, and efficiency.	1A4

DPS Staff Report-Westchester	28		Con Edison should continue to work on improvements to the System Trouble Analysis and Response program, Emergency Control System, Outage Management System and Call Center operations. It should test these improvements to ensure that these systems can provide accurate outage information at much higher call volumes.	1A4
DPS Staff Report-Westchester	29		Con Edison should review, evaluate and improve its outreach and education program regarding outage management and the restoration process so customers are aware of how the Company restores service and how it prioritizes restoration. An implementation plan for the program is to be provided to Staff.	2B5
DPS Staff Report-Westchester	30		Con Edison should provide its customer service representatives, timely and accurate information regarding outage areas, restoration status, location of dry ice distribution centers, and the location of consumer advocates outreach vans.	2B2
DPS Staff Report-Westchester	31		Con Edison should make detailed restoration estimates accessible to customers via live telephone communication, pre-recorded information on voice response units, and the Internet.	2B4
DPS Staff Report-Westchester	32		Con Edison should modify the voice response unit to either provide an update regarding daily location of dry ice distribution centers and outreach advocates or provide a message stating that the customer service representatives have the information.	2B2
DPS Staff Report-Westchester	33		Con Edison should develop a special section on its website dedicated to outage restoration information including restoration times and employing frequent updates (including a listing of the number of outages by municipality), dry ice distribution and customer advocate locations, news releases, and claims information. This section should be easily identified/prominently displayed on the Company's homepage by using an attention getting feature such as a pop-up box, running banner, etc. The existence of the new section should be advertised repeatedly to all Con Edison customers.	2B3
DPS Staff Report-Westchester	34		Con Edison should allow customers to report outages via the Company's website using their customer account number (or other forms of identification such as their home phone number). Prior to implementing this option, Con Edison must ensure that reports obtained via the Internet will be connected with the outage management system. This customer option should be well publicized by the Company through various communications vehicles with customers.	2B3

DPS Staff Report-Westchester	35		Con Edison should expand its review of the "best practices" of other utilities nationwide to include Communications methods and Outage Management systems to facilitate the public's ability (both public officials and customers) to report outages. A detailed account of this review, including any recommendations for revising current practices and an explanation of why any best practices will not be adopted, should be filed with the Staff within four months of the Commission's order adopting this report.	1A4
DPS Staff Report-Westchester	36		Con Edison should continue to meet with the Westchester County Municipal Managers Association to receive input about the following: 1. The effectiveness of the Company's current outreach program (including the effectiveness of the daily conference calls; 2. Methods by which the municipalities can work with Con Edison to enhance communication with Westchester residents prior to and during an outage event and restoration activities; and 3. Methods of communicating to public officials outage information showing the location of crews on a regional map, workforce allocation and distribution, location of dry ice distribution centers, and customer outreach advocates, etc.	3B
DPS Staff Report-Westchester	37		Con Edison should review and update the contact list for municipal and public officials and emergency personnel at least twice a year. In addition Con Edison should add the municipal list to their news media contact list so that the municipal officials receive news releases and updates at the same time as the news media. The update should be completed by June 1, 2007. Staff should be notified when the update is complete, as well as, at each six-month interval thereafter.	3B
DPS Staff Report-Westchester	38		Con Edison should provide press releases to local media prior to all approaching storms that provide information on the Company's outage and restoration procedures and emphasizes the steps customers should take in the event of a power outage.	3A
DPS Staff Report-Westchester	39		Con Edison should issue press releases to the media to coincide with local news cycles or at a minimum of two times daily.	3A
DPS Staff Report-Westchester	40		Con Edison should post press releases as soon as they are issued to the Company website and should place it in a page/section dedicated to the outage and restoration activities. The section/page should be prominently advertised on the homepage.	3A

DPS Staff Report-Westchester	41		Con Edison should proceed with improvements to the System Trouble Analysis and Response System and its Voice Response Unit Call Back system's capability and should test the improvement to ensure its proper functioning in delivering storm warning and follow-up calls to Life Support Equipment cust	2B1
DPS Staff Report-Westchester	42		Con Edison should design and implement an expanded Life Support Equipment customer identification program to raise the awareness of its customers and other affected individuals (i.e., those who pay utility costs as part of their rent or as a part of master metered or sub metered arrangements) to the opportunity to be identified in the Company's records as using Life Support Equipment by partnering with community agencies, senior care facilities, and other such organizations. Con Edison should report its actions and plans to Staff. It should also include its plans as part of its next rate filing.	2B1
DPS Staff Report-Westchester	43		Customer service representatives should continue to take the opportunity during in-bound calls to identify and inform customers of the Company's Life Support Equipment program.	2B1
DPS Staff Report-Westchester	44		Con Edison's Customer Operations Corporate Comprehensive Emergency Response Plan should be reviewed and updated to include additional outreach mechanisms for identifying customers who would qualify for the Life Support Equipment program. Consideration should be given to providing program information to home medical agencies and personnel, rehabilitation centers, hospitals and other medical care facilities, and programs and personnel that regularly deal with the prescription, supply or maintenance of Life Support Equipment.	1A1
DPS Staff Report-Westchester	45		Con Edison should develop an emergency notification/distribution process by which all its large and small critical care facility customers (hospitals and nursing homes) would receive advanced notice of approaching storms and potential power losses. This process should be incorporated into the Company's Comprehensive Emergency Response Plan.	1A1
DPS Staff Report-Westchester	46		Con Edison should establish a dedicated telephone line(s) or other more direct communication links for critical care facility customers and notify all critical care facility customers of the dedicated telephone line by which these customers can contact Con Edison's Emergency Command Center directly, 24 hours a day, seven days a week.	2A2

DPS Staff Report-Westchester	47		Con Edison should redesign its website so that the dry ice program and distribution locations can be prominently advertised on the website under the "Storm Preparations" section or in a new section entitled, "Outage Information," or in a pop-up box or on a running banner displaying the locations, dates, and times.	2B3
DPS Staff Report-Westchester	48		Con Edison should modify its Voice Response Unit system to allow a customer to select from a variety of options including reporting an outage, hearing information about dry ice distribution locations, Customer Outreach Advocate field locations, safety tips, and remaining on the line to reach a customer service representative. A second option is to modify the Voice Response Unit message with a statement indicating that the customer service representatives have information on dry ice, advocates, claims, and safety tips. The Company should advise Staff of the modifications it has put into place to comply with this recommendation.	2A4
DPS Staff Report-Westchester	49		Con Edison should investigate ways to increase the visibility of its dry ice distribution sites and customer advocate van sites.	3D
DPS Staff Report-Westchester	50		Con Edison should send dry ice distribution program and location information to its municipal and public official and emergency personnel contact list.	3B
DPS Staff Report-Westchester	51		During its planned meeting with the Westchester County Municipal Managers Association, Con Edison should discuss the dry ice distribution program and the possibility of municipalities assuming the distribution duties with pre-determined sites identified. The Company should report its findings and recommendations to Staff within four months following the Commission Order adopting this report.	3B
DPS Staff Report-Westchester	52		Con Edison should ensure that information about claims, including filing, reimbursement and eligibility criteria, is clearly stated and prominently placed on its website.	3C
DPS Staff Report-Westchester	53		Con Edison should provide its customer service representatives with prepared scripts that clearly identify reimbursement eligibility criteria and other pertinent information regarding the claims program.	2A1
DPS Staff Report-Westchester	54		Con Edison should instruct its customer service representatives not to make assurances to consumers regarding payment of claims, except to the extent that the representatives are decision makers and will ensure that the decision is carried out.	2A1
DPS Staff Report-Westchester	55		Con Edison should provide payment of claims and eligibility criteria information to the media during outage events.	3A

DPS Staff Report-Westchester	56		Con Edison should analyze the sufficiency and appropriateness of its claims tariff for Commission action in accord with Recommendation No. 25 as contained in Appendix A of the 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, issued February 2007.	4B
DPS Staff Report-Westchester	57-A		Con Edison should establish additional procedures and protocols to ensure that its automated call message system will enable callers to reach customer service representatives directly and quickly during future emergencies. Within four months after this Staff Report is issued, Con Edison should advise Staff of the additional procedures and protocols it has or is establishing to comply with the intent of this recommendation.	2A1
DPS Staff Report-Westchester	57-B		Con Edison should identify and correct the problems that plagued its System Trouble Analysis and Response, Emergency Control and Outage Management systems to accurately reflect outage and restoration status.	1A4
DPS Staff Report-Westchester	58		Con Edison should establish procedures and assign employees to ensure that the problems it identifies during training exercises or when supervisors are monitoring customers' calls are corrected in a timely manner.	2A3
DPS Staff Report-Westchester	59		Con Edison should provide sensitivity training for its customer service representatives.	2A3
DPS Staff Report-Westchester	60		Con Edison should review its procedures for determining staffing levels during outages to ensure adequate coverage of the Call Center operations.	2A1
DPS Staff Report-Westchester	61		Con Edison should arrange refresher and new employee training in the storm process for all employees involved in storm restoration.	1A1
DPS Staff Report-Westchester	62		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 case. At that time, there should be discussions about additional Communication activities including teleconferences to brief public officials about the status of restoration and other outage-related information.	4A

Evaluation of Con Edison 2006 Outage Related Recommendations				
LIC Related				
Report Source	**VCI #**	**Rpt. #**	**Recommendation Description**	**Bucket**
CE Comprehensive Report	1	Action 1A	**Action 1A –** Improve the design of the contacts associated with rack-out breakers. Four substations, including North Queens, have contacts on rack-out breakers that need to be upgraded to an improved design. This work requires the equipment to be out of service (de-energized). North Queens is scheduled to be completed by June 1, 2007. Work at the remaining three stations will be completed by June 1, 2008.	1B3
CE Comprehensive Report	2	Action 1B	**Action 1B** – Modify the supervisory wiring so that the station operator can detect a problem in the trip circuit of a rack-out breaker. The supervisory wiring associated with feeder 1Q21 and the other 21 network feeders at North Queens substation has been modified. Three other substations may also have this condition and will be modified where required by December 31, 2006.	1B3
CE Comprehensive Report	3	Action 2A	**Action 2A** – As an interim step, the protective relay settings for all North Queens feeders have been revised to further reduce the probability of inrush current causing trip outs. Prior to summer 2007, feeders with connected transformer capacity of more than 32 MVA at other stations will also have their relay settings reviewed and revised to reduce the probability of trip outs caused by inrush currents.	1B3
CE Comprehensive Report	4	Action 2B	**Action 2B –** Install microprocessor relays to the protective circuits of LIC feeders with more than 32 MVA of connected transformer capacity to further reduce the probability of an inrush current trip out. These microprocessor relays will differentiate between an actual fault and inrush current. This work is scheduled to be completed by December 31, 2007.	1B3

CE Comprehensive Report	5	Action 2C	**Action 2C** – At other substations that have feeders with more than 32 MVA of connected transformer capacity, investigate the installation of microprocessor relays or other equipment, as appropriate, to further reduce the probability of an inrush current trip out. This investigation will be completed by December 31, 2007.	1B3
CE Comprehensive Report	6	Action 4A	**Action 4A** – The system used to monitor transformer loads and temperatures will be enhanced to more quickly identify units that are highly loaded or projected to become highly loaded in order to better support the dispatch and coordination of crews for supplemental cooling. Units identified will be prioritized so that crews can be dispatched for supplemental cooling. This enhanced transformer loading and prioritization system will be ready by the summer 2007.	1B2
CE Comprehensive Report	7	Action 4B	**Action 4B** – Prior to each summer period, refresher training on transformer cooling will be given to all supplemental cooling crews who will be self sufficient in cooling operations. The first refresher training will be given to all supplemental cooling crews by June 1, 2007.	1B4
CE Comprehensive Report	8	Action 4C	**Action 4C** – Cooling kits containing the necessary material to perform transformer-cooling operations will be assembled and maintained at each employee dispatch location by June 1, 2007.	1B1
CE Comprehensive Report	9	Action 4D	**Action 4D -** Prior to the event, the remote monitoring systems (RMS) in the LIC network had an availability rate of 79.5 percent. The reporting rate has since been improved to provide more comprehensive information for control room operators. The company will continue to deploy the upgraded RMS transmitters to improve reporting for all networks.	1B2

CE Comprehensive Report	10	Action 5A	**Action 5A** – Sixty-six locations in the Long Island City network where heat-sensitive splices may exist have been identified. Con Edison will replace the splices before the summer of 2007. There are approximately 1,000 similar locations on the Con Edison system. Con Edison will continue its program to replace these splices by the end of 2008.	1B3
CE Comprehensive Report	11	Action 6A	**Action 6A** – Investigate methods to improve the computer models of the secondary circuits in a network to provide a better estimate of secondary cable loading. The investigation will be completed by December 31, 2007.	1B2
CE Comprehensive Report	12	Action 6B	**Action 6B –** Investigate improved methods to protect primary feeders from external fire and heat. This investigation will be completed by December 31, 2007.	1B1
CE Comprehensive Report	13	Action 7A	**Action 7A** – Complete the retrofit of the nine remaining network feeder breakers at North Queens substation to the new rack-out circuit breaker design. Also, test and certify the associated ground and test devices to be used during feeder processing. This work is scheduled for completion before the summer of 2007.	1B3
CE Comprehensive Report	14	Action 7B	**Action 7B** – Complete the retrofit of stationary network feeder breakers at the four remaining test bus substations with a rack-out breaker design by 2009.	1B3
CE Comprehensive Report	15	Action 8A	**Action 8A –** Investigate methods to more quickly identify and open network protectors that remain closed causing alive on back feed conditions. This investigation will be completed by December 31, 2007.	1B1
CE Comprehensive Report	16	Action 9A	**Action 9A** - Develop additional visual operational tools to provide operators with the information necessary to take the most appropriate action in a given situation. The work is scheduled for completion by the summer of 2007.	1B2

CE Comprehensive Report	17	Action 10A	**Action 10A -** Develop information systems to help operators better determine the results of demand response actions on a real time basis. These information systems will be developed by summer of 2007.	1B2
CE Comprehensive Report	18	Action 10B	**Action 10B -** Establish a Demand Response position within the Distribution Engineering	1A6
CE Comprehensive Report	19	Action 11A	**Action 11A** - Hold an inter-utility conference with the various mutual groups to discuss underground assistance. The conference should focus on reaching a mutual agreement that would outline terms and conditions of mutual assistance for underground network support during emergencies. The inter-utility conference will be held by March 31, 2007.	1A3
CE Comprehensive Report	20	Action 11B	**Action 11B** - Create a contact list of utilities that have skilled underground employees, as currently exists for the skilled overhead mutual assistance crews, for future planning discussions and response needs. The utility contact list will be developed by April 30, 2007.	1A3
CE Comprehensive Report	21	Action 12A	**Action 12A** – For the short term, we have developed a process and system to help provide better estimates of customers out of service. We have begun using a new computer-aided tool that analyzes data from existing network monitoring systems, as well as calls from customers and the public.	1C1
CE Comprehensive Report	22	Action 12B	**Action 12B** – By summer 2007, we expect to develop and put in place a map-based graphics tool that will display the status of secondary network components and the locations of reported electrical problems.	1A4
CE Comprehensive Report	23	Action 12C	**Action 12C –** By summer 2007, we will complete our review of the installation of electric meters that could alert the company when a customer is out of service.	1A5
CE Comprehensive Report	24	Action 13A	**Action 13A** – To reduce the possibility of customers receiving busy signals, increase the number of telephone lines into the Con Edison call system from approximately 400 to 650. This will be completed by the end of 2006.	2A2

CE Comprehensive Report	25	Action 13B	**Action 13B** – Improve the interactive automated system for customers to report electrical outages. This has been completed. The new system requires about 90 seconds to report an electrical outage.	2A2
CE Comprehensive Report	26	Action 14A	**Action 14A** - Develop a modified plan to manage a severe heat event. This plan was already being developed prior to the LIC incident and will be completed before next summer. A tabletop drill will be held by the summer, 2007.	1A1
CE Comprehensive Report	27	Action 15A	**Action 15A -** Customer Outreach will maximize the use of Con Edison publications such as *Customer News* and *Spotlight* to inform customers about the process for service restoration during emergency events and to stress the importance of contacting Con Edison if they lose power. Information about the claims procedure and food spoilage will also be included. Outreach presentations to customers, community groups, and others also will include outage information. Our enhanced outreach program has already begun and the entire enhanced outreach effort will be completed by the summer, 2007.	3D
CE Comprehensive Report	28	Action 15B	**Action 15B -** Equip an additional two Outreach vans for use in multiple locations at the same time, which will increase the total number of outreach vans to three by the summer, 2007.	2B5
CE Comprehensive Report	29	Action 16A	**Action 16A** – Study advancing the in-service date for the new area station based on enhanced reliability to customers in the area by the summer, 2007.	2B5
State Assembly Task Force	30	1	1. Require the PSC to conduct a periodic review of Con Edison's Certificate of Public Necessity for the Con Edison service area, with an opportunity for competitors to offer proposals for management of all or part of the distribution system.	4A
State Assembly Task Force	31	2	2. Examine the extent to which Con Edison reliability has been impaired as a result of relaxed PSC oversight.	4A

State Assembly Task Force	32	3	3. Establish clearly defined statutory qualifications for PSC commissioners, which would establish minimum pre-requisites for prospective PSC commissioners to best serve the interests of the public as contemplated by the legislature.	4A
State Assembly Task Force	33	4	4. Determine whether PSC "service quality metrics" actually and accurately measure the right things to assure reliability and adequacy of service.	4A
State Assembly Task Force	34	5	5. Increase economic consequences to utilities for not attaining existing service quality standard targets set by the PSC.	4A
State Assembly Task Force	35	6	6. Amend the Public Service Law to require the PSC to impose prompt, meaningful rate refunds or reductions in response to objectively measured failures to provide reliable needs.	4A
State Assembly Task Force	36	7	7. Require that the PSC reconsider the practice of multi-year rate plans and instead require annual rate reviews of Con Edison and the State's other investor-owned utilities.	4A
State Assembly Task Force	37	8	8. Encourage the PSC to facilitate open public scrutiny of utility management practices and spending priorities.	4A
State Assembly Task Force	38	9	9. Require the PSC to establish an annual or biannual process for public review and comment and Commission approval of Con Edison's infrastructure expenditure plans, especially operation and maintenance of its distribution network.	4A

State Assembly Task Force	39	10	10. Require the PSC to mandate that each utility submit annual public expenditure reports that specify discrete capital, operating and maintenance spending levels in specific categories, such as power purchases, distribution facilities, transmission, environmental controls and new/existing generation, and make these reports subject to public scrutiny with an opportunity for public comment.	4A
State Assembly Task Force	40	11	11. Enforce the legislatively required schedule for PSC audits of Con Edison.	4A
State Assembly Task Force	41	12	12. Con Edison should establish a working group to develop clear protocols in the event of a power outage. The working group could be composed, initially, of members of Con Edison management, the PSC and elected officials. The protocols developed by the working group should mandate speedy communication by Con Edison to elected officials in the areas affected by power outages.	3B
State Assembly Task Force	42	13	13. Con Edison's communications to elected officials should provide clear indication as to the status, extent, projected duration and forecasted time of repair of a given power outage. The protocols should mandate that Con Edison communicate with elected officials on a frequent basis throughout the duration of a power outage, and establish clear procedures for relaying this information to the general public in a clear and regular fashion.	3B

State Assembly Task Force	43	14	14. The working group should concentrate its efforts not only on developing clear protocols in the event of a power outage, but also on enhancing its relations with the local communities which it serves. Examples of enhanced community relations might include, as an ongoing business practice, holding meetings between Con Edison officials and members of the public on a semiannual basis.	3B
State Assembly Task Force	44	15	15. More forthcoming and accurate representation of the number of people affected must be provided by Con Edison.	1C2
State Assembly Task Force	45	16	16. Con Edison should establish more effective methods of discovering the scope of an outage. Knowledge of the system by operators and maintenance workers would be greatly enhanced by electronic means rather than manual field surveys.	1A4
State Assembly Task Force	46	17	17. Con Edison should develop a more effective emergency response plan, including better methods of communicating information internally between field personnel and management.	1A1
State Assembly Task Force	47	18	18. Con Edison's reimbursement policies should be expanded to include coverage for damaged electrical equipment, computer equipment, air conditioning equipment, and other electronic equipment necessary for maintaining other sophisticated instruments used by commercial establishments or residences. The dollar amounts could be capped with an aggregate dollar maximum, tied to the duration of a power outage, but should provide for compensation to both residential and commercial customers affected by a power outage.	4B

State Assembly Task Force	48	19	19. Con Edison's liability provisions should be connected to the duration of a blackout in order to render them meaningful. Accordingly, the Task Force recommends that Con Edison apply its liability provisions to residential and commercial customers proportionately for every 48 hour increment of continued power outage. This would provide more adequate and more fair coverage to Con Edison's customers than Con Edison's currently contemplated and vague "per incident" standard.	4B
State Assembly Task Force	49	20	20. Con Edison's liability provisions should expressly indicate that Con Edison will offer compensation to commercial customers who have lost business opportunities as a result of a power outage. One way of formulating the amount to be compensated for lost business opportunities could be based on average amounts of revenue accumulated by the business during previous years when power was available. For a new business, a projected forecast of quarterly earnings could be used as the basis for formulating the amount of dollar compensation due to a power outage, again pro-rated to the length of the duration for every 48 hour period.	4B
State Assembly Task Force	50	21	21. Con Edison should earmark additional funds within the Long Island City network to support demand reduction measures, including demand response, permanent demand-side management and customer sited generation. The programs should be designed to include low-income households who may lack resources to invest in these measures.	1A6

State Assembly Task Force	51	22	22. Con Edison should allocate $20 million over 3 years to create a "Network of the Future" pilot project within the Long Island City network, creating a test bed for demonstration of state-of-the-art smart grid technologies, modeled on the proposed RECO Smart Grid pilot for Ramsey, New Jersey. Costs of the project should not be passed through to rate-payers.	1B3
State Assembly Task Force	52	23	23. "Network of the Future" funding should be earmarked for the following specific research, development and deployment purposes: • "Smart Grid" technologies that are capable of improving the performance and technical efficiency of the grid or that would facilitate the economical interconnection of distributed generation to network systems; • Targeted area incentives for clean distributed generation to promote reliability and/or relieve congestion; • Targeted area incentives for advanced metering technology for residential and small commercial and industrial consumers to enable real-time monitoring and enhance the demand responsiveness of electricity consumption; • Research and development of superconductor and other high efficiency distribution lines in conjunction with national laboratories; and • High visibility public-private demonstration projects.	1B3

State Assembly Task Force	53	24	24. The "Network of the Future" program would be developed in consultation with a high-level Advisory Committee including, among others, representatives of NYSERDA, the PSC, elected officials and other community stakeholders.	1B3
State Assembly Task Force	54	25	25. NYSERDA should allocate to New York City a fair share of program dollars committed to grid modernization through the $10 million reauthorization of the Energy $mart Program. Con Edison should make every effort to leverage its own resources by securing state and federal funding.	1B3
State Assembly Task Force	55	26	26. The PSC should institute a formal proceeding on the question of Con Edison's prudence and gross negligence.	4A
State Assembly Task Force	56	27	27. The State Legislature should amend the New York State Public Service Law to remove the tariff bar against suits for damages from outages due to simple negligence.	4C
State Assembly Task Force	57	28	28. Ensure that the Con Edison workforce is not adversely affected by any changes made in response to the above recommendations.	4C
DPS Staff Report	58	1	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.	1B2
DPS Staff Report	59	2	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.	1A1

DPS Staff Report	60	3	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. The Company should report to Staff, within six months of the issuance of this Report, of the results of its analyses.	1B3
DPS Staff Report	61	4	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.	1A1
DPS Staff Report	62	5	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.	1C1
DPS Staff Report	63	6	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.	1C1

DPS Staff Report	64	7	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: Ø the importance of contacting the Company if power is lost; Ø alternative ways to contact the Company, in the event telephones do not operate in an electric outage; Ø where to find information about dry ice and water distribution, cooling, or warming centers; Ø where to learn about outage information and estimated times of restoration; Ø the impact of low voltage and the steps people can take to protect appliances, computers, and other equipment; Ø how telecommunications services, technologies, and equipment might function during power outages; and Ø 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.	3D

DPS Staff Report	65	8	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.	3B
DPS Staff Report	66	9	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.	3B
DPS Staff Report	67	10	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.	3B

DPS Staff Report	68	11	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.	3A
DPS Staff Report	69	12	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.	2A2
DPS Staff Report	70	13	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.	2B5

DPS Staff Report	71	14	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.	2B1
DPS Staff Report	72	15	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.	2B1
DPS Staff Report	73	16	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.	2B1
DPS Staff Report	74	17	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.	2B2

DPS Staff Report	75	18	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.	2B2
DPS Staff Report	76	19	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.	2B3
DPS Staff Report	77	20	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.	3C
DPS Staff Report	78	21	21 Con Edison should redesign its website so that heat wave and cold weather specific information is not subsumed in the "storm central" pages.	3C
DPS Staff Report	79	22	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.	1A1

DPS Staff Report	80	23	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.	1A1
DPS Staff Report	81	24	24. Also see recommendations in Section 5.4 "Comments from People Affected by the Event". • 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.	3C
DPS Staff Report	82	25	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.	4B

DPS Staff Report	83	26	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.	4B
DPS Staff Report	84	27	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.	4B
DPS Staff Report	85	28	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.	4B
DPS Staff Report	86	29	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.	1A3

DPS Staff Report	87	30	30. Con Edison should modify E0-4095 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.	1A1
DPS Staff Report	88	31	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.	1A1

DPS Staff Report	89	32	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.	1B3
DPS Staff Report	90	33	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.	1B1
DPS Staff Report	91	34	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.	1B4

DPS Staff Report	92	35	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.	1B4
DPS Staff Report	93	36	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.	1A1

DPS Staff Report	94	37	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 hi pot testing with the intent to have such a new procedure in place by the summer of 2008.	1B4
DPS Staff Report	95	38	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.	1B1
DPS Staff Report	96	39	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.	1B2

DPS Staff Report	97	40	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.	1B2
DPS Staff Report	98	41	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.	1A4
DPS Staff Report	99	42	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.	1A7
DPS Staff Report	100	43	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 1,2 007, it should develop a manual solution. The Company should report the outcome of its investigation and plans by June 1, 2007.	1A4
DPS Staff Report	101	44	44. Con Edison should investigate alternatives to current limiters and provide a report to Staff within 90 days of this Report.	1A5

DPS Staff Report	102	45	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.	1B1
DPS Staff Report	103	46	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.	1A4
DPS Staff Report	104	47	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.	1A7
DPS Staff Report	105	48	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.	1B4
DPS Staff Report	106	49	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.	1B1

DPS Staff Report	107	50	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.	1B3
DPS Staff Report	108	51	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.	1B2
DPS Staff Report	109	52	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.	1B4
DPS Staff Report	110	53	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.	1B1
DPS Staff Report	111	54	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.	1B4

DPS Staff Report	112	55	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.	1B1
DPS Staff Report	113	56	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.	1B4
DPS Staff Report	114	57	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.	1B3
DPS Staff Report	115	58	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.	1B3

DPS Staff Report	116	59	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.	1B3
DPS Staff Report	117	60	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.	1B4
DPS Staff Report	118	61	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.	1C2
DPS Staff Report	119	62	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.	4A

DPS Staff Report	120	63	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.	1A3
DPS Staff Report	121	64	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.	1A3
DPS Staff Report	122	65	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.	1A5
DPS Staff Report	123	66	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.	1A6

DPS Staff Report	124	67	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.	1A6
DPS Staff Report	125	68	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.	1A6

DPS Staff Report	126	69	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.	1A6
DPS Staff Report	127	70	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.	1A6
DPS Staff Report	128	71	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.	1B1

DPS Staff Report	129	72	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.	1B1
DPS Staff Report	130	73	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.	1B1
DPS Staff Report	131	74	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).	1B3
DPS Staff Report	132	75	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.	1A1
DPS Staff Report	133	76	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.	4A
DPS Staff Report	134	77	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.	1B4

DPS Staff Report	135	78	78. Con Edison should commence tracking of actual work volumes and expenditures (capital, and operations and maintenance) by electric network as soon as practicable. Con Edison should determine what systematic changes are necessary to implement this recommendation and report its findings to Staff by June 1, 2007.	1B4
DPS Staff Report	136	79	79. Con Edison should file its current five-year capital budget with Staff within 30 days of the issuance of this Report.	4A
DPS Staff Report	137	80	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.	4A
DPS Staff Report	138	81	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.	4A
DPS Staff Report	139	82	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.	1A1
DPS Staff Report	140	83	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.	4A

DPS Staff Report	141	84	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.	4A
DPS Staff Report	142	85	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.	4A
DPS Staff Report	143	86	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.	4A
DPS Staff Report	144	87	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.	1A7

Donahue Report	145		□ Conduct a study to determine the expected time to failure in a multi-contingency event. The study should determine the time required to enable remedial actions to prevent /control overloads and failures. If insufficient time is available, consider and develop appropriate engineering solutions.	1A7
Donahue Report	146		□ Evaluate if feeder ratings, estimated loads on associated feeder bands, and individual feeders should be considered in planning network reinforcement.	1B1
Donahue Report	147		□ Investigate and develop criteria for application of “band relief” which may suggest relief be implemented earlier than only relieving individual overloads.	1A7
Donahue Report	148		□ Review the transformer ratings being assigned for normal, first, and second contingency operation and ensure that the secondary street ties and mains cables are within their ratings during the corresponding operation.	1B4
Donahue Report	149		□ Evaluate load curves currently applied to transformers and confirm the curves are appropriate. If not, revise them so that the proper curve is used and the PVL model is updated. Specific attention should be given to nearby transformers.	1B2
Donahue Report	150		□ Establish criteria which require that all transformers that are forecasted to be loaded at or above a pre-determined value prior to the event are analyzed to identify potential load pocket problems. These transformers should be monitored during the event.	1A7
Donahue Report	151		□ Investigate the use of arc-proofing on secondary cables and crab joints or the installation of fire shields between secondary crabs and primary cables to limit collateral failure and the communication potential from fire damage from one to the other.	1A7

Donahue Report	152		Train additional field crews who can supplement crews normally assigned to cooling transformers. Use the Long Island City network event as a guide to determine staffing levels to ensure cooling can begin early enough to prevent transformer overheating. Consider a three hour period until a study can be performed to identify a suitable timeframe.	1A3
Donahue Report	153		Identify all the sources of information that may assist analysis of secondary mains trouble such as calls from customers, third parties, community agencies, field crews, network maps, installed monitoring systems, and engineering support systems. Then develop a procedure and provide training to analyze all the streams of information to identify remedial actions that would isolate the problem areas and protect uninvolved network components from overload. As part of the analysis answer questions such as: o When, where, and how far should localized load be reduced o What equipment can be isolated by live-end capping of feeders and when not to use this method to expedite feeder restoration o Advise operators of the priority order of when feeders should be returned to service first and why o Estimate the impact of how much secondary load can be picked up when a feeder is restored and its impact on facilities being restored o What might be the secondary transformer loading upon feeder restoration o When specific feeders should be restored within a short time of one another to avoid excess thermal stressing o Estimate of the location and number of customers impacted during the outage and restoration.	1A4

Donahue Report	154		Evaluate the effectiveness of the replacement contact arrangement being installed on circuit breakers similar to 1Q21 and if that arrangement is found to be an optimal solution to the misalignment issue, review the criteria currently in use that determines at what point the replacement is installed. Adjust the criteria as necessary to prevent a future occurrence similar to the Bus Section 3S trip that occurred during the Long Island City network event.	1A7
Donahue Report	155		Expedite the modification of this wiring scheme on all circuit breakers in which the scheme is similar to that of 1Q21 where the Merlin Gerin Model SF2 breakers were used to retrofit the cubicle.	1A7
Donahue Report	156		Establish a review process that includes the Relay Protection Section for all modifications and alterations of the relay protection system.	1B1
Donahue Report	157		Review all feeders on the Con Edison system to determine the total MVA of the transformers connected and establish a procedure for changing the settings based on new transformers or equipment being added or transferred.	1B1
Donahue Report	158		Utilize available breaker positions at the North Queens substation to establish new feeders to reduce the average normal and emergency feeder loading and improve diversity on the Long Island City network.	1B5
Donahue Report	159		Review the use of ratings in PVL and establish criteria for when the use of these ratings should be applied, specifically during operating and planning conditions (see Attachment D for definitions of engineering applications).	1B4
Donahue Report	160		Review the transformer ratings that are presently assigned in PVL and ensure they are appropriate for the actual load cycle for the area during peak conditions.	1B4

Donahue Report	161		□ Use the operations analysis of the Brooklyn/Queens Engineering Department's compliance with CSP 5-3-19, EO-2072, and EO-2048 as a guide and consider similar analyses of engineering departments in other operating regions. Re-analyze Brooklyn Queens Engineering to ensure all recommendations have been implemented.	1A7
Donahue Report	162		□ Share the operations analysis among all regional engineering groups. Consider following future engineering analyses with field audits or analyses of the completed work.	1A7
Donahue Report	163		□ Develop a procedure such that pre-event analyses include confirming that all transformers that are out of service are accounted for	1A1
Donahue Report	164		□ Consider the impact of dropping un-faulted transformers on the next worst event prior to dropping un-faulted transformers.	1A7
Donahue Report	165		□ Consider establishing a transformer installation team equipped with vehicles, equipment, and material to replace transformers during the event.	1A3
Donahue Report	166		□ Establish clear criteria, as part of EO-10110 that requires appropriate supervisory approval to downgrade a "heavy corrosion condition" to a lower classification.	1A1
Donahue Report	167		□ Develop procedures to reduce small commercial and residential customer demand during periods in which a local high load pocket is subject to expanding due to overloaded or highly loaded nearby transformers and secondary mains.	1A6
Donahue Report	168		□ Consider reducing the action-threshold which identified the specific points that transformers are to be cooled.	1A5
Donahue Report	169		□ Conduct PVL studies as part of summer preparation for all networks to identify transformer cooling candidates if multiple contingencies beyond design criteria were to occur.	1B4

Donahue Report	170		Revise EO-4095 to more specifically address details how to use knowledge of "field conditions" when making decisions about how to restore feeders in terms of priority, live-end caps, shunts, and partial restorations.	1A1
Donahue Report	171		Investigate if design modifications or different criteria are appropriate during normal operation and contingency operation along network fringes. The fringe area of the network is most vulnerable to directional network support.	1B4
Donahue Report	172		Revise EO-4095 to ensure that special attention is directed to network fringe areas and ensure the operators and designers consider new fringe areas created during multiple contingency events.	1A1
Donahue Report	173		Develop and implement customer awareness programs to increase outage calls from interrupted customers served by networks.	3D
Donahue Report	174		Develop a process to ensure that when field crews receive customer reports of outages or other service problems, those reports are added to the information used to analyze secondary mains trouble.	1A2
Donahue Report	175		Revise voice scripts to reduce the likelihood of inferring to network customers that Con Edison is aware of their service problem. State explicitly that Con Edison needs their specific information to ensure timely restoration of service.	2A1
Donahue Report	176		Develop criteria and a process to separately identify calls regarding extremely low voltage trouble from calls regarding low voltage during an 8% voltage reduction action.	2A1
Donahue Report	177		During periods of network trouble, include trouble calls from third parties (NYPD, OEM, and FDNY) in the analysis of secondary mains trouble.	2A1

Donahue Report	178		□ Review the calls that are currently coded as EDSCRE (referrals to electricians) during a multiple contingency. Presently these may not be evaluated, losing critical information that could be made available to trouble analysis. During this event, these represented approximately 10% of the B tickets.	1A4
Donahue Report	179		□ Consider a research program to develop some type of empirical-based algorithm or rule-of-thumb that can be used to estimate the locations and number of customers who may be affected by a network problem based upon the number of customer who actually called to report a problem.	1C1
Donahue Report	180		□ Standardize engineering support applications and centralize quality controls, version controls, application testing, application interfacing, and new application development.	1B1
Donahue Report	181		• Establish specific criteria and develop a procedure that assures the implementation of actions and ensures that network secondary connections are accurately represented in the PVL model. Modify the PVL connectivity model to include overhead secondary mains and place customer loads appropriately.	1B2
Donahue Report	182		• Complete the development of and deploy an enhanced PVL model or the procurement of a commercial equivalent of an enhanced PVL. To be most useful to today's engineers, PVL should be more visual and preferably linked to a Geographical Information System (GIS). It should seamlessly integrate with other existing applications to coordinate protection, forecast load growth and provide a variety of analyses in a visual format.	1B2
Donahue Report	183		• Investigate commercial software that exists today to see if they can be applied to a network as large as Con Edison's, that will allow one to point and click at a section of a feeder to quickly reconfigure the feeder and secondary connectivity and perform revised load flows. PVL is not currently capable of doing this for secondary networks.	1B2

Donahue Report	184		Develop and implement a standard Company procedure to ensure that “local load pockets” can be analyzed in real time when network components such as feeders, cable sections, transformers and secondary mains are out of service.	1A1
Donahue Report	185		• Develop criteria and new output reports for PVL and other analyses to provide designer’s earlier warning, instead of just seeing “overloaded conditions.” Create a threshold below the overload condition so that designers and operators see components that are approaching overload or a threshold of concern.	1A4
Donahue Report	186		• Standardize mapping symbols utilized in the visual tools used by operators and designers.	1B2
Donahue Report	187		Develop and implement processes and standards to ensure that data are consistent between engineering support applications, as well as naming conventions and engineering symbols.	1B1
Donahue Report	188		Revisit the corporate data integration and presentation approach and strategy. Confusion will be reduced and operational efficiency will be improved.	1B1
Donahue Report	189		Require that testing of RMS reporting is completed after transformer additions or when transformers or transmitters are electrically moved from one feeder to another feeder.	1B1
Donahue Report	190		Ensure that the RMS database index file is appropriately updated.	1B1
Donahue Report	191		Identify minimum RMS reporting requirements below which operators will know that the information is suspect or not sufficiently accurate to use for operating decisions. Institute proper management controls and audits to ensure compliance with those requirements.	1B1

Donahue Report	192		□ Enforce present criteria for RMS reporting as specified in Con Edison specifications or review the 95% reporting requirement. Test the system to determine the appropriate level or determine other ways to measure the effectiveness of the RMS reporting rate.	1B2
Donahue Report	193		□ Ensure networks with high transformer counts and large pockets of residential load are prioritized accordingly in all efforts undertaken to improve reporting rates.	1C1
Donahue Report	194		□ Suspect pickup coils should be replaced as soon as practical. With restoration work underway, pickup coils should be replaced as needed as feeder outages are scheduled. This work should be placed in the feeder repository to ensure the District Operator knows that it is outstanding and may combine it with planned work or when a feeder opens auto.	1B1
Donahue Report	195		• Develop a new RMS ID and transmitter phase database, or update the existing database, by conducting a field survey of units without proper records. Further, embed ID, transmitter phase and status checking into normal routines when visiting such equipment for maintenance, inspection or other routine purposes.	1B2
Donahue Report	196		• Establish an annual review of the number of transformers per feeder and perform periodic reviews of feeder relay settings.	1B4
Donahue Report	197		• Study the impact of raising the instantaneous current relay protection setting to determine if tripping times adequately protect the equipment and the public. If so, consider replacing electro-mechanical relays with micro-processor relays whose settings can distinguish between inrush and fault current to maintain fast clearing times.	1B4

Donahue Report	198		• Develop and implement a procedure that requires all operating regions to notify the Relay Protection Engineering Section of specific changes to the number or size of transformers in a timely manner. Require the Relay Protection Engineering Section to take actions to ensure the relay setting adequately considers inrush current from magnetization such that "no fault" cut-in open-autos are prevented.	1B1
Donahue Report	199		• Investigate if a procedure that requires periodic testing or calculation of inrush current from magnetization is required and assure that relay settings are coordinated accordingly.	1B4
Donahue Report	200		• Review and modify as appropriate the Con Edison maintenance procedure that should have prevented the failure of the electromechanical relay targets on 1Q01 on July 17th and 1Q07 on July 20th.	1B1
Donahue Report	201		• Develop a method for the PQ Node equipment to provide a station alarm when fault current is detected, thus providing the District Operator and Station Operator with a confirmation that a fault existed even when a relay target is not present.	1B2
Donahue Report	202		• Inspect and test feeder circuit breakers 1Q20 and 1Q19 (including breaker timing tests) to correct the apparent long clearing times observed on July 18th and July 21st.	1A5
Donahue Report	203		• While it is impossible to predict what contingencies will occur during any event, a review of local area impact and what the next worst event would be for that local area should be considered in all decisions to drop multiple network transformers.	1A1
Donahue Report	204		• The secondary cable loading, and the ability of the secondary mains and supporting transformers for the next worst contingency, should be evaluated and included in the decision making process.	1A1

Donahue Report	205		• Ground and Test equipment at North Queens Substation and other substations of like design, should be commissioned as soon as possible after breaker commissioning.	1B3
Donahue Report	206		• The rack out breaker replacement program at North Queens Substation and other substations of like design should be completed as quickly as possible. Acceleration options should also be evaluated.	1B3
Donahue Report	207		• Review criteria outlined in System Operations procedure SO11-5-9 and provide specific instruction regarding closing feeder breakers on underground feeders that have positive indicators of faulted conductors. Criteria should restrict this practice except for extreme emergencies.	1A1
Donahue Report	208		• Repair decisions for expedited feeder restoration should include consideration of all outstanding isolated cable.	1A1
Donahue Report	209		• The action of closing in breakers without following the standard feeder restoration process should be thoroughly reviewed. If considered for future use, specific procedures on when such actions can take place should be well defined.	1A1
Donahue Report	210		• Isolated feeders should not be restored to service in certain situations but deliberately be held out of service so that there is less likelihood of a transformer or feeder becoming overloaded.	1A7
Donahue Report	211		• Since contingencies can change quickly, strategies need to be reviewed during the course of any event and modified as appropriate.	1A7
Donahue Report	212		• The implementation of the "Rule Book" Section 9, while it may expedite one feeder's restoration, may delay or negatively impact the processing of the other feeders out of service. This factor should be considered when adopting a restoration strategy	1A7

Donahue Report	213		• Consider ways to reduce the significance and negative consequences to the community of shutting down the network by making the network smaller or effectively smaller. This should include, but not be limited to, considering a new substation to split the network and the 161 consideration of primary and/or secondary grid sectionalizing capability.	1B3
Donahue Report	214		• Consider changing the design criteria, now based solely on station capacity, to include local demographics and the community impacts of a network shutdown.	1B3
Donahue Report	215		• Consider splitting the Long Island City network to reduce average feeder loading, length and shut down impact to the community.	1B3
Donahue Report	216		• Investigate and as appropriate develop detailed plans to manually sectionalize the secondary into predetermined sections.	1B4
Donahue Report	217		• Develop a training program to ensure high levels of analytical skills and strategic decision-making for Incident Commanders and others involved in the process of evaluating multiple contingency situations and deciding the most effective tactical responses.	1A3
Donahue Report	218		• Organize the Incident Command team so that the unique responsibility for the analysis and remediation of each of the three considerations provided in EO-4095 (and listed below) are clearly assigned in the structure of the response team. o Overloads on primary feeders can not be eliminated, or o There are reports of cascading manholes on fire, or o Network transformers are loaded beyond the allowable limits when cooled.	1A1
Donahue Report	219		• Utilize “Jeopardy” analysis as part of the criteria in evaluation of the need for reinforcement and prioritization of relief projects.	1B2
Donahue Report	220		• Investigate what role the Jeopardy application should play in the evaluation of a possible network shutdown decision.	1A4

City of New York Report	221		● Con Edison should develop a better method to measure the number of customers without service or with low voltage. This should include utilization of the voltage readings obtained from the Remote Monitoring System and from customer service points; developing an appropriate system algorithm to identify lost customer load as an indicator of customers out of service; taking account of the condition of the secondary system, including manhole events, and considering the level of voltage being supplied to customers. In addition, the Company should expedite discussions with cable television providers to transmit a loss of power message to the Company and should incorporate information obtained from third parties into the Company's customer count.	1C1
City of New York Report	222		• The Company should apply Very Low Frequency testing technology to 50% of the Long Island City network feeders prior to the 2007 summer load period. The feeders that are selected for Very Low Frequency testing should not have DC Hi pot testing applied to those tested feeders for a minimum of three years after Very Low Frequency testing is performed. The remaining feeders within the Long Island City network should receive a DC Hi pot prior to the 2007 summer load period. In addition, Con Edison should implement, prior to the 2007 summer load period, an inspection and test program for all network transformers in the Long Island City network that were overloaded during the event.	1B4

City of New York Report	223		● Prior to the 2007 summer load period, the Company should complete a testing program for each feeder within the Long Island City network that will exercise all network protector relays (including all other electrical and mechanical components) and identify non-responsive units for correction and re-test if necessary to insure improvement in the performance of these network feeders. These feeders should not stay Alive on Back Feed when removed from service due to a fault or by operator action.	1B4
City of New York Report	224		• Prior to the 2007 summer load period, the Company should complete an appropriate inspection and maintenance program to improve the reporting rate of its Remote Monitoring System up to, at a minimum, its designated 95% reporting level. In addition, the Company should accelerate the planned installation of a remote monitoring capability for all of its high-tension customer installations system-wide. • Prior to the 2007 summer load period, the Company should examine its training and testing program for Substation Operators and District Operators to insure that operators are properly instructed, with particular emphasis on actions to be undertaken during stressful emergency conditions.	1B2
City of New York Report	225		• Prior to the 2007 summer load period, the Company should install substation PQNodes on a system-wide basis and complete testing and tuning of the PQNodes to insure that the Reactance-to-Fault application is functional for all of the networks. Con Edison should also complete the required testing of the G&T devices at the North Queens substation to insure that they will be available to expedite the feeder processing effort before the summer of 2007.	1B3

City of New York Report	226		• Con Edison should expand the use of visualization tools to its Brooklyn/Queens Control Center, as it has already done in its Manhattan Control Center, to combine multiple information reporting systems and improve the way that critical operating information is presented to the control center operators, especially with regard to secondary network events and customer service problems (e.g., outages, side out, low voltage, etc.).	1B2
City of New York Report	227		• The Company should improve its formal plans for operating networks under multiple contingency conditions including criteria for evaluating the secondary network cable system, manhole events, customer outages, and the level of secondary voltage supply to their customers. Improved guidance clearly needs to be provided to determining when a network load area should be deenergized. Specifically, this should also include guidance on the application of three phase grounds to clear backfeeding network protectors, and guidance on the cooling of network transformers.	1A1
City of New York Report	228		• Con Edison should review the design settings for all relay protection schemes on its distribution feeders to insure that they have been kept up-to-date and reflect the increased load growth (transformers) being supplied. Any identified corrective actions should be completed prior to the start of the 2007 summer load period. In addition, Con Edison should utilize the three existing vacant feeder positions at the North Queens substation to create three additional 27 kV feeders providing supply to the Long Island City network in order to increase the overall reliability of service.	1A7
City of New York Report	229		• The Company should develop a specific operating procedure that provides clear rules for the use of voltage reduction in response to distribution system contingencies. Specifically, the Company's development of the procedure should take into account the potentially damaging effect of voltage reduction on all system components as well as on customers who may already be experiencing sub-standard voltage due to the multiple contingency.	1A1

City of New York Report	230	1	1. For network contingencies where greater than two feeders are out of service during a heat storm, Con Edison should institute an improved process for the collection of failed cable, joint, and termination components for examination and analysis, including a detailed chain of custody. This should include both primary and secondary samples. (CJ-1)	1A1
City of New York Report	231	2	2. Con Edison should accelerate its programs to eliminate the PILC primary cables and the associated targeted stop joints from the electric distribution system as rapidly as reasonably practicable given cost and other factors. (CJ-2, WH-12). a. Con Edison should accelerate the programs to eliminate poor performing targeted stop joints and the associated PILC primary cable from the electric distribution system supplying the Long Island City network as rapidly as practicable. (WH-11) b. Through the autopsy and examination of both failed and removed before failure components, Con Edison should work to improve the prioritization methodology to ensure that the most failure sensitive components are being removed first. (CJ-3, WH-13)	1B3
City of New York Report	232	3	3. Con Edison should reconsider incorporation of flame resistant construction concepts for insulation and jackets into secondary cables employed for future use in ducts. (CJ-4)	1B4
City of New York Report	233	4	4. Con Edison should consider use of more modern secondary cable constructions on their system for new constructions (i.e., self-sealing cables). (CJ-5)	1B4

City of New York Report	234	5	5. Very Low Frequency testing technology should be applied to 50% of the Long Island City network feeders prior to the 2007 summer load period. The feeders that are selected for Very Low Frequency testing should not have DC Hi pot testing applied to those tested feeders for a minimum of three years after Very Low Frequency testing is performed. The remaining feeders within the Long Island City network should receive a DC Hi pot prior to the 2007 summer load period. (CJ-7) a. Additionally, Con Edison should plan to Hi pot test the 3 worst performing Long Island City feeders each year until the Long Island City network is split into two networks. (CJ-7)	1B4
City of New York Report	235	6	6. Con Edison should continue to examine the use of Very Low Frequency testing and its associated procedures, and develop results and conclusions. (CJ-6, WH-14) a. Con Edison should apply Very Low Frequency testing to 5% of the second tier of worst performing system feeders (those between the worst 5% and 10% of the worst performing feeders) on their system and not apply DC Hi pot testing to those tested feeders for a minimum of 3 years after Very Low Frequency testing is performed. (CJ-8)	1B4
City of New York Report	236	7	7. Con Edison should increase the number and effectiveness of its system wide feeder testing program on both a post failure and a planned basis. (FR-10)	1B1
City of New York Report	237	8	8. Con Edison should promptly schedule Feeder 1Q13 for a DC Hi pot test to determine whether a strongly indicated incipient fault exists on this feeder. (FR-6)	1B3
City of New York Report	238	9	9. Con Edison should initiate an aggressive plan to evaluate commercially available predictive diagnostic tools to analyze the current state of installed cables, joints, terminations and associated equipment. (CJ-9)	1B2
City of New York Report	239	10	10. It is recommended that Con Edison conduct a study to determine the internal static pressure that would be developed under the loading conditions to which some transformers (S/N F124281 and	1B4

City of New York Report	240	11	11. One transformer (S/N M105273) reportedly failed due to a weld leak resulting from stress corrosion. The presumed source of the stress corrosion was exposure to a high concentration of chlorides. It is recommended that a study be made to determine the likelihood of this problem occurring on other units of similar design. (TR-2)	1B4
City of New York Report	241	12	12. During the course of the Long Island City network event, many network transformers were exposed to high ambient temperatures and loadings well in excess of nameplate ratings for significant time intervals. Con Edison should implement, prior to the 2007 summer load period, an inspection and test program for all network transformers in the Long Island City network that were overloaded during the event. (TR-3)	1B4
City of New York Report	242	13	13. Con Edison has indicated that its policy is to impulse test (BIL test) reconditioned transformers before returning them to service. As an added aspect of this test, it is recommended that Con Edison consider conducting dielectric testing while the transformer is at elevated temperatures. (TR-4)	1B1
City of New York Report	243	14	14. It is recommended that Con Edison evaluate the use of condition-based maintenance, where the service life and service conditions of transformers are used in a more prominent role in the determination as to when maintenance is required. (TR-5)	1B1
City of New York Report	244	15	15. A review of several Con Edison Specifications reveals that there is a relatively complex method of characterizing the capability of a transformer under various operating conditions. In spite of this relatively complex system, there is no apparent consideration given to loss of life per event or cumulative aging of the transformer insulation. The major determinant of transformer life expectancy is the combined effect of the hottest spot temperature in the transformer insulation system and the	1B4
City of New York Report	245	16	duration of that exposure. Loss of life is cumulative and non-reversible. Thus, it is recommended that Con Edison determine the cumulative loss of life as a result of normal or emergency operation.(TR-6)	

City of New York Report	246	17	16. Transformer manufacturers today have the computer design capability to maximize KVA of transformation while respecting physical limitations on unit size. Thus, one could possibly design a 550 or 600 KVA unit that could physically fit into the vault that is currently occupied by a 500 KVA rated transformer. It is recommended that this issue be reviewed with manufacturers to determine whether or not and to what degree this could be accomplished. (TR-7)	1B3
City of New York Report	247	18	17. Con Edison's specifications state that the top oil temperature is the criterion that is to be used in determining whether supplemental cooling of the unit is required. The use of top oil temperature to solely determine whether or not to use supplemental cooling is not recommended. The time constant for the transformer oil is much greater than the time constant of the winding. Therefore, the winding hottest spot temperature could be at severely elevated levels while the oil has yet to reach its ultimate value as a result of step increases in load. It is recommended that Con Edison consider	1B1
City of New York Report	248	19	Changing their criteria to hottest spot temperature. (TR-8)	
City of New York Report	249	20	18. It is recommended that an analysis of the relay targets associated with suspected transformer inrush issues be made to determine if relay setting changes would have the potential of affecting the likelihood of tank rupture by changing the I2t energy released in the transformer tank during an internal fault. (TR-10)	1B4

City of New York Report	250	21	19. It is recommended that prior to flooding vaults or spraying transformers as a means of reducing their oil temperatures, the units should be verified as leak free. (TR-12) a. Additionally, the Company should expand the number of network transformers equipped with voltage reporting capability so that an improved voltage picture is available to the control center operators. (NWP-4, WH-5) b. Con Edison should expand the capability of the RMS transmitters by deploying the next generation transmitters that can provide information on the transformer operating temperature, the transformer pressure, the transformer oil level, as well as providing a voltage reporting capability. (TC-3, WH-6) c. Moreover, the Company should examine accelerating the planned installation of a remote monitoring capability for high-tension customer installations. (NWP-4, WH-20) d. Con Edison should continue to improve the RMS system with increased consideration to the following: i. Aggressively pursue technology enhancements that will allow for an increased success rate of network protector information being available for stuck network protectors. (NWP-5) ii. Ensure that all new RMS transmitters have the capability to provide voltage readings. This becomes increasingly valuable as a tool to clear ABF conditions as information regarding stuck network protectors becomes more available. (NWP-5) iii. provide a link from NetRMS to the network protector relay information contained within the equipment database so that operators can have a quick way to determine what type of relay is installed at any location of interest. (NWP-5)	1B4
City of New York Report	251	22	20. It is recommended that gas in oil analysis also be performed for those units that have experienced significant accelerated loss of life or have reached a significant accumulated loss of life. (TR-13)	1B1

City of New York Report	252	23	21. Con Edison should complete a testing program for each feeder within the Long Island City network prior to the 2007 summer load period that will exercise all network protector relays (including all other electrical and mechanical components) and identify non-responsive units for correction and re-test to insure improvement in the performance of these network feeders with regard to them staying improperly Alive on Back Feed when removed from service due to a fault or by operator action. (NWP-1) a. In addition, Con Edison should implement a system-wide testing program to insure the operation of each feeder at least once biannually to exercise all network protector relays as well as other electrical and mechanical components and identify non- responsive units for correction and re-test. (NWP-1)	1B1
City of New York Report	253	24	22. During the analysis of the Long Island City power outages, Con Edison hired a consultant to perform an Electro Magnetic Transient Pulse ("EMTP") analysis to measure transients for the Long Island City event. Because it is suspected that several network protector microprocessor relays failed during the event as a result of transients, Con Edison should ensure that this study includes transients on the secondary system and share the results of the EMTP study with the network protector Microprocessor relay manufacturers. Con Edison should work with the microprocessor relay manufacturers to conduct a design review of the relay and implement any design changes that may be required as a result of the study's findings. (NWP-2)	1B4

City of New York Report	254	25	23. Con Edison should develop a more detailed reporting form for their network protector and transformer inspections. The form that is completed by the field personnel should be entered into a field computer and then downloaded into a database that has the ability to be accessed to produce individual equipment reports and summary reports. From this database equipment failure trends could be discerned or developed. (NWP-3) a. In addition, Con Edison should modify its protocol to include the "as found" position on all network protectors associated with failed transformers. (NWP-3) b. In reviewing inspection reports (CINDE records) on the 13 transformers that failed, it was found that transformer reporting was inconsistent and sometimes incomplete. It is recommended that completed transformer reports be subjected to a random sample audit to ensure that the database is relatively complete and up to date. (TR-11)	1B1
City of New York Report	255	26	24. Con Edison should complete an appropriate inspection and maintenance program to improve the reporting rate of its Remote Monitoring System within the Long Island City network up to, at a minimum, its designated 95% reporting level before the beginning of the 2007 summer load period. (NWP-4, TC-1)	1B2
City of New York Report	256	27	25. Con Edison should engage in a program to improve the reporting rate of its Remote Monitoring System, system wide, up to, at a minimum, its designated 95% reporting level within a reasonable amount of time. (NWP-4, TC-2, WH-4)	1B2
City of New York Report	257	28	26. In order to provide voltage information to further assess backfeeding network protectors, Con Edison should consider a system to obtain voltage readings in the network at points other than the transformers (at service boxes, lamp posts, customer premises, etc.). An automatic system with data being fed to a visualization tool would be best. However, in the interim, a program to obtain manual readings during events would provide information on the potential for network protectors to remain closed and thus become a source of backfeed. (NWP-6)	1B2

City of New York Report	258	29	27. Con Edison should modify its procedures for operating the distribution system under contingencies to provide guidance for operator actions under severe contingency levels with potential low voltage conditions within the network of concern. (NWP-7) a. This should include guidance on the application of three phase grounds to clear backfeeding network protectors. (NWP-7) b. This should include detailed guidance on the criteria for cooling of network transformers. (TC-4) c. This procedure should establish a clearly defined protocol to incorporate observations made by responsible outsiders as well as its own employees regarding conditions in the field. (C-1) d. This should include guidance on the application of Rapid Restoration procedures applicable to the distribution system while operating networks under multiple contingency conditions. (FR-7) e. This should include criteria for evaluating the secondary network cable system, manhole events, customer outages, and the level of secondary voltage supply to their customers. Improved guidance needs to be provided to determining when a network load area should be de-energized. (ND-4)	1A1
City of New York Report	259	30	28. Con Edison should consider the creation of a dedicated engineering team directed towards the evaluation of the secondary network cable system during multiple feeder contingencies to ensure that appropriate attention, evaluation, and planning is applied to this area while immediate efforts are directed towards the restoration of the primary feeders. (ND-5)	1A3
City of New York Report	260	31	29. Con Edison should reevaluate the requirement that network protector relays prevent the network protector from closing if the network voltage is between 60 volts and 13 volts. They should also modify their procedures for operating the distribution system under contingencies to ensure that operating personnel are aware of this requirement. (NWP-8)	1A1

City of New York Report	261	33	30. Con Edison should incorporate available outage duration information for specific locations into its call center messaging system so that customers are given the best and most recent information on their specific situation. (C-2)	2B4
City of New York Report	262	33	31. It is recommended that Con Edison develop another way to either replace or augment the customer interruption reporting process as a means of more accurately estimating the number of customers without service. (CI-1) a. These sensors, located in manholes and service boxes, should be used to develop a voltage profile of the network. Any problems relating to blown limiters, burned out cables, and faults would be displayed in an entire network voltage profile. (NM-1, M-4, WH-7) b. Con Edison should study a means to utilize automatic meter reading ("AMR") to all or selected locations at customer premises to know when there are disruptions in service. (NM-2) c. Con Edison should actively participate in the Department of Energy's Grid 2030, an "Advanced Metering Infrastructure" project ("AMI"). This project could assist the Company in deciding how it will collect and analyze data in the future. (NM-4)	1C4
City of New York Report	263	34	33. Con Edison should review Alive on Back Feed occurrences which are one of the causes for feeder restoration delays and are often caused by a network protector that does not operate properly. An approach that would make it easier to locate the malfunctioning network protector is use of a local remote secure radio control device built directly into the network protector relays. (NM-3) a. All Alive on Backfeed events should be reviewed to determine the amount of backfeed and the duration of that backfeed and that the transformer's condition be noted with respect to any accelerated loss of life. (TR-9)	1B4

City of New York Report	264	34	34. Con Edison should have studies conducted on how to collect real-time information supporting the real-time decision making on rapid directed load control. A combination of monitoring systems and deterministic and knowledge-based modeling methodologies should be considered. (NM-5)	1A4
City of New York Report	265	36	35. Con Edison should examine and strengthen their contractor oversight processes from initial design, to on-site inspection, and through acceptance testing to insure that proper controls are being exercised over contractor work within its substations. (FR-1) a. Con Edison should complete the required testing of the G&T devices at the North Queens substation to insure that they will be available to expedite the feeder processing effort before summer 2007. (FR-3)	1B1
City of New York Report	266	38	36. Con Edison should examine its training and testing program for Substation Operators and District Operators to insure that operators are properly instructed, with particular emphasis on actions during stressful emergency conditions. (FR-2) a. Improvements need to be made to these processes to insure that operator errors do not impact the overall feeder restoration process by decisions being made on incomplete or incorrect data. (FR-5) b. Improvements need to be made to insure that the operators understand what the desired results of their actions are, as well as what undesirable consequences can result, so that they can make informed decisions that will not negatively impact the overall feeder restoration process or cause additional damage. (FR-11)	1A3
City of New York Report	267	39	37. Con Edison should expedite the installation of substation PQNodes on a system-wide basis to insure that all of their substations are completed prior to summer 2007. Additionally, testing and tuning of the PQNode should be completed to insure that the Reactance-to-Fault application is functional for all of their networks prior to summer 2007. (FR-4)	1B3

City of New York Report	268	40	38. Con Edison should review the design settings for all relay protection schemes on its distribution feeders to insure that they have been kept up-to-date and reflect the increased load growth (transformers) being supplied. A schedule for this review and any identified corrective actions should be completed before the summer of 2007. (FR-8, WH-16) a. Con Edison should establish a periodic review process that validates the settings for all relay protection schemes on its distribution feeders to insure that they have been kept up-to-date and will operate properly when called upon. (FR-9, WH-17)	1B4
City of New York Report	269	41	39. If Con Edison plans to continue using voltage reduction for unloading distribution circuits, which should mean reduction of current, the Company should perform studies to determine the conditions under which the voltage reduction would be effective for this specific objective, if at all. (VR-1) a. Con Edison should perform a thorough field and empirical analysis to determine the effects of voltage reduction on actual voltage and current in the network under severe contingencies. (VR-2) b. After the aforementioned analyses are completed, Con Edison should develop a set of specific operating procedures and specifications to provide clear rules for the use of voltage reduction in response to distribution system contingencies. Such procedures should take into account the effect of voltage reduction on all system components as well as customers that may already be experiencing substandard voltage due to a multiple contingency. (VR-3, WH-15)	1A6
City of New York Report	270	42	40. Con Edison should improve the way in which critical information is accumulated and presented to the control center operators especially with regard to secondary network events and customer service problems (e.g., outages, side out, low voltage, etc.). (M-1) a. Con Edison should expand the use of visualization tools to combine multiple information reporting systems and improve the way that critical operating information is presented to the control center operators. (M-2)	1A4

City of New York Report	271	43	41. Con Edison should develop and implement appropriate technology and / or systems to identify network distribution customers that are out of service (one or more phases) or are being provided inadequate voltage on a real-time basis. Additionally, the Company should: (M-3, WH-8) a. Investigate the possibility of having the cable and/or telephone service providers provide data on the loss of service from their remote devices located within customer's premises. (WH-8) b. Investigate the implementation of an Automated Meter Reading system including the capability of automatic detection of customers without power. (WH-8) c. Establish, along with Department of Public Service Staff, a value of service voltage that would be considered inadequate and therefore would be counted as a service outage. (WH-8)	1C1
City of New York Report	272	44	42. Con Edison should utilize the voltage readings obtained from the RMS system and from the customer service points to develop an appropriate system algorithm to identify lost customer load as an indicator of customers out of service. (M-5, WH-9)	1C1

City of New York Report	273	45	43. Con Edison should improve the way in which critical information is accumulated and presented to its control center operators especially with regard to secondary network events and customer service problems (e.g., outages, side out, low voltage). (ND-1) a. Con Edison should immediately take steps to improve the way in which critical information is visually presented to the Brooklyn/Queens Control Center personnel through the installation of a large screen projector display system similar to what is installed within the other regional control centers compatible with the space limitations at this location. (ND-2) b. Con Edison should expand the use of visualization tools at its control centers to combine multiple information reporting systems and improve the way that critical operating information is presented to the control center operators. (ND-3)	1A4
City of New York Report	274	46	44. Con Edison should accelerate from its current target date of 2015 the planned split of the Long Island City network into two networks to establish the new Sunnyside network substation. Con Edison should study designing these networks that provide service to critical customers, especially the MTA and LIRR, is not interrupted during the shutdown of either network. (PL-1)	1B4
City of New York Report	275	47	45. Before summer 2007, Con Edison should utilize the three existing vacant feeder positions at the North Queens substation to create three additional 27 kV feeders providing supply to the Long Island City network in order to increase the overall reliability of service. (PL-2)	1A5

City of New York Report	276	48	46. Con Edison should review its method for calculating its design temperature variable. A statistical analysis of weather conditions that has existed over an extended period of time (e.g., 50 – 100 years) should be performed. The analysis should consider the weather conditions of all days, and not just the maximum annual temperature variable, to gain a true measure of the expected frequency that weather conditions will exceed the system's design conditions. (PL-3) a. The Company should determine whether a more stringent criterion is appropriate for its distribution system such that it is exceeded less frequently (e.g., once every five or ten years rather than the current three). (WH-10)	1A4
City of New York Report	277	49	47. Con Edison should accelerate its ongoing efforts to improve the accuracy of its secondary network load flow models by insuring that all system configuration changes are rapidly reflected in the mapping database that is then frequently extracted into an updated secondary load flow model. (WH-1)	1B2
City of New York Report	278	50	48. Con Edison must keep its library of procedures, specifications, and other directives up-to-date and reflective of current conditions. (WH-18)	1B1
City of New York Report	279	51	49. Con Edison should evaluate its emergency procedures in light of lessons learned from the July 2006 outages and modify these procedures as necessary. (WH-19)	1A1
City of New York Report	280	52	50. Con Edison must review its entire Call Center reporting process to ensure that all potential bottlenecks are eliminated so that customers can report their service problems to them in a rapid, simple, user-friendly manner under all emergency conditions. (WH-21)	2A4

City of New York Report	281	53	51. Con Edison should be required to increase the current payments for distribution system failures of twelve or more hours in a 24-hour period to reflect, at a minimum, the rate of inflation from 2000 to 2007: (WH-22) a. Increase the compensation for losses due to spoilage of food or other perishables for lack of refrigeration for residential users from $350 to $450 per incident; b. Increase the compensation for losses due to spoilage of perishable merchandise for lack of refrigeration for non-residential customers from $7,000 to $9,000; c. Increase the liability per incident to a total of $15,000,000; and d. Provide for automatic increases equal to the rate of inflation each time that a new electric rate case is approved or every five years, which ever comes first.	4B
City of New York Report	282		52. Con Edison should be required to provide compensation to customers for verifiable damages to their appliance motors, electronic equipment, and other voltage sensitive property. (WH-23)	4B
City of New York Report	283		53. Con Edison should be required to fully implement all of the Washington Heights recommendations or explain why it cannot do so. (WH-24)	4A

APPENDIX 5 - GLOSSARY AND ACRONYMS

Alert Condition – Alert Condition indicates that a major storm is following a trajectory projected to cause widespread outages in our service area. An Overhead System Alert is usually declared 12-24 hours before the storm's arrival and may require partial to full mobilization of Con Edison resources. A Serious or Full Scale Event is projected.

Blizzard Warnings – Blizzard Warnings are issued when a considerable accumulation of snow is combined with sustain wind gust of 35 MPH or greater. Low visibility, usually less than ¼ miles and dangerous high winds and temperature less than 22 degrees Fahrenheit.

Branch - A branch can be a single phase, two phase, or three phase open wire circuit connected to the main run of the feeder.

CAIDI - Customer Average Interruption Duration Index is the average interruption duration time (customers-hours interrupted) for those customers that experience an interruption during the year, including all outages, e.g., prearranged, etc.

CAIDI Feeder Performance Report – This is a listing of the non-network feeders for a particular operating area ranked in order of CAIDI performance, worst to best.

Command Post Activation - The Command Post will be activated in response to a Emergency Condition that is expected to impact multiple operating areas or an event or series of events has either directly impacted or is anticipated to have a severe impact on the distribution system and results in a Condition Red being declared. If multiple regions are affected, the Command Post may assume a strategic command and control role under ICS.

Comprehensive Emergency Response Program (CERP) - CERP is an extensive document encompassing all of the key activities associated with emergency management.

Condition Red – Condition Red occurs when some equipment is loaded above emergency ratings, part of the System is in voltage reduction due to problems on the Con Edison system, or more than 15,000 customers have been interrupted due to one event. An event for which the electrical system condition is classified as a "condition red" will normally correspond to, at minimum, a level 3 event and may correspond to a level 4 event as identified in the Corporate 'Incident Command System' procedure.

Condition Yellow - This next contingency (excluding breaker failure) either will result in an outage to more than 15,000 customers or will result in some equipment being loaded above emergency ratings. Methods to relieve the overloads will impact the general public in the following ways: voltage reduction, customer appeals to reduce load, or load shedding. An event for which the electrical system condition is classified as 'condition yellow' will normally correspond to a level 2 event as defined in the Corporate 'Incident Command System Procedure'.

Crew Guide - A Crew Guide escorts restoration field crews to work locations. Crew Guides meet crews at prearranged locations and then provide such crew support as fuel, food, and lodging coordination.

Customer Information System (CIS) – CIS is a system used to interrogate and display customer-account and billing information stored on a computerized mainframe database. It is through CIS that customer calls are processed to ECS generating trouble tickets.

Cut in the Clear - This is the standard terminology for cutting overhead wires that have been knocked down during a storm. These wires are cut to eliminate public health and safety hazards.

EEI Mutual Assistance - The Edison Electric Institute Mutual Assistance Program allows for the exchange of overhead crews among participating companies during storms. Utilities that participate in this program are able to provide field crew assistance, based on their own status, to other participating utilities that request aid in repairing overhead transmission and distribution systems to restore customers.

Emergency Condition – Emergency Condition indicates that widespread outages are imminent. An Overhead Emergency is usually declared 6-12 hours before the storm's arrival and will require partial to full mobilization of Con Edison and possibly non-Con Edison resources. A Serious or Full Scale Event is projected and imminent.

Emergency Control System (ECS) – ECS is a mainframe-based computer system used to process, track, and control trouble reports received from customers and other sources.

Emergency Information Center (EIC) – The Information and Liaison Officer (or staff) along with the Planning Section EIC Unit will staff this area to gather and distribute incident related information to the media, customers, C.I.G., governmental agencies, and employees. They will also respond to internal requests for information as needed.

Emergency Management Center (EMC) – The Emergency Management Center refers to all of the following contiguous areas: the Incident Command Area, Expediting & Information Center, Control Center, and the Engineering & Planning Area.

Engineering & Planning Area (EPA) – The Engineering & Planning Area will generally be located adjacent to the Electric Control Center. It is here that members of the Planning group (Trouble Analysis) will work with members of the Operations group, and possibly, Logistics and Finance/Administration to plan the recovery effort.

Extreme Weather – Extreme Weather is whenever the projected system peak demand is expected to be greater than 10,500 megawatts (MW) or whenever the Customer Service Electric Operations anticipate or declare an overhead storm emergency.

Extreme Weather Criteria – This situation exists whenever the contracted weather service predicts a one day average of the maximum wet bulb and dry bulb temperature to be 80 degrees Fahrenheit or higher (not including weekends and holidays) or a major winter ice/snow melt where municipalities have used salt.

Gap or Gap List – Gaps exist when electrical wires are cut down from pole to pole along a continuous run of high or low voltage overhead cable and are not immediately replaced. This sometimes occurs during cut in the clear operations. A listing of gaps is maintained to ensure that permanent repairs are made after storm work has been completed.

Heat Alert State – Heat Alert State is defined as a period of severe weather where the forecasted weather conditions and the resulting increase in load are anticipated to place additional stress on the distribution system and its components. The Chief Distribution Engineer or designee is responsible for the declaration of the 'Heat Alert State.' The Heat Alert condition is defined as when meteorological forecasts predict heat indices of 100 degrees Fahrenheit or higher for more than two days. A heat advisory or warning is then issued by the National Weather Service.

Heavy Snow Warning –A Heavy Snow Warning is issued when 6 inches of snow or more can be expected to accumulate within the next 12 hours.

Ice Storm Warning –A Storm Warning is issued when damaging accumulations of ice, generally ½ inches or more, is expected to produce significant damage to trees, and power lines and travel becomes treacherous.

Incident Command Area (ICA) – The ICA is established by the Incident Commander. It is typically established for level 2 or greater storms and is usually located in an area near the Electric Control Center. The Incident Commander and staff will usually convene in this location for the duration of the recovery effort.

Incident Command System (ICS) - The ICS establishes lines of supervisory authority and formal reporting relationships. There is a complete unity of command as each position and person within the system has a designated supervisor. Direction and supervision follows established organizational lines at all times.

Ladder Line Crew –The Ladder Line Crew is typically a two-person crew assigned to restore individual customer electric services.

Life Sustaining Equipment (LSE) – LSE is a classification used to identify customers who have electrically powered equipment required for life support as defined in Customer Service Procedure 3-1-8.

Line Clearance – Line Clearance is the organization and activity associated with cutting/trimming branches and trees to allow storm recovery participants and restoration field crew access to the overhead system.

Major Storm – A major storm is a period of adverse weather during which service interruptions affect at least 10 percent of the customers in an operating area and result in customers being without electric service for durations of at least 24 hours. These storms are excluded from the annual performance report.

Major Storm Event – A Major Storm Event is a day during which the Major Storm index is predicted to reach 100 degrees Fahrenheit, or a major winter melt were salt mixed with water is introduced into Con Edison's underground system.

Major Storm Index – Major Storm Index is an estimation of the influence of temperature and humidity on the evaporative and relative transfer of a Major Storm between a human and the environment.

Main-Run – Main Run is the three phase open wire portions of 4 kV and 13 kV distribution feeders and loops.

Momentary Interruption – Momentary Interruption is a loss of electric service for less than five minutes, for one or more customers

Municipal Agencies – Municipal Agencies are usually the Police, Fire Department, Department of Public Works, Department of Water, or Department of Environmental Protection within a municipality or borough that report problems during a storm.

NCI - No Company Interest (i.e. a 'wire down' ECS job) is when field checked, turns out to be a telephone or cable television wire.

Network Feeder – Network Feeder is a primary 13kV or 27 kV feeder that supplies low voltage distributed secondary network load. The second contingency design low voltage distributed secondary networks are in the Bronx, Brooklyn, Manhattan, and Queens.

Network Feeder Performance Report – This is a listing of the network feeders for a particular operating area ranked in descending order of opened automatics (OA's), including total duration of outages. See operating areas' (Bronx, Brooklyn, Queens, and Manhattan) reports, sections 4, 5, 6, and 7 respectively.

New York City Office of Emergency Management (NYCOEM) – This office responds to and coordinates emergency responses within the confines of New York City.

Non-Network Feeder – Non-Network Feeder is a primary feeder 4kV, 13kV, 27kV or 33 kV that supplies non-network load.

Open Main – Open Main exists when electrical wires are cut underground manhole-to manhole along a continuous run of secondary voltage underground cable and are not immediately replaced. A database of open mains is maintained to ensure that permanent repairs are made after emergency work has been completed.

Operating Area – Operating Area is the geographic sub-division of each electric utility's franchise territory. Con Edison operating areas are Bronx, Brooklyn, Manhattan, Queens, Staten Island, and Westchester.

Operating Authority – Operating Authority is an employee who is trained and qualified to issue operating orders to an authorized person to perform switching moves on the distribution system.

Outage Manager - This is a web-based reporting tool that captures data from ECS and is the primary source of storm status information.

Overhead Feeder – Overhead Feeder designates the overhead wires connected electrically to a substation circuit breaker or electrical isolating device. The voltage range of Bronx-Westchester overhead distribution feeders is from 4,000 to 13,000 volts.

Reliability – Reliability is the degree to which electric service is supplied without interruption.

SAIFI - System Average Interruption Frequency Index – is the average number of times that a customer is interrupted during the year, including all outages, e.g., prearranged, etc.
SAIFI = Total number of customers interrupted X 1000 Total number of customers served.

SAIFI Feeder Performance Report – This is a listing of the non-network feeders for a particular operating area ranked in order of SAIFI performance, worst to best.

Snow Advisory – A Snow Advisory is issued when between 2–5 inches of snow is expected to accumulate.

STAR – STAR is a system that analyzes trouble and tracks jobs on the electric distribution system. It receives information from both customer calls and telemeter field equipment and 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.

Storm Emergency Kit – These kits contain material needed to perform storm duties. They contain equipment such as wire, connectors, tape, maps, and safety items. Different kits are made available based on need.

Storm Surge – Storm Surge is water that is pushed toward the shore by powerful hurricane winds. A storm surge can strike land five hours before the hurricane itself.

Strategic Planning Area (SPA) - Engineering Support and Members of the Trouble Analysis Unit typically will staff this area. Other subject matter experts from various organizations may also be included to monitor and respond to changing incident status.

Supervisory Control and Data Acquisition (SCADA), (Distribution System Telemetry) – SCADA electronic monitoring equipment reports the status of distribution equipment. In some cases, the remote control of that equipment is possible.

System Job – System Job is the result of the process whereby Trouble Analysis groups ECS trouble reports that relate to a single problem into a single job.

Trouble Ticket –Trouble tickets are printed reports of ECS records. They detail location, name, phone number, and trouble type (among other information) associated with a report.

USA (Unit Substation Automation) - An electronic monitoring system, USA provides an alarm when distribution feeder breakers or transformer circuit breakers change their current status in a 4 kV Unit Substation.

Voice Response Unit (VRU) - A VRU is an electronic means of answering and handling phone calls. VRUs enable customers to initiate an ECS trouble ticket and will automatically call customers back when ECS is updated to indicate that service has been restored.

Watch – Watch means that severe weather is possible within the designated watch area. Customers should be alert! Watches are issued up to 36 hours in advance.

Warning – Warning means that severe weather has been reported or is imminent. Customers should take necessary precautions! Warnings are issued up to 24 hours in advance.

Westchester County Office of Disaster and Emergency Services - Part of the Department of Public Safety, this Agency manages disaster preparation and response to countywide emergencies.

Winter Weather Warnings – These warnings are issued for much larger areas than Severe Weather Warnings and for much longer periods of time, usually for 6 to 12 hours but occasionally up to 24 hours.

Worst Performing Non-Network Feeders – This is a list of the worst 2 ½ percent of each operating area's non-network feeders (based on WSAIFI and WCAIDI reports), totaling five percent of the non-network feeders in each operating area or three feeders, whichever is more.

Worst Performing Network Feeders – This is a listing of the worst five percent of each operating area's total network feeders or three feeders, whichever is more. The duration of interruption is used to rank feeders with equal number of open automatics.

LIST OF COMMON ACRONYMS

B&A	Before and After Sketch
CERP	Comprehensive Emergency Response Program
CIG	Central Information Group
CM	Construction Management
CMG	Communication Management Group
CNS	Central Notification System
CPM	Customer Project Manager
DECP	Distribution Engineering Command Post
DIS	Distribution Information System
DOCS	Division Operations Control System
ECS	Emergency Control System
EIC	Emergency Information Center
EMC	Emergency Management Center

ENS	Electronic Notification System
ESA	Engineering Support Area
EWC	Extreme Weather Criteria
FCR	Feeder Control Representative
FLT	Flickering Lights
FOB	Field Operators Bureau
FS	Finance Section
I&A	Installation and Apparatus
IAP	Incident Action Plan
IC	Incident Commander
ICS	Incident Command System
HE	Heat Event
HI	Heat Index
JIUS	Job Initiation and Update Screen
LS	Logistics Section
LSE	Life Sustaining Equipment
M&S	Mains and Services Plate
MAR	Major Account Representative
MCC	Manhattan Control Center
NL	No Light
NLA	No Light Area
NOPACM	Not Possible Asbestos Containing Material
OC	Operations Chief
OEM	Office of Emergency Management (Mayor's Office)
OH	Overhead
OS	Operations Section
PACM	Possible Asbestos Containing Material
PS	Planning Section
PSC	Public Service Commission
SM	Shift Manager
SO	Side Off
SOB	Side Off Bridged
SOCCSX	System Operations Computer Control System Expansion
SOP	Side Off - Needs Power
EPA	Engineering & Planning Area
SPL	Splicing
SSO	Substation Operations
T.B.A	To Be Announced
UG	Underground
VDAMS	VAX Computer Data Acquisition Management System
VRU	Voice Response Unit
WOLF	Worldclass Load Flow