FINAL REPORT

PERFORMANCE REVIEW OF EDCS IN 2011 MAJOR STORMS

August 9, 2012

Prepared By:

E | P | P
EMERGENCY PREPAREDNESS PARTNERSHIPS

Prepared For:

New Jersey BPU Board of Public Utilities

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1.0 REPORT SUMMARY

Hurricane Irene (Irene)[1] was a storm so large in mass that it caused wide spread flooding across the entire State of New Jersey, leading many hurricane analysts to suggest Irene was a 100-year event. In New Jersey alone, the storm disrupted electrical service to 1.9 million of the State's 3.9 million customers. In the aftermath of the storm Governor Chris Christie directed the New Jersey Board of Public Utilities (BPU or Board) to hold public hearings and to review all aspects of the Electric Distribution Companies' (EDCs) planning and response to the storm.

The BPU held a series of six public hearings around the state in September and October 2011 for the purpose of soliciting comments from members of the public, elected officials and all others regarding the state of preparedness and responsiveness of the EDCs prior to, during and after Hurricane Irene. Hundreds testified as to the impacts including spoiled food, loss of water/telephone/internet service, cold showers and inability to pump water out of basements that in many cases caused flooding in homes. Communities which experienced both flooding and power outage sustained even greater impact. In addition, the BPU attended numerous meetings with mayors, legislators, utility executives, and other officials. Only days after the final public hearing, a severe snow storm hit New Jersey on Saturday, October 29, 2011. Statewide approximately 1.0 million customers lost power, with some out for up to 10 days.

These two catastrophic storm events left many of New Jersey's residents without electric power, some for extended periods of time. The impact on these individuals and their communities cannot be overstated. Individual households and businesses went without electricity and heat, with entire communities disrupted and stretched to the limit of their emergency management capabilities.

On December 14, 2011, the BPU released a preliminary report on staff's review of the EDCs major storm event planning and emergency response. Staff's investigation included, but was not limited to, testimony from the public hearings, examination of written and verbal inquiries with each of the electric utilities, as well as meetings with local elected and emergency management officials.

This preliminary report created an action plan to implement "lessons learned" which readily emerged in an after action review of the electric utilities' responses to Irene and, to a limited extent, the October snow event. The preliminary report calls for immediate action by the EDCs to improve communications; increase staffing levels during major events to accommodate expected calls, utilize social media to in addition to the company websites when providing restoration information to the

[1] Irene was forecasted to hit New Jersey as a Category 1 hurricane on August 28, 2011, and initial reports described the storm as Hurricane Irene. Subsequent analysis by the National Oceanic and Atmospheric Administration's (NOAA) National Hurricane Center downgraded Irene to a tropical storm when it impacted New Jersey.

public, and review and revise customer call back scripts to better convey the messaging from companies.

In addition, the preliminary report recommended areas warranting further investigation by BPU staff with the assistance of an expert consultant. The recommendations in this report are designed to further address the problems identified during Board staff's review of the electric utilities' responses to Hurricane Irene and the October snow storm.

The purpose of this report, the *Performance Review of EDCs in 2011 Major Storms,* is to provide the BPU and all other interested parties with facts, findings, data and recommendations in the areas as warranted in the preliminary report and outlined in the resulting Request for Qualifications.

The BPU required that this evaluation be conducted by a consultant with expertise in electric utility inclement weather preparation, outage restoration and response management in order to analyze the effectiveness of New Jersey's four (4) EDCs' responses to significant service interruptions caused by Hurricane Irene and the snow storm of October 29, 2011. The BPU specified that analysis should focus on the EDCs' actual effectiveness, specifically related to actions taken before, during, and on the days immediately following Hurricane Irene and the October snow storm, and provide written protocols and procedures that are essential to the implementation of those measures.

Through a competitive bidding process, Emergency Preparedness Partnerships (EPP) was selected to perform this analysis. EPP's team of eight experienced consultants began work in April 2012. In the course of its review EPP performed 110 interviews, and reviewed close to 800 data responses. EPP also consulted regularly with the BPU's Division of Reliability and Security during the review. Each EDC appointed a coordinator to expedite the data request and interview process.

This report provides the results of EPP's review, including its observations regarding the actual effectiveness of New Jersey's four (4) EDC's preparation, response and restoration to Hurricane Irene and the October 29th snow storm, and EPP's recommendations to improve the identified areas of weakness of each EDC's existing inclement weather preparedness, delivery system resiliency and post-storm response policies and practices. Each section begins with a general explanation of the topic area, a description of why it's important generally and in relation to these storms and any best practice areas. This is followed by observations and recommendations for all the EDCs and separately by organization.

BACKGROUND

On August 28, 2011, Tropical Storm Irene made landfall in New Jersey and caused the largest number of electrical outages recorded in New Jersey's history. Statewide, 1.9 million electric

customers were affected. All four of the State's Electric Distribution Companies' (EDCs), Atlantic City Electric (ACE), Jersey Central Power & Light (JCP&L), Public Service Electric and Gas (PSE&G), and Rockland Electric (RECO), experienced significant storm-related challenges.

In preparation for the forecasted hurricane, on August 25, Governor Chris Christie declared a state of emergency. Consistent with the State's disaster plan, the State's Office of Emergency Management was closely monitoring the impending storm and the New Jersey State Police Regional Operations and Intelligence Center (ROIC) had been made fully functional, with staff assigned from all the partnering agencies. In the days prior to the forecasted hurricane's arrival, Governor Christie embarked on a media campaign to convince residents and vacationers to evacuate the State's coastal communities and to stress the importance of planning and preparation for the massive storm.

In the aftermath of the storm, on August 31, a federal disaster declaration was made for the entire State of New Jersey. The massive scope of the storm led to extensive efforts that restored all customers' service by September 5.

Approximately two months after Irene, on October 29, a record breaking early autumn snow storm hit New Jersey. The heavy, wet snow caused extensive damage because most trees were full of foliage. Statewide, over 1 million customers were without electrical service, with some out for up to ten days. Worst hit areas were in northern New Jersey, breaking previous snowfall records for October, whereas, the southern portion of the State primarily experienced rain. On October 29, Governor Christie declared a statewide state of emergency. All customers' service was restored by November 7.

Shortly after Irene, Governor Christie directed the President of the New Jersey Board of Public Utilities (BPU or Board) to conduct an investigation of the EDCs' restoration decisions and actions taken prior to, during, and after Irene.[2] On December 14, the BPU released a preliminary report on major storm event planning and emergency response by the four EDCs (BPU Hurricane Irene Report). The Board ordered BPU staff (Staff) to address areas that warranted further investigation, in consultation with an expert consultant.

[2] The BPU investigation was initially focused exclusively on the EDCs activities related to Hurricane Irene. Following the October snow storm, the scope of the BPU investigation was expanded to also include activities related to that event. The BPU Hurricane Irene report contains findings and recommendations addressing both events.

THE IMPACT

Though vastly different, both these events significantly impacted individuals and their communities, as millions of New Jersey residents were without electrical power, some for extended periods of time. Individual households went without electricity, including air conditioning and heat. Entire communities were disrupted and emergency management capabilities were stretched to the limit. Schools and businesses were closed, family routines disrupted and critical facilities activated emergency contingency plans.

The BPU held six public hearings subsequent to Hurricane Irene. Many individuals testified as to the storm's impact, including loss of water service, loss of telephone and Internet, air conditioning, the inability to pump water out of basements resulting in flooded homes, and spoiled food. Communities that experienced both flooding and power outages sustained the greatest impact.

BPU's investigation determined that there were significant problems with the EDCs' internal and external communications. It was clear that public officials and residents had difficulty obtaining basic information from their EDC, such as estimated restoration times and efforts to ensure the safety of downed electrical wires. This was particularly disruptive to local governments trying to manage the disasters, and residents anxious to make decisions about shelter, sustenance, property security, and maintenance.

As was noted in the BPU Hurricane Irene Report, during the Board's public hearings, many of JCP&L's customers complained about the underlying condition of infrastructure and vocalized concerns about the reliability of their electric service in general. In areas that suffered extensive localized flooding, particularly in JCP&L and PSE&G territories, a common criticism was that the substations were located in flood plains.

The vulnerability of substations to flooding became apparent given the loss of power to tens of thousands of customers from inundation of substations. The susceptibility of aerial infrastructure to tree damage was underscored by the massive amount of outages caused by vegetation.

ACTIONS TAKEN

Following Governor Christie's directive, the BPU opened an investigation into the EDCs' restoration decisions and actions taken prior to, during and after Hurricane Irene. Following the snow storm, the BPU expanded the scope of the investigation to also include a review of that event. As previously noted, the Board held six public hearings to receive input from the public regarding the EDCs Hurricane Irene-related preparation and restoration performance.

Recognizing that the entire community is substantially affected by lengthy outage restoration efforts, the BPU record, considered part of the investigation, contained significant input from various stakeholders. BPU held meetings with elected officials and emergency management personnel in the various service territories to discuss their assessments of the EDCs' preparation and restoration performance relative to Hurricane Irene. The BPU also received letters, calls, and emails, which were made part of the record and are considered part of the investigation. The BPU requested information from each EDC about planning and preparations before the weather events and its performance during and after the storm until service was restored to all customers.

On December 14, 2011, the Board publicly issued the BPU Hurricane Irene Report, which detailed the results of Staff's preliminary investigation of the EDCs performance regarding Hurricane Irene. The BPU Hurricane Irene Report states that:

> At the hearings, "numerous people testified with the vast majority complaining about JCP&L's service. To a much lesser extent, complaints involved PSE&G or RECO. The following is a summary of the most predominate complaints:
>
> **Communications with mayors** by JCP&L: Many mayors, municipal officials and local offices of emergency management (OEMs) had an extremely difficult time reaching JCP&L to get information regarding restoration in their towns.
>
> **Communications with the public** by JCP&L**:** Many customers could not contact JCP&L to get information regarding restoration of their service and automated company call backs were confusing.
>
> **Estimated Restoration Times** (ETRs) provided by JCP&L were inaccurate or nonexistent.
>
> **Prioritization of Restoration** by JCP&L of special needs customers or customers utilizing well water: these should be given priority restoration.
>
> **Infrastructure** issues related to JCP&L's system design and/or maintenance and whether this increased the level of outages in the event.
>
> **Flooding** of PSE&G and JCP&L substations, more specifically why were they built in flood areas, and that they should be moved to higher ground or flood proofed.
>
> **Tree Damage** on the JCP&L distribution system and whether this was related to ineffective tree trimming practices.[3]

The BPU Hurricane Irene Report created an action plan to implement "lessons learned," which emerged in an after action review of the EDCs' responses to both storms. The Board subsequently issued an Order directing the EDCs to implement the recommendations outlined in the Report.

[3] BPU Hurricane Irene Report at page 4.

The Board further ordered Staff to retain a subject matter consultant to provide assistance to Staff in analyzing areas of the report warranting further review. Given the magnitude of the storms and their impact on New Jersey residents and businesses, the BPU retained, following a request for qualifications (RFQ) process, Emergency Preparedness Partnerships (EPP) to perform an evaluation of New Jersey's EDCs emergency preparation, response, and restoration efforts. The goal of the review was to identify specific actionable steps that could be implemented to bolster planning for and response to major storm events that could impact New Jersey's electric distribution system.

EPP analyzed data from 110 interviews and involved approximately 800 data responses focused on pre-storm preparation, intra-storm delivery system resiliency, post-storm recovery efforts and communications. Recognizing that large scale and lengthy outage restoration efforts require public and private entities to work in partnership to restore New Jersey communities, EPP considered data provided by utility employees, executives, residents, elected officials and emergency responders that were impacted by these two storm events. EPP reviewed and considered the record established during the BPU's investigation, including the testimony presented at the public hearings. EPP also reviewed prior Board Orders and Reports that were applicable, including the BPU Hurricane Irene Report, prepared by the BPU Division of Reliability and Security.

KEY FINDINGS AND RECOMMENDATIONS

COMMUNICATIONS

The entire community is dependent on power; therefore, information about power outages and restoration is critical. Effective communications is a key component to the success of an EDC's restoration process. No matter how successfully an EDC conducts its restoration activities, poor and inaccurate communications will outweigh many of the positive aspects of those efforts.

Advance communications provide customers with knowledge of what to expect and the opportunity to adequately prepare. Preparation is especially important for special needs customers and their caregivers. Early warnings and effective communication regarding expected weather conditions and potential damage also assists local police, fire and public works departments' efforts to prepare available resources and protect their communities, communicate preparatory requirements to constituents, and facilitate restoration efforts. It is essential that the plan establish effective communications with the Offices of Emergency Management (OEM), municipalities, and elected officials.

Once a storm has passed, customers need a realistic idea of Estimated Times of Restoration (ETR) to make informed decisions for their families' welfare. Likewise, local governments need this information to conduct business until full community functioning is restored. Facilities that rely on backup emergency generators need to know if they will have enough fuel to get through the outage.

School officials need to judge when they will be able to reopen. Commercial and industrial customers need to plan work and process schedules. Moreover, communicating safety advice to customers is vitally important, particularly concerning downed power lines and other potentially life-threatening conditions.

Providing accurate, consistent, and frequent ETR updates, issued through all available media is an effective way for EDCs to communicate this information to customers. Managing customer expectations by educating the public about the prioritization process for determining restoration order is critical.

BPU's investigation determined that the EDCs experienced significant issues with their internal and external communications. In particular, it was apparent that JCP&L did not adequately and effectively provide information to its customers and public officials during the weather events. Subsequent to Irene, the BPU worked with JCP&L to develop and implement an emergency communications strategy. This plan, as well as all of the EDCs communications plans, were reviewed and analyzed as part of EPP's investigation

Each EDC has established communications plans to communicate with customers, community leaders, the news media, and stakeholders, before and after an event, though some plans were significantly less effective than others. Each plan called for the respective EDC to use multiple channels to communicate with its stakeholder groups both before and after an event. Tools utilized include websites, social media channels, press releases, call centers, and dedicated representatives. Examples of necessary improvements include the following:

- Establish, or continue to maintain, effective communications with the OEMs, municipalities, and elected officials;
- Websites should include outage related information in greater detail, including reminding customers of the prioritization process;
- Use social media and recognize the public's need to access/receive reports on outages and receive updates via mobile devices;
- Employ the use of a crew spokesperson to help answer questions from the public during the restoration process;
- Provide a Global ETR (this is when all customers will be restored) within 24 hours of the end of a storm event. Provide more specific ETR based on the magnitude and severity of the storm event;
- Review and revise customer call back scripts and procedures to eliminate customer confusion and provide customers with as much immediate help and advice as is possible during each point of the storm and restoration.

Atlantic City Electric has a communications plan that establishes the framework for ACE to manage communications during major weather events that proved to be effective overall during the storm. An evaluation of the communications related actions ACE took before, during, and immediately

following the storms identified the major areas of strengths and weakness in ACE's existing plan. ACE successfully maintains relationships with OEM, municipalities, and elected officials. It used multiple channels, including social media, and did an effective job during the two storms. Improvement can be made in ACE's message construction to ensure that tips to cope with outages and safety advice are given the highest priority.

Jersey Central Power & Light has an emergency communications plan that was ineffective during Irene and, to a lesser extent, the snow storm. JCP&L's plan calls for relationships with OEM, municipalities, and elected officials, however, like the communication plan itself, many of those relationships, were ineffective during the storms. JCP&L's efforts are supported by its parent company, FirstEnergy, and personnel were sent from Ohio to support the communications efforts. Inaccurate or non-existent ETR information caused frustration, county and local officials had difficulty reaching their assigned representatives, and early media messaging was unsuccessful. In addition, the wording used on the automated call-back system caused confusion.

In response to the communications failures during Hurricane Irene, JCP&L, in conjunction with BPU Staff, developed a Storm Restoration Communications Implementation Plan. While the enhanced plan improved JCP&L's external communications during the snow storm, there are additional areas that need improvement. Specifically, JCP&L still needs to enhance its media relations staff, prioritize messaging that is customer-focused, provide more frequent and accurate updates during events, and clarify the customer call-back wording. JCP&L must also continue to work on its ETR calculation process to ensure that data providing a greater level of geographic detail is available. Furthermore, it is essential that JCP&L centralize its ETR process.

Public Service Electric and Gas has an emergency communications plan that clearly defines the audience, vehicle, message, and when to be issued. PSE&G's communication process is centralized and executed by its communications department, which includes subject matter experts. Its process is focused on keeping stakeholders, including the media, municipalities, elected officials, customers, and company personnel, informed, which minimized complaints during the storms. The review of PSE&G's storm related activities identified areas that its communications need improvement. For example, PSE&G's storm center website does not provide sufficient outage details. Its website requires major improvements; as the largest EDC in the State, PSE&G should not have the least effective website. Additionally, PSE&G should also designate additional trained personnel to staff the local OEM centers, upon request.

Rockland Electric also has a communications plan that calls for relationships with OEM, municipalities and elected officials. The process is centralized and supported by a highly detailed storm website. Following both storms, RECO formed a process improvement team to immediately begin working on identifying and implementing areas to improve its communications process. RECO should continue to implement the recommendations made by its process improvement team. In addition, RECO should continue work on its ETR enhancement project.

VEGETATION MANAGEMENT

Damage from fallen trees and limbs are a major cause of electrical outages in most storms. EDCs have certified arborists who work with communities to ensure that trimming and clearing is performed and to encourage the planting of appropriate tree species. EDC vegetation management best practices includes analyzing previous storm damage data to identify vulnerable areas, surveying lines to discover and remediate at risk areas, and maintaining a budget sufficient to execute preventive trimming and clearing. It is particularly important for EDCs to implement effective community relations efforts to deal with local objections to trimming and clearing based on aesthetic concerns.

As detailed in this report, good vegetation management is a complex balancing act of many variables. Besides the EDC and its regulator, many other stakeholders are involved, including municipalities, property owners, environmental groups, planning and shade tree commissions, land planners, and landscape architects.

Damage caused by trees during Hurricane Irene was significant, yet different from the damage caused by trees during the snow storm. Hurricane Irene was a horizontal-force event with high winds, heavy rain, and flooding, which caused the collapse of many trees and limbs. In comparison, the October snow storm was a vertical-force event, with heavy, wet snow sticking to leaves and tree branches, which created a heavy canopy of snow that caused limbs to sag and break. As a result, there were more individual incidents of damage to New Jersey's electrical infrastructure caused by the snow storm than Hurricane Irene, particularly in Northern New Jersey.

The numerous tree-related power outages caused by the two storms renewed discussions about the option of burying electric lines underground. However, significantly, the cost to convert overhead to underground electric distribution lines could range from $80,000 per mile in a rural area to over $2,000,000 per mile in an urban or suburban area.[4]

Moreover, there are questions as to whether underground lines are more reliable than overhead lines.[5] While underground outages occur less frequently, these lines are still susceptible to corrosion, flooding, tree roots and people digging into the lines. When an outage does occur, it typically takes three to four times longer to locate and fix a problem on an underground line than on an overhead line. In addition, repair of underground lines requires specialized crew personnel.

[4] Edison Electric Institute, *Out of Sight, Out of Mind Revisited, An Updated Study on the Undergrounding of Overhead Power Lines,* December 2009

[5] In 2000, a report issued the Maryland Public Service Commission's Selective Undergrounding Working Group found that there was insufficient evidence to conclude that underground lines were more reliable overall than overhead lines.

Conversion of an existing overhead line to underground requires coordination with telecommunications and cable providers.

Underground electric lines may offer some advantages compared to overhead electric lines. For instance, underground lines are less vulnerable to air-borne elements, such as wind, rain, and ice. Consequently, despite the difficulty in repairing underground lines, overall, EDCs may spend less on operating and maintenance costs for these lines. In heavily populated areas, underground lines may be more practical than overhead lines. In addition, there are obvious aesthetic advantages to underground lines.

While it could be prohibitively expensive to replace overhead distribution lines with underground lines statewide, the Board may want to consider whether increased system-wide reliability could justify burying lines in high consequence areas. Without a full understanding of the actual cost and the associated increased rates for residential and business customers, this option is not recommended statewide.

In addition to considering the potential of underground lines, the State should focus on vegetation management. The magnitude of tree-related damage to New Jersey utility infrastructure, State and local government roadways, and individual homeowners indicates that vegetation management is not a problem that the utilities can solve alone. Even with increased trimming, electric facilities are still impacted by healthy trees falling or uprooting from outside the utility maintained right-of-way (ROW). Therefore, as detailed in this report, addressing the State's vegetation management issues will require an integrated approach with support from all the stakeholder groups.

It is critical that the EDCs collect objective information in order to conduct a more detailed analysis of tree related outages. However, many EDCs do not collect information in sufficient detail to allow a fair assessment of the programs.

A review of the vegetation management budget trends, and the actual amount spent, provides an indication of the trends at an EDC. An increasing budget level trend, as well as spending the budgeted amount each year, indicates an increased focus on vegetation management.

Each EDC should develop a program to track tree related damage at a more granular level. Such tracking would facilitate the analysis required to determine the effectiveness of the EDCs vegetation management programs.

BPU Staff should develop and implement a review to evaluate the present vegetation management standards with the goal of establishing a more aggressive tree vegetation management standard for electrical distribution systems, similar to the guidelines previously established for the transmission systems. The National Electric Safety Code ("NESC") standards that New Jersey adopted for the regulations does not specifically address vegetation clearance around power distribution lines. As

such, this initiative should establish clearly defined parameters on clearance and expectations. It should focus initially on high consequence feeder lines, which can cause large outages when impacted. Staff should also evaluate the usefulness of switching to a shorter tree trimming cycle.

Given the subjective nature of the current vegetation management guidelines on distribution lines in the New Jersey regulations, more clearly defined requirements should be established. The requirements should clearly state how the EDC handle vegetation issues within the ROW or easements; such as specific clearance requirements, need to trim or clear above the lines in addition to around the lines, and a specific listing of species allowed within the ROW, if at all.

Atlantic City Electric has a reliability-based distribution vegetation management program that is on a four-year cycle. ACE's vegetation management program includes condition based maintenance and reactive maintenance. ACE has significantly increased its vegetation management budget over the past five years and has spent over the budgeted amount by 23%.

Jersey Central Power & Light has a cyclic distribution vegetation management program that is on a four-year cycle. JCP&L has significantly increased its vegetation management budget over the past five years and has spent the budgeted amount.

Public Service Electric and Gas inspects and conducts tree trimming on a four-year cycle. PSE&G has a model that looks at the number of critical customers on a circuit, outages, and the budget to prioritize circuits for vegetation management. PSE&G has kept its vegetation management budget flat over the past five years and has spent less than the budgeted amount by approximately 8%.

Rockland Electric inspects and conducts tree trimming on a four-year cycle. RECO has a cyclic maintenance program and reviews tree outages daily. RECO's vegetation management budget differed from year to year over the last five years. RECO has spent over the budgeted amount by approximately 5%.

CIRCUIT OUTAGES

Electric circuits deliver power to the customers.[6] There is some relationship between circuit configuration, technology, and the capability of the circuit to recover from the impact of weather or other system failures.

[6] A circuit includes many pieces of equipment critical to its proper operation such as conductors, transformers, fuses, switches, reclosers, capacitors, regulators and poles. Circuit design can be network, radial or looped. Networks are interconnected so that all customers have multiple sources of power. Radial circuits are supplied from one end only, originating from a substation. Looped circuits are radial circuits that also meet at a common (remote) location such as a pole, but are not normally connected. Looped circuits can be manual

Outage statistic measurements include: Customer Average Interruption Duration Index (CAIDI), which is the average duration of a customer outage, Momentary Average Interruption Frequency Index (MAIFI), which is the average number of momentary interruptions a customer would experience, and System Average Interruption Frequency Index (SAIFI), which is the average number of customer interruptions a customer might experience.

Comparing reliability statistics across utilities is complicated because there are many variables and demographic factors that impact the numbers. This includes customer density, service territory terrain, system age, and the amount of underground or network facilities. The time to restore any circuit, loop or radial, depends upon a number of factors, including the travel time to the trouble location, the weather conditions, the degree of damage on the circuit, the length of the circuit, and the number of customers served by the circuit.

Many state utility commissions have implemented a form of EDC service quality regulation.[7] Some of these regulations merely monitor, some set benchmark standards, and some set benchmark standards and also establish an incentive or penalty. When a benchmark standard is established, the values are unique to the specific EDC. The utility industry does not employ a standardized format to collect circuit outage data; instead the majority of the information is submitted as part of a Major Storm Reports to the respective state utility commissions.

In New Jersey, each EDC files a system reliability report on an annual basis with the BPU. Storm activity is excluded when there is a sustained interruption of electric service resulting from conditions beyond the EDC's control. This may include, but is not limited to, thunderstorms, tornadoes, hurricanes, heat waves or snow and ice storms, which affect at least 10% of the customers in an operating area. New Jersey has established a "minimum reliability level" for the SAIFI and CAIDI metric, which is monitored by the BPU.

New Jersey's four EDCs have similar reliability programs, although names and definitions may differ. These include substation and distribution equipment inspections and a review of worst performing circuits. Each EDC uses different terminology and reports damage in different categories; this makes direct comparisons difficult.

While BPU staff used a formalized process during both storm events to interact fluidly with the utilities through the State's Incident Command structure, a common set of metrics must be established for the EDCs to communicate the magnitude of outages and restoration efforts to the BPU. When comparing the severity of an event, it is important to look at the percentage of customers out of service, as well as the peak number of customers impacted. The peak number

tie, automatic tie or networked. If there is an outage on a looped circuit, the configuration may allow for all or parts of the damaged circuit's load to be picked up, thereby, reducing the length of an outage.

[7] Edison Electric Institute, State of Reliability Distribution Regulation in the United States, September 2005.

differs from the total affected due in part to additional, temporary outages necessitated by utility switching. The number of orders, trouble locations and the types of damage are other indicators of severity.

BPU Staff should standardize the Major Event Report, thus requiring all EDCs to report information on a consistent basis utilizing identical categories and definitions.

Each EDC should work with the BPU to evaluate the potential benefits of utilizing distribution automation[8] initiatives as a way to protect the integrity of the system and improve customer reliability. It is understood that several of the New Jersey EDCs have implemented pilot programs on such initiatives. The EDCs should complete these pilot programs and the results should be fully reviewed for benefits to the system and customers, along with any operational or practical hurdles that need to be addressed.

Each EDC should consistently report, and update, to the BPU estimates of the crew hours of restoration work required to restore all customers' service. This data can be developed from the EDCs, Outage Management System (OMS), Supervisory Control and Data Acquisition (SCADA), and other information sources after the initial damage assessment has been performed, within 24 hours of the storm. Estimates of pending restoration work will establish a severity index to enable comparison between EDCs of a storm's impact on a consistent basis.

Atlantic City Electric has a department responsible for system reliability. ACE has a number of reliability programs, including Distribution Automation. This is a major component of ACE's strategy for improving customer reliability, involving installation of advanced control systems across the distribution system to allow the electric system to identify faults and perform switching automatically. ACE classified all circuits as radial circuits and maintains yearly reliability statistics.

Jersey Central Power & Light has a department responsible for distribution circuit planning, reliability, protection asset management, voltage concerns, circuit enhancements, monitoring and addressing circuit reliability performance, maintaining circuits and distribution operation. JCP&L's territory includes barrier islands, remote locations along the Delaware River, and mountains. This results in a higher percentage of radial circuits, which cannot be reasonably converted to looped circuits. JCP&L maintains yearly statistics.

[8] Distribution automation enables automated relaying of information to the utility control center, including real-time data acquisition, communication with utility databases and other automated systems. Distribution automation does not prevent faults or reduce the likelihood of an outage, but it can minimize the number of customers that experience a sustained outage and reduce restoration times by identifying and isolating the faulted segment.

Public Service Electric and Gas has several departments with responsibility for system reliability. PSE&G has a higher ratio of looped versus radial circuits because its service territory is compact with limited natural barriers such as the ocean or mountains. PSE&G has networks in the major cities of East Orange, Jersey City and Newark, along with 79 smaller municipalities. PSE&G maintains yearly reliability statistics.

Rockland Electric has several departments that have responsibility for system reliability, including operating the system, monitoring system performance, restoring systems during an event, and developing reliability programs to improve system performance. RECO maintains yearly reliability statistics.

SUBSTATION FLOODING

Substation flooding had a substantial impact on service and operations during Irene. A total of 15 substations located in the 100-year flood zone in New Jersey experienced operational impacts due to wind, rain or flooding. As the primary feed for the distribution circuits, the loss or inoperability of these substations affected numerous customers, caused outages on an area-wide basis, and limited operational flexibility with the surrounding circuits.

While the EDC's have design standards and contingency plans to address such issues, not all of these design standards were in place at the time the substations were built. Substations built within the 100-year flood zones are particularly at risk to flooding. Mitigation efforts by the EDCs were not always sufficient due to the magnitude of the event.

Each EDC should work with the BPU to review, analyze, and evaluate the current preparedness plans for substations during storm events. In light of the actual incidents of damage incurred during Irene, EDCs, working with the BPU, must develop and implement improved mitigation plans.

Atlantic City Electric had no substations impacted due to flooding by the two weather events under review.

Jersey Central Power & Light had seven substations impacted by wind, rain or flooding during Irene. The mitigation efforts implemented were not always effective. In one case, this was due to debris obstructions at a down-river bridge which caused floodwaters to breach the substation flood gates.

Public Service Electric and Gas had eight substations impacted by wind, rain or flooding. PSE&G did implement mitigation plans, but not all were effective. One substation lost power due to flood damage that occurred at another substation.

Rockland Electric had no substations impacted due to flooding from the two storm events under review.

PREPAREDNESS AND RESPONSE

Organizations that perform most effectively during emergency events are those that have an effective plan, clearly defined roles and responsibilities, and advance opportunities to practice, evaluate performance and adapt through additional planning and training. Effective planning provides a conceptual roadmap, making it possible for hundreds or thousands of employees from dozens of different functions, including contractors and crews from other EDCs, to be merged into a single coordinated effort. Emergency Restoration Plans define and align roles, responsibilities, human resources, standard operating procedures, information technology, data capture, communications systems and more. All EDCs have plans, though the format and content differ.

As previously noted, during Irene, New Jersey faced the largest number of customer outages in the State's history and, following the October 2011 snow storm, New Jersey experienced the highest amount of individual damage to the distribution system on record. Hundreds of additional utility employees were pressed into service and repair crews traveled from around the country to support the restoration efforts. EDC planning and preparation processes must continue to improve to ensure a higher level of performance during the restoration process.

Exercises and drills help to test and evaluate the efficacy of emergency operations training. Exercises are essential for pressure-testing the effectiveness of emergency operations plans, and providing a means for continuous improvement. Well-designed exercises seek to discover gaps both in plan knowledge and overall resource and logistics readiness. Although storms will frequently test the restoration team, backup and second-role personnel are rarely activated for "routine" events. Exercises provide the practice and fine-tuning of processes and skills need for optimal response to and performance in a major event where the environment is high-pressure, fast-paced, and the results have a direct impact on a great number of people.

The best restoration plan is no better than the restoration personnel's understanding of that plan, including its priorities, processes, organization, and coordination. This understanding comes from training. Organizations with best practices in this area have a process for ensuring that personnel are pre-identified for primary and secondary storm roles and then trained according to a pre-defined curriculum for that role.

Incorporation of past lessons learned is another valuable component of an effective program. No two storms or major outage events will ever be alike, but each can provide valuable lessons for improving restoration plans, processes and performance. The "text" for each lesson comes from the

post event reviews and analysis of recorded data. This information must lead each EDC to evaluate and identify both the successful strategies and opportunities for improvement, which must be applied while the event is still fresh. After-action reports provide valuable input to process changes, identify training needs, and prompt plan revisions.

A well-defined plan, which incorporates best practices, also requires strong leadership. Given that major storm restoration efforts involve thousands of people performing a variety of tasks in unison, the leadership, strategic vision, and quality control of a few people in command roles is critical. While tactical decisions can be empowered down through a chain of command, the responsibility remains with one person; therefore, the span of control must be kept tight and the number of direct reports must be manageable.

During a major storm event, leaders must ensure that the team has the resources and the ability to mobilize all company personnel to fill appropriate roles. The ability to mobilize sufficient resources and personnel is key to an organization's success. Many organizations call this the "second role" or "storm role" process. An effective storm organization plan also provides for sound shift management, tools and job aids, such as checklists and job descriptions, and record keeping and documentation policies. During daily or non-storm operations the utility's Emergency Management/Emergency Preparedness function should be a stand-alone function within the organization with the requisite authority to ensure compliance with readiness related initiatives across the entire organization, including any affiliated parent companies and/or subsidiaries.

The Incident Command System is utilized by organizations because it provides an organizational structure for emergency incident management and guides the process for planning, building, and adapting that structure for large scale events.

Each EDC should have a plan that comports with Incident Command System (ICS) principles and is designed to manage a storm of such magnitude that a minimum of 75% of their customers will be out of service.

Atlantic City Electric has a thoroughly documented emergency plan that is updated annually and the exercise program is well-established. The ACE organization is modeled on the Incident Command System. Lessons learned from previous major events have led to continuous improvements in the storm readiness efforts.

Jersey Central Power & Light has a documented emergency plan that is updated annually, but recent events show that the organizational structure did not provide for "deep" backup staffing at the managerial level, adequate span of control or clear roles and responsibility. Individuals were overworked and overwhelmed in certain cases. JCP&L does not conduct exercises because it feels that actual storm events can take the place of an exercise. The JCP&L organization is not modeled on the Incident Command System. Much of the training is focused on technical topics and system

training. JCP&L should ensure that checklists and job aids are included in the plan, and adopt the Incident Command System structure for managing events. JCP&L should conduct an annual exercise and participate in FirstEnergy corporate-wide exercises. JCP&L should expand its training program to include the interdependencies between functional areas and storm roles. JCP&L should also develop training requirements for all positions within the storm restoration organization. JCP&L should implement the use of logs during events, and establish a process to ensure timely completion of process improvement items noted during post event debriefings. JCP&L should develop an Emergency Management/Emergency Preparedness role as a stand-alone function within JCP&L with the requisite authority to ensure compliance with readiness related initiatives.

Public Service Electric and Gas has a plan that is designed to manage a major restoration event in the same way that an average storm is handled; however the plan has not been updated since 2007. While PSE&G does have a documented plan, some aspects of the plan do not represent how PSE&G actually operates during an event. The plan describes the use of the Incident Command System (ICS) model for the Distribution Emergency Recovery Center (DERC); unfortunately, in practice, PSE&G does not utilize the ICS. Past annual exercises were too small in scope and the training is focused only on assessing damage. Lessons learned following major events have not been documented for the past three years. PSE&G should revise its plan to reflect the level of effort needed to address a major storm event, and review and update the plan annually. PSE&G should adopt the Incident Command System structure described in its plan. PSE&G should enhance its annual exercise to deal with much larger scale events, and expand its training program to include the interdependencies between functional areas and storm roles. PSE&G should also develop training requirements for all positions within the storm restoration organization. PSE&G should perform a lessons learned debriefing after each major storm and establish a timeframe when these post event reviews will be completed. PSE&G should develop an Emergency Management/Emergency Preparedness role as a stand-alone function with the requisite authority to ensure compliance with readiness related initiatives.

Rockland Electric has a well-established plan that is updated annually and its exercise program is documented. The RECO organization is modeled on the Incident Command System structure. Lessons learned from previous major events have led to continuous improvements in RECO's storm readiness efforts. RECO should prepare written post-exercise reports. RECO should expand its training program to include the interdependencies between functional areas and storm roles, and implement the use of logs during events.

PRE-EVENT WEATHER MONITORING/ACTIVATION

Destructive weather conditions are the root cause of the vast majority of widespread and long duration outages. At the first indication of potentially damaging storm conditions, weather

forecasting provides necessary information for the first decisions that must be made to adequately prepare for restoration. Unfortunately, in spite of impressive advances in meteorological technology, weather prediction is still an inexact science.

Gathering weather data from multiple sources is best practice for improving confidence in forecasts. Dialogue with the weather service and contact with outside agencies can provide added perspective.

Each EDC utilizes multiple weather services and monitors weather conditions constantly; some EDCs even have internal meteorologists. In the case of Hurricane Irene, there was significant advance notice of the conditions, including the storm's track, size, and strength. Conversely, the weather predictions leading up to the snow storm provided a more limited time frame for advance preparation.

Even with the best weather monitoring and forecasting practices, activation of restoration resources is still a judgment call, attempting to balance the potential for millions of dollars in mobilization expense against the need for continued service for thousands of customers. Some EDCs trigger activation by using multivariate decision criteria and predictive models, while others utilize institutional knowledge and past experience. For storms on distant horizons, pre-defined storm levels can help project potential damage and dictate the resources needed for restoration.

Advance communication of conditions to both internal and external stakeholders allows everyone involved to make sound decisions about preparing for the expected emergency. Use of pending event checklists helps with the mobilization of resources that will be needed ahead of the event. Sudden weather events that do not allow for pre-planning pose their own set of challenges, including contacting off-duty personnel and impeded travel conditions. Unexpected events require rapid decision-making; therefore, it is crucial that each EDC has an effective preparedness program.

While all the EDCs have activation criteria in their plans, they appear to rely too heavily on institutional knowledge to forecast potential storm damage. Alternatively, institutional knowledge combined with a predictive model can provide a better estimate of potential damage, allowing for a predetermination of resource levels. These models can be based on previous storm history, system design, customer density, topology, vegetation, and storm type.

Each EDC should develop an outage prediction model to anticipate the level of damage expected based upon a predicted storm's intensity and path. Using projected damage information, an estimate of the resources needed to respond for each of the storm restoration roles should be developed. Once an event is predicted, this information can be used to guide mobilization decisions.

Atlantic City Electric utilizes several weather services. ACE has a documented activation process in its plan, and utilizes checklists that describe what actions need to be taken prior to an event that is forecasted. All employees have a second storm event role. ACE should ensure there is sufficient

depth in the leadership level storm positions and that adequate resources are available in the event of simultaneous large-scale events across multiple PHI service territories.

Jersey Central Power & Light utilized internal meteorologists as well as several external weather forecasting resources. JCP&L has documented event levels in the plan, but it should develop an activation criteria and procedure for all functions as a clearly defined process in its emergency response plan for each specific storm function. FirstEnergy moves personnel from its affiliates to support restoration efforts at JCP&L, when required. JCP&L should ensure there is sufficient depth in the leadership level storm positions and that adequate resources are available in the event of simultaneous large-scale events across multiple FirstEnergy service territories.

Public Service Electric and Gas utilizes several weather forecasting services. Activation of directly related personnel was supplemented by PSE&G personnel with storm roles and later a pool of employee volunteers. PSE&G should review its second role process and designate, train and equip personnel to fill storm roles (i.e. OEM representation). PSE&G should ensure there is sufficient depth in the leadership level storm positions.

Rockland Electric utilized internal meteorologists and several weather forecasting services. The plan covers activation for all storm functions, and all employees have a second role. RE should ensure there is sufficient depth in the leadership level storm positions and that adequate resources are available in the event of simultaneous large-scale events across multiple Con Edison service territories.

MUTUAL ASSISTANCE/EXTERNAL RESOURCE PROCUREMENT

An EDC staffs its internal line resources (line personnel) by planning and evaluating the capital and maintenance work requirements needed to operate the utility's infrastructure on a normal day, and can respond to moderate levels of weather impact using these resources. This planning and evaluating of all internal work keeps the EDC's internal line resource levels at economic and reasonable numbers to complete this work. If additional line resources are needed to supplement the workforce, the EDC may use contract line personnel or pay overtime to its internal resources.

To acquire additional line resources for large restoration events, most utilities participate in regional mutual assistance groups (RMAG). These RMAGs collectively utilize their internal, contract line and support personnel to fill the needs of their members. In the last 15 years a number of utilities have merged and now belong to several RMAG. An RMAG can request resources from another RMAG to supplement its resources in order to fulfill a members request when their own RMAG is depleted of resources. All of the New Jersey EDCs belong to at least one or more of these RMAG.

Because the projected track of Irene affected the entire East Coast of the United States and Canada, the event strained the mutual assistance process because of the large geographic areas affected – the South, Mid Atlantic, Northeast and Canada. An RMAG that might normally supply mutual assistance resources were either restoring its own companies or providing resources within its RMAG. The weekend before Irene came ashore, the Mid-West and Canada were supplying resources to its RMAG in areas that were devastated by the weekend's thunderstorms and tornados. As those resources became available they were utilized up and down the East Coast. The Canadian resources were very late in their availability because of Irene's expected track into Canada, and the Canadian utilities held its resources until the threat was over.

For Irene, none of the EDCs received the requested quantity of line personnel, at the time they wanted them. For the snow event, the acquisition of mutual assistance was less of an issue because the storm was concentrated in a smaller geographic area.

Each EDC should develop a plan to mitigate the impact of a severe shortage of line personnel in the event of a wide-spread natural disaster. This could include use of non-electric utility personnel who are not involved in the restoration efforts (i.e. water, gas, telecom, etc.) to perform support tasks that can free up line personnel to deal with job duties that only they are qualified to perform.

Each EDC should provide periodic, more organized updates to the BPU Staff regarding both mutual assistance requests made by the EDC, or mutual assistance being provided to another EDC. BPU should develop the frequency and type of information required.

Atlantic City Electric coordinates its mutual assistance through its parent company, Pepco Holdings, Inc. (PHI). During Irene, ACE had 12 companies provide 167 line and forestry crews. ACE should add a section to its plan to describe how mutual assistance crews will be allocated between affiliated companies (ACE, Delmarva, and Pepco) when simultaneous large-scale events occur in multiple service territories. It must be clear what resources will be allocated to New Jersey during system-wide impact events.

Jersey Central Power & Light coordinates its mutual assistance through its parent company, FirstEnergy. At the height of the Irene restoration efforts, JCP&L had 1,350 additional FirstEnergy personnel and 2,173 mutual assistance and line contractor personnel. JCP&L relies on FirstEnergy to procure mutual assistance and external resources. In preparation for Irene, parent company FirstEnergy did not fulfill JCP&L's requests for additional line personnel when requested. Consequently, the interaction between FirstEnergy and its affiliates' requests for resources should be reviewed and resolved for major outages. It is critical that JCP&L develop an improved plan to ensure that adequate resources are available when needed in the event of simultaneous large-scale events across multiple FirstEnergy service territories. JCP&L's plan should ensure that an adequate and proportionate share of FirstEnergy resources is deployed to New Jersey during these events.

Public Service Electric and Gas had 187 mutual assistance and contractor crews during Irene; two thirds of these crews were on-site prior to the storm. PSE&G had 259 additional forestry crews. PSE&G had 187 mutual assistance and contractor crews during the snow storm. PSE&G should utilize the term personnel instead of crews in order to more accurately portray the number of personnel that assisted it during weather events.

Rockland Electric coordinates its mutual assistance through its affiliate Con Edison. Crew allocation between the companies is determined at the executive level. The Con Edison plan was used to guide mutual assistance requests based on forecasted storm events. During Irene, RECO utilized 681 mutual assistance line and service personnel, with an additional 201 forestry personnel. RE utilized 1,522 additional mutual assistance line and service personnel during the snow storm.

DAMAGE ASSESSMENT

Before crews can be assigned to repair damage, the restoration team needs a damage assessment to determine infrastructure damage. For major storms, personnel who have other primary roles within the EDC perform some of the damage assessment. Challenges to effective performance of damage assessment include weather conditions, travel impediments, securing enough personnel with advanced training in the temporary roles, advance notice and staging for rapid mobilization, and provision of proper transportation and communications equipment.

Damage data can be transmitted most effectively to the restoration team through remote digital communications technology, including mobile data terminals. Damage information is also obtained from municipal, county and state public works, police and fire personnel. Proactive community relations efforts can help prepare these resources to assist in this effort by training them to report specific conditions (road and bridge conditions, safety situations, pole locations, etc.) and by designating dedicated communications channels for their use. On the receiving end, this intelligence needs to be analyzed by the EDC to provide effective work prioritization and dispatch.

Rapid assessment is important to situational awareness – the EDC leaders and personnel must understand the scope of the damage in order to plan effectively. Rapid assessment takes place within hours of an incident, and results in a quick evaluation of the extent of the damage to utility infrastructure. This information provides input to the analysis process, leading to estimates of the resources needed for response to life-threatening situations and restoration.

The information received from the damage assessment process is instrumental to restoration planning. Specifically, restoration planning necessitates an accurate identification of the work load, materials required, and the type of personnel required to perform the repairs. Technological enhancements that could speed up the assessment process and provide more detailed information

would be a benefit to the restoration process. In a major event, second role personnel often supplement the damage assessment role.

Each EDC should develop technology solutions that will enable more efficient reporting and/or processing of damage assessment information. For instance, the EDCs that do not already, should provide a smart phone app concept and/or mobile data terminals.

Atlantic City Electric has a damage assessment process that is clearly defined in its Incident Response Plan, with additional details outlined in the job summaries for the role. Assessment personnel are deployed after conditions in the field are safe.

Jersey Central Power & Light has a process that is designed to address hazardous situations as quickly and safely as possible and remove or stand-by any specific or immediate danger. Hazard responders, dispatched to individual trouble locations, initially assess damage. Formalized damage assessment for both events did not take place immediately after the events because personnel were focused on the hazardous areas, such as downed wires and public safety issues. JCP&L should develop a rapid damage assessment process to be used during major events. This should describe the prioritization of areas to be assessed, how personnel will be assigned and the timeframe (4 to 6 hours) that they have to report back with their findings. JCP&L should ensure that it has enough trained personnel to conduct the damage assessment process in parallel with the hazard process. This could include contract damage assessors, second role personnel or other alternative staffing methods. JCP&L should establish a dedicated planning function to analyze information coming in from damage assessment.

Public Service Electric and Gas has 500 trained damage assessors, and all were activated for both storms. The magnitude of the two 2011 storms caused PSE&G to add additional damage assessment personnel, some of whom were trained just in time and on the job. Damage Assessors have to call or radio their information in to the division office so that it can be entered into the Outage Management System (OMS).

Rockland Electric has a clearly defined damage assessment process and used contractors to augment the internal damage assessment forces; these contractor personnel are trained and available for use during an emergency event.

CREW/WORK MANAGEMENT/WORKFORCE LEVELS

Effective storm restoration requires coordination on a significant scale. Personnel send in damage intelligence, objectives are prioritized, crews are deployed accordingly, and progress updates must

be constant. A great deal of advance organization, well-established processes, and detailed training is required when "reserve units," such as second role personnel, mutual assistance and contractors, must be mobilized.

In order to complete a restoration effort the utility must have adequate field forces (linemen, operators, dispatchers, technicians, meter personnel, meter readers, etc.), customer service personnel, logistics personnel (materials, fleet and facilities) and supervision and administration (communications, engineers, managers and executives). The BPU receives operating personnel staffing trends as part of the reliability report that each EDC submits annually.

Each EDC uses different position descriptions, with different duties and requirements, has differing labor contracts, has access to resources from affiliates or associated divisions, such as gas operations, and has varying levels of automation and technology.

Crew location is an important factor in the work management process. Knowing where crews are working is important from a safety perspective, to ensure that no one is injured by a switching error. It also facilitates more efficient crew deployment, minimizing travel time. And equally important, stakeholders expect that a utility knows where all of its crews are working at any given time, and will be able to communicate that information when requested.

During Irene and the snow storm, many customers expressed frustration when they didn't see any crews in the area, or when crews would drive by their location, not stopping to restore their service. Customers also reported seeing crews 'sitting around' or at local restaurants. The safety of the public and EDC personnel is paramount; therefore field crews working extended hours need to have adequate rest time or breaks during their shift to remain focused. More robust communications from the EDCs describing the situations a customer might see during a major restoration event could alleviate some of the criticisms.

During major restoration events, crew personnel are deployed to support municipal and state road opening efforts that are impeded by downed wires. The large number of requests, and competing priorities, can cause delays in response. A more effective approach to individual municipal level requests would be to centralize the process at a county level, with state oversight for the most critical roadway issues.

During Irene, the level of mutual assistance staffing was not adequate in the early stages of the restoration efforts for any EDC due to the widespread nature of the event.

Each EDC should be able to report detailed and accurate crew locations to the BPU, which could be achieved using a web portal. Each EDC should also be responsive to local governments needs for coordination of crew work efforts and work priorities.

Each EDC should participate in a debris management/road opening initiative organized by the BPU in conjunction with other key stakeholders. This initiative should establish a process to provide more structure to the determination of roadway access prioritization, efficient utilization of EDC resources, and provide for input and enlistment of local Department of Public Works (DPWs) in the debris management and roadway access process.

Each EDC should identify ways to efficiently and decisively track and report crew (internal, contractor and mutual aid) locations during restoration events.

Atlantic City Electric shows that the number of operations personnel decreased approximately 19% over the ten year period from 2002 to 2011. There has been no effective decrease in the number of customer service personnel and the number of logistics personnel has decreased 14% over the ten-year period. Supervision and administration have remained stable.

Jersey Central Power & Light shows that the number of operations personnel decreased approximately 12% from 2002 through 2005 and then remained relatively constant through 2011. There has been a decrease in the number of customer service personnel of approximately 27% and the number of logistics personnel has decreased 26% over the ten-year period. Supervision and administration have remained stable. The decreases in customer service and logistics are the result of shifts of duties to the holding company affiliates.

Public Service Electric and Gas shows that the number of operations personnel has remained constant over the ten year period from 2002 to 2011. The logistics function was included within the operations data. There has been an increase in the number of customer service personnel of approximately 8%. Supervision and administration has decreased by 28% over the ten year period.

Rockland Electric shows that the number of operations personnel increased by approximately 5% over the ten year period from 2002 to 2011. There has been no effective decrease in the number of customer service personnel. Supervision and administration have decreased 18% over the ten year period.

LOGISTICS AND FIELD SUPPORT

In addition to foul weather, poor road conditions and damage to facilities, an outage restoration can be hampered by logistics failures; inadequate staging areas or receiving centers; poor arrangements for lodging and meals; insufficient or ineffective supply or distribution of materials; fleet shortages; and employee distractions. Organizations with a best practice in this area have detailed plans and checklists, established staging areas, advance contracts with service providers and adequate personnel to manage the logistics process.

Irene and the October snow storm produced a significant number of logistical challenges ranging from housing and feeding the thousands of personnel, to keeping crews stocked with materials needed for the repairs. During Irene and the snow storm, logistical issues did not hamper restoration efforts.

Each EDC should predetermine Staging Areas sufficient to support restoration from an outage equal to 75% of total customers. This should include location specific layouts. Each EDC should, if needed, have contractual arrangements in place for the use of the predetermined Staging Areas to resolve issues such as liability, access, security and existing support services at the site before an outage occurs.

BPU

Prior Orders

New Jersey has experienced a variety of natural and man-made disasters that have affected millions of electric customers over the past ten to fifteen years. The Board has reviewed the electric utilities' performance before, during and after these events. Internal Board Staff reports containing improvement recommendations have been generated and implementation subsequently ordered by the Board.

A number of re-occurring themes permeate the reports and Orders, including: communications with customers and emergency management offices; restoration priorities; outage assessment methodology; well dependent and special needs customers; vegetation management; supplemental crew acquisition; equipment Inspection and upgrades; and employee training .

EDCs have integrated the recommendations from past Board Orders and investigations into their restoration process. A review of the main areas is necessary to see if the recommendations put in place are scalable to events of this magnitude or if new recommendations are needed to incorporate the lessons learned from these events.

The BPU should review all past Orders and determine which Orders are still relevant.

Enforcement Authority

Over the past fifteen years, state regulatory agencies have increased their scrutiny of EDC performance, particularly in the wake a major storm events. Since the role of the regulatory agency is to protect the public interest and ensure that a fair rate of return is earned based on reliability and service levels, some agencies feel that the best way to do this is to enforce a penalty if a desired result is not met.

Comparing and evaluating utility performance against agreed-upon standards requires a significant amount of effort on the part of the regulatory agency. Establishing reliability penalties requires careful attention and complex calculations. For instance, variations in weather from year-to-year can have significant impacts on traditional reliability metrics. Penalty categories can range from a reliability target, restoration targets for all conditions other than catastrophic events, and call center performance targets.

Current programs in New Jersey have established a "minimum reliability level" for the SAIFI and CAIDI metric, which is monitored by the BPU. Developing straightforward and reasonable mechanisms to monitor performance in New Jersey will the BPU's biggest challenge.

At the present time, the BPU does not have an adequate level of penalty authority to ensure minimum standards of behavior and performance for EDCs and other regulated utilities. For instance, the penalty for a utility's failure to comply with a Board order, including those related to health and public safety is $100 dollars for each day the default continues.[9] In contrast, the Board's authority underlying its Pipeline Safety and Underground Facility Protection Programs allows enforcement based penalties ranging up to $1 million in certain circumstances. Other State agencies have far greater penalty authority for enforcement purposes than BPU's current, statutory enforcement authority for failure to comply with Board orders. Increased enforcement authority will improve service reliability and create disincentives for poor service.

The BPU should seek statutory authority to penalize the EDCs for failure to satisfy the standards established pursuant to this investigation. The BPU's current enforcement authority must be increased to provide incentives for the EDCs to follow the identified best practices, including making improvements to operations and performing higher than the minimum industry standards.

[9] N.J.S.A. 48:2-42 Penalty for noncompliance with orders.

CONCLUSION

Without a doubt, Tropical Storm Irene and the October snow storm were catastrophic weather events that fully challenged New Jersey's electric distribution companies impacted by these storms. The duration of outages was not unexpected given the severity of these events, but that is little comfort to those who went without power for multiple days. The difficulties and frustrations customers and government officials faced were further compounded by the lack of accurate and timely information.

EPP's examination of each company's methods, plans and processes used both during and after the storm provides helpful insights into what went right and, more importantly, where improvements are needed. BPU will determine the appropriate course of action going forward.

1.1 GLOBAL RECOMMENDATIONS[10]

PLANNING

1-G-1 Each EDC should be required to have plans that conform to a standard of content to ensure that key areas of an effective emergency plan are described sufficiently in the plan. The plans should include the following descriptions: emergency organization; emergency classifications; annual training and exercise program; on-going readiness initiatives; pre-event preparatory measures; procedures for mobilizing personnel, materials and equipment; communications procedures; process for acquiring external resources; process for acquiring internal support services; and linkages to corporate plans, if applicable.

1-G-2 Each EDC's plan should be designed to manage a storm of such magnitude that a minimum of 75% of the customers will be out of service at some point during the planned restoration.

POST EVENT PROCESSES

4-G-1 Each EDC should solicit input regarding performance from external stakeholders for any event that requires a Major Event Report.

ACTIVATION

6-G-1 Each EDC should develop an outage prediction model to anticipate the level of expected damage based upon a predicted storm intensity and path. Using this projected damage information, an estimate of the resources needed to respond should be developed for each of the storm restoration roles. Once an event is predicted, this information can be used to guide mobilization decisions.

COMMAND AND CONTROL

7-G-1 Each EDC should ensure that there are a minimum of three personnel identified, trained and assigned to fill each leadership level position in its emergency / incident response / storm restoration organization.

[10] Note: Global Recommendations apply equally to all EDCs. Recommendations that apply to a specific EDC are listed under the respective EDC in Section 5.0.

PRE-EVENT COMMUNICATIONS

8-G-1 Each EDC's pre-storm communication primary messages should emphasize the "worst case" severity of potential damage, customer safety advice, and resources to allow both employees and customers enough time to prepare.

MUTUAL ASSISTANCE / EXTERNAL RESOURCES PROCUREMENT PROCESS

9-G-1 Each EDC should develop a plan to mitigate the impact of a severe shortage of line personnel in the event of a wide-spread natural disaster. This could include use of non-electric utility personnel who are not involved in the restoration efforts (i.e. water, gas, telecom, etc.) to perform support tasks that can free up line personnel to deal with job duties that only they are qualified to perform.

9-G-2 Each EDC should provide periodic, more organized updates to the BPU Staff regarding both mutual assistance requests made by the EDC, or mutual assistance being provided to another EDC. The frequency and type of information required will be developed by BPU Staff.

SUBSTATION FLOODING

10-G-1 Each EDC should prepare formal reports after instances of substation flooding to assist in analyzing long term trends and impacts.

10-G-2 Each EDC should consider higher flood levels for future substation design and upgrades to existing substations in floodplains as current 100-year Flood Zone elevations may be too conservative as demonstrated by Irene.

10-G-3 Each EDC should determine the potential impact of upstream dams and reservoirs, and if appropriate establish contact and share information with operators before a potential flooding event.

10-G-4 Each EDC should educate municipalities responsible for maintaining drainage management systems about the potential impact on substations if debris is not cleared before and during storm events.

10-G-5 Each EDC should work with the BPU to review, analyze, and evaluate the current preparedness plans for substations during storm events. In light of the actual incidents of flooding during Irene, EDCs, working with the BPU, must to develop and implement better mitigation plans.

VEGETATION MANAGEMENT

11-G-1 Each EDC should develop a program to track tree related outages at a more granular level. This could include the type of tree problem (inside the ROW, outside the ROW); failure mode (tree falls, tree limb); health of the tree (live, dead, or diseased); how far the tree was from the power lines; species of the tree and other appropriate categories.

11-G-2 BPU Staff should implement a review to evaluate the present vegetation management standards with the goal of establishing a more aggressive tree vegetation management standard for electrical distribution systems, similar to the guidelines previously established for the transmission systems. The National Electric Safety Code ("NESC") standards that New Jersey adopted for the regulations does not specifically address vegetation clearance around power distribution lines. As such, this initiative should establish clearly defined parameters on clearance and expectations. It should focus initially on high consequence feeder lines, which can cause large outages when impacted. Staff should also evaluate the usefulness of switching to a shorter tree trimming cycle.

11-G-3 Each EDC should use outage analysis and reliability statistics over multiple years to evaluate the effectiveness of its vegetation management program.

CIRCUIT OUTAGES

12-G-1 Each EDC should work with the BPU to evaluate the potential benefits of utilizing Distribution Automation initiatives as a way to protect the integrity of the system and improve customer reliability. It is understood that several of the New Jersey EDCs have implemented pilot programs on such initiatives. The EDCs should complete these pilot programs and the results should be fully reviewed for benefits to the system and customers, along with any practical, operational hurdles that need to be addressed.

12-G-2 The BPU Staff should standardize the Major Event Report so that all EDCs report information using the same categories and definitions.

12-G-3 The BPU Staff should review the reliability goals to determine if an adjustment is required.

DAMAGE ASSESSMENT

13-G-1 Each EDC should develop technology solutions that will enable more efficient reporting and/or processing of damage assessment information. This could

include a smart phone app concept or providing mobile data terminals for those who do not have them already.

RESPONDER SYSTEMS, TOOLS AND JOB AIDS

14-G-1 Each EDC should evaluate a cell phone app so that the customer can report outages and receive system outage information.

14-G-2 Each EDC should identify ways to efficiently and decisively track and report crew (internal, contractor and mutual aid) locations during restoration events.

ESTIMATED RESTORATION TIMES

15-G-1 Each EDC should establish a Global ETR within 24 hours of the end of the event.

15-G-2 The EDCs, working with Board Staff, should establish a schedule of when more granular levels of ETRs should be expected based upon the magnitude and severity of the event.

15-G-3 Each EDC should conduct a study of the accuracy of its ETRs during "Major Events" during the last three years.

CREW / WORK MANAGEMENT / WORKFORCE LEVELS

16-G-1 EDC should develop a common damage "glossary" for reporting damage to the BPU during and after events.

16-G-2 Each EDC should be able to report crew locations to the BPU Staff at the level of detail requested by Board Staff. This could include via a web portal.

16-G-3 Each EDC should be able to report crew locations at the municipal level for other stakeholder audiences.

16-G-4 Each EDC should participate in a debris management / road opening initiative organized by the Reliability and Security Staff in conjunction with other key stakeholders. This initiative can establish a process to provide more structure to the determination of roadway access prioritization, and provide for input and enlistment of local Department of Public Works (DPWs) in the debris management and roadway access process.

16-G-5 Each EDC should develop and provide improved customer education regarding field restoration work processes.

16-G-6 BPU should review the annual reliability report filings for each EDC to determine if staffing level trends have some correlation to reliability.

FOLLOW-UP WORK (POST-EVENT)

17-G-1 Each EDC should have a clearly defined section in its plans outlining the follow-up "temporary repairs" work process and responsibilities including post storm patrolling and inspection.

17-G-2 Each EDC should develop a storm quality assessment process to track the locations of all temporary repairs and the date the temporary repair was made permanent.

LOGISTICS AND FIELD SUPPORT

19-G-1 Each EDC should predetermine Staging Areas sufficient to support restoration from an outage equal to 75% of total customers. This should include location specific layouts.

19-G-2 Each EDC should, if needed, have contractual arrangements in place for the use of the predetermined Staging Areas to resolve issues such as liability, access, security and existing support services at the site before an outage occurs.

STORM RESTORATION PROCESS METRICS

20-G-1 In addition to an ETR, the EDC's should jointly develop and then consistently report the estimated crew hours (or man hours) of restoration work required to restore all known or estimated customers out of service for a major storm. This value can be developed from the EDCs' OMS, SCADA and other information sources after the initial damage assessment has been performed (within the first 24 hours after a storm). In essence this becomes a severity index to compare a storm's impact on a consistent basis.

SAFETY

21-G-1 All EDC should continue their current safety programs and practices.

CUSTOMER SERVICE / CALL CENTER

22-G-1 Each EDC should set reasonable call center performance standards for ASA and AR during major outage events.

22-G-2 Each EDC should manage call center staff to meet its performance standards throughout the outage event, including the critical end of restoration period.

22-G-3 Each EDC should develop IVR/VRU messages to provide customers with as much immediate help and advice as is possible (that is accurate) during each point of the storm and restoration and regularly update that information.

EXTERNAL COMMUNICATIONS

23-G-1 Each EDC should review its customer communications and outage website to reflect the following concepts:

- Customer safety and ability to cope should be the primary focus of all messages, especially in the beginning of major events.
- All communications channels at an EDC's disposal should be mobilized as soon as potential major outage events are forecasted.
- Worst case projections should be issued from the outset of any major event to effectively portray a sense of urgency.

Outage websites should be optimized to show:

- Number of customers out of power by county and municipality (not by zip code)
- Number of customers served by county and municipality
- Percentage of customers out of power by county and municipality
- Total number of outage locations (work locations) by municipality
- Time outage reported
- Crew en route or on scene working per outage location
- Cause of outage per outage location
- Estimated Time of Restoration per outage location
- Directive information about alternative shelter resources, community support, online telephone validation, and secondary language options.
- Outage websites should include graphics and video to help depict safety and preparedness messages.
- Provide a web portal for BPU Staff to view additional details related to the outages.
- Provide a mechanism to automatically notify BPU Staff via e-mail or text message when certain outage thresholds are reached.

23-G-2 Each EDC should consider designating second role employees to fill the role of crew spokesperson. A crew spokesperson travels with a block of crews and is able to explain the restoration process in general and the work at hand in particular, while the line crews make the repairs. This position can increase

crew productivity, increase customer safety, answer customers' specific questions and educate the public.

23-G-3 Each EDC should provide additional methods to report and check on the status of an individual outage. This could include an option on the website, through a mobile version of the website via a Smart Phone, or through text messaging.

23-G-4 Each EDC IVR, if not currently done, should have the ability to accept multiple customer telephone numbers, including a cell phone number.

INTERNAL COMMUNICATIONS

24-G-1 Each EDC should develop messaging specifically for foreign crews to recognize their voluntary service and build relationships to support future restorations.

BENCHMARKING / EXTERNAL ANALYSIS

25-G-1 Each EDC should develop a process to analyze and transfer restoration experiences from other utilities where appropriate. An organized process to communicate with other utilities beyond New Jersey that have experienced a major restoration can provide important insights.

BPU / PRIOR ORDERS / ENFORCEMENT AUTHORITY

26-BPU-1 BPU should review all past Orders and determine which Orders are still relevant.

26-BPU -2 Orders should specify an end result and not describe the specifics of the EDC implementation process.

27-BPU-1 BPU should investigate the options for penalty categories. BPU should evaluate seeking statutory authority to increase its penalty capabilities for EDCs non-performance or under-performance.

Note: Global Recommendations apply equally to all EDCs. Recommendations that apply to a specific EDC are listed under the respective EDC in Section 5.0.

2.0 INTRODUCTION

Shortly after Irene, New Jersey Governor Christie directed the President of the New Jersey Board of Public Utilities (BPU or Board) to conduct an investigation of the Electric Distribution Companies (EDCs) restoration decisions and actions taken prior to, during, and after Hurricane Irene. On December 14, 2011, the BPU released a preliminary report on major storm event planning and emergency response by the four EDCs (BPU Hurricane Irene Report). The Board ordered BPU Staff (Staff) to address areas that warranted further investigation.

The BPU Hurricane Irene Report created an action plan to implement "lessons learned," which readily emerged in an after action review of the EDCs' responses to Irene and, to a limited extent, to the October 29, 2011 snow storm. The Board subsequently issued an Order directing the EDCs to implement the recommendations outlined in the BPU Hurricane Irene Report.

The Board further ordered Staff to retain a subject matter consultant to provide assistance to Staff in analyzing areas of the report warranting further review. The BPU required that this evaluation be conducted by a consultant with expertise in electric utility inclement weather preparation, outage restoration and response management in order to analyze the effectiveness of New Jersey's four (4) EDCs' responses to significant service interruptions caused by Irene and the snow storm of October 29, 2011. The BPU specified that analysis should focus on the EDCs' actual effectiveness, specifically related to actions taken before, during, and on the days immediately following Irene and the October snow storm, and provide written protocols and procedures that are essential to the implementation of those measures.

Through a competitive bidding process, the BPU selected Emergency Preparedness Partnerships (EPP) to perform this analysis. EPP's team of eight experienced consultants began work in April 2012. In the course of its review EPP performed 110 interviews, and reviewed close to 800 data responses. EPP also consulted regularly with the BPU Division of Reliability and Security during the review. Each EDC appointed a coordinator to expedite the data request and interview process.

This report, *Performance Review of EDCs in 2011 Major Storms,* provides the results of EPP's analysis, including its observations regarding the actual effectiveness of New Jersey's four (4) EDC's preparation, response and restoration to Irene and the October snow storm, and EPP's recommendations to improve the identified areas of weakness of each EDC's existing inclement weather preparedness, delivery system resiliency and post-storm response policies and practices.

2.1 BACKGROUND

The Companies

Following is a brief overview about each of the EDCs under review.

Atlantic City Electric (ACE):

ACE is a subsidiary of Pepco Holdings, Inc. (PHI) which is an energy holding company operating in Delaware, the District of Columbia, Maryland and New Jersey. PHI subsidiaries that provide regulated electricity service include Potomac Electric Power Company (Pepco), Delmarva Power & Light Company (Delmarva Power) and Atlantic City Electric Company (ACE). ACE's service territory covers approximately 2,700 square miles in southern New Jersey and serves approximately 547,000 customers. ACE is headquartered in Mays Landing, New Jersey.

Jersey Central Power & Light (JCP&L):

JCP&L is a subsidiary of FirstEnergy, which is an energy holding company that includes the following EDCs: Jersey Central Power & Light, Met-Ed, Ohio Edison, Mon Power, Penelec, Penn Power, Potomac Edison, The Illuminating Company, Toledo Edison and West Penn Power. JCP&L distributes electricity to 1,087,395 customers in 13 counties in central and northern New Jersey. JCP&L operates 22,670 miles of distribution lines and 2,550-mile transmission system. JCP&L's headquarters are located in Morristown and Red Bank, New Jersey.

Public Service Electric and Gas (PSE&G):

PSE&G is a subsidiary of Public Service Enterprise Group (PSEG) which is a diversified energy holding company which also includes PSEG Power, PSEG Energy Holdings and PSEG Services Corporation. Its operations are primarily located in the Northeastern and Mid-Atlantic United States. PSE&G's total service territory covers approximately 2,600 square miles and serves 1.8 million gas customers and 2.2 million electric customers in more than 300 urban, suburban and rural communities, including New Jersey's six largest cities. The electric system service territory covers approximately 1,404 square miles. PSEG's corporate headquarters is in Newark, New Jersey.

Rockland Electric Company (RECO):

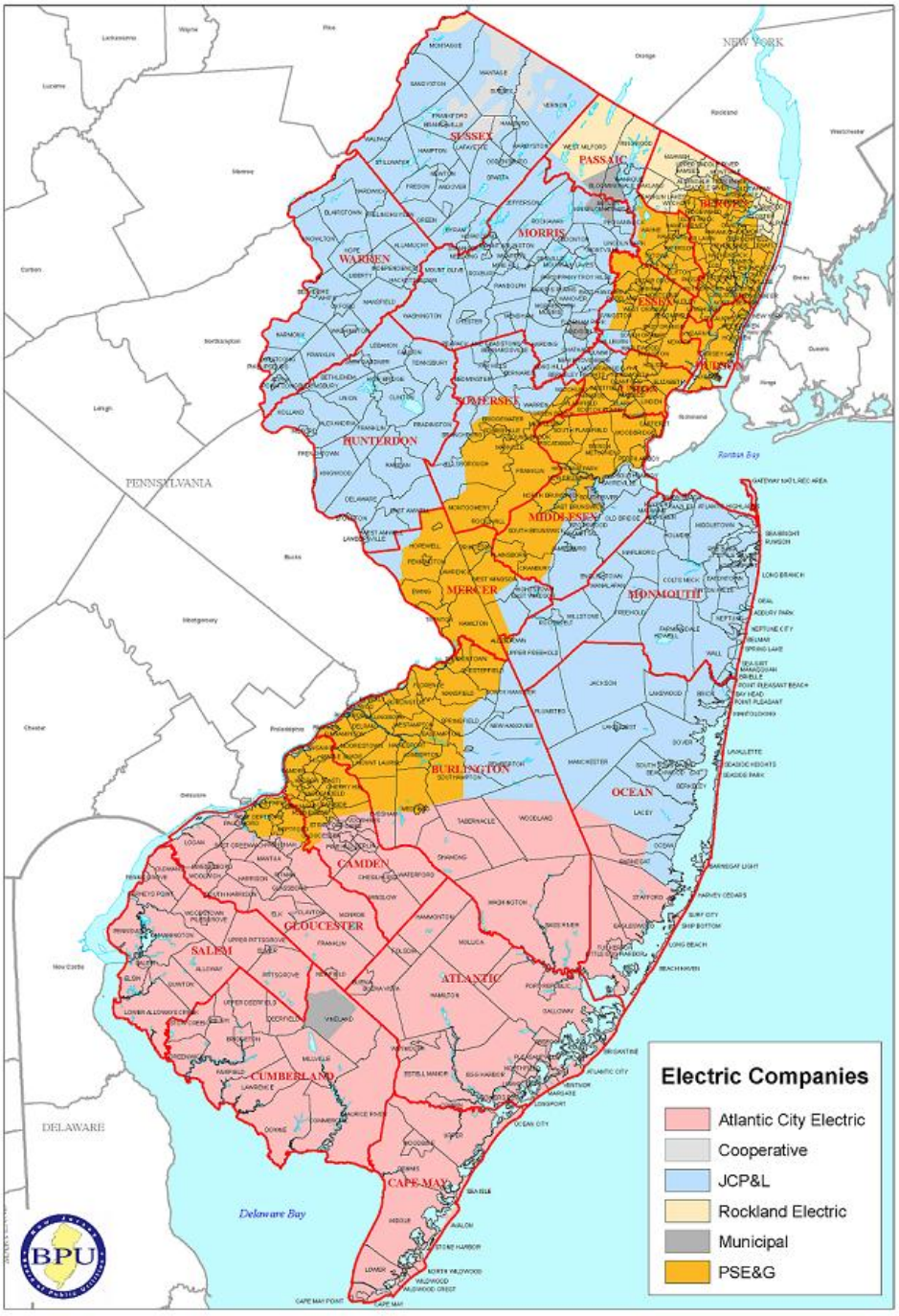
RECO is a utility subsidiary of Orange & Rockland Utilities, Inc., which is a wholly owned subsidiary of Consolidated Edison, Inc. Orange & Rockland Utilities is an electric and gas utility located in the northwestern suburbs of New York City. Orange & Rockland and its two utility subsidiaries, RECO and Pike County Light & Power Co., deliver energy to customers in seven counties in New York, northern New Jersey and the northeastern corner of Pennsylvania. Orange & Rockland's service territory encompasses a 1,350 square-mile region, principally residential in nature, with a broad

base of commercial, industrial, agricultural and recreational facilities. The company serves approximately 300,000 electric customers in all three states and approximately 128,000 natural gas customers in New York and Pennsylvania. It is headquartered in Pearl River, New York.

Key statistics for the EDCs include:

	ACE	JCP&L	PSE&G	RECO
# of New Jersey Electric Customers	547,000	1,087,395	2,200,000	72,431
# of New Jersey Gas Customers	No gas customers	No gas customers	1,800,000	No Gas customers
Total # of New Jersey Municipalities Served (all or part)	125	236	300	23
Total # of New Jersey Counties Served (all or part)	8	13	13	3
# of New Jersey Counties Served (all or part) – Electric Only	8	13	10	3
New Jersey Counties Served (all or part) – Electric Only	Atlantic Burlington Camden Cape May Cumberland Gloucester Ocean Salem	Burlington Essex Hunterdon Mercer Middlesex Monmouth Morris Ocean Passaic Somerset Sussex Union Warren	Bergen Camden Essex Gloucester Hudson Mercer Middlesex Passaic Somerset Union	Bergen Passaic Sussex
Circuit Miles – Distribution	10,352	22,670	19,620	853
Circuit Miles - Sub Transmission and Transmission	1,361	4,362	2,393	35
Electric Service Area (sq. mi.) in New Jersey	2,700	3,256	1,404	207
Contiguous	Yes	No	Yes	Yes

Service territories for the four EDCs:



2.2 THE STORMS

Hurricane Irene

On August 28, 2011, Tropical Storm Irene made landfall in New Jersey and caused the largest number of electrical outages recorded in New Jersey's history. Statewide, 1.9 million electric customers were affected. All four of the State's Electric Distribution Companies' (EDCs), Atlantic City Electric (ACE), Jersey Central Power & Light (JCP&L), Public Service Electric and Gas (PSE&G), and Rockland Electric (RECO), experienced significant storm-related challenges.

Irene made landfall near Little Egg Harbor on the southern New Jersey shore. Further north, severe river flooding occurred due to record rainfall, with a statewide rainfall maximum of 11.27 inches (286 mm) in Freehold. Eleven rivers reached record levels, and a week after the storm, all rivers in the State remained at "moderate flooding level". The flooding affected roads, including the heavily used Interstate 287 and the Garden State Parkway. Along the Hudson River, floodwaters affected parts of Jersey City and Hoboken. The north tube of the Holland Tunnel was briefly closed. Flooding affected the train lines in the Trenton area. The storm killed seven people in the State, and damage was estimated at around $1 billion. The most severe impact of Irene in the northeastern United States was catastrophic inland flooding in New Jersey, Massachusetts and Vermont.[11]

In addition to major flooding, the combination of already heavily saturated ground from a wet summer, and heavy wind gusts made New Jersey vegetation especially vulnerable to wind damage. Fallen trees blocked vital roads, including portions of Interstate 287 and U.S. Route 22. The wind also caused structural damage to numerous homes.

In preparation for the hurricane, on August 25, Governor Chris Christie declared a state of emergency. Consistent with the State's disaster plan, the State's Office of Emergency Management was closely monitoring the impending storm and the New Jersey State Police Regional Operations and Intelligence Center (ROIC) had been made fully functional, with staff assigned from all the partnering agencies. In the days prior to the hurricane's arrival, Governor Christie embarked on a media campaign to convince residents and vacationers to evacuate the State's coastal communities and to stress the importance of planning and preparation for the massive storm.

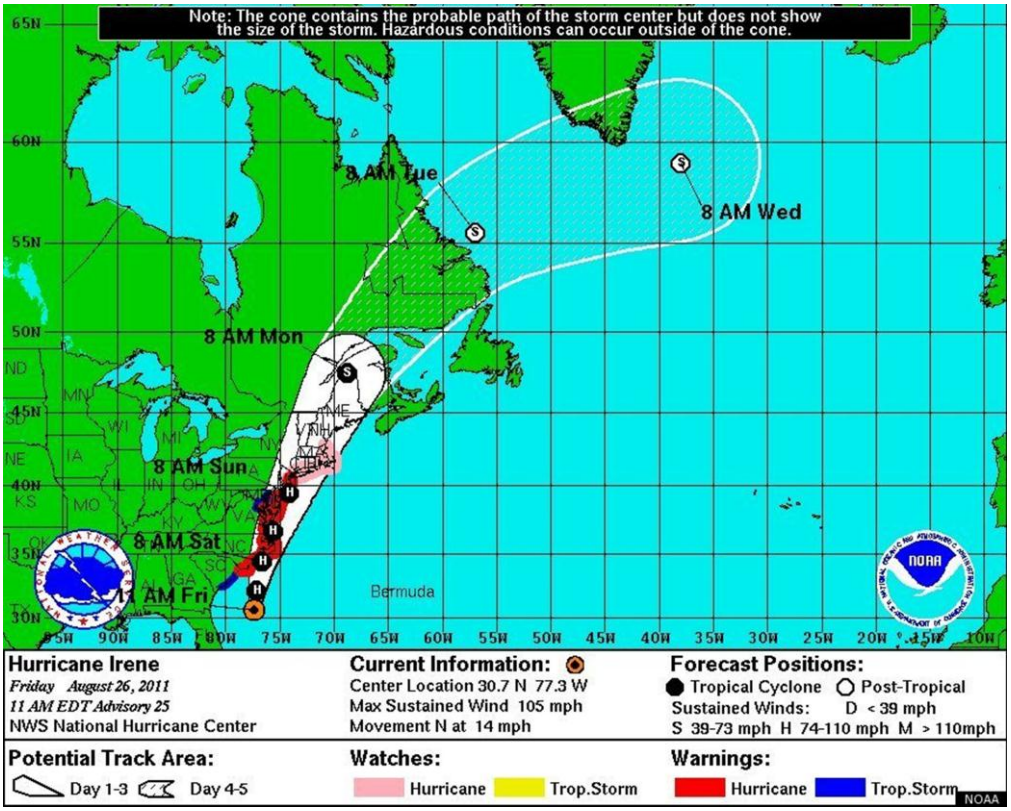
In the aftermath of the storm, on August 31, a federal disaster declaration was made for the entire State of New Jersey. The massive scope of the storm led to extensive efforts that restored all customers' service by September 5.

On August 31, President Barack Obama declared the State a disaster area, including all 21 counties.

[11] NWS Tropical Cyclone Report AL092011

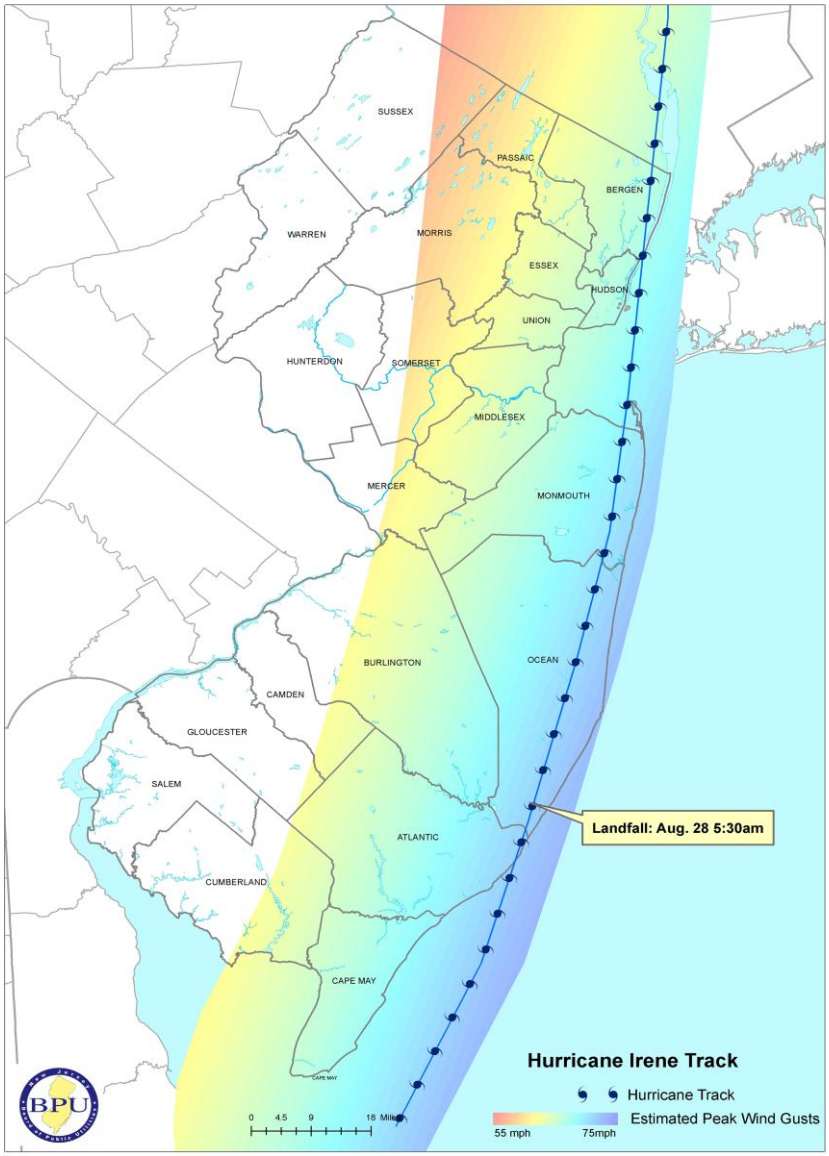
In response to Irene, the following states also declared a State of Emergency: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, and Virginia.[12]

Hurricane Irene's path along the Eastern United States.[13]



[12] U.S. Department of Energy Office of Energy Delivery and Reliability Hurricane Situation Report #15, September 3, 2011 (10:00 AM EDT)
[13] www.nhc.noaa.gov/graphics

Irene's path over New Jersey.



IRENE OBSERVED CONDITIONS						
Extracted from NWS Tropical Cyclone Report AL092011, Table 3						
	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Total Rainfall
Location	Date/Time	Pressure (mb)	Date/Time	Sustained Wind (mph)	Wind Gust (mph)	Inches
Millville, NJ	8/28 @ 8:54 am	970.4	8/28 @ 2:54 am	31.1	49.5	6.31
Trenton, NJ	8/28 @ 11:53 am	972.2	8/28 @ 3:26 am	31.1	51.8	5.74
Atlantic City, NJ	8/28 @ 09:36 am	965.1	8/28 @ 6:12 pm	40.3	57.5	5.88
Newark, NJ	8/28 @ 12:18 pm	967.5	8/28 @ 7:54 pm	44.9	61.0	8.92
Teterboro, NJ	8/28 @ 12:46 pm	966.8	8/28 @ 8:07 pm	34.5	48.3	8.22

Irene outage statistics.

IRENE				
	ACE	JCP&L	PSE&G	RECO
Total Electric Customers	547,000	1,087,395	2,200,000	72,431
Number of Customers Out of Service	273,898	780,000	872,492	27,220
% of Total Customers Out of Service	52%	71%	40%	38%
Peak # Customers Out of Service	-	530,824	415,814	-
% of Customers Out at Peak*	-	48%	19%	-
Days to Restore	6	9	8	7
Note: Peak # Customers Out of Service is the net value (Total Cumulative Interrupted less Cumulative Restored)				
*Not all EDC track this value.				
Source: BPU Hurricane Irene Report.				

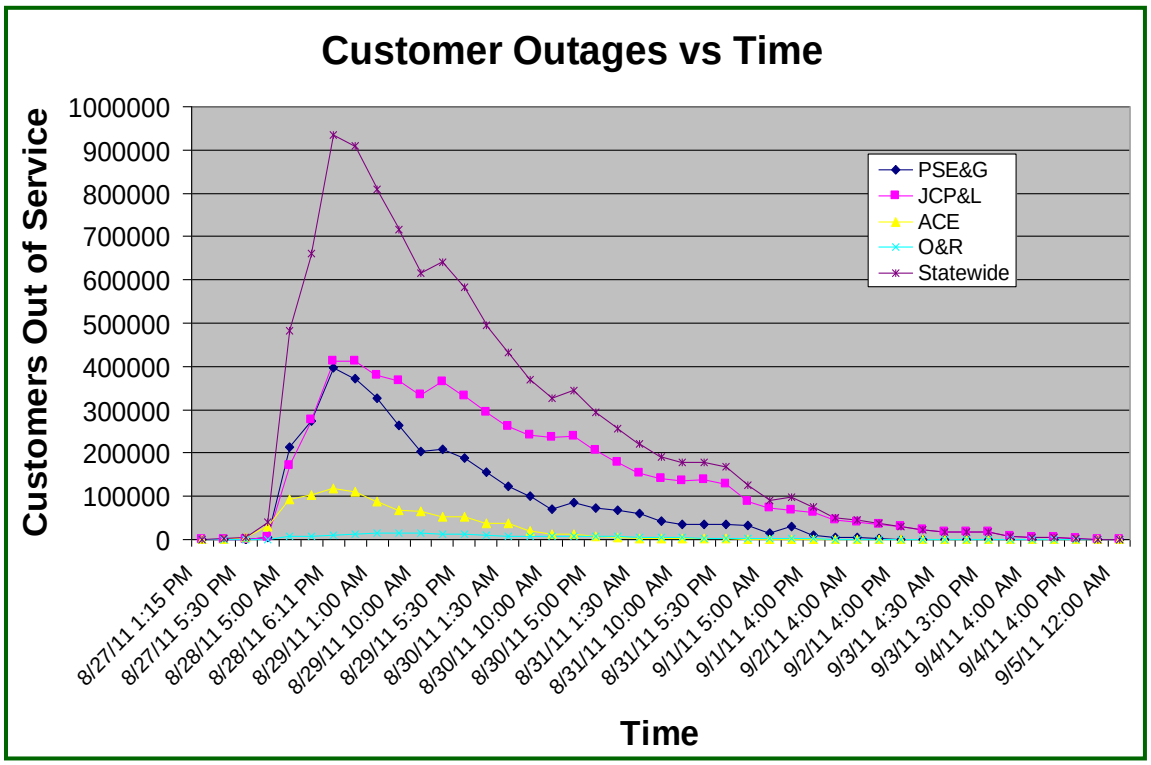
Irene damage to EDCs.

HURRICANE IRENE				
	ACE	JCP&L	PSE&G	RECO ***
Spans of Wire (ft.)	136,661	248,160	NR	5,714
Poles	59	466	599	27
Cross Arms	911	1,077	NR	N/A
Transformers	107	465	383	58
69-26 kV	N/A	N/A	78	N/A
13-4 Kv	N/A	N/A	1,384	N/A
Reclosers	1	5	3	0
Switches	12	88	240	0
Regulators	2	0	0	0
Secondary	N/A	280	519	N/A
Service	858	1,520	2,223	90
Tree Related	1,463	5,336	2,314	1,425
Equipment	23	4,412	N/A	30
Customer Problem	223	14	N/A	1
Unknown	N/A	1,136	N/A	N/A
Total Trouble Locations*	**2,588**	**31,900**	**7,500**	**974**
Note: N/A = Not Applicable; the EDC does not report damage in this category.				
* Total Trouble Locations include outage and non-outage calls and do not represent the sum of the total above				
*** Much of the data provided by RECO is for the entire O&R system. RECO is estimated based on a proportion of 24% for Irene.				

Restoration progress for each EDC. *Note: This information was extrapolated utilizing the BPU Hurricane Irene Report graph and stated total customers out for each utility. Blank boxes indicate that restoration was complete.*

IRENE								
	ACE	%	JCP&L	%	PSE&G	%	RECO	%
28-Aug-11	216,379	79%	375,000	48%	278,583	32%	-	
29-Aug-11	235,552	86%	405,000	52%	572,000	66%	6,158	23%
30-Aug-11	262,942	96%	540,000	69%	713,000	82%	16,288	60%
31-Aug-11	268,420	98%	640,000	82%	759,000	87%	20,109	74%
1-Sept-11	271,159	99%	705,000	90%	829,000	95%	24,543	90%
2-Sept-11	273,898	100%	755,000	97%	863,000	99%	26,648	98%
3-Sept-11	-	-	765,000	98%	868,947	99%	27,177	100%
4-Sept-11	-	-	775,000	99%	872,492	100%	27,220	100%
5-Sept-11	-	-	780,000	100%	-	-	-	-

Customer outages versus time. *Source: BPU Hurricane Irene Report.*



October Snow Storm

On Saturday, October 29, 2011 a severe snow storm hit New Jersey. The snowfall amounts ranged between 6 to 12 inches, breaking previous October records. The combined factors of unusually heavy, wet snow, trees still with leaves, and high winds caused an extremely large number of downed trees, tree limbs, branches, and power lines. Although the majority of damage was concentrated in northern New Jersey, this storm caused more individual incidents of damage to New Jersey's electric infrastructure than Irene. As a result, statewide the storm impacted approximately 1,031,000 customers.

Late Friday night, October 28, 2011, an area of low pressure moved from the South Carolina coastal plain into the western Atlantic Ocean. The low pushed up the coast late Friday night into Saturday morning. The low began to rapidly strengthen late Saturday morning when it was east of the Delmarva coast and continued to strengthen as it passed south of Long Island Saturday night. With water temperatures in the lower 60s, much of Long Island received mainly rainfall.

However, heavy wet snow blanketed colder areas north and west of New York City. The heaviest snowfall fell along a corridor from northeast New Jersey into central and western New England. In addition to the heavy rain and snow, strong winds buffeted the coastline. In fact, wind gusts of up to 63 mph occurred across Suffolk County, New York late Saturday afternoon and evening as the low passed offshore.

Thousands of people across New Jersey, southern New York and Connecticut lost power as trees and limbs with foliage fell and damaged power lines.[14]

October snow storm statistics.

OCTOBER SNOW STORM				
	ACE	JCP&L	PSE&G	RECO
Total Electric Customers	547,000	1,087,395	2,200,000	72,431
Number of Customers Out of Service	Not impacted	443,334	636,898	35,000
% of Total Customers of Service	Not impacted	39%	29%	49%
Peak # Customers Out of Service	Not impacted	272,000	336,503	28,000
% of Customers Out at Peak[15]	Not impacted	25%	15%	39%
Days to Restore	Not impacted	10	9	8
Note: Peak # Customers Out of Service is the net value (Total Cumulative Interrupted less Cumulative Restored)				

[14] http://www.erh.noaa.gov/okx/StormEvents/10292011/index
[15] Not all EDC track this value or can provide the data to establish this value

EDC damage during the snow storm.

OCTOBER SNOW STORM				
	ACE **	JCP&L	PSE&G	RECO ***
Spans of Wire (ft.)	-	720,000	N/A	5,014
Poles	-	612	298	34
Cross Arms	-	2,400	N/A	NR
Transformers	-	300	274	35
69-26 kV	-	N/A	66	N/A
13-4 Kv	-	N/A	1,340	N/A
Reclosers	-	1	0	N/A
Switches	-	13	303	N/A
Regulators	-	N/A	0	N/A
Secondary	-	423	541	N/A
Service	-	2,192	16,174	183
Tree Related	-	4,128	12,041	3182
Equipment Failure	-	898	N/A	26
Customer Problem	-	13	N/A	0
Unknown	-	1,349	N/A	N/A
Total Trouble Locations*	**-**	**31,568**	**30,734**	**2,709**
Note: N/A = Not Applicable; the EDC does not report damage in this category.				
* Total Trouble Locations include outage and non-outage calls and do not Represent the sum of the total above.				
** ACE was not impacted by this event.				
*** Much of the data provided by RECO is for the entire O&R system. RECO is estimated based on a proportion 31% for the snow storm.				

Restoration progress for each EDC.

Note: this information has been extrapolated utilizing the stated total customers out for each utility. The snow storm did not impact ACE. The blank boxes indicate that restoration was complete.

OCTOBER SNOW STORM								
	ACE*	%	JCP&L	%	PSE&G	%	RECO	%
27-Oct-11	-	-	-	-	-	-	401	1%
28-Oct-11	-	-	-	-	-	-	3,997	11%
29-Oct-11	-	-	139,344	31%	142,235	23%	13,082	38%
30-Oct-11	-	-	173,334	39%	328,000	52%	16,767	48%
31-Oct-11	-	-	233,334	53%	450,400	71%	23,748	68%
1-Nov-11	-	-	253,334	57%	523,400	82%	32,164	92%
2-Nov-11	-	-	343,334	77%	563,700	89%	34,667	100%
3-Nov-11	-	-	393,334	89%	590,100	93%	34,824	100%
4-Nov-11	-	-	428,334	97%	615,200	97%	-	-
5-Nov-11	-	-	433,334	98%	629,200	99%	-	-
6-Nov-11	-	-	441,334	99%	636,898	100%	-	-
7-Nov-11	-	-	443,334	100%	-	-	-	-

2.3 PROJECT SCOPE

The BPU, in its Request for Qualifications (RFQ), defined the scope of this project was to conduct an evaluation of the EDCs' current emergency response, restoration, and communications protocols/ practices to determine the magnitude of financial, social and health related issues caused by electric outages due to Irene and the October snow storm.

The RFQ specified five basic elements:

- Pre-Storm Preparedness
- Intra-Storm Delivery System Resiliency
- Post Storm Recovery Efforts
- Communications
- Prior Documentation and Reports

The RFP broke down these elements into more granular review areas, as follows:

Part 1 - Pre-Storm Preparedness

Review and evaluation of the storm restoration process and general preparedness

1. Planning
2. Exercises / Drills
3. Training
4. Post Event Processes

Review and evaluation of pre-storm forecasting and contingency preparations

5. Activation
6. Weather Monitoring / Forecasting
7. Pre-Event Communications
8. Command and Control
9. Mutual Assistance / External Resources Procurement Process

Part 2 - Intra-Storm Delivery System Resiliency

10. Substation Flooding
11. Vegetation Management
12. Circuit Outages

Part 3 - Post Storm Recovery Efforts

13. Damage Assessment
14. Responder Systems, Tools and Job Aids
15. Estimated Restoration Times
16. Crew / Work Management / Workforce Levels
17. Follow-Up Work (Post-Event)
18. Organizational Structure, Roles and Responsibilities
19. Logistics and Field Support
20. Storm Restoration Process Metrics
21. Safety

Part 4 - Communications

22. Customer Service / Call Center
23. External Communications
24. Internal Communications
25. Benchmarking / External Analysis

Part 5 – BPU

26. Prior Orders
27. Enforcement Authority

Part 6 – Personal Preparedness

28. Personal Preparedness

The objective of this report, the *Performance Review of EDCs in 2011 Major Storms,* is to provide a comparison (where appropriate) of the four EDCs and identify opportunities for improvement in inclement weather preparedness, delivery system resiliency, post-storm response policies and practices, and communications in an effort to minimize the impact of future severe weather events. The report describes the events and restoration activities associated with both storms, as well as recommendations for improvement.

EDCs provided information as to numbers of personnel, customers, material and in response to a specific request by the BPU or its consultant. The authors and reviewers have made every effort to ensure that these numbers are reflected as accurately as possible. However, report author EPP believes that the data contained are sufficiently accurate to support the report's observations and recommendations.

Recognizing that the entire community is substantially affected by lengthy outage restoration efforts, the BPU record, considered part of the investigation, contained significant input from numerous stakeholders. The BPU held meetings with elected officials and emergency management personnel in the various service territories to discuss their assessments of the EDCs' preparation and restoration performance relative to Hurricane Irene. The BPU also received letters, calls, and emails, which were made part of the record and are considered part of the investigation. This report reflects an assessment of the BPU Hurricane Irene Report, and considers input received at the six public hearings held by the BPU.

In some cases, the four EDCs use different terms to describe the same function, and every effort has been made to explain the difference in terminology in the corresponding report section. The following terms have been used interchangeably to describe response to a weather related storm restoration event: incident, event, emergency, storm restoration.

EPP has issued global recommendations applicable to each of the four EDCs in addition to individual recommendations made for each EDC.

2.4 ABOUT THE AUTHOR

EMERGENCY PREPAREDNESS PARTNERSHIPS (EPP) is a Hammonton, New Jersey, based company that assists US-based utilities prepare for and respond to operational challenges posed by weather and other emergencies. The EPP team is composed of experienced consultants with significant expertise in planning for, responding to and analyzing the performance of utility response to emergency situations.

Since January of 2001, Emergency Preparedness Partnerships (EPP) has been helping utility companies prepare and respond to emergencies through plan review, audit and development; training and plan implementation; drills and exercises; standard operating procedure development;

crisis communications plans; government liaison programs; vulnerability assessments and physical security assessments.

EPP team members have performed restoration reviews or provided regulatory support to electric utilities in California, Connecticut, Massachusetts, Missouri, New York, Texas, Washington and Jamaica West Indies; support and/or testimony to regulatory commissions in Connecticut, Delaware, District of Columbia, Georgia, Ohio, and Oregon; and support and/or testimony to customer advocates in Maine, Maryland, Michigan and Pennsylvania.

2.5 APPROACH

EPP conducted the project utilizing the following principal activities of:

- Information gathering through:
  - Review of BPU Hurricane Irene Report
  - Review of public meeting transcripts
  - Review of media coverage for each storm
  - Data requests made to each EDC
  - Interviews of key EDC personnel
- Review, evaluation and analysis of the information relevant to the assessment of each area
- Fact-checking by reference to the original source data or interview
- Development of observations to determine existing conditions for comparison purposes and identify opportunities for improvement
- Development of recommendations designed to take advantage of opportunities for improvement or resolve an open issue

3.0 OBSERVATIONS AND RECOMMENDATIONS

EPP analyzed the four EDCs in five key review areas; pre-storm preparedness, intra-storm delivery system resiliency, post storm recovery efforts and communication. These were further subdivided into more granular categories.

Each section of this report begins with a general explanation of the topic area, a discussion of storm relevance and any related best practices. This is followed by observations and recommendations, both for all EDC and separately by organization.

In areas where an observation would apply equally to all EDCs, it is included in the section called Global Observations. Likewise, if there are recommendations that apply to all EDCs, those are listed under Global Recommendations. If observations and recommendations apply to a specific EDC, it is listed under the respective EDC.

A. PRE-STORM PREPAREDNESS

As described in the RFQ:

RFQ SECTION	RFQ REQUIREMENT
3.3.1	PRE-STORM PREPAREDNESS The contractor shall review, analyze, and critique pre-storm forecasting and contingency preparations made prior to the impact of Hurricane Irene *(and the October snow storm)* and determine what corrective measures can be taken.

For this section, we have divided the review into two distinct sections:

- Part 1 covers the EDC's overall level of preparedness, focusing on key activities that ensure a continuous state of readiness. In EPP's experience, organizations that perform most effectively during emergency events are those that have an effective plan, clearly defined roles and responsibilities, and advance opportunities to practice, evaluate performance and adapt through additional planning and training.
- Part 2 reviews key processes and activities that also contribute to readiness, but also include specifics related to the two storms under review.

3.1 PLANNING

A utility's successful response to outage emergencies begins with thoughtful planning, long before a storm appears on the radar screen. Effective planning provides a conceptual roadmap, making it possible for hundreds or thousands of employees from dozens of different functions, contractors, and crews from other EDC's to be merged into a single coordinated effort. Emergency Restoration Plans define and align roles, responsibilities, human resources, standard operating procedures, information technology, data capture, communications systems and more.

As weather conditions and EDC organizations are never static, planning must be a perpetual process, constantly updating internal and external information, and adapting plans with lessons learned, best practices and technological advances. Planning should be flexible so that innovative responses to changing conditions can be developed and implemented when appropriate.

In preparation for an event that is forecasted in advance, such as Irene, a plan provides guidance regarding the pre-event preparation. For an event with less advance warning, like the October snow storm, a plan supports the rapid activation of resources once the magnitude of the event is determined.

Global Observation:

All the EDCs have emergency management plans. However, the format, content and level of detail differ. Some companies have more comprehensive processes and procedures documented for the various aspects of storm restoration than others.

Plans are developed to provide a roadmap for personnel; describing roles, responsibilities and standard operating procedures. As a best practice, all EDCs should conform to a standard of content, and ensure that the plans are reviewed and updated annually at a minimum.

Global Recommendation:

1-G-1 Each EDC should be required to have plans that conform to a standard of content to ensure that key areas of an effective emergency plan are described sufficiently in the plan. The plans should include the following descriptions: emergency organization; emergency classifications; annual training and exercise program; on-going readiness initiatives; pre-event preparatory measures; procedures for mobilizing personnel, materials and equipment; communications procedures; process for acquiring external resources; process for acquiring internal support services; and linkages to corporate plans, if applicable.

1-G-2 Each EDC's plan should be designed to manage a storm of such magnitude that a minimum of 75% of the customers will be out of service at some point during the planned restoration.

Atlantic City Electric

Observations:

The ACE "Incident Response Plan" provides a systematic and efficient process to respond to incidents and manage the restoration of electric service. The plan establishes guidelines to streamline communication and coordination for extensive emergency response activities. The plan describes the Incident Severity Classifications, job descriptions, job checklists, process flows and links to other corporate plans (i.e., Crisis Management, Customer Communications, Security, Logistics, etc.). The ACE Incident Response Plan falls under the PHI Crisis Management Plan.

The plan is organized, comprehensive, well written and easy to follow. ACE maintains a rigorous schedule for plan review and parent company PHI's Emergency Preparedness Organization maintains and updates the plan. Function-specific appendices supplement and support the overall plan.

In an appendix section of the Incident Response Plan, the organization charts show positions and lists the names of employees who will fill those roles. While that is effective at ensuring personnel know where they fit within the organizational structure, it is something that requires frequent updating as personnel shift around the organization.

Recommendations:

1-ACE-1 ACE should modify the organization charts (in the Incident Response Plan appendix) so that they show only position titles and not names. Maintain the organization charts with positions and employee names outside of the plan document where frequent updating is easier.

Jersey Central Power & Light

Observations:

JCP&L utilizes the E-Plan which covers the high level process, and roles and responsibilities that are consistent across the FirstEnergy. The E-Plan includes information specific to JCP&L, including organizational charts and process specific details. FirstEnergy believes that effective management

of a restoration effort depends on all personnel having a clear understanding of the basic strategies and objectives, which may require expansion of responsibilities outside of normal activities.

The plans are housed electronically in Lotus Notes, and a specific person within the FirstEnergy organization updates the document. Plan sections are reviewed annually. The use of Lotus Notes allows for documentation of responsibilities and updates plus date stamps changes. While Lotus Notes is useful for plan maintenance, the flow of the plan is disjointed when viewed by itself without integration of the live links on the company network.

The JCP&L E-Plan includes organizational charts and position descriptions for all functions. It also includes a list of all employees along with their primary and secondary storm roles. During the interviews, some personnel brought their own checklists or job aids that they had developed; these do not appear to be part of the documented plan.

Much of the Construction Restoration Lead's activities are not documented in E-Plan. Fortunately the personnel filling those roles have a significant amount of institutional knowledge.

Personnel with institutional knowledge may not need fully documented plans during an average event, but during events like Irene and the snow storm, use of the plan ensures that no critical details are overlooked. Additional personnel brought in to assist during major storms will need the plan for them to be effective. Individually developed checklists and job aids indicate that there is a gap in the plan documents, and these should be standardized and included in the plan.

Recommendation:

1-JCP&L-1 JCP&L should ensure that individually developed job aids and checklists are included in the E-Plan so that all E-Plan users can benefit from them. They should also ensure that the Construction Restoration Lead's plan is included in the JCP&L E-Plan.

Public Service Electric and Gas

Observations:

The PSE&G Electric Delivery Outage Management System Storm Disaster Manual (OMS Manual) describes the organization and procedures to be used to restore service to customers following interruptions caused by severe storms. The OMS Manual outlines the scope of operations and the detailed assignments necessary for an efficient, coordinated storm restoration effort. This manual also contains procedures to be used for mutual assistance mobilization and other support procedures. The OMS Manual, last updated in September, 2007, is one of five plans which fall under the responsibility of the Business Interruption Management Committee.

The OMS Manual includes forms, checklists, procedures, process flow charts and reference material for a variety of functions. While PSE&G does have a documented plan, some aspects of the OMS Manual do not represent how PSE&G actually operates during an event. The OMS Manual describes the use of the Incident Command System (ICS) model for the Distribution Emergency Recovery Center (DERC); unfortunately, in practice, PSE&G does not utilize the ICS.

Some key employees do not have a copy of the OMS Manual and a major department had a copy of an outdated storm plan. Transportation has its own plan, which is updated annually. The OMS Manual includes a chapter listing Vegetation Management Contractors along with contact information that is out of date.

PSE&G's planning for restoration suffers from "a failure to imagine the worst". The OMS Manual does not describe the process to engage second role staff (utility employees who fill a job during storm that differs from their day-to-day job) to assist with a major recovery effort, the circuit restoration process or executive management roles.

Plans need to be reviewed and updated annually, at a minimum. All personnel should be using the same version of the plan, and individually developed plans currently in use are indicative of a process that does not have centralized oversight of the emergency preparedness process. This is a major area that needs PSE&G's attention.

Recommendations:

1-PSE&G-1 PSE&G's OMS Manual should be revised to reflect the specific level of effort needed to deal with a significant restoration event. The roles and responsibilities defined in the OMS Manual should be followed.

1-PSE&G-2 PSE&G should maintain contact names and phone numbers in a document separate from the OMS Manual where frequent updating is easier.

1-PSE&G-3 PSE&G's OMS Manual should be reviewed, updated, and distributed annually.

Rockland Electric

Observations:

Orange & Rockland (O&R) has an Electric System Emergency Plan (ESEP or Plan) which is intended as a guide for restoring electric service caused by incidents beyond O&R's control. The plan is designed to encompass all of O&R, including RECO and Pike County Light & Power Co. The plan was designed to provide a systematic organized plan for the purpose of promoting a safe and efficient recovery from storm events. The plan provides O&R management with a trained, operationally ready work force and operational processes that can be employed to deal with the unique aspects of each storm. It is also based on understanding the magnitude of the problem and the expectations of the customers.

The plan is organized, comprehensive, well written and easy to follow. RECO follows a predefined schedule for review and maintenance of the plan. The plan is supplemented by twenty-nine function specific appendices that support the overall plan and cover each area of the Incident Command System organization. The overall plan is maintained and updated by the Emergency Management department, while primary organizations and function-specific sections are the responsibility of the functional coordinator. The plan was last updated in April 2012 and contact lists are reviewed and updated semi-annually.

Recommendations:

RECO should continue its current planning process.

3.2 EXERCISES / DRILLS

Exercises and drills test and evaluate the efficacy of emergency operations personnel training. They are essential for pressure-testing the effectiveness of emergency operations plans, as well as providing a means for continuously improving them. Well-designed exercises seek to discover gaps both in Emergency Response Plan (ERP) knowledge and overall resource and logistics readiness. Although storms will frequently test a restoration team's mettle, backup or second-role personnel are rarely activated. Exercises provide the practice people need to be able to respond and perform in major events. Even the lessons learned from a tabletop exercise can result in key changes to an ERP.

Most utilities conduct at least one exercise on an annual basis, with tabletop exercises being the most frequently used method. Exercises can be very focused on a specific functional area or corporate wide, and this is driven by the objectives that need to be achieved.

Organizations with a best practice in this area develop an exercise and drill program that describes the annual objectives that need to be achieved along with the corresponding type and quantity of exercises that will fulfill the objectives. Inclusion of external organizations in exercises is another area of best practice. This could include mutual assistance partners, regulatory agencies, city, State and local officials.

No two storm events are the same, so practicing the response to a storm like Irene or the snow storm during an exercise can provide valuable insight into the challenges that each of these storms would pose.

Global Observations:

There are no observations that apply equally to each EDC; all the observations are included in the EDC specific area below.

Global Recommendations:

There are no recommendations that apply equally to each EDC; all the observations are included in the EDC specific area below.

Atlantic City Electric

Observations:

ACE has a clearly defined process for conducting exercises and drills and ACE personnel understand the importance of participating in exercises and drills. The Emergency Preparedness organization is responsible for developing and conducting the exercises. Following each exercise a report is developed which includes a summary of the exercise as well as what went well and what needs to be improved. The post exercise reports are sufficiently detailed, describing participants, objectives, what occurred, and recommendations for improvement.

ACE personnel participate in the PHI corporate-wide (ACE, Delmarva Power, Pepco and PHI) yearly exercise. External agency personnel are invited to participate or observe the exercise. Depending on the scenario, the corporate-wide exercise can include incident response team personnel at all levels of the organization, from the PHI Crisis Management Team to the Districts (field resources). County OEM representatives are invited to attend the annual exercise.

ACE personnel also participate in additional function-specific exercises throughout the year, with a majority of the functions holding one additional exercise. Examples of these include:

- Quarterly Planning and Analysis drills
- Joint coastal table top drill
- District drills twice a year - part of summer / winter preparation
- PJM drills
- Call Center drills, 2-3 times throughout the year
- Corporate Communications refresher drills for all positions annually
- Human Resources - two exercises per year at a minimum
- External stakeholder group exercises (OEMs, etc.)

Recommendations:

2-ACE-1 ACE should continue its current exercise and drill program.

Jersey Central Power & Light

Observations:

JCP&L believes that minor storm events provide exercise and drill opportunities for employees to gain storm experience and master the storm process. Over the past three years, there have been on average over 30 minor storms per year and this prevalence of minor storm events in 2009, 2010 and

2011 was a deciding factor in not conducting an exercise or drill during these years. Corporate philosophy is that personnel practice enough during real events.

JCP&L conducts system specific exercises (Customer Care System, etc.) and a stress test within the Outage Management System (OMS). During the stress test, a large storm simulation is utilized to engage the companywide storm support organization (e.g., RDO, Hazard Dispatching, Service and Forestry Dispatch). Members of the storm teams are provided with an opportunity to work in OMS and gain experience with the process of using the system.

Aside from system exercises, the last exercise that JCP&L personnel participated in is unknown. According to Docket Number EX98101130, dated December 16, 1998, the BPU has required each electric utility to conduct at least one annual drill with participation of the local Office of Emergency Management, and this has not been done.

The mindset that participation during a storm event takes the place of an exercise is flawed. A well-planned exercise, just like a major weather event, taxes an EDC from both a resource and logistical perspective. The best time to identify training and plan deficiencies is during an exercise, not during an actual event.

Recommendations:

2-JCP&L-1 JCP&L should conduct an annual exercise. This exercise should include participation of personnel from all functions / departments with a restoration role, as well as external agency partners, in order to test the limits of the restoration plan and systems. Outside agencies such as BPU, OEM's, and County leaders should be invited to participate and observe the exercise.

2-JCP&L-2 JCP&L should participate in FirstEnergy corporate-wide exercises to ensure that roles and responsibilities are clearly understood.

2-JCP&L-3 JCP&L should prepare a written post exercise report, providing a summary of the exercise, objectives, who participated, what occurred, and recommendations for improvement.

Public Service Electric and Gas

Observations:

PSE&G has a clearly defined process for conducting drills. Over the past ten years PSE&G's drills focused on modest storm scenarios with between 50,000 and 83,000 customers out of service. The drill is scheduled for a weekday during business hours.

PSE&G does not use any predetermined criteria or metrics to evaluate the Annual Storm Restoration Drills. The drills were labeled a success when no major issues that would adversely affect the storm restoration process were encountered. Minor issues such as incorrect connections between computers and printers, office supply issues and other administrative issues were addressed as they arose.

PSE&G associates that are utilized frequently for storm restoration duties are familiar with the storm restoration process and their respective roles.

Leadership also views the drills as successful because storm work mimics day-to-day operations and their four divisions are run consistently. Other than including additional functional areas in the drill for the first time (communications, government affairs and vegetation management), the structure and format was the same for the 2012 drill. Any modifications to the process would be determined by DERC. There is a belief that the best drills are actual little events.

In reality, PSE&G's drills are too small in scope and do not stress test the restoration process. PSE&G has had actual storms that resulted in over 200,000 customers out of service, yet its drill plans do not include sufficient testing that would activate second role personnel or contractors.

PSE&G is of the mindset that every storm is equivalent in terms of how response should be handled and uses the same process during the annual Storm Restoration Drill, a major storm event or a minor storm. The concept that every storm should be handled the same – large or small – is flawed. A major event taxes the system from both a resource and logistical perspective.

Recommendations:

2-PSE&G-1 PSE&G should continue to conduct an annual exercise and enhance its annual exercise to deal with much larger scale events. Participation in this exercise should be expanded to include personnel from all functions / departments with a restoration role in order to test the limits of the restoration plan and systems. Lessons learned from real events should be incorporated in the exercise. Outside

agencies such as County leaders should be invited to participate and observe the exercise.

2-PSE&G-2 PSE&G's post-exercise reports should be expanded to include the role of the participants as well as recommendations for improvement.

Rockland Electric

Observations:

RECO has a clearly defined process for conducting exercises and drills. The O&R Plan describes the process and the annual requirements. The Emergency Management staff is responsible for coordinating and conducting the corporate exercise as well as functional exercises / drills as directed by the Storm Director. Past exercises have focused on significant level events such as hurricanes.

RECO participates in an annual corporate-wide exercise with Con Edison. In addition to a corporate-wide exercise, each individual functional section of the O&R Electric Emergency Response Plan specifies its own drill requirements. The Emergency Management staff is tasked with ensuring that these function specific exercises / drills are conducted according to plan.

The RECO exercise / drill program involves numerous organizations ranging from O&R operating departments involved directly in an emergency incident to corporate support organizations. The program also involves other agencies such as local OEM representatives, public safety, the American Red Cross, and regulatory agencies, dependent on the type of exercise or drill.

The exercises / drills are designed and planned to achieve goals that result in improving the Company's preparedness for emergencies. Exercise scenarios are derived from "lessons learned" during real events. Observers evaluate the performance of each participating organization. Debriefing sessions with key personnel are held immediately following emergency drills. Any major deficiencies observed are addressed, corrective action taken or plans modified as necessary. Exercise documentation can be improved.

Recommendations:

2-RE-1 RECO should prepare a written post exercise report, providing a summary of the exercise, objectives, who participated, what occurred, and recommendations for improvement.

3.3 TRAINING

The best restoration plan is no better than a restoration team's understanding of that plan, including its priorities, processes, organization and coordination. This understanding comes from training.

While many of the skills required during a modest size restoration are similar to the day-to-day skills of distribution system construction, operations and maintenance, those needs magnify greatly during a major restoration when less experienced personnel must become involved. A challenge for the training function is making sure that personnel who have restoration as a secondary responsibility are capable of filling those roles. Training must also take into account staffing changes, employee turnover, and competing job priorities to ensure resource readiness.

Organizations with best practices in this area have a process for ensuring that personnel are pre-identified for primary and secondary storm roles and then trained according to a pre-defined curriculum for that role. Training should include an overview of the entire storm restoration process and organization, as well as function-specific duties. Training is necessary to ensure that personnel understand the key restoration processes and their specific role within that framework and may include a combination of instructor-led classroom instruction, hands-on training, web-based courses, hands-on field instruction, eLearning modules, and participation in exercises / drills. Most utilities provide several days of training for storm restoration personnel, with differing amounts depending upon the role. Training records should be stored in a central location for easy retrieval.

During Irene and the snow storm, each EDC mobilized employees who do not normally have a role in the storm restoration organization. Advance training ensures that such personnel have the necessary skills to effectively perform their assigned role.

Global Observations:

There are no observations that apply equally to each EDC; all the observations are included in the EDC specific area below.

Global Recommendations:

There are no recommendations that apply equally to each EDC; all the observations are included in the EDC specific area below.

Atlantic City Electric

Observations:

Personnel are trained in their Incident Response Plan (IRP) roles on an annual basis. Depending upon their role, this may include attending classes, participating in exercises, and / or reviewing their IRP responsibilities along with the associated job aids. Where appropriate for the role, training includes a review of technology and systems used during incident response activities (e.g., OMS, Web Trouble, Advantex, C3, etc.). Additional IRP role training needs are identified as a result of debriefings, drills and post incident surveys.

When a new employee is hired and assigned an IRP role, the Emergency Preparedness Team contacts the new employee and their manager to review the training requirements of the role.

For many of the second role functions, the required training curriculum is specified and progress is tracked. Training curriculum, course list descriptions, training schedules and statistics is reviewed for the following:

- Damage Assessment and Wire Down Processes
- Standby, Patroller and Patroller Driver
- eLearning for Voice Mail Retrieval
- Crew Guides
- Call Center Training (Primary and Supplemental Role)
- OMS and Advantex

A majority of the formalized training efforts are related to Patrollers, Patroller Drivers, Crew Guides, Standby and call center functions. Many ACE personnel consider participation in annual exercises and drills as sufficient training. Exercises can be an appropriate form of training for certain storm restoration positions, as it helps to reinforce the interdependencies across functional areas and varying storm roles. Drills help to reinforce function-specific activities and allow personnel to practice tasks. A more formalized approach to training for all positions would ensure that employees with storm roles have the information they need to perform that role most effectively.

Recommendations:

3-ACE-1 ACE should develop training requirements (curriculum, frequency, initial, refresher, etc.) for all positions, not just technical or system training, within the storm restoration organization.

3-ACE-2 ACE's training should be developed and conducted in accordance with the requirements of the position.

3-ACE-3 ACE should develop a centralized repository for training records to ensure compliance with the training requirements of each position.

Jersey Central Power & Light

Observations:

JCP&L follows the FirstEnergy E-Plan which describes the annual training requirements. The training program focuses on nontraditional support roles utilized during emergency conditions and how employees contribute to the strategic restoration objectives. The training philosophy suggests that actual experience provides the most valuable training for the personnel involved in storm restoration procedures. The plan also states that planned training exercises provide the advantage of timeliness and uniformity. The plan describes the three training formats which are to be used:

- Classroom sessions to explain overall objectives and interrelationships
  - Conducted on an "as needed" basis
  - Driven by modifications resulting from storm reviews
  - Scheduled refresher sessions will be held if the review team feels it is warranted
- Simulated storm exercises for nontraditional support groups
- On-the-job training in actual emergency storm situations
  - Could include overstaffing a particular part of the operation during a real event if an employee needs experience

The same personnel who are responsible for updating the plan section have the responsibility for tracking the training status of all personnel involved in storm related activities. Training status is normally reviewed as part of process improvement feedback reviews and is determined from records of the past year's training sessions plus documentation of successful "on-the job" use of restoration techniques in actual storm situations. Training records for personnel attending the formalized courses are documented in the SAP system. There are no records for on-the-job training.

The majority of formalized training is technical or system-related in nature. Training session descriptions, participant materials and attendee lists are reviewed for the following topic areas:

- PowerOn Core
- PowerOn Remote Dispatch (PORD) Initial and Refresher
- Hazard Responder Reference Guide
- Hazard Responder Guidelines
- Hazard Findings Form and Diagram
- Hazard Responder Initial Training Course
- Hazard Responder Refresher Training Course
- Public Protector Initial Training Course

- Public Protector Refresher Training Course
- Communication Liaison Training
- Service Restoration Initial Training
- Service Restoration Refresher Training
- PORD Dispatcher Storm Aid
- PORD Dispatcher Storm Aid Storyboard
- Single Phase Service Restoration Initial Training
- Single Phase Service Restoration Refresher Training
- Storm Analyst and Job Aid

FirstEnergy and JCP&L have a significant number of function-specific training programs and modules and these are updated on a regular basis. The majority of the modules are technical in nature, and do not address the need to understand cross-functional interdependencies. The plan describes the importance of simulated storm exercises and on-the-job training as additional important areas of focus, however, no exercises were conducted and on-the-job training is not tracked. A more formalized approach to training for all positions is required to ensure that employees with storm roles have the information they needed to perform effectively.

Recommendations:

3-JCP&L-1 JCP&L should revamp its training program to include opportunities to train personnel on the interdependencies between functional areas and storm roles. This should be accomplished during include exercises and drills.

3-JCP&L-2 JCP&L should develop training requirements (curriculum, frequency, initial, refresher, etc.) for all positions (not just technical or system training) within the storm restoration organization.

3-JCP&L-3 JCP&L should track on-the-job training participation.

Public Service Electric and Gas

Observations:

The OMS Manual states that advance training of personnel is one of the most, if not the most important, aspect of the entire storm restoration procedure; and that there is no time for training once a storm is imminent or has arrived. The plan provides a detailed description of the annual training requirements for a number of functions, and these are summarized below.

At the Division level, the Manager is responsible to conduct annual training sessions for all personnel involved in the storm restoration process. This annual training would include the following components:

- Review of every job function
- A drill
- Review of assignments, including:
  - Data gathering
  - Record keeping
  - Severity appraisal
- Check of pre-positioned material and supplies
- Communications facilities

Annual training is also required for Electric Distribution Systems General Office personnel who may be assigned to a Division to provide assistance in restoration, Lookup duties or as guides for foreign crews. These personnel receive training on Lookup and reporting / records conducted by the Distribution System Operations Manager, who will also ensure attendance.

General Office personnel involved in DERC will also attend annual training to review the various job responsibilities with an emphasis on internal / external communications, data gathering and report preparation. The Distribution System Operations Manager has the responsibility to organize and schedule this training. During the interview process, it was noted the Distribution System Operations Manager is not a current title.

Gas Distribution Personnel are expected to receive annual Storm Restoration Training provided by the Division, in accordance with the latest instructions.

The OMS Manual also states that supervisory personnel involved with storm restoration work from the Customer Services Department should attend annual refresher meetings with Electric Distribution personnel, both at the General Office and field locations. A review of the importance of effective communication between Electric Distribution and Customer Services, along with their liaison responsibilities, should be reviewed. Information Technology Department personnel are also encouraged to attend the General Office annual training session. The Managers are responsible for coordinating these sessions for Customer Services personnel in their service area.

Despite the training requirements outlined in the OMS Manual, PSE&G had to arrange for just-in-time and on-the-job training for a number of required skills such as damage assessment (Lookup), wires down and support at the OEM. County OEM staffing support was required around-the-clock for an extended period of time in response to the two storm events, requiring additional personnel support to back fill shift schedules. Due to this increased demand for staffing at the County OEMs,

some of the assigned PSE&G representatives were not trained to use OMS. Following is a list of additional training needs that were expressed during the interview process:

- Backup Regional Public Affairs people needed OMS training
- Collectors need more Lookup training
- Large Customer Liaison has trained more people to use OMS to expand their skill set
- Hundreds from general office should have training, some done here (Division)

PSE&G references in its Plan the need for all employees to be prepared and to attend annual refresher training, however, there is little to no documentation to show that this is occurring with the exception of the Lookup process. The only training course materials that were received in response to a request was for Lookup Training, along with a copy of the attendance list of those that were trained in 2011. Lookup training is performed annually. A statement was made that a lot of time is spent on Lookup and wires down training, however, no records were received for wires down training.

Again, the PSE&G plan describes the importance of advance training, however little training is being conducted with the exception of the damage assessment process. Requests for training course materials received for any other storm functions received no response. A more formalized approach to training for all positions would ensure that everyone with a storm role has the information they need to perform that role most effectively.

Recommendations:

3-PSE&G-1 PSE&G should ensure readiness of personnel with a storm restoration role by expanding its training program to include opportunities to train personnel on the interdependencies between functional areas and storm roles. This could be accomplished during exercises and drills.

3-PSE&G-2 PSE&G should develop training requirements (curriculum, frequency, initial, refresher, etc.) for all positions (not just technical or system training) within the storm restoration organization.

3-PSE&G-3 PSE&G should develop a centralized repository for training records to ensure compliance with the training requirements of each position.

3-PSE&G-4 PSE&G should ensure that, when applicable, second role personnel attend refresher training prior to a pending event.

Rockland Electric

Observations:

RECO follows the O&R Electric System Emergency Plan (ESEP), wherein all departments are responsible for the readiness and training of staff with storm recovery duties. The O&R Emergency Management Department ensures that training requirements are communicated and that all newly assigned employees receive appropriate storm training. They also ensure that all employees receive annual training and that appropriate training records are maintained by the respective function coordinator.

Each functional section of the ESEP specifies the unique training requirements and the timeframe for completion for that particular function. An example of the Community Relations function includes:

- All newly assigned employees will receive initial training in the areas. This must be complete within 90 days of their assignment. Annual refresher training would cover these same topics as well as any procedural or policy changes pertinent to the function.
  - Call Handling for Customers on Life Support Equipment
  - Call Handling for Escalated Calls
  - Data Entry and Reporting Requirements
  - CIMS and OMS Navigation
  - Interaction with Emergency Management and Control Center Staff

For many of the second role functions, the required training curriculum is specified and progress is tracked. Training curriculum, course list descriptions, training schedules and statistics were reviewed for the following:

- 3rd Part Training
- Supplemental Training for House Service
- SRT Training
- Safety Sheet for Supplemental Crews
- Supplemental Groundmen OJT Checklist and Verification
- CCS Electric 101

The O&R Site Safety team conducts annual training, which must be completed in order to participate during a storm event. The Customer Assistance Center conducts supplemental workforce training once a year. The Special Response Team conducts annual training and maintains a log of who was trained. There was no quick refresher training conducted for second role personnel before Irene hit.

The training program for field positions is adequate. However, the modules are technical in nature, and do not address cross-functional interdependencies. Record keeping is done at a functional level, but there is not a centralized way to easily retrieve the records. O&R needs to adopt a more

formalized approach to training for all positions would ensure that everyone with a storm role has the information they need to perform that role effectively.

Recommendations:

3-RE-1 RECO should revamp its training program to include opportunities to train staff on the interdependencies between functional areas and storm roles. This could be accomplished during exercises and drills.

3-RE-2 RECO should develop a centralized repository for training records to ensure compliance with the training requirements of each position.

3-RE-3 RECO should ensure that, when applicable, second role staff attend refresher training prior to a pending event.

3.4 POST EVENT PROCESSES

No two storms or major outage events will ever be alike, but each can provide valuable lessons for improving restoration plans, processes and performance. The "text" for each lesson comes from the post event reviews, documented checklists, logs, data, and reports recorded during the event. Each EDC must evaluate and identify both the successful strategies and the opportunities for improvement. After-action reports provide valuable input to process changes, identify training needs, and prompt plan revisions. Application of successes and opportunities for improvement must be applied while the event is still fresh.

With such organizational self-awareness and commitment to continuous improvement, the storm debrief or after-action report provides valuable input to identify necessary process and procedure changes, identify training needs, and prompt plan revisions. Best practice organizations find that response activities improve when recommendations are incorporated into the plan and functional support procedures following an event.

Following Irene, organizations that conducted post event lessons-learned sessions and implemented improvements were able to incorporate changes that helped to improve performance during the snow storm.

Global Observation:

While many EDCs conduct internal post-event reviews, listening to input from external stakeholders often provides a viewpoint that is vastly different from internal perceptions of performance. For example, some EDCs solicit input from utilities that mutually assist them during major events, and this forms the basis for process improvements. The inclusion of external stakeholders in the post-event review process is an area where all New Jersey EDCs can improve.

Global Recommendations:

4-G-1 Each EDC should solicit input regarding performance from external stakeholders for any event that requires a Major Event Report.

Atlantic City Electric

Observations:

Post-event activities are defined in the ACE Incident Response Plan. The Plan clearly states that a Post-incident Evaluation leads to improvements in the Plan and that representatives from all business units should participate in these post-event sessions. Each area of the response

organization is responsible for conducting a post-incident performance review. The review evaluates response activities, discusses lessons learned, identifies observed deficiencies, and recommends improvement opportunities. Participants and representatives from each business unit of the response organization are invited.

Following Irene, all functions participated in a post-event lessons learned process with their respective teams as well as with the ACE Incident Management Team (IMT). Substation, Restoration, Planning & Analysis, and Damage Assessment participated in a regional lessons learned as well. The Customer Service organization solicited input from Call Center Representatives, Supervisors and Managers prior to their participation at the regional level meeting (Atlantic City Electric) to ensure that feedback was captured. Some groups also participated in a corporate wide (PHI) session. Results of our interviews clearly identified that these sessions were conducted and that recommendations from these sessions have already been implemented.

ACE personnel utilize checklists and activity logs for all positions. Activity logs provide a post-event record of key activities and decisions that were made during a shift and post-event analysis of the activity logs clearly identified areas of improvement.

Recommendations:

There are no recommendations for ACE beyond the global recommendation.

Jersey Central Power & Light

Observations:

A post-storm review meeting is scheduled with key members of the Regional Storm Team following a major event that requires significant reassignment of activities to nontraditional support functions, or any storm that exceeds a specific level. Representatives from the involved groups identify and distribute "lessons learned" to be used for improving the plan. As process changes are identified, modifications to the plan will be made as soon as practicable.

JCP&L typically does not create a separate written report of the post-storm critique or review. Instead, action items that require follow-up are identified during the post-storm review meetings and are included in the FirstEnergy Storm Summary & Post-Storm Agenda Topics report. This report is a comprehensive summary of the event, and a list of action items with assigned responsibility is included. A standard format is followed, covering details about the various storm positions and difficulties encountered. The list of personnel participating in this meeting is not described in the report.

FirstEnergy and JCP&L developed a list of Storm Action Items based on lessons learned identified in the wake of Irene and the October snow storm which outline key initiatives for 2012. The Escalated Call Process, which was developed during Irene, is still in draft form and not part of the formalized plan.

JCP&L personnel do not use logs to track key activities and decisions during an event. However, logs are an important part of the storm restoration process, allowing for improved record keeping which supports post storm documentation and reporting. Logs also aid during shift turnover to ensure that activities currently underway can be tracked and to avoid duplication of efforts by the next shift. JCP&L should utilize logs to improve their performance.

Recommendations:

4-JCP&L-1 JCP&L should implement the use of logs to track activities and decisions by storm team members.

4-JCP&L-2 JCP&L should establish a process to ensure timely completion and final approval of process improvement items noted during post storm debriefings / lessons learned.

4-JCP&L-3 JCP&L should identify one responsible party who will review all lessons learned, meet with the submitting department, finalize action items, assign responsibility for the action items, track action item completion and report progress to leadership.

Public Service Electric and Gas

Observations:

According to the OMS Manual, a lessons-learned will be conducted after each major storm event. "These are not conducted because things went wrong; rather, each major storm event provides an opportunity to identify ways of making the storm restoration process better."

PSE&G failed to conduct a lessons learned exercise after Irene and the snow storm on advice of counsel, however local level lessons learned were done. The value of a lessons learned exercise is demonstrated by the fact that individual departments conducted their own discussions, in spite of advice to the contrary. The BPU investigation was considered as an alternative to corporate lessons learned. When asked for copies of lessons learned from previous events, the response was that post-event critiques were not conducted for any storms in the past three years, so the failure to conduct a lessons learned is not unique to these two storms. Lessons learned should be conducted after every major event.

Storm logs are kept for storm events when DERC is open. We were unable to ascertain the use of checklists for the storms because they are not kept on file.

Recommendations:

4-PSE&G-1 PSE&G should perform a lessons learned after each major storm to find and reward innovative actions, understand training requirements, correct errors or omissions in the Plan, foster a culture of continuous improvement, and establish a timeframe when these post event reviews will be completed.

4-PSE&G-2 PSE&G should identify one responsible party who will review all lessons learned, meet with the submitting department, finalize action items, assign responsibility for the action items, track action item completion and report progress to leadership.

Rockland Electric

Observations:

According to the O&R Electric System Emergency Plan (ESEP), a post-storm critique will be held following a certain level of event to determine the effectiveness of the Plan and identify any process improvements. Members of the Command Staff, General Staff, Branch Directors and Functional Coordinators, or their representatives, will be invited to participate. In addition, after each Class 2 or 3 event, the Electric System Emergency Plan Response Scorecard will be utilized to determine the effectiveness of the plan implementation. In areas that didn't meet the plans requirements, corrective action will be identified and implemented.

In addition to reviewing the overall effectiveness of the implementation of the plan through the use of the Scorecard, the Quality Assurance group may also be utilized to perform individual functional coordinator audits. These audits will ensure that all functional coordinators are following their procedures, completing any required documentation and employing qualified trained staff.

Following the two storms under review, O&R undertook a major process review after its internal lessons learned was conducted and with input from external stakeholder meetings. A team of approximately 15 people working on identified process improvements, with the due dates for all the deliverables clearly understood. O&R has modified its storm level categories and updated functional guides that accompany the Plan. As improvements are finalized, personnel training and exercising follow.

O&R personnel do not use logs to track key activities and decisions during an event. Logs are an important part of the storm restoration process, allowing for improved record keeping which

supports post storm documentation and reporting. Logs also aid during shift turnover to ensure that activities currently underway can be tracked and to avoid duplication of efforts by the next shift. O&R should use logs.

Recommendations:

4-RE-1 RECO should implement the use of logs to track activities and decisions by storm team members.

4-RE-2 RECO's Emergency Management Department should review all the lessons learned, meet with the submitting department, finalize action items, assign responsibility for the action items, track action item completion and report progress to leadership.

3.5 WEATHER MONITORING / FORECASTING

Destructive weather conditions are the root cause of the vast majority of widespread and long duration outages. At the first indication of potentially damaging storm conditions, weather forecasting provides necessary information for the first decisions that must be made to adequately prepare for restoration. Unfortunately, in spite of impressive advances in meteorological technology, weather prediction is still an inexact science.

Gathering weather data from multiple sources is best practice for improving confidence in forecasts. Dialogue with the weather service and contact with outside agencies can provide added perspective. Participation in mutual assistance group conference calls can provide additional intelligence, as many times the weather may already be impacting the other member utilities.

A key part of utility situational awareness is awareness of the projected path and potential severity of a weather system. Irene was the type of event that provided plenty of advance notice – the primary variables were where the storm would hit and the intensity level. The snow storm forecast was not as well developed; hence it caught some off guard with the intensity of the event.

Global Observations:

All EDCs conform to the best practice of using multiple weather forecasts to monitor approaching weather systems.

Global Recommendations:

All the EDCs should continue to improve situational awareness in weather monitoring.

Atlantic City Electric

Observations:

ACE uses two different forecasting services. Both services provide near and long-term weather threat assessments, 24/7 consultation and conference calls, and severe weather alerts. One provider focuses on the development, tracking and forecasting of weather systems associated with the Atlantic Tropical Season, June 1 to November 30.

The tracking and forecasting reports are issued as daily "Morning Briefings" or storm-specific "Advisories" via email distribution to those with 24/7 monitoring (System Operations), key Regional Management (IMT Leaders) and senior supervisory personnel. Emergency Management is responsible for the email distribution. When tropical force winds are forecasted to hit the PHI

service territory, specific "Site Forecasts" that detail predicted wind onset, strength and duration are issued for Atlantic City, NJ; Ocean City, MD; and Wilmington, DE. In addition, intermediate advisories may be issued to accurately update the status of active storms. These email notifications allow ACE to proactively prepare for the impact of significant storms on the service territory. Upon receiving notification that a significant storm may impact the service area, a conference call is conducted by the ACE Incident Management Team (IMT).

In addition to the contract weather services, ACE also utilizes NOAA's National Weather Service and Tropical Weather Outlook resources. This weather information is also distributed to all user groups on a daily basis and whenever updates are received. This process was effective for the two storm events.

Recommendations:

There are no recommendations for ACE beyond the global recommendation.

Jersey Central Power & Light

Observations:

JCP&L utilizes the weather services of FirstEnergy's staff meteorologists. FirstEnergy Meteorological Services provides Energy Delivery (ED) strategic and tactical decision support services from its Meteorological Operations Center in Akron, Ohio. Services include:

- Advanced notice of atmospheric conditions that will cause power disruptions - wind, ice, snow, lightning, severe storms, solar activity
- Real time monitoring tools to track on-going weather events
- Data Interpretation

During large weather events, the meteorologists lead off ED pre-storm conference calls and supplement advanced notice email alerts with short video briefings. In addition, the System Control Center (SCC) and Regional Dispatching Offices (RDO) have continuous internal and external weather services available that provide advance information about approaching adverse weather conditions. The SCC and RDO constantly monitor the weather and share any information that may be useful.

Recommendations:

There are no recommendations for JCP&L beyond the global recommendation.

Public Service Electric and Gas

Observations:

PSE&G subscribes to two subscription based weather services. In addition, PSE&G utilizes several non-subscription weather services.

The Delivery Operations Support group receives, analyzes and distributes the weather updates to a defined distribution list of personnel; however this process is not documented in the OMS Manual.

PSE&G's weather monitoring provided long term input into potential restoration requirements in advance of Irene, however, due to the evolving nature of the snow storm forecast, PSE&G had approximately one day's warning.

Recommendations:

5-PSE&G-1 PSE&G should add a section describing the weather monitoring, analysis and dissemination process to the OMS Manual.

Rockland Electric

Observations:

RECO utilizes the services of two in-house meteorologists from its affiliate, Con Edison, plus other contract weather services. RECO also utilizes NOAA's National Weather Service and Tropical Weather Outlook resources. Electric Operations constantly monitors the weather and long-range forecasts. The Control Center Section Manager has the responsibility to monitor the weather forecasts, anticipate any potential impact to the system, and then advise the O&R Storm Director and O&R Emergency Management staff.

The Irene forecast was accurate and received well in advance of the storm. Due to the evolving nature of the snow storm forecast, RECO had less warning.

Recommendations:

There are no recommendations for RECO beyond the global recommendation.

3.6 ACTIVATION

Even with the best weather monitoring and forecasting, activation of restoration resources is still a judgment call, attempting to balance the potential for millions of dollars in expense against the need for continued service for thousands of customers. Some EDCs trigger activation by using multivariate decision criteria and predictive models, while others utilize institutional knowledge and past experience. For storms on distant horizons, pre-defined storm levels can help project potential damage and dictate the resources needed for restoration.

Advance communication of conditions to both internal and external stakeholders allows everyone involved to make sound decisions about preparing for the expected emergency. Use of pending event checklists ensure that needed resources will be in place ahead of the event.

Events that do not allow for pre-planning (earthquakes, major equipment failures, bad weather forecast, etc.), pose their own set of challenges. EDCs may need to contact personnel in the off-hours, and travel conditions may be an issue. Getting the full team in place and up-to-speed requires rapid decision making and an effective preparedness program.

During Irene, there was ample time to make many of the required preparations. One area where this was a problem was procurement of mutual assistance resources due to high demand along the East Coast and storm events in the Mid-West; this is discussed in more detail in Section 3. For the snow storm, there was limited time to pre-plan an activation strategy, but having this process described in the plan ensures that the EDC can scale up appropriately to meet the needs of the storm event.

Global Observation

While all the EDCs have activation criteria in its plans, they appear to rely on institutional knowledge to forecast potential storm damage. Alternatively, institutional knowledge combined with a predictive model can provide a better estimate of potential damage, allowing for a predetermination of resource levels. These models can be based on previous storm history, system design, customer density, topology, vegetation, and storm type.

Global Recommendation

6-G-1 Each EDC should develop an outage prediction model to anticipate the level of expected damage based upon a predicted storm intensity and path. Using this projected damage information, an estimate of the resources needed to respond should be developed for each of the storm restoration roles. Once an event is predicted, this information can be used to guide mobilization decisions.

Atlantic City Electric

Observations:

Mobilization of the storm organization can occur at the District, Region and Corporate level. The District locations manage the tactical operations associated with the event. The Region level provides direction and oversight at the ACE level, while corporate level support is handled at the PHI level.

The internal announcement of the approaching hurricane allowed for advanced outage and restoration preparation. Pending Incident Preparation Checklists were followed and signed-off that the appropriate portion of the list was completed (e.g., T minus 3 day portion). Any exception(s) were noted with the reason for the exception(s) and corrective actions being taken. Completion of these lists continued until the incident occurred.

For Irene, the District Incident Management Team (IMT) Leaders completed and signed the District Pending Incident Preparation List and sent it to the appropriate ACE Regional IMT Leader. The Regional IMT Leaders signed and sent the Regional Pending Incident Preparation List to the PHI IST Chief of Staff. All lists are sent electronically (fax or email) unless electronic communication is not available.

For Irene, all District IMTs as well as the ACE Regional IMT were activated. ACE had enough advance warning to activate all functions of its response plan. All areas were staged and ready for activation. Community leaders, State and local officials were updated about preparatory activities and OEM's were staffed with ACE representatives. All personnel and work schedules were assigned, mutual assistance and contractors were procured, a staging area was set up, IT systems were checked, food & housing were in place, materials and the fleet were checked, and media was provided constant communication.

ACE was monitoring the snow storm forecast but was not impacted by storm.

ACE categorizes emergency incidents into "event levels" with a four level scale. By assigning an incident an event level, response personnel have an understanding of the severity of an event and are able to respond in an appropriate manner. Various departments and areas within ACE know the expected response based on the incident event level.

During a major event, District and Regional IMT are mobilized to support the assignment and management of work, deployment of resources and updating of information systems. The anticipated event level triggers dictate the activation of District and Regional IMTs. Triggers describe the actions that should be taken upon based upon specific conditions. The Regional Operations Center (ROC) prioritizes first responder efforts and coordinates with the Districts to identify first responder resource needs. The District IMTs serve as the point of coordination for all follow-up crew

work, including the prioritization and routing of work to Regional staging areas, if required to support the restoration efforts. "Web Trouble" is used in the Districts to prioritize, assign, manage, update and close out all work.

Individual circumstances dictate the necessity of mobilizing various District and Regional IMTs to support restoration efforts. District or Regional IMTs are activated when the following conditions are met:

- A specific % customers out of service in a given District (District IMT is activated)
- A specific % of outage and trouble orders in the same District (District IMT is activated)
- A specific number of customers out of service in the Region (Regional IMT is activated)
- Two or more District IMTs are activated. (Regional IMT is activated)

Recommendations:

There are no specific recommendations for ACE beyond the global recommendation.

Jersey Central Power & Light

Observations:

JCP&L categorizes storms based upon its actual or estimated severity so that internal and/or external resources may be mobilized. The OMS can be used as the source of the estimated restoration times. If conditions change, the category is upgraded or downgraded as appropriate. When severe weather is imminent, the Regional Dispatcher on duty initiates the early warning notification process to appropriate personnel.

JCP&L has six defined storm levels. Based upon the anticipated storm level the Mutual Assistance Coordinator determines if a storm is significant enough to warrant the need for "storm mode" support from IT Production Support. For a significant storm, the Mutual Assistance Coordinator or the Director of ED Operations Services calls the IT Help Desk who, in turn, contacts those individuals from the "OMS Storm Support" list. Once contacted, representatives from IT arrive on-site at ISOC to monitor OMS performance, and other locations as deemed necessary.

For the two events, the FirstEnergy Corporate and JCP&L E-Plan were activated. However, the activation criteria and procedure for all functions does not appear to be a clearly defined process in either the FirstEnergy or JCP&L plans. This is an area that needs improvement.

For Irene, JCP&L started preparatory activities on the Monday before the storm hit. As part of its activation process, JCP&L requested additional crews, support personnel and set up staging sites. There were two FirstEnergy conference calls and two JCP&L conferences calls per day.

For the snow storm, staffing was activated and additional staff was flown in from Ohio. Conference calls were started on Saturday, October 29.

Recommendations:

6-JCP&L-1 JCP&L should develop an activation criteria and procedure for all functions as a clearly defined process in its emergency response plan.

6-JCP&L-2 JCP&L should evaluate the risks inherent in their plan which requires large movements of personnel between affiliates in different states. These risks include severe weather that would restrict or prohibit travel, and large numbers of personnel traveling in the same vehicle or mode of transportation.

Public Service Electric and Gas

Observations:

As stated before, PSE&G does not have pre-storm damage prediction models and uses experience and past history instead. However, PSE&G's OMS Manual contains detailed, clearly defined charts and staffing levels for each storm classification. The initial mobilization steps of the Storm Disaster Recovery Manual are described below. As these steps are being taken, the severity appraisals of plant damage and restoration requirements are also initiated.

The OMS Manual will be implemented when projected restoration work exceeds the capability of the supplemented Operations Group. Mobilization should be in accordance with the procedures and organizational guidelines of the OMS Manual. Implementation can be initiated by a Division or by the Manager - Delivery Operations Support, and could involve one or more Divisions, depending on the intensity and scope of the storm. The Division locations manage the tactical operations associated with the event. These steps are defined in the Mobilization section of the OMS Manual.

The OMS Manual does not describe the process to mobilize supplemental skilled personnel to support major storm activation, nor does it describe what additional PSE&G or PSEG personnel might be available to support the response efforts for a significant event.

Based upon the weather forecasts PSE&G was able to begin its preparation on Monday, August 22. Preparation for the snow storm was more limited due to the evolving nature of the weather forecast. Activation of directly related personnel was supplemented by PSE&G personnel with storm roles and later a pool of "volunteers" or "recruits".

Recommendations:

6-PSEG-1 PSE&G should describe the process to mobilize supplemental skilled personnel to support major storm activation, and identify what employees would be available to support the restoration efforts for a significant event.

Rockland Electric

Observations:

The O&R ESEP is detailed and function specific. It is written in such a way that anyone can review the steps needed to activate (mobilize) each function; it is separated into specific functional areas. Each of these functions has a specific activation (mobilization) process that is unique to the specific duties of that function, as well as an individual function checklist.

Upon receipt of a threatening weather forecast, the Storm Director, Emergency Management staff and Control Center Manager will conference and determine next steps. The Storm Director has the responsibility to evaluate the situation and recommend a storm declaration and activation of the Plan. The ERP lists three classes of storm severity, to determine appropriate resources to be activated. The Storm Director will request all coordinators to activate if warranted. All coordinators review and execute their pre-event checklists which are included in the Plan for each function.

RECO executed its activation procedures for Irene and was prepared when the storm hit. Preparation for the snow storm was more limited due to the evolving nature of the weather forecast.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendation.

3.7 COMMAND AND CONTROL

To succeed, any endeavor that requires the assistance of many people doing many different things requires the guidance, strategic vision and quality control of a few people in command roles. While tactical decisions can be empowered down through a chain of command, the responsibility remains with one person. With so many functions involved, span of control must be kept tight and the number of direct reports must be manageable.

The Incident Command System is utilized by organizations because it provides an organizational structure for emergency incident management and guides the process for planning, building, and adapting that structure for large scale events. This results in a more effective and efficient restoration organization. This is discussed in more detail in Section 3.18 – Organizational Structure, Roles and Responsibilities.

By clearly defining who is in charge, and ensuring a strong Command and Control structure is in place, an EDC can better manage the restoration team and ensure that everyone has the information and tools to do their job effectively.

During Irene and the snow storm, the Incident Command System concept was particularly important given the magnitude of the damage, the widespread areas impacted and the number of personnel mobilized to support the efforts.

Global Observations

All the EDCs have documented organizational structures and identified the personnel expected to fill key roles. However a lengthy restoration event can tax the organization from a staffing perspective. In key leadership roles, where the number of experienced candidates is smaller, it can be a challenge to provide continuous round-the-clock coverage. Many times these personnel will work lengthy shifts of 18 hours or more, taking only short breaks before returning for the next day.

During Irene, feedback from elected officials, emergency management personnel, and other stakeholder groups stated that it was sometimes difficult to reach someone in an EDC command position to obtain information or make strategic decisions. This became very frustrating to external stakeholders who needed immediate assistance or information to make decisions.

Global Recommendations

7-G-1 Each EDC should ensure that there are a minimum of three personnel identified, trained and assigned to fill each leadership level position in its emergency / incident response / storm restoration organization.

Atlantic City Electric

Observations:

For Irene, the ACE Incident Management Team (IMT) was activated. This team consists of the Incident Manager; his/her support staff which includes Safety, Corporate Communications, Chief of Staff, Operations, Planning, Logistics, and Financial. The ACE IMT reports to the Corporate Incident Support Team (IST) which provides support and coordination between all three of the Companies (ACE, Delmarva and Pepco). Supporting the ACE IMT are the District Incident Management Teams.

The roles and responsibilities of each position are clearly defined, and required positions were filled. A shift schedule was established. Checklists and logs were utilized to facilitate the transfer of command process between shifts.

The ACE Incident Management Team was located in the Regional headquarters location, and the District Incident Management Teams were located at each District location.

Recommendations:

There are no specific recommendations for Atlantic City Electric beyond the global recommendation.

Jersey Central Power & Light

Observations:

The management of storm events at JCP&L is handled by the Regional Director Operations Services with support teams that report to them. The overall command of the restoration is centralized at the Region, supported by the Regional Dispatch Offices. The tactical implementation of the work is decentralized to JCP&L's line shops, which are the normal work locations for field personnel. For Irene, the event was managed from the Northern Region, supported by teams located in the Central Region. For the snow event, Central Region was consolidated into the Northern Region to manage the event.

The JCP&L E-Plan describes the storm organization and includes organizational charts and position descriptions for all functions; however it appears that organizational structure and duties shifted during the storm event. The duties described in interviews were inconsistent with the organizational structure and role descriptions. It appears that the organizational structure was modified as needed to scale up for an event this large.

The linkage to a FirstEnergy Corporate Storm Team or Crisis Management organization is unclear in the E-Plan. The concept of operations for the communications function is described in the E-Plan,

but it does not show a clear reporting structure. The Safety function is not included on the organizational chart in the E-Plan.

Personnel from affiliated FirstEnergy companies were mobilized to support JCP&L during both events; arriving in person at JCP&L locations and remotely through use of technology. The level of FirstEnergy support for JCP&L could be impacted by a multi-company storm that impacts more than one of the FirstEnergy companies.

Many key decisions are made at FirstEnergy, and JCP&L personnel have no control over that aspect of the organizational process. The mutual assistance process is one example of a situation where JCP&L requested assistance well before Irene hit, yet its request was not fulfilled until the following week.

There were not enough people to fill the storm management leadership roles for a multi-shift operation of this duration. In some instances, one individual filled multiple roles within the storm organization; filling one role during the day shift, and another role on the night shift. This is an area that needs improvement.

Recommendations

7-JCP&L-1 JCP&L should develop staffing contingency plans to deal with a storm event where FirstEnergy corporate support is limited.

Public Service Electric and Gas

Observations:

PSE&G's DERC (Delivery Emergency Response Center) was activated in response to Irene and the snow storm. The OMS Manual contained criteria used to determine activation. The Incident Commander managed the event, and DERC provided detailed internal communications with team members through the use of structured three per day conference calls with a specific agenda and protocol.

The overall command of the restoration was centralized at the DERC while the tactical implementation of the actual work was decentralized to PSE&G's four operating Divisions. The DERC rolled up the status from the four Divisions and was responsible for obtaining and allocating additional resources from PSE&G's mobile construction Division and foreign resources from other utilities (mutual aid) or outside contractors, which are generally dispatched to a Division staging area.

In some cases, personnel used institutional knowledge and not the documented plans and procedures. As personnel retire or are reassigned, this reliance on institutional knowledge will becomes magnified as less experienced personnel are called upon to fill these roles.

The OMS Manual describes an Incident Command System organization; however that is not how PSE&G actually operates during a storm event (for additional discussion about this, see Section 3.1 – Planning). The Incident Commander is supposed to be charge; however the senior executives were all in DERC for the first couple of days of both of the storms. The role of the executives was not clearly defined in the OMS Manual and it is not clear who the Incident Commander is. This is an area that needs improvement.

Recommendations:

7-PSE&G-1 PSE&G should follow the ICS organizational model endorsed in the OMS Manual.

7-PSE&G-2 PSE&G should revamp its OMS Manual and define a clear role for the executives separate from the Incident Commander and in accordance with ICS principles.

Rockland Electric

Observations:

The O&R ESEP describes the organizational structure used to manage storm events. This organization follows the ICS organizational model. Each functional appendix in the ESEP has an organization chart which ties back to the organization chart in the Plan. The Storm Director was responsible for managing the event and ensuring that required positions were filled.

The O&R Incident Command Team was located at the Spring Valley Operations Center (SVOC) and supported by personnel in the workout locations (the normal work locations for field personnel) and staging areas. A multi-shift operation was established and modified as necessary. Some roles found it helpful to have two personnel on the day shift, and not all roles were staffed in the evening.

For these two events, personnel discovered that two backups were not sufficient and they have now have added a third backup for all positions.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendation.

3.8 PRE-EVENT COMMUNICATIONS

Advance communications via print, electronic media, the internet and social media provide customers with knowledge of what to expect and predicted duration of outages. This allows customers essential time to make appropriate plans for their families' welfare. Preparation is especially important for special needs customers and their caregivers.

Advance safety advice to customers is vitally important to prevent life-threatening accidents involving downed wires. Early warning communication regarding expected weather conditions and potential damage assists local police, fire and public works departments' efforts to prepare available resources to protect its communities, communicate preparatory requirements to constituents, and facilitate restoration efforts. It is essential to establish effective communications with the Offices of Emergency Management (OEM), municipalities and elected officials.

A best practice is to utilize multiple channels to communicate with customers and other stakeholder groups to ensure that expectations are managed effectively.

The tables on the following pages indicate the channels that each EDC used to communicate with its stakeholders and when the communications in each channel began for each storm event. A blank space in the table indicates that no information was provided to validate communications using that particular channel.

IRENE	ACE	JCP&L	PSE&G	RECO
Media				
Press Releases/Advisories	8/24	8/25	8/25	8/27
Radio Announcements	Yes	Yes		Yes
Broadcast Coverage (All)	8/25	Yes	8/27	Yes
Local Officials				
Outbound Emails	8/26		8/25	8/26
Outbound Blast Fax		8/25		Yes
Phone or Live Contacts w/ Public Officials	8/24	8/27	8/25	8/25
Customers				
Inbound VRU Messages	8/26	Yes	8/28	8/27
Automated Outbound Phone Calls	8/25	8/27	8/26	8/26
Storm Page Website	8/26	8/28	8/25	Yes
Twitter	Yes		8/25	
Facebook/Flickr/YouTube	8/28			
Collateral Leaflets		Yes		
Outbound Emails			8/26	
Employees				
Emails	Yes	Yes		
Intranet	Yes	Yes	8/24	Yes
Hotline	Yes	Yes	8/24	
Newsletter (print or electronic)	Yes	Yes	8/24	Yes
Handouts/ Briefing Notes			8/24	Yes
Video Terminals				Yes
Internal Blog				

Note: A blank space in the table indicates that no information was provided to validate communications using that particular channel.

SNOW STORM	ACE*	JCP&L	PSE&G	RECO
Media				
Press Releases/Advisories	-	10/28	10/29	10/30
Radio Announcements	-	10/28	10/30	Yes
Broadcast Coverage	-	Yes	Yes	Yes
Local Officials				
Outbound Emails	-		10/29	
Outbound Blast Fax	-	10/29		
Phone or Live Contacts w Public Officials	-	10/29	10/28	10/29
Customers				
Inbound VRU Messages	-	Yes	10/29	Yes
Automated Outbound Phone Calls	-	10/29	10/29	Yes
Storm Page Website	-	10/29	10/31	Yes
Twitter	-	10/28	Yes	Yes
Facebook/Flickr/YouTube	-			
Collateral Leaflets	-	Yes	Yes	
Outbound Emails	-		11/2	
Employees				
Emails	-			
Intranet	-		10/29	
Hotline	-		Yes	
Newsletter (print or electronic)	-		11/1	
Handouts/ Briefing Notes	-		11/2	
Video Terminals	-			
Internal Blog	-		Yes	

* ACE was not impacted by the snow storm.

Note: A blank space in the table indicates that no information was provided to validate communications using that particular channel.

Global Observations:

The EDCs used multiple channels to provide notice of potential storm damage well ahead of Irene to stakeholders. The lack of advance weather notification prevented the EDCs from addressing all key stakeholders in time to fully prepare for the October snow storm.

"Storm Page" features on company websites were used both as advance notice and outage tracking channels. All EDCs have at least tested the use of Twitter as a "force multiplier" for providing restoration updates.

Global Recommendations:

8-G-1 Each EDC's pre-storm communication primary messages should emphasize the "worst case" severity of potential damage, customer safety advice, and resources to allow both employees and customers enough time to prepare.

Atlantic City Electric

Observations:

For Irene, the first press release was issued on August 24, with a second later that same day, stating that ACE was monitoring Irene, outages could be widespread, restoration could be multi-day event, mutual assistance crews had been requested, and customers were urged to prepare. However, no advice was given to customers as to how to prepare. A press release issued Friday, August 26, the day before the storm hit the ACE service territory, included specific customer advice. Press releases and automated calls notified customers of potential for preventive outages on barrier islands in case of flooding.

ACE posted proactive Twitter and Facebook messages, including a YouTube Safety advice video.

ACE also used its Inbound VRU messages, automated Outbound Phone Calls and Storm Page website to provide advance warning and advice on August 25 and 26.

The Community Relations Lead ("CRL") has built up a rapport with the community leads throughout the years. The CRL started calls to the communities prior to the event and continued these calls throughout the event. Once the ETR's were updated this information was passed along to the communities. Community Relations communicated with all outside agencies and responded to and answered all inquiries in a timely manner. Community Relations had enough lead time in preparation for the event which provided sufficient time to communicate with its stakeholders.

Conference calls with public officials started on August 24, prior to Irene's landfall.

ACE was not impacted by the snow storm.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendation.

Jersey Central Power & Light

Observations:

For Irene, the first news release was sent to media and relayed to all stakeholders (public officials and internal employees) on August 25, which read "FirstEnergy Utilities Prepare for Hurricane Irene – JCP&L, Met Ed and Potomac Ed Mobilize Resources for Possible Effects in Their Service Areas." This release included advice to customers to prepare for outages. The next release was sent on August 28, the day after the storm hit. The first message on the IVRU was on August 27, which included basic safety tips and advice to follow the guidance of local emergency management systems.

JCP&L launched a dedicated outage info website on August 28. The first message at 2:01 PM included rough ETR, basic safety tips and phone numbers to call. Website messages were posted through September 6, but no web messages were found to be posted on August 30.

In preparation for the snow storm, JCP&L issued the first news release on October 28, which included advice to customers to prepare for outages. This was followed the same day with more details about the storm threat and links to the storm website and Twitter account.

JCP&L launched a Twitter account on October 28 and used it to send storm tips to customers on October 29, the day the storm hit.

JCP&L aired radio spots on October 28 directing customers to outage reporting phone numbers. Web messages were issued on October 29 at 11:38 PM and included rough ETR, basic safety tips and phone numbers to call. The first IVR message on record is dated October 30 at 10:59 AM, notifying customers they could be out of power 24 hours or longer, but with no further tips or information.

- Before Irene JCP&L's communications were limited and spotty with the storm website not being launched until Sunday August 28, the day after the storm hit.
- JCP&L was more proactive for the October snow storm, with news releases, Twitter and radio spots all of which launched on Friday October 28, the day before the storm hit.

- IVR messages and storm website messages were still delayed, launching on October 30 and October 29, respectively.

- In both storms, early messages concentrated on what FirstEnergy/JCP&L were doing to prepare. Given the early rough ETR transmitted in these messages, customers were not advised that these outages could potentially last for more than a few days.

After Irene, the BPU Staff worked with JCP&L to develop an improved Storm Restoration Communications Implementation Plan. Each area includes a section on commitments, a descriptive narrative and an implementation plan. Four major focus areas are included in the plan:

A. Direct Communications with Mayors and other Local and State Officials
B. External Communications
C. Contact Center Communications
D. Operations

The implementation of this plan positively addressed many of the issues experienced by JCP&L's pre-storm external communications group during Irene. However, improvements still need to be made in this area.

Recommendations:

8-JCP&L-1 JCP&L should continue to implement and build upon the recommendations of the improved Storm Restoration Communications Implementation Plan, developed in conjunction with the BPU Staff.

8-JCP&L-2 JCP&L should launch its storm website as soon as significant threats are declared, and notify customers that the website is activated.

8-JCP&L-3 JCP&L should determine the proactive role for IVR messages as soon as significant threats are determined.

Public Service Electric and Gas

Observations:

PSE&G communicated the potential magnitude of Irene to its customers well in advance of landfall (August 25) describing both the measures necessary for customers to take, the potential length of the restoration (7 to 21 days) and the process of restoration after a major storm. The press release on August 26 included an effective explanation of the restoration process.

A Hurricane button was created on PSE&G's website on August 25. The PSE&G website features a graphic illustration of how to turn off a typical gas valve in case of flooding. PSE&G's existing website content, other than the outage map, is text-heavy. Absent were illustrations, graphics, and links to YouTube video, which can aid in instructing customers.

Storm messages were tweeted 24 hours a day beginning on August 25, and prominent public officials acted as a force multiplier by re-tweeting many messages to their followers.

PSE&G began email messages to 800,000 customers on August 26. PSE&G's communications priority is to give customers as much information as possible including ETR so they can plan.

Communications to all stakeholders was centralized where the day's messages were developed and then disseminated to the various stakeholders to ensure a consistent message. The Communications function's preexisting cadre of over thirty subject matter experts that also have a role in PSE&G's communications efforts during normal operations supported this process. Due to the high volume of media requests and overall activity, logs of media activity were not kept. Logs of media activity aid with post event reporting and lessons learned, and this is an area that needs improvement.

Recommendations:

8-PSE&G-1 PSE&G should keep basic high-level logs of all media contacts to assist with lessons learned and post event analysis.

Rockland Electric

Observations:

RECO started communicating with public officials about Irene on August 25. RECO notified public officials and the news media by stating that "it may have to virtually rebuild much of its electric system." RECO sent emails to 38,000 customers on its email list, starting August 26, which featured links to its website. RECO found there was a 40% open rate on the emails.

Outbound phone calls to Life Sustaining Equipment (LSE) customers were made August 26.

VRU messages on August 27 at 11:00 AM and 9:10 PM stated "Details on when your electricity will be restored will be available as soon as we assess the severity of damage to our system."

The first press release was transmitted August 27 at 5:00 PM as Irene was already impacting parts of southern New Jersey. Press releases served as talking points and source material for Community Relations blast faxes to public officials and public advisories on ORU's website.

On August 27 RECO had a conference call with its Storm Plan Coordinators. The conference call emphasized the importance of providing the public with information – "We will be judged on the information we provide and also our restoration times."

Due to lack of accurate advance weather intelligence for the snow storm, there were no pre-storm communications from RECO. Public officials were first contacted by RECO representatives on October 29, the day the storm hit the area. The first press release was transmitted the next day. The Major Event Report submitted after the snow storm includes little documentation of the communications channels used or messages delivered at the storm's onset.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendation.

3.9 MUTUAL ASSISTANCE/ EXTERNAL RESOURCES PROCUREMENT PROCESS

For normal business, an EDC staffs its internal line resources (line personnel) by planning and evaluating the capital and maintenance work requirements needed to operate the utility's infrastructure, and can respond to moderate levels of weather impact using these resources. If additional line resources are needed to supplement the workforce, the EDC may use contract line personnel or pay overtime to its internal resources.

To acquire additional line resources for large restoration events, most utilities participate in regional mutual assistance groups (RMAG). These RMAGs collectively utilize its internal, contract line resources, and support personnel to fill the needs of its members. In the last 15 years, a number of utilities have merged and now belong to several RMAG. An RMAG can request resources from another RMAG to supplement its resources in order to fulfill a members request when their own RMAG is depleted of resources. All of the New Jersey EDCs belong to at least one or more of these RMAG.

An Edison Electric Institute (EEI) agreement facilitates sharing of resources among utilities by pre-addressing legal formalities and defining financial arrangements for a major event. The EEI mutual assistance agreement establishes billing requirements and standard crewing requirements. The EEI agreement also sets the time and date to start the mobilization and travel time costs to acquire and transport resources to the requesting utility. The start time begins when one utility requests resources and the other utilities/contractors commit to provide those resources. Utilities/contractors providing resources normally charge its full rates along with any expenses that they may incur during travel and its stay at the requesting utility's locations.

The EEI web site provides utilities with information to locate additional overhead, underground and vegetation management resources, along with listings of companies with specialized equipment (i.e. track aerial lift devices). At the 2012 Spring Meeting of the EEI Mutual Assistance Committee, a decision was made to replace the term "crew" with "personnel" in transfer documentation and rules for making a request.

Some utilities have agreements in place with large line contractor companies to have additional resources available just for restoration events.

A utility may decide to pre-arrange for foreign (mutual assistance and contractor) personnel in advance of a restoration event. The cost includes hourly salary and benefits, time, equipment, housing and the expense to travel to the area. These expenses are incurred as soon as the personnel leave their home utility and head to the company that requested them, regardless if they are needed for a restoration effort or the weather has shifted and they return to their home utility.

Activating a response organization involving hundreds of personnel based upon potential weather events that may not materialize is a significant expense.

RMAG membership and relationships with other utility emergency management personnel are key drivers of resource acquisition success. Understanding the capabilities and limitations of other organizations provides insight into how and when requests for assistance need to be made. For Irene, even early requests for assistance were not successful due to storm related conditions on the East Coast, the Mid-West and in Canada. For the snow storm, acquisition of mutual assistance was less of an issue because the storm was concentrated in a smaller geographic area.

Global Observations:

The major storms of 2011 in New Jersey (Irene and the snow storm) required the four New Jersey EDCs to obtain additional resources utilizing both the mutual assistance process and external line contractors to restore customers. None of the New Jersey EDCs received the requested quantity of line personnel, at the time they wanted them, for Irene. This was due to the projected track of the storm. For the snow storm, the acquisition of mutual assistance was less of an issue because the storm was concentrated in a smaller geographic area.

The four New Jersey EDCs are members of the Edison Electric Institute (EEI) and use the nationwide mutual aid process, agreement, and web site to acquire additional line resources. The Mid-Atlantic Mutual Assistance Group (MAMA) and Southeastern Electric Exchange (SEE) meet two times per year and the EEI members meet once per year. Presentations are given by member companies on operation issues, social media, staging areas, weather, damage assessment, etc. Participation in these RMAG meetings fosters on-going relationships that can be of great benefit during emergency events.

Mergers in the last 15 years have created an expanded internal resource pool for ACE, JCP&L and RECO. These affiliates have increased the possible internal mutual assistance personnel that can be accessed to restore customer service which is offset by the increased size of the holding company's service territory. Needs for internal mutual assistance may increase if multiple states are impacted at the same time, diluting these resources at a greater pace than before the consolidation.

When the RMAG need additional mutual assistance personnel beyond what member companies can supply, those requests are managed by designated coordinators at other MAMA companies – Con Edison is the representative to NYMAG; ACE is the representative to SEE and FirstEnergy is the representative to Great Lakes.

The New Jersey EDCs all requested mutual assistance personnel well before Irene was projected to impact New Jersey. The Regional Mutual Assistance Groups continued to conduct conference calls after Irene made landfall with representatives from the Southeastern Electric Exchange (SEE), the

Mid-Atlantic Mutual Assistance Group (MAMA), and the New York Mutual Assistance group (NYMAG), the Northeast Mutual Assistance Group (NEMAG), the Great Lakes Mutual Assistance Group (GLMA), and the Midwest Mutual Assistance Group (MWMAG). These calls coordinated the allocation of resources between the various mutual assistance groups during Irene recovery.

RMAGs that each of the EDCs belong to.

RMAG AFFILIATIONS				
REGIONAL MUTUAL ASSISTANCE GROUP	ACE (PHI)	JCP&L (FIRSTENERGY)	PSE&G	O&R / RECO (CON EDISON)
Great Lakes Mutual Assistance Group (GLMA)		X		
Maryland Utilities	X			
Mid- Atlantic Mutual Assistance (MAMA)	X	X	X	X
NYMAG		X		X
Southeastern Electric Exchange (SEE)	X	Pending*		
Allegheny Managers Members Group/FirstEnergy (AMMG/FE)		X		

* Applied for membership and anticipate acceptance in 2012.

For Irene, each EDC began the process of resource acquisition well before the storm. None of the EDCs received the requested quantity of line personnel, at the time they wanted them, for Irene.

The tables on the following pages describe the number of RMAG conference calls that each EDC participated in, along with the number of personnel requested. The table also indicates if and when the resource request was fulfilled. Table 2.1 is for Irene and Table 2.2 is for the snow storm.

Table 2.1

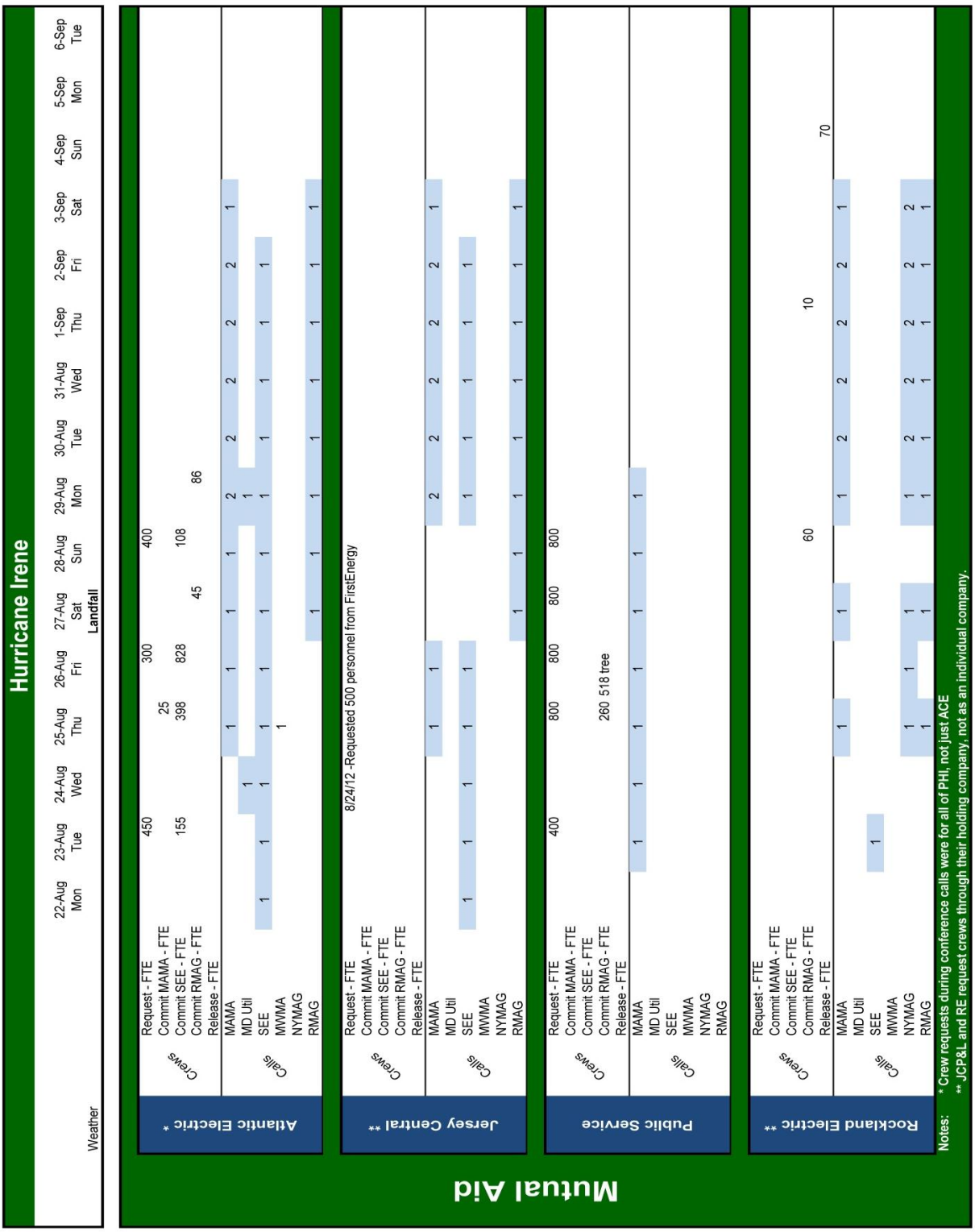
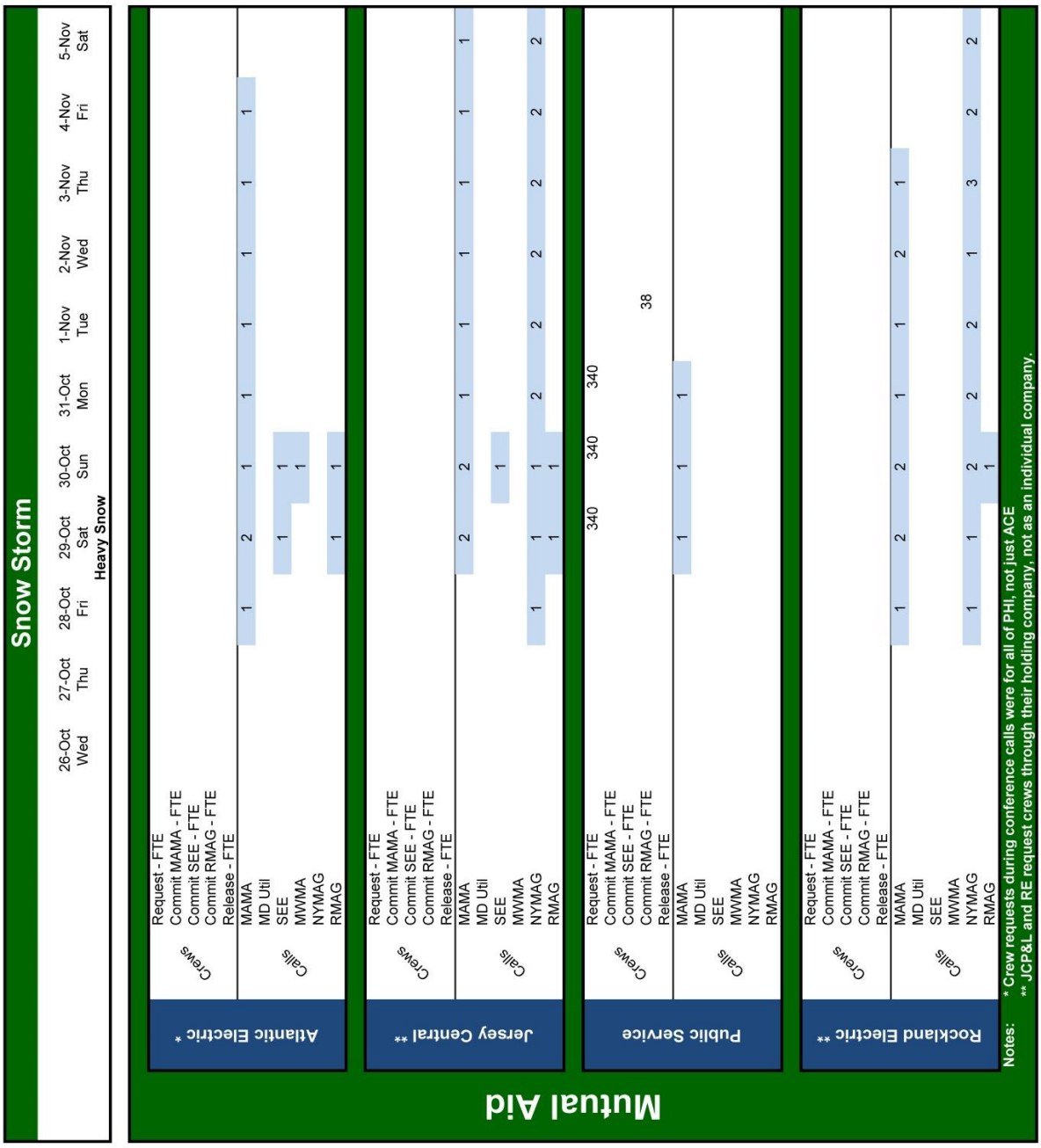

Hurricane Irene
Weather
22-Aug Mon
23-Aug Tue
24-Aug Wed
25-Aug Thu
26-Aug Fri
27-Aug Sat
Landfall
28-Aug Sun
29-Aug Mon
30-Aug Tue
31-Aug Wed
1-Sep Thu
2-Sep Fri
3-Sep Sat
4-Sep Sun
5-Sep Mon
6-Sep Tue
Mutual Aid
Atlantic Electric *
Crews
Request - FTE
Commit MAMA - FTE
Commit SEE - FTE
Commit RMAG - FTE
Release - FTE
Calls
MAMA
MD Util
SEE
MWMA
NYMAG
RMAG
Jersey Central **
8/24/12 -Requested 500 personnel from FirstEnergy
Public Service
260 518 tree
Rockland Electric **
Notes:
* Crew requests during conference calls were for all of PHI, not just ACE
** JCP&L and RE request crews through their holding company, not as an individual company.

Table 2.2


Snow Storm
26-Oct Wed
27-Oct Thu
28-Oct Fri
29-Oct Sat
Heavy Snow
30-Oct Sun
31-Oct Mon
1-Nov Tue
2-Nov Wed
3-Nov Thu
4-Nov Fri
5-Nov Sat
Mutual Aid
Atlantic Electric *
Jersey Central **
Public Service
Rockland Electric **
Crews
Calls
Request - FTE
Commit MAMA - FTE
Commit SEE - FTE
Commit RMAG - FTE
Release - FTE
MAMA
MD Util
SEE
MWMA
NYMAG
RMAG
340
38
Notes: * Crew requests during conference calls were for all of PHI, not just ACE
** JCP&L and RE request crews through their holding company, not as an individual company.

Irene strained the mutual assistance process because its projected track affected a large geographic area - the South, Mid Atlantic, Northeast and Canada. An RMAG that might normally supply mutual assistance resources were either restoring its own companies or providing resources within its RMAG. The weekend before Irene came ashore, the Mid-West and Canada were supplying resources to its RMAG in areas that were devastated by the weekend's thunderstorms and tornados. As those resources became available they were utilized up and down the East Coast. The Canadian resources were very late in their availability because of Irene's expected track into Canada, and the Canadian utilities held its resources until the threat was over.

To summarize, none of the EDCs received the requested quantity of line personnel, at the time they wanted them, for Irene. This was an issue for EDC in neighboring states as well. For the snow event, the acquisition of mutual assistance was less of an issue because the storm was concentrated in a smaller geographic area.

Global Recommendations:

9-G-1 Each EDC should develop a plan to mitigate the impact of a severe shortage of line personnel in the event of a wide-spread natural disaster. This could include use of non-electric utility personnel who are not involved in the restoration efforts (i.e. water, gas, telecom, etc.) to perform support tasks that can free up line personnel to deal with job duties that only they are qualified to perform.

9-G-2 Each EDC should provide periodic, more organized updates to the BPU Staff regarding both mutual assistance requests made by the EDC, or mutual assistance being provided to another EDC. The frequency and type of information required will be developed by BPU Staff.

Atlantic City Electric

Observations:

ACE has two restoration levels where mutual assistance may be requested. The PHI Manager of Emergency Management participates in the MAMA, Maryland Utility and SEE Mutual Assistance calls to ask for or provide resources and then reports his findings to the ACE Resource Manager. For an event that is only expected to impact ACE, the Mutual Assistance Coordinator role is described in the ACE plan. In a large scale event impacting multiple PHI companies, resource allocation between the companies could be an issue.

PHI participated in many RMAG conference calls prior to Irene; these are summarized in Table 2.1.

There were 12 companies providing 167 line and forestry crews to ACE during Irene. During the October snow storm PHI/ACE provided personnel to JCP&L because ACE was not impacted by the storm.

Recommendations:

9-ACE-1 ACE should add a section to its Plan to describe how mutual assistance crews will be allocated between affiliated companies (Atlantic City Electric, Delmarva, and Pepco) when simultaneous large-scale events occur in multiple service territories.

Jersey Central Power & Light

Observations:

The process used at JCP&L for mutual assistance specifies that a FirstEnergy corporate representative participates in all RMAG calls. FirstEnergy operates ten EDCs, and routinely moves resources between companies when necessary. The JCP&L representative participates in the FirstEnergy corporate calls and requests additional resources from FirstEnergy, who obtains those resources for JCP&L, if any are available. This process is described in the JCP&L and the FirstEnergy E-Plans.

On Tuesday, August 23, before Irene, 280 FirstEnergy linemen were sent south after they were requested by Florida Power & Light. No JCP&L personnel left New Jersey as part of that deployment.

JCP&L conducted two conference calls per day starting on August 23. This supplemented the FirstEnergy conference calls that were also conducted twice a day. On the Thursday morning (8/25/11) FirstEnergy conference call, the JCP&L Director of Operations requested an additional 250 2-person line crews for the storm; he was told that FirstEnergy would acquire the additional line personnel. On the Sunday morning (8/28/11) FirstEnergy conference call, the JCP&L Director of Operations requested an additional 100 2-person crews from FirstEnergy. This represented a request by JCP&L for a total of 350 additional 2-person crews.

Line crews from other FirstEnergy Operating Companies in Pennsylvania, Ohio, Maryland and West Virginia were utilized as they became available beginning on Monday, August 29. JCP&L received 101, two-to-three person crews on August 29 with the rest coming onto the property slowly until September 2.

As the extent of the damage became more apparent, FirstEnergy requested resources through its mutual assistance groups on August 29. The full number of personnel requested was not received until September 2 when additional mutual assistance personnel and FirstEnergy personnel were

available from other FirstEnergy companies. The responsiveness of FirstEnergy to requests for additional personnel by JCP&L is an area that requires resolution.

The request that was made by JCP&L for additional resources prior to Irene was not filled by FirstEnergy in a timely fashion. FirstEnergy resources did not arrive until after the storm, and mutual assistance / contractor help did not begin to arrive until 5 days after the storm had hit.

Following is a summary of when additional crews were on-site in New Jersey to support JCP&L efforts. The number of crews does not correspond to the number of personnel, as crew sizes vary. Service crews are used to make repairs to service drops, which are the wires between the utility pole and the customers' residence.

DATE	FIRSTENERGY AFFILIATE	MUTUAL ASSISTANCE / CONTRACTOR	SERVICE	TOTAL ADDITIONAL
8/27/11	0	0	0	0
8/28/11	0	0	0	0
8/29/11	101	0	0	101
8/30/11	137	0	0	137
8/31/11	151	0	0	151
9/1/11	183	0	5	188
9/2/11	183	60	97	340
9/3/11	183	175	156	514
9/4/11	183	213	141	537
9/5/11	182	225	149	556
9/6/11	180	54	16	250
Note: This list does not include tree-only crews.				

At the height of the Irene restoration efforts, JCP&L had 1,350 additional FirstEnergy personnel and 2,173 mutual assistance and line contractor personnel.

For the snow storm, resources from other FirstEnergy Operating Companies assembled on Friday, October 28, with some departing for JCP&L that evening. External mutual assistance (including contractors) was initially secured on October 29, with the first crews arriving early Sunday, October 30. On November 6, Service Crews were added to restore single customer outages, once progress had been made to restore the primary distribution circuits. More than 1,000 forestry personnel were deployed. Following is a summary of when additional crews were on-site in New Jersey to support JCP&L efforts.

DATE	FIRSTENERGY AFFILIATE	MUTUAL ASSISTANCE / CONTRACTOR	SERVICE	TOTAL ADDITIONAL
10/29/11	40	0	0	40
10/30/11	40	26	0	66
10/31/11	55	144	16	215
11/1/11	55	168	16	239
11/2/11	97	294	16	407
11/3/11	122	341	16	479
11/4/11	121	326	25	472
11/5/11	121	396	30	547
11/6/11	117	481	390	988
11/7/11	117	74	36	227
Note: This list does not include tree-only crews.				

During the snow storm, JCP&L resources peaked at approximately 5,600 line and forestry personnel. The majority of these personnel were provided through the mutual assistance process and contractors.

It is common for a utility holding company like FirstEnergy to represent multiple distribution companies on an RMAG call. This eliminates potential duplicate requests for resources. When multiple affiliate companies are impacted by the same storm, resource allocation decisions are made by the holding company.

As the Irene forecast models became more specific, FirstEnergy began requesting additional outside restoration personnel from the RMAGs two days before Irene came ashore in New Jersey. However, until an RMAG was certain that they would not be impacted by Irene, the RMAGs were holding off in providing restoration personnel to FirstEnergy. FirstEnergy was unable to procure the needed resources in their requested timeframe.

JCP&L customers and staff were the victims of FirstEnergy's inability to imagine the worst case restoration event in the history of JCP&L. The quantity of restoration personnel JCP&L requested from FirstEnergy during the corporate conference calls in the days before Irene was never filled. FirstEnergy assumed they had sufficient internal restoration resources to support JCP&L, and had pre-staged these resources in Maryland and Pennsylvania.

Recommendations:

9-JCP&L-1 JCP&L should have FirstEnergy develop an appendix in its E-Plan to provide guidance on when FirstEnergy resources can leave the FirstEnergy affiliate companies to mutually assist non-FirstEnergy companies. This appendix should describe triggers that determine when and how many personnel can leave, along with a plan to replace these personnel if they are unable to return to FirstEnergy as rapidly as they may be needed by a FirstEnergy affiliate company.

9-JCP&L-2 JCP&L should have FirstEnergy develop a plan to manage at least two or three major simultaneous restoration events on its system at the same time.

9-JCP&L-3 JCP&L should have FirstEnergy add a section to its E-Plan to describe how mutual assistance crews will be allocated between companies when simultaneous large-scale events occur in multiple service territories.

Public Service Electric and Gas

Observations:

PSE&G has a mutual assistance section in its OMS Manual. This section has some job position checklists and rudimentary information on the mutual assistance process. In this plan any restoration event with a predicted ETR of 7 days or more triggers the need for mutual assistance.

PSE&G made six requests for mutual assistance before and during Irene to the MAMA. The path of this storm caused MAMA utilities along the East Coast to be unable to commit to providing mutual assistance until hurricane landfall and damage assessments were completed. Three members of the MAMA are the other New Jersey EDCs that were also looking for mutual assistance resources. Therefore expected foreign resources were not available. Faced with this situation, PSE&G decided on late Wednesday, August 24, to directly contact EEI members to request resources starting Thursday, August 25. By calling the EEI companies directly, PSE&G was able to obtain resources from as far away as Missouri. These resources arrived on Saturday, August 27. PSE&G also had a limited number of line contractors on site and they were held over for customer restoration.

Before and after the onset of Irene, PSE&G acquired 187 mutual assistance and contractor line crews and 259 additional forestry crews. PSE&G also utilized Verizon personnel to set poles. PSE&G was able to obtain these additional tree personnel through its forestry contractor and MAMA.

PSE&G acquired 187 mutual assistance and contractor crews during the snow storm. After the snow storm, PSE&G negotiated and implemented a first call/refusal option for line contractors, although these contractors may still be subject to utility release.

Recommendations:

9-PSE&G-1 PSE&G should review and add more detail to the mutual assistance section in the OMS Manual. At a minimum this should include a description of who is responsible for: estimating resources needs, participating in RMAG conference calls, making the decision to send or obtain mutual assistance.

9-PSE&G-2 PSE&G should participate in RMAG calls even when its mutual assistance needs are not met by the RMAG.

9-PSE&G-3 PSE&G should utilize the term personnel instead of crews in order to more accurately portray the number of personnel that assisted during weather events.

Rockland Electric

Observations:

RECO coordinates its mutual assistance through its affiliate Con Edison. Crew allocation between the companies is determined at the executive level.

The Con Edison plan is used to guide mutual assistance requests based on forecasted storm events. Con Edison participated in many RMAG conference calls prior to Irene; these are summarized in Table 2.1. Con Edison participated in many RMAG conference calls following the snow storm; these are summarized in Table 2.2.

During Irene RECO utilized 681 mutual assistance line and service personnel, with an additional 201 forestry personnel. RECO utilized 1,522 additional mutual assistance line and service personnel during the snow storm.

Recommendations:

9-RE-1 RECO should add a section to its Plan to describe how mutual assistance crews will be allocated between affiliated companies (Con Edison and O&R) when simultaneous large-scale events occur in multiple service territories.

B. INTRA-STORM DELIVERY SYSTEM RESILIENCY

RFQ SECTION	RFQ REQUIREMENT
3.3.2	INTRA-STORM DELIVERY SYSTEM RESILIENCY The contractor shall identify any system design, equipment, maintenance or infrastructure issues which may have contributed to the cause or duration of outages, such as substation flooding, circuit flexibility and vegetation management. This analysis shall specifically include a review of the following and recommendations for corrective measures if applicable. a) Substations constructed within the 100 year flood zone, history of these substations flooding and protective measures in place at the time of the hurricane. b) Vegetation Management policies and adherence to State and federal guidelines by the EDCs as well as the extent of damage to facilities, property and personal injuries as a result of trees and vegetation. c) Circuit outages during the hurricane *(and the October snow storm)* for a comparison between radial circuits (single feed) and looped circuits (multiple feed). The comparison should include general comments/recommendations as to how these types of circuits affected the restoration program and operation of the systems.

3.10 SUBSTATION FLOODING

Substations are critical facilities for power distribution. Their operability ensures power is available to thousands of customers. Common substation design criteria include protection from intrusion, lightning, wind damage and flooding. In case of unmitigated flooding conditions, affected substations must be taken out of service to avoid equipment damage. Reenergizing a substation is a complex and time consuming process that involves picking up loads transferred to other substations (including mobile units), picking up loads with portable generation, or curtailed due to emergency conditions. Current best practices include not locating a substation within a floodplain or constructing (or modifying) the substation to provide protection from flooding. Prudent management calls for close monitoring during storms, robust storm water management infrastructure and/or strong temporary flood protection measures.

Flooding in New Jersey is generally the result of high tides along the ocean and bays, high levels of rain that overflow rivers and streams, debris in rivers and streams that create a temporary blockage,

increased levels of development upstream that causes, increases or accelerates river and stream water levels, flood water release strategies to protect reservoirs and dams, or dam and reservoir problems resulting in unplanned water release.

The record rainfall that occurred during Irene caused severe river flooding. Eleven rivers reached record levels, and a week after the storm all rivers in the State remained at "moderate flooding level." The most severe impact of Irene in the northeastern United States was catastrophic inland flooding in New Jersey, Massachusetts and Vermont.[16]

Flooding was not an issue during the snow storm.

Global Observation:

Substation flooding had a substantial impact to the service and operations during the Irene hurricane event. Water intrusion impacted a total of 15 substations in New Jersey and flooding caused damage to relays, breakers, controls, bushings and bus work. While the EDC's have design standards to address such issues, not all of these standards were in place at the time the substations were built. Substations built within the 100-year flood zones are particularly at risk to flooding.

As the primary feed for the distribution circuits, the loss or inoperability of these substations affected greater numbers of customers, caused outages on an area-wide basis and limited operational flexibility to the surrounding circuits. Mitigated efforts by the EDC's were not always sufficient due to the magnitude of the event.

FEMA is currently working to update its flood mapping for Bergen, Hudson and Union Counties. The revised maps, expected in draft form the summer of 2012, will likely affect the reported 100-year flood elevations. These revised maps may have an impact on facilities in the PSE&G and RECO service territories.

Each EDC receives weather forecasts about potential flooding and tide information from its weather service. This information may provide useful information when pre-planning for an event that could produce flooding. A lack of detailed information on the causes of substation damage caused by flooding prevents a more detailed analysis.

[16] NWS Tropical Cyclone Report AL092011

Global Recommendations:

10-G-1 Each EDC should prepare formal reports after instances of substation flooding to assist in analyzing long term trends and impacts.

10-G-2 Each EDC should consider higher flood levels for future substation design and upgrades to existing substations in floodplains as current 100-year Flood Zone elevations may be too conservative as demonstrated by Irene.

10-G-3 Each EDC should determine the potential impact of upstream dams and reservoirs, and if appropriate establish contact and share information with operators before a potential flooding event.

10-G-4 Each EDC should educate municipalities responsible for maintaining drainage management systems about the potential impact on substations if debris is not cleared before and during storm events.

10-G-5 Each EDC should work with the BPU to review, analyze, and evaluate the current preparedness plans for substations during storm events. In light of the actual incidents of flooding during Irene, EDCs, working with the BPU, must develop and implement improved mitigation plans.

Atlantic City Electric

Observations:

ACE's substation design criteria requires mounting equipment above the flood level, and mounting critical relays and protection equipment at least 30" above the relay enclosure floor level. ACE completed engineering studies, which recommended replacement of metal clad switchgear. ACE has eliminated metal-clad switchgear and uses self-enclosed switchgear.

ACE has 12 substations in the 100-year flood zone. Due to the threat of flooding isolating the barrier islands was considered but it was not needed and no substation flooding or damage occurred during Irene.

SUBSTATIONS IN 100-YEAR FLOOD ZONE	DID IRENE IMPACT OPERATIONS?	TYPE OF DAMAGE CAUSED BY HURRICANE IRENE
Bridgeport	No	None
Cape May	No	None
Deepwater	No	None
Higbee	No	None
Huron	No	None
Lake Avenue	No	None
Marven	No	None
Missouri Ave.	No	None
Ocean City	No	None
Paulsboro	No	None
Salem	No	None
Sea Isle	No	None

The word 'none' in the column "Type of Damage Caused by Hurricane Irene" means that the substation did not sustain any damage.

There have been no substation equipment failures as a result of flooding/storm damage in the past 10 years.

ACE used a pre-event checklist to prepare for the emergency events but was not sure if substation flooding related items were included on the checklist. High tide information and predicted high water levels are received from ACE's weather service. ACE is not aware of any notification agreement in place with any dam or reservoir managers upstream of the substation to notify or warn of impending water releases.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observation:

JCP&L's substations are designed per the FirstEnergy substation standards, which provide that "[the final finished grade of a substation yard located near a river, stream or lake must exceed the 100-year flood level for that area by a conservative, yet economic margin."

JCP&L has seven substations located in the 100-year flood zone and all were impacted by Irene.

SUBSTATIONS IN 100-YEAR FLOOD ZONE	DID IRENE IMPACT OPERATIONS?	TYPE OF DAMAGE CAUSED BY HURRICANE IRENE
Morristown	Yes	Relays, Switches, Breaker, Cable
Sussex	Yes	Breaker, Bus Work
Pequannock	Yes	Bushings, Bus Work
Canoe Brook	Yes	Charging Motor
Sea Bright	Yes	No equipment was damaged.
Monmouth Consolidated Water	Yes	Controller and Switch
Windsor	Yes	Relays, Telemetering, Breaker

The word 'none' in the column "Type of Damage Caused by Hurricane Irene" means that the substation did not sustain any damage.

As JCP&L builds new substations or makes additions to existing substations, these will conform to the current design standards.

JCP&L notes that there have been very few instances or occasions of substation equipment failures due to flooding. However, obtaining the records of substation equipment failures that resulted specifically from flooding/storm damage for the last 10 years is difficult because the information is not filed that way.

JCP&L had seven substations that were impacted by flooding. Flooding at the Morristown Substation was the most significant. While mitigation measures (flood gates) were completed in 2005, the flooding during or in the aftermath of Irene resulted from obstructions (debris) at a down-river bridge that caused the river to back-up to levels exceeding the 100-year flood level. JCP&L engaged a consultant after Hurricane Isabel to review the Morristown substation flooding, and sees no need for additional consultant recommendations for enhancing substation resiliency. JCP&L now performs a visible inspection of the bridge, and maintains regular contact with town officials, who are also now aware of the obstruction concern and have committed to respond to clear any developing obstructions in the future. Morristown load was picked up on other substations.

When Tropical Storm Lee arrived immediately after Irene, JCP&L deployed sandbags and sump pumps for use at substations. JCP&L is considering additional measures at the Windsor Substation, which floods due to blocked drainage facilities on neighboring properties.

In preparation for Irene, JCP&L reviewed critical circuits, contingency plans and projected flooding. Morristown substation floodgates were closed. JCP&L has 15 mobile substations used to restore customers.

Recommendations:

There are no specific recommendations for JCP&L beyond the global recommendations.

Public Service Electric and Gas

Observations:

PSE&G's design criteria specify elevating control house equipment above ground level (typically 18 to 24 inches above grade). All of the substations identified as flood-prone were built in the time period between 1925 and 1976, which predates the development of comprehensive flood mapping surveys.

PSE&G has 12 substations in the 100-year zone. Five of the PSE&G substations regularly affected by some level of flooding during major rain events are Bayway, Belmont, Jackson Road, Ewing and Garfield Place. These stations have been surrounded by floodwalls, sand bags or jersey barriers to offer protection. During Irene, 8 substations were impacted, which included the six listed below plus Marshall Street and Scotch Plains.

Substation In 100-Year Flood Zone	Did Irene Impact Operations?	Type Of Damage Caused By Hurricane Irene
Belmont	No	None
Jackson Road	No	None
Ewing	No	None
Somerville	Yes	Breakers, Relays, batteries
Cranford	Yes	Transformers, regulators, cables
Rahway	Yes	Lost station light & power
Bayway	No	None
Marion Switching Station	Yes	Water in station but no damage or impact
Garfield Place	Yes	Breakers, regulator, relays
River Edge	Yes	Water in station but no damage or impact
New Milford	Yes	Breakers, Relays, Batteries
Hillsdale	Yes	Water in station but no damage or impact

The word 'none' in the column "Type of Damage Caused by Hurricane Irene" means that the substation did not sustain any damage.

PSE&G does not prepare formal reports for specific flooding events and damage has been primarily restricted to water incursion, which was remediated by extensive cleaning and drying out. Flooding is not a regular occurrence during normal weather events. Flooding for most of the stations had typically been a non-event until the last 10 – 12 years. It is believed that increasing floodwaters are a result of increased levels of development and the collateral effect of flood water mitigation strategies to protect reservoirs and dams in the Pascack Valley and the Hackensack River Basin. Other flooding storm events include Tropical Storm Floyd (Ewing, Cranford, Belmont, Hillsdale, New Milford, Garfield Place, Jackson Road and Somerville substations); a multiday major rain event in April 2007 (Cranford, New Milford, Garfield Place and River Edge substations); and a March 2010 Nor'easter (flooding in north but no impact on operations).

Substations are prepared for a potential flooding event by clearing the yard, ensuring flood barriers are intact and obtaining generators / pumps if needed. Sump pumps are used for indoor substations. PSE&G has 10 mobile subs (with additional units on order), which may be moved into an area to prepare for potential flooding. Mitigation methods used include the redundancy of the 26kV distribution system, connection of mobile substations, installation of 26 kV to 4 kV transformers, activation of air conditioning load control measures, shifting large loads to rented on-site generation and load interruption.

After Irene, PSE&G engaged a consultant to perform a comprehensive flood mitigation study involving twelve substations, which has been completed. PSE&G is now performing a flood mitigation effects study to determine the negative effects, if any, on the areas surrounding these facilities as result of the recommended mitigation strategies. After the flood mitigation effects are validated, PSE&G will then decide upon what flood mitigation actions can be undertaken.

Recommendation:

10-PSE&G-1 PSE&G should complete the flood mitigation validation and implement appropriate recommendations from its consultant's report to mitigate substation flooding.

Rockland Electric

Observations:

RECO now constructs its enclosures to minimize the impact from flying debris, water, etc. Future substations will be designed out of the Minimum Approach Distance (MAD). Storm water drainage facilities are to be designed for the 100-year storm conditions. In addition, floodplain data is reviewed as part of the design process to adjust foundation / equipment height as necessary.

RECO has one substation in the 100-year flood plain, which had foundation heights raised during the initial design and this substation was not affected by Irene.

SUBSTATION IN 100-YEAR FLOOD ZONE	IRENE IMPACTED OPERATIONS	TYPE OF DAMAGE CAUSED BY HURRICANE IRENE
Closter	No	None

The word 'none' in the column "Type of Damage Caused by Hurricane Irene" means that the substation did not sustain any damage.

The Hillburn substation (located in New York) experienced flooding when a privately owned dam broke. The Hillburn substation has 1,700 customers of which 85% are in New Jersey. The two outdoor breakers that were four to five feet off the ground were replaced with materials on-hand. There were enough loop circuits to transfer the load to other substations.

Cresskill, Congers and Upper Saddle River substations experience some wash-out under the fences during major rains. Most water issues are ground water issues, so the only solution would be stilts. RECO does not have any records of substation flooding, frequency, or flood related equipment damage for the past 10 years.

RECO uses normal operating procedures to prepare substations in advance of an event. This consists of positioning personnel, buttoning up substations, conducting roving checks of low lying areas, and responding to alarms and events. For distribution transformers, O&R has 5 mobile substations at O&R to pick up loads as necessary. O&R also has a stock of substation transformers. RECO has a spare 345/138 transformer available at Con Edison.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendations.

3.11 VEGETATION MANAGEMENT (VM)

Damage from fallen limbs and trees are a major cause of electrical outages in most storms. EDCs have certified arborists who work with communities to ensure trimming and clearing is performed and to encourage the planting of appropriate tree species. EDC vegetation management best practices includes analyzing previous storm damage data to identify particularly vulnerable areas, vigilant surveying of lines to discover and remediate at-risk areas, and a budget sufficient to execute preventive trimming and clearing. It is particularly important for EDCs to implement effective community relations efforts to deal with local objections to trimming and clearing based on aesthetic concerns.

An electric line right-of-way (ROW) is a strip of land that an EDC uses to construct, maintain, repair or replace an overhead or underground power line. The ROW permits the utility to provide clearance from trees, buildings and other structures that could interfere with the line installation, maintenance and operation. The ROW for a distribution line can vary in width, though they are usually between 10 to 20 feet wide unless terrain, vegetation, or unusual construction conditions require a wider easement. This ROW is obtained through an easement from the property owner.

ROW may be required in conjunction with a town, county or State project for the construction, maintenance, and routine operation of water lines, sanitary sewer lines, and storm drainage lines. Street improvement projects, installation of sidewalks, new roadway construction, and lane-widening projects may also require the acquisition of ROW.

An easement is a written legal document by which the property owner grants an electric utility or other organization, a permanent right to use land for the specific purpose. An easement is associated with the property, which means it stays with the property even when ownership of the property changes hands. An easement may have been obtained many years ago, when electric distribution equipment and standards were vastly different.

While there are many ways to trim a tree to prevent outages, each method has its drawbacks, primarily aesthetic. Trimming can be designed to remove all vegetation above and/or alongside the electrical lines (the trimming method preferred by many EDC is directional pruning). Trees located outside of the ROW can be removed, replaced or trimmed aggressively to protect the electrical lines. Aggressive vegetation management performed without customer education usually generates a negative backlash.

Good vegetation management is a complex balancing act of many variables. Besides the EDC and its regulator, many other stakeholders are involved, including municipalities, property owners, environmental groups, planning and shade tree commissions, land planners, and landscape architects.

The numerous tree-related power outages caused by the two storms renewed discussions about the option of burying electric lines underground. However, significantly, the cost to convert overhead to underground electric distribution lines could range from $80,000 per mile in a rural area to over $2,000,000 per mile in an urban or suburban area.[17]

Moreover, there are questions as to whether underground lines are more reliable than overhead lines.[18] While underground outages occur less frequently, these lines are still susceptible to corrosion, flooding, tree roots and people digging into the lines. When an outage does occur, it typically takes three to four times longer to locate and fix a problem on an underground line than on an overhead line. In addition, repair of underground lines requires specialized crew personnel. Conversion of an existing overhead line to underground requires coordination with telecommunications and cable providers.

Additionally, there is significant ratepayer cost associated with burying utility lines.[19] There appears to be a large gap between what the public's perceptions of what it should cost versus the actual cost for undergrounding electric lines.[20] Furthermore, there seems to be a corresponding unwillingness to pay the increased rates that would be associated with the undergrounding approach.

Underground electric lines may offer some advantages compared to overhead electric lines. For instance, underground lines are less vulnerable to air-borne elements, such as wind, rain, and ice. Consequently, despite the difficulty in repairing underground lines, overall, EDCs may spend less on operating and maintenance costs for these lines. In heavily populated areas, underground lines may be more practical than overhead lines. In addition, there are obvious aesthetic advantages to underground lines.

Given the subjective nature of the current vegetation management guidelines on distribution lines in the New Jersey regulations, more clearly defined requirements should be established. The requirements should clearly state how the EDC handle vegetation issues within the ROW or easements; such as specific clearance requirements, need to trim or clear above the lines in addition to around the lines, and a specific listing of species allowed within the ROW, if at all.

[17] Edison Electric Institute, *Out of Sight, Out of Mind Revisited, An Updated Study on the Undergrounding of Overhead Power Lines,* December 2009

[18] The Selective Undergrounding Working Group *"Report to the Public Service Commission of Maryland on the Selective Undergrounding of Electric Transmission and Distribution Plant",* February 2000.

[19] North Carolina Utilities Commission, "The Feasibility of Placing Electric Distribution Facilities Underground," November 2003. In 2003 the North Carolina Public Utilities Commission concluded that it would cost $41 billion and take 25 years to bury the utility lines, increasing customer bills by 125%.

[20] Edison Electric Institute, *Out of Sight, Out of Mind Revisited, An Updated Study on the Undergrounding of Overhead Power Lines,* December 2009

Global Observations:

EDC vegetation managers have stated that out of ROW trees caused many of the tree related outages during Irene and the snow storm. However statistics have not been gathered to support this statement. Across the utility industry, between 20 to 50% of all unplanned distribution outages are tree-related, with a majority caused by tree failures outside the ROW.[21] The EDC have no authority to remove trees that are not in the ROW unless they receive permission from the property owner.

A recent FERC report: "Report on Transmission Facility Outages during the Northeast Snowstorm of October 29-30, 2011"[22] stated that "As noted above, off-right–of-way tree fall-ins accounted for about half of the storm's transmission line outages, and nearly 75% of all confirmed vegetation-caused outages." Although there were few transmission issues in New Jersey, this report supports EDC's concerns about the impact of out of ROW trees on the distribution system.

The four EDCs follow the North American Electric Reliability Council (NERC) Reliability Standard FAC-003-1, which sets several requirements for completing work on bulk transmission lines 200 kV and above (NERC Transmission Vegetation Management Program (TVMP) Standard).

All EDCs refer to the BPU regulations on Vegetation Management at N.J.A.C. 14:5-9 and trim on a 4 year vegetation management cycle schedule, however some portions of circuits may need to be trimmed more often due to growth rates of certain vegetation species or weather. The National Electric Safety Code ("NESC") standards that New Jersey adopted for the regulations does not specifically address vegetation clearance around power distribution lines.

Texas A&M University submitted to the PUC of Texas a 'Best Practices in Vegetation Management for Enhancing Electric Service in Texas' (November 11, 2011), which "recommends a reliability-centered program. In such programs, heavy emphasis is placed on inspection and condition-based decision making by vegetation professionals using continuously updated data on vegetation-caused outages. A reliability-centered program allows a utility to choose practices that can be selectively applied based on variations across the utility service area. Factors such as annual growth rates, tree species, feeder construction type and feeder voltage can be taken into account to achieve optimal reliability for a given expenditure of funds.

A reliability-centered vegetation program must engage the public, so that it understands the necessity of vegetation management. Success of a reliability-centered program requires continuity of vegetation-management expenditures to enable proper planning over multiple years." The same

[21] Guggenmoos, S., Effects of Tree Mortality on Power Line Security. Journal of Arboriculture, 29(4), July 2003.
[22] Page 46 and 48 of "Report on Transmission Facility Outages during the Northeast Snowstorm of October 29-30,2011" prepared by the Staffs of the Federal Energy Regulatory Commission and the North American Electric Reliability Corporation in May, 2012.

study also states: "To quantify the effectiveness of vegetation-management programs, however, it is necessary to separately calculate these indices, the System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI) based only on vegetation-cause outages and interruptions." A Vegetation Management Workshop for Texas PUC (March 2011) determined that SAIDI/SAIFI are highly correlated to VM practices if you look at 10 plus years of information. For 5 to 10 years the correlation is questionable because of the short timeframe and multiple variables, like weather conditions.

Irene and the snow storm caused significantly different tree-related damage. Irene was a horizontal-force event with high winds and heavy rain. Sustained tropical storm force winds covered the majority of the State with gusts up to 75 mph at some locations and sustained 70+ mph winds as the eye passed up the coastline. Rainfall totaling 6-12 inches throughout the State caused widespread record setting flooding. This, combined with the saturated soil, caused the collapse of many trees and limbs in full leaf.

In comparison, the October snow storm was a vertical-force event, with rain soaked snow sticking to leaves and tree branches, causing breakage from above. Trees that hold leaves later into the season were particularly vulnerable during the storm because of the heavy canopies. As a result, this storm caused more individual incidents of damage to New Jersey's electric infrastructure than Irene. The majority of the damage was concentrated in Northern New Jersey during this event.

The magnitude of tree-related damage to New Jersey utility infrastructure, State and local government roadways and individual homeowners during Irene indicates that vegetation management is not a problem that the utilities can solve alone. Even with increased trimming, electric facilities are still impacted by healthy trees falling or uprooting from outside the utility maintained ROW. Therefore, this will require an integrated approach with support from all stakeholder groups.

However, due to the complexity of vegetation management, it's critical to collect objective information that can provide input to more detailed analysis of tree related outages. Unfortunately many EDCs do not collect information at the level of detail that will allow for a quantitative assessment of its program.

Both ACE and JCP&L have significantly increased its vegetation management budgets over the past five years, while PSE&G has remained the same on average and RECO has varied from year to year. A review of the vegetation management budget trends, and the actual amount spent, provides an indication of the trends at an EDC. An increasing budget level trend, as well as spending the budgeted amount each year, indicates an increased focus on vegetation management.

Vegetation management programs, cycles and expenditures for each EDC.

VEGETATION MANAGEMENT RELATED DATA				
	ACE	**JCP&L**	**PSE&G**	**RECO**
Reliability-Centered VM	Yes – Condition Based Maintenance & Reactive Maintenance	Cyclic Maintenance	Model to Determine Priority Circuit & Review Tree Outages Daily	Cyclic Maintenance, Hot Spot Trimming & Review Tree Outages Daily
Danger Tree Program	Yes	Yes	Yes	Yes
Out of ROW Statistics	Yes	Non-Preventable**	No	No
Transmission VM Cycle	4	4	4	3
Distribution VM Cycle	4	4	4	4
Transmission Miles	1,121	2,550	-	35
Sub-transmission Miles	240	1,812	2,393	0
Distribution Miles	10,352	22,670	19,620	853
VM Expenditures* 2007	$6,565	$23,484	$28,516	$531
VM Expenditures* 2008	$7,995	$21,363	$23,476	$1,433
VM Expenditures* 2009	$6,710	$21,448	$33,493	$2,029
VM Expenditures* 2010	$10,793	$20,849	$21,774	$1,884
VM Expenditures* 2011	$12,742	$33,553	$28,720	$989
* Thousands of dollars				
**Out of ROW is included in the Non-Preventable category, but not as a separate item.				

The following is a comparison of EDC vegetation management spend versus budget for 2007 through 2011 (dollars are in thousands, storms are excluded, and actual expenditures are included in the table above).

	ACE	JCP&L	PSE&G	RECO
Actual Spend versus Budget Total for 2007 - 2011	+23.2%	-0.9%	-8.3%	+5.2%

For the past five years, ACE and RECO have spent above its vegetation management budgets, and JCP&L spent what was budgeted.

PSE&G has underspent its vegetation management budget by over 8%. PSE&G noted that the variance was due to tree density being lighter than anticipated one year and another year distribution tree trimming budget reductions were enacted, with some distribution tree trimming budgeted funds transferred to the transmission tree trimming budget.

Global Recommendations:

11-G-4 Each EDC should develop a program to track tree related outages at a more granular level. This could include the type of tree problem (inside the ROW, outside the ROW); failure mode (tree falls, tree limb); health of the tree (live, dead, or diseased); how far the tree was from the power lines; species of the tree and other appropriate categories.

11-G-5 BPU Staff should develop and implement a review to evaluate the present vegetation management standards with the goal of establishing a more aggressive tree vegetation management standard for electrical distribution systems, similar to the guidelines previously established for the transmission systems. The National Electric Safety Code ("NESC") standards that New Jersey adopted for the regulations does not specifically address vegetation clearance around power distribution lines. As such, this initiative should establish clearly defined parameters on clearance and expectations. It should focus initially on high consequence feeder lines, which can cause large outages when impacted. Staff should also evaluate the usefulness of switching to a shorter tree trimming cycle.

11-G-6 Each EDC should use outage analysis and reliability statistics over multiple years to evaluate the effectiveness of its vegetation management program.

Atlantic City Electric

Observations:

ACE's distribution vegetation management program is on a four year cycle, is reliability-based, and includes condition based maintenance and reactive maintenance. The Condition Based Maintenance program analyzes feeder performance data (feeder mileage, feeder Tree SAIFI, total overhead mileage, etc.), which is used to select feeders for vegetation management inspection and remediation. The Reactive Maintenance Program addresses unscheduled vegetation management activities for vegetation conditions that are reported by customers, regulators, municipalities, utility personnel and incidental weather related activities. Regulatory and community concerns are addressed through proper selection and prioritization of vegetation management projects. Aerial patrols are performed on a two-year cycle for transmission and four-year cycle for distribution.

The program includes responding to all reports of danger trees by ACE patrols or departments of public works. An arborist looks at every reported danger tree and schedules removal. Other initiatives include Tree Planting / Replacement programs, Arbor Day, Tree-line USA and Membership in Industry / State / Community Organizations including the New Jersey Shade Tree Federation and New Jersey State Forester's Community Forestry Council.

Staffing includes Manager-Vegetation Management, Senior Staff Forester and Staff Forester / Regional Forester. ACE employs professional foresters and arborists to manage this work, increasing credibility, professionalism, and public acceptance.

The vegetation management department works with Customer Care, System Operations, district personnel, and other groups with customer contact, to receive, investigate, work, and track customer tree requests.

ACE uses contractors to perform vegetation management. Contracts are put out for bid. The contractor's work is reviewed and any work not completed to specifications is resolved before payment. Vegetation management work units completed are tracked on a monthly basis and reported.

Event roles and responsibilities are clear and vegetation management is three deep in backup for major storms. The vegetation management group participates in exercises once per year and updates the vegetation management section of Incident Response Plan.

Following Irene, the vegetation management group requested that the District IMTs provide them with information regarding the circuits with that had the most serious vegetation issues during the storm. Vegetation management contractors were then directed to clear those identified problems. When work was completed, all resources were directed back to routine vegetation management responsibilities.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observations:

Transmission and distribution vegetation management are performed on a four-year cycle. The JCP&L Vegetation Management Lead is responsible for distribution and 34.5 kV, but not transmission. FirstEnergy vegetation management lead has responsibility for 115 kV and above, and has a local forester in New Jersey.

JCP&L tracks outages caused by out of ROW trees as part of a "Non-Preventable" category, and most tree issues were noted to be from off-corridor trees. If customer asks for tree to be trimmed, JCP&L will send a forester out. JCP&L will disconnect service for customer to allow the customer to engage a tree trimmer to do the work. JCP&L looks for trees that will fall and impact service.

Staffing includes an Advanced Forestry Specialist, Forestry Specialist, Assistant Forestry Technician, and an Associate Forestry Technician. JCP&L sets goals for individual job responsibilities. The Advanced Distribution Specialist has forestry performance objectives to meet operating company Key Performance Indicators (KPIs) for distribution and transmission reliability performance.

JCP&L uses contractors to do vegetation management and audits vegetation management projects to ensure that the work is completed per contract. JCP&L normally has 100 to 110 crews working on sub transmission and distribution lines. JCP&L will notify the municipality before doing tree trimming there.

For Irene and the snow storm JCP&L vegetation management leadership participated in both JCP&L and FirstEnergy conference calls, requesting additional contractors. Vegetation management leadership had both FirstEnergy and contract crews; it also received FirstEnergy transmission crews. The vegetation management lead started at 1 AM preparing work packets, which were given to contractor supervisor for crews. The vegetation management lead backup worked the day shift and managed the crews. The vegetation management leadership reviewed outages in OMS and would give work to a foreman, who then assigned work to crews.

Each operating district had 6 to 10 tree crews for its use with line crews. For some major outages vegetation management crews worked from the substation out (circuit restoration). Some tree crews were assigned to work in quarantined areas. The vegetation management staff relied on institutional knowledge, which is not documented in the E-Plan. This means that staff coming in

from other FirstEnergy affiliates would need to be briefed on the process used at JCP&L. Vegetation management staff kept logs of when crews arrived and used a grease board, taking pictures of the grease boards as documentation.

At the end of the event, the tree crews conducted circuit sweeps and then returned to normal work. After the 2011 storms, JCP&L continued to trim vegetation in accordance with established and accepted methods to ensure the continued safe, reliable operations of its distribution system.

Recommendations:

11-JCP&L-1 JCP&L should develop and institute a vegetation management pre-event, activation, and demobilization checklist to document institutional knowledge.

Public Service Electric and Gas

Observation:

PSE&G inspects and trims on a four-year cycle. Every mile is not considered equivalent, and PSE&G worked with a consulting firm to develop a model to aid in the decision making process. The model looks at the number of critical customers on a circuit, past outages, and the budget to prioritize circuits for vegetation management. PSE&G started using the model last year and have run it twice. The density modeling provides a good feel for key tree areas and provides better quantification.

The Manager Vegetation Management reviews the outages every morning, looking for tree related issues. A Vegetation Management Audit / Quality Assurance process verifies that the work is completed per standards or corrected before payment.

PSE&G's other tree programs include a Danger Tree Program. On a daily basis, 80-85% of tree related outages are from trees out of ROW. In 2011, PSE&G started to devote 10-15% of its budget to danger trees. The trees are identified by contractors / crew leaders during the course of their normal work. PSE&G will ask the homeowner for permission to trim and many times the homeowner obliges. For counties and municipalities, PSE&G will do the work and the local Department of Public Works will clean up the debris. Regional Public Affairs personnel assist with this process during the year by generating new briefing information and other communications to the public.

Staffing includes: Manager - Vegetation Management, Distribution Supervisor Vegetation Management and Delivery System Forester Vegetation Management. PSE&G is working on a pilot program to have internal PSE&G tree trimmers and currently have 13 employed. The Foresters have good relationships and know all the local municipal personnel. The BPU is working on the issue of some municipalities not allowing trimming, particularly in Bergen County. The FERC and NERC

regulations are challenging to manage, particularly in an environmentally conscious State like New Jersey with endangered / threatened species.

PSE&G averages 150 vegetation management contractor crews on the transmission and distribution system, of which 110-115 are 2 person crews and approximately 45 are 3-5 person crews. There is a Contractor Evaluation Initiative where metrics are instituted and contractors receive a monthly score. PSE&G is working on a process to look at best practices across the industry.

PSE&G vegetation management goals for 2011 included: complete 100% of transmission targeted maintenance spans; complete 95% of funded distribution circuits; implement in house distribution tree trimming pilot; implement consultant optimization model as a decision making tool for selection of circuits / substation; and introduce contractor performance metrics around safety, schedule, quality and customer service.

Historically, the vegetation management group did not participate in the annual exercise, but it did for 2012.

For Irene and the snow storm, vegetation management leadership contacted contractors early and participated in conference calls. Distribution Supervisors become Lead Coordinators for the tree crews during an event. PSE&G had 290 contractor crews for Irene and 245 – 250 crews for the snow event. PSE&G had 2,000-3,000 tree jobs for Irene and 12,000 for the snow event. Local / Municipal Departments of Public Works provided valuable information to aid the tree clean-up process. Irene was mostly large trees coming down versus the snow event, which were primarily broken limbs. Crews are coordinated at the Division with one supervisor for 5-8 crews. The Supervisor was in early to prepare the tickets (work packages). When work was completed in the field, it was called in and additional jobs were dispatched. Approximately 10-15% of the tree crews went with the line crews, which worked well in the snow event. The OMS had a hard time keeping up with the high volume of tree jobs. Analysts came in from other departments to help with closing out jobs in OMS. This was ad-hoc for Irene and the snow event, but they are working on formalizing the process.

PSE&G undertook two specific vegetation management initiatives after the 2011 storms covering the trimming of additional circuits and consolidation of distribution specifications to provide a single tree clearance zone.

Recommendations:

There are no specific recommendations for PSE&G beyond the global recommendations.

Rockland Electric

Observations:

RECO follows a 4-year trimming cycle and has 853 miles of distribution circuits and no sub-transmission. They conduct an edge-to-edge cut and enforce the easements; this has made an improvement in its transmission program. There are three zones: under conductor, 10' on each side of wire zone, and a broader zone of edge-to-edge of right-of-way. New York and New Jersey have slightly different rules but are comparable (depends on sag and land contour).

RECO conducts transmission vegetation management on a 3-year cycle versus the 4-year cycle completed by the other New Jersey EDC.

The Section Manager tracks outages every day to get a feel for vegetation impacts. Poor performance circuits are first in the annual program. A reliability engineer reviews all outages over 500 customers and worse performing circuit segments.

RECO notifies the municipalities before work proceeds by sending letters and scheduling meetings. Letters are sent to each building on the circuit to be trimmed, as required in New Jersey, including underground customers. RECO personnel also hold a face to face meeting with the customer; this provides an educational opportunity for RECO personnel to review the importance of vegetation management with customers. RECO then does the work. Prior to tree removal RECO talks to the owner of the tree, however RECO is not responsible for the debris removal if the tree is out of the ROW. Overall they have had good success with this method of working with customers when trimming trees.

The Danger Tree Program involves the vegetation management Section Manager following up on calls from line supervisors, VP Operations, and Emergency Management to check trees. The program has been successfully publicized in RECO and resulted in additional tree removal. If a tree is outside the ROW, RECO contacts the tree owner in an attempt to resolve the potential issue. RECO may cut trees on private property but the property owner is responsible for debris disposal.

RECO staffing includes: Section Manager, Manager Vegetation Management, Chief Construction Inspector, Foresters, and Supervisors. RECO employs foresters that are credible and knowledgeable to work with municipalities and shade tree commissions, educating them about the proper types of trees to plant. If tree removal or trimming is required,

RECO inspects 100% of contractor work and does not pay until all substandard work is corrected.

RECO does not have specific vegetation management goals, but the concept is included in reliability goals for SAIFI and CAIDI.

Vegetation management participates in RECO exercises.

During Irene and the snow storm, RECO's vegetation management group used a separate tree screen in OMS as the primary tool to identify tree jobs. Jobs came in, sorted by division, and assigned to a supervisor. RECO had sufficient tree contractors for both events, with 5 – 10 supervisors that were responsible for three to five tree trimming trucks each. Crews completed the jobs and reported back to the supervisor when the work was complete. The supervisor called the Vegetation Management Lead, who closed out the jobs on OMS and assigns more jobs, providing for a constant flow of work.

There were no transmission issues in either storm. During Irene, most distribution issues were related to uprooted trees and branches on lines. In the snow storm, most distribution issues were the result of large branches down on wires and across roads.

In the aftermath of the 2011 storms, RECO completed additional hazard tree patrols to identify and remediate storm damaged trees, increased assistance to local municipalities to remove compromised or dead trees, and instituted targeted poor-performing vegetation-related circuits segment improvement program.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendations.

3.12 CIRCUIT OUTAGES

Electric circuits deliver power to the customers. A circuit includes many pieces of equipment critical to its proper operation such as conductors, transformers, fuses, switches, reclosers, capacitors, regulators and poles. Circuits can be network, radial or looped. Networks are interconnected so that all customers have multiple sources of power. Radial circuits are supplied from one end only (substation). Looped circuits are radial circuits that also meet at a common (remote) location such as a pole, but are not normally connected. Looped circuits can be manual tie, automatic tie or networked. If there is an outage on a looped circuit, the configuration may allow for all or part of the damaged circuit load to be picked up and reduce the length of an outage. There is some relationship between circuit configuration, technology, and the capability of the circuit to recover from the impact of weather or other system failures. As an example, the use of tie schemas or reclosers can aid in underlying service reliability by reducing the length of an outage. This is important to customers and the community.

Distribution Management Systems (DMS) include reclosers that can operate automatically or be controlled remotely to connect the circuits and reduce the length of an outage. Distribution automation (DA) can provide real-time adjustment to changing loads and failure conditions on the distribution system, usually without operator intervention. This requires control of field devices to enable automated decision making in the field and relaying of information to the utility control center. This includes real-time data acquisition, communication with utility databases and other automated systems. Distribution automation does not prevent faults or reduce the likelihood of an occurrence, but it can minimize the number of customers that experience a sustained outage and reduce restoration times by identifying and isolating the faulted segment.

Outage statistic measurements include: Customer Average Interruption Duration Index (CAIDI), which is the average duration of a customer outage; Momentary Average Interruption Frequency Index (MAIFI), which is the average number of momentary interruptions a customer would experience; and System Average Interruption Frequency Index (SAIFI), which is the average number of customer interruptions a customer might experience.

The utility industry does not employ a standardized format to collect circuit outage data; instead the majority of the information is submitted as part of Major Event Reports[23] to the respective state utility commissions. Comparing reliability statistics across utilities is complicated because there are many variables and demographic factors that impact the numbers. This includes customer density, service territory terrain, system age, and the amount of underground or network facilities.

[23] A Major Event Report is submitted to the BPU in accordance with N.J.A.C. 14:5-8.8. This requires that electric utilities submit a report within 15 days of a "major event," and includes a list of the items that should be included in that report.

The time to restore any circuit, loop or radial, depends upon a multitude of factors which include: travel time to the location, degree of damage on the circuit, and length of the circuit. A looped circuit configuration may allow for all or part of the damaged circuit load to be picked up from an alternate supply and reduce the length of an outage. While distribution automation does not prevent faults or reduce the likelihood of an occurrence, it can minimize the number of customers that experience a sustained outage and reduce restoration times by identifying and isolating the faulted segment.

Many state commissions have implemented a form of EDC service quality regulation. This can take the form of monitoring only, setting a benchmark standard and setting a benchmark standard along with an incentive or penalty. When a benchmark standard is established, the values are unique to the EDC. New Jersey uses a "minimum reliability level" for the SAIFI and CAIDI metric, which is monitored by the BPU.

A utility's reliability function is responsible for identifying reliability issues and working to resolve issues to reduce outages during normal operation and storms.

During the October snow storm, there were more individual instances of damage to New Jersey's electric infrastructure which take longer to restore because crews had to repair many individual locations.

Global Observation:

Each EDC files a system reliability report on an annual basis with the BPU. Storm activity is excluded when there is a sustained interruption of electric service resulting from conditions beyond the control of the EDC. This may include, but is not limited to, thunderstorms, tornadoes, hurricanes, heat waves or snow and ice storms, which affect at least 10% of the customers in an operating area. The system reliability report provides an in-depth review of reliability statistics, reliability programs, major events, staffing levels and initiatives. Weather induced outages are examined through separate Major Event Reports.

New Jersey's four EDCs have similar reliability programs, although names and definitions may differ. These include substation and distribution equipment inspections and a review of worst performing circuits. Each EDC uses different terminology and reports damage in different categories; this makes direct comparisons difficult. Some EDC have established Distribution Automation pilot programs.

The amount of pole failures for the two storms was not inconsistent with storms of this magnitude; poles damaged amounted to less than 1% of the total poles on the system, well below the average

for a storm with winds of this magnitude. Wind is the primary root cause of most pole failures during a significant storm event, with deterioration and grade not an important factor.[24]

The following table provides a summary of the types of programs that each EDC employs. Since terminology between the EDCs is not consistent, some program categories may not apply to a specific EDC. An asterisk (*) indicates that no information was provided to validate a program in that category or using that naming convention.

RELIABILITY PROGRAMS				
PROGRAMS	**ACE**	**JCP&L**	**PSE&G**	**RECO**
Vegetation Management Programs:				
Distribution Vegetation Management	X	X	X	X
Transmission ROW and Line	X	X	X	X
Transmission Programs:				
Transmission Aerial Patrols	X	X	X	X
Transmission Pole	X	X	*	X
Substation Programs:				
Equipment / Inspections	X	X	X	X
Substation Maintenance	X	X	X	X
Relays	X	X	X	X
Substation Transformer	X	X	*	X
Battery Maintenance	X	X	X	X
Circuit Breaker	X	X	X	X
Substation Underground	*	X	*	*
Distribution Programs:				
Priority / Poorest Performing Circuits	X	X	X	X
Distribution Regulator	X	X	*	X
Distribution Line Recloser	X	X	X	X
Distribution Circuit & Equipment	*	X	*	X
Distribution Pole	X	X	*	X
Distribution Underground	*	X	*	X
Distribution Maintenance	*	X	*	X
Distribution Capacitor	X	X	*	X
Power Quality	X	X	X	X

[24] IEEE GM 2006 Working Group on System Design

RELIABILITY PROGRAMS				
PROGRAMS	**ACE**	**JCP&L**	**PSE&G**	**RECO**
Underground Transformer Load Check	*	*	X	*
Network Protector	X	*	X	*
Automatic Transfer Switches Inspection	X	*	X	*
Overhead Line Inspection	*	X	X	*
*** Note:** This means that the program may be covered as part of a larger program or under a different name.				

The following is a summary of New Jersey EDC reliability statistics (this is 2011 information and the statistics exclude major storms), along with how to interpret the SAIFI, CAIDI and MAIFI statistics. It is not appropriate to compare reliability statistics between one EDC and another, as there are many variables that contribute to the values (urban vs. rural, terrain, travel distance, etc.). What constitutes acceptable level of performance varies across utilities and it is more appropriate to look for improvements from one year to another for each EDC.

- SAIFI is average number of customer interruptions, so lower is better.
- CAIDI is average duration of a customer outage, so lower is better.
- MAIFI is average number of momentary interruptions (blinking lights) a customer would experience, so lower is better.

RELIABILITY STATISTICS				
	ACE*	**JCP&L**	**PSE&G**	**RECO**
SAIFI – Radial - 2007	1.49	1.24	0.16	0.88
SAIFI – Radial - 2008	1.64	0.66	0.15	1.37
SAIFI – Radial - 2009	1.61	0.92	0.13	0.97
SAIFI – Radial - 2010	1.56	1.40	0.17	1.10
SAIFI – Radial - 2011	1.76	1.67	0.14	1.08
SAIFI – Looped - 2007	-	1.40	0.59	1.05
SAIFI – Looped - 2008	-	0.95	0.55	1.25
SAIFI – Looped - 2009	-	1.26	0.56	1.19
SAIFI – Looped - 2010	-	1.22	0.67	1.07
SAIFI – Looped - 2011	-	0.90	0.63	0.84
CAIDI – Radial - 2007	111	113.21	91.48	100.12
CAIDI – Radial - 2008	131	97.76	79.60	100.22
CAIDI – Radial - 2009	131	132.11	79.15	93.06

RELIABILITY STATISTICS				
	ACE*	JCP&L	PSE&G	RECO
CAIDI – Radial - 2010	118	120.98	75.94	127.77
CAIDI – Radial - 2011	110	138.29	92.51	130.02
CAIDI – Looped - 2007	-	77.98	60.94	87.99
CAIDI – Looped - 2008	-	89.62	61.60	119.20
CAIDI – Looped - 2009	-	89.31	58.74	98.47
CAIDI – Looped - 2010	-	108.41	65.46	106.20
CAIDI – Looped - 2011	-	95.68	66.68	105.74
MAIFI – Radial - 2007	-	NA	0.07	2.66
MAIFI – Radial - 2008	-	NA	0.06	5.53
MAIFI – Radial - 2009	-	NA	0.08	4.73
MAIFI – Radial - 2010	-	NA	0.07	7.43
MAIFI – Radial - 2011	-	NA	0.03	5.21
MAIFI – Looped - 2007	-	NA	1.29	2.81
MAIFI – Looped - 2008	-	NA	1.26	7.75
MAIFI – Looped - 2009	-	NA	1.16	6.04
MAIFI – Looped - 2010	-	NA	1.24	6.74
MAIFI – Looped - 2011	-	NA	1.14	5.53
# of Radial Circuits - 2007	-	70	953	70
# of Radial Circuits - 2008	-	73	952	68
# of Radial Circuits - 2009	-	72	954	55
# of Radial Circuits - 2010	-	72	950	53
# of Radial Circuits – 2011*	-	73	947	53
# of Looped Circuits - 2007	0	1084	964	13
# of Looped Circuits - 2008	0	1096	973	13
# of Looped Circuits - 2009	0	1099	979	30
# of Looped Circuits - 2010	0	1099	991	32
# of Looped Circuits – 2011*	0	1098	1,010	32

*Note: ACE classifies all circuits as Radial.

**Note: From year to year, the number of circuits can change due to various factors including but not limited to retirement of circuits in the field, as well as, the addition of new circuits.

Global Recommendation:

12-G-4 Each EDC should work with the BPU to evaluate the potential benefits of utilizing Distribution Automation initiatives as a way to protect the integrity of the system and improve customer reliability. It is understood that several of the New Jersey EDCs have implemented pilot programs on such initiatives. The EDCs should complete these pilot programs and the results should be fully reviewed for benefits to the system and customers, along with any practical, operational hurdles that need to be addressed.

12-G-5 The BPU Staff should standardize the Major Event Report so that all EDCs report information using the same categories and definitions.

12-G-6 The BPU Staff should review the reliability goals to determine if an adjustment is required.

Atlantic City Electric

Observation:

At ACE, the responsibility for reliability resides with the Asset Reliability Planning group. This group includes Asset Strategy, Maintenance Analysis and Planning, and Chemistry Lab functions within Asset Management. The function is comprised of engineers, analysts and technical assistants.

ACE has a number of reliability programs, including Distribution Automation. This is a major component of ACE's strategy for improving customer reliability, and this involves installation of advanced control systems across the distribution system to allow the electric system to identify faults and perform switching automatically. The ACE reliability programs are summarized in the Reliability Programs table at the beginning of this section.

ACE classified all circuits as radial circuits. ACE maintains yearly reliability statistics for SAIFI, CAIDI and SAIDI, including major events and outage statistics for each circuit

The following table describes the damaged caused by Irene. ACE was not impacted by the snow storm. EDC damage statistics are not reported in standardized categories.

ACE	
DAMAGE CATEGORY	**IRENE**
Reports of Down Power Lines	1,070
Primary Wire (Feet)	136,661
Secondary Outages (#)	14,630
Service Outages (#)	858
Poles Replaced	59
Cross Arms (#)	911
Transformers	107
Reclosers	1
Switches	12
Regulators	2
Tree Outages (#)	1,463
Other Equipment (#)	23
Customer Problem (#)	223
No Cause Found (#)	2,033
Unknown (#)	22,154
Street Light Fixtures	17

Recommendation:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observation:

At JCP&L, system reliability is the responsibility of the Engineering Services Department (including planning and reliability engineers), Operations Managers and the Regional Dispatch Office. These groups are responsible for distribution circuit planning, reliability, protection asset management, voltage concerns, circuit enhancements, monitoring and addressing circuit reliability performance, maintaining circuits and distribution operation. The JCP&L reliability programs are summarized in the Reliability Programs table at the beginning of this section.

The JCP&L reliability engineering group regularly reviews circuit reliability for its own and regulatory-required improvement programs. For each circuit, the reliability engineer will perform a root cause analysis to ensure the actions taken will improve reliability for that circuit based on the circuit's outage history and field patrol of the circuit.

JCP&L reports on Highest Priority Circuits in its Annual System Performance Report (ASPR). JCP&L annually reports actions taken to address reliability issues on four percent of each of its two region's highest priority circuits in the ASPR.

JCP&L also maintains yearly reliability statistics for MAIFI, SAIFI, CAIDI and SAIDI, including major events and outage statistics for each circuit. Reviewing individual circuit outages post storm requires a detailed analysis of circuit reliability as part of its regular overall reliability improvement program. There are many factors that contribute to the analysis, including system damage, travel time, and weather conditions.

JCP&L normal operations for reliability include planning engineers completing customer expansions and remediating voltage concerns. Reliability engineers monitor and address circuit reliability performance issues, resolve customer reliability complaints, and provide strategic direction to improve system reliability performance. Operations Managers maintain the circuits and the Regional Dispatch Office operates the distribution system and dispatches crews to outages and trouble calls.

Prior Board Orders have required the installation of aerial spacer cable (Hendrix Cable) in certain circumstances as a method to reduce vulnerability. It appears that in some circumstances, particularly when large out of ROW trees fall, the resulting damage is greater than it might have been otherwise.

JCPL's territory includes barrier islands, remote locations along the Delaware River, and mountains. This results in a higher percentage of radial circuits, which cannot be reasonably converted to looped circuits because they are at the end of the territory. The JCP&L service territory is split into two pieces, further limiting the potential for looped circuits.

During an emergency event damage statistics are collected in OMS. The following table describes the damaged caused by Irene and the snow storm. EDC damage statistics are not reported in standardized categories.

DAMAGE CATEGORY	IRENE	SNOW STORM
Reports of Down Power Lines	21,000	20,000
Wires (Repaired / Replaced)	47 miles	136 miles
Secondary Outages (#)	280	423
Service Outages (#)	1,520	2,192
Poles Replaced	466	483
Cross Arms (#)	1,077	2,034
Transformers (#)	465	390
Reclosers (#)	5	1
Switches (#)	88	13
Regulators (#)	0	0
Tree Outages (#)	5,336	4,128
Other Equipment (#)	4,412	898
Customer Problem (#)	14	13
Unknown (#)	1,136	1,349

Recommendation:

There are no specific recommendations for JCP&L beyond the global recommendations.

Public Service Electric and Gas

Observation:

PSE&G system reliability is the responsibility of the Division Engineering, Division Operation and Division Construction groups and asset management groups (electric delivery planning, system protection, engineering and design, technical support, system reliability and asset strategy-electric). PSE&G has a higher ratio of looped versus radial circuits because its service territory is compact with limited natural barriers such as the ocean or mountains. PSE&G has networks in major cities such as East Orange, Jersey City and Newark and also in 79 smaller municipalities. PSE&G maintains yearly reliability statistics for MAIFI, SAIFI, CAIDI, and SAIDI, including major events.

PSE&G's design philosophy has been standardized distribution design since the 1970s, which includes: Strict N-1 criteria from the transmission system, 13 kV loop - full redundancy at peak (without AC control) with tie recloser and remote operation; and 4 KV straight bus with 2 or 3 times transformers. PSE&G is enhancing substation maintenance and relay.

PSE&G reports that it has worked to harden its system by facility replacement of underground components due to age, including underground transformers. Additional work includes replacing

poles, aerial cable and equipment. PSE&G's focus is on poorest performing circuits, right fusing, lightning and animal protection and adding more automated reclosers to 13 KV circuits.

The PSE&G reliability programs are summarized in the Reliability Programs table at the beginning of this section. PSE&G files its Annual System Performance Report with the BPU. This report provides performance statistics and a summary of reliability programs.

The Poorest Performing Circuit's Program identifies Poorest Performing Circuits (4 and 13-kV distribution circuits) for the rolling twelve month period of 2010-2011 by calculating a "health score". Circuits are identified where remediation would have the greatest benefit on the total number of customers experiencing extended interruptions in relation to the total number of customers served (SAIFI). The Poorest Performing Circuits are then defined as the 4% of the circuits in each division which will yield the greatest SAIFI benefit / improvement. These circuits are reviewed, remediation is identified and corrective actions are taken to improve reliability.

During an emergency event, OMS collects damage statistics. The following table describes the damaged caused by Irene. EDC damage statistics are not reported in standardized categories.

DAMAGE CATEGORY	IRENE	SNOW STORM
Sub Transmission (#)	78	66
Primary (#)	1,384	1,340
Secondary Outages (#)	519	541
Services Outages	2,223	16,174
Poles (#) Replaced	599	298
Cross Arms (#)	0	0
Transformers	383	274
Reclosers (#)	3	0
Switches (#)	240	303
Regulators (#)	0	0
Tree Outages (#)	2,314	12,041

Recommendation:

There are no specific recommendations for PSE&G beyond the global recommendations.

Rockland Electric

Observation:

RECO system reliability is the responsibility of the Electrical Engineering, Electric Operations, Control Center, and Substation Operations groups. These groups are responsible for operating the system,

monitoring system performance, restoring system during an event and developing reliability programs to improve system performance.

RECO maintains other yearly reliability statistics including major events and outage statistics for each circuit. RECO has increased the number of looped circuits by 19 over the last five years. RECO has no networks. On a daily basis, all outages over 500 customers are reviewed by the Reliability Engineer and Vegetation Management to determine the cause.

In preparation for major storm events, RECO follows its Control Center's Pre-storm Checklist, requires that circuits be secured and placed in automatic status whenever possible. During an emergency event damage statistics are collected in OMS.

The RECO reliability programs are summarized in the Reliability Programs table at the beginning of this section. The 'Rockland Electric Company Service Reliability Filing for 2011 System Performance' (filed with the BPU in May 2012) contains a description of these reliability programs. Some of the 2011 reliability related goals included Distribution Automation goals to test and verify additional Supervisory Control and Data Acquisition (SCADA) points, commission field reclosers for operator control through the DMS, and install additional packages on existing vacuum reclosers. There were also pilot projects for capacitor and regulator communication packages.

RECO has a Circuit Ownership Program, which engages employees to 'adopt' a distribution circuit and be responsible for its reliability performance. Each 'owner' will periodically inspect and identify 'faults waiting to happen' on the main line and significant side spurs and report those conditions to a Divisional Coordinator to expedite corrections.

The following table describes the damaged caused by Irene and the snow storm. EDC damage statistics are not reported in standardized categories. Damage statistics below are for RECO only unless otherwise noted that they are O&R totals.

DAMAGE CATEGORY	IRENE	SNOW STORM
Reports of Down Power Lines	974	2,709
Sub Transmission Wire (Feet)	NA	NA
Primary Wire (Feet)	23,809 (O&R)	16,175 (O&R)
Secondary Outages (#)	NA	NA
Service Outages (#)	90	183
Poles Replaced	27	34
Cross Arms (#)	NA	NA
Transformers	58	35
Reclosers (#)	0	0
Switches (#)	0	0
Regulators (#)	0	0
Tree Outages (#)	1,425	3,182
Other Equipment (#)	30	26
Customer Problem (#)	1	0
No Cause Found (#)	12	5
Unknown (#)	0	0

Recommendation:

There are no specific recommendations for RECO beyond the global recommendations.

C. POST STORM RECOVERY EFFORTS

RFQ SECTION	RFQ REQUIREMENT
3.3.3	**POST STORM RECOVERY EFFORTS** The contractor shall review, analyze, and critique the effectiveness of restoration activities undertaken before, during and after Hurricane Irene *(and the October snow storm).* The contractor shall then identify solutions to any gaps found during assessment. The contractor shall include a detailed evaluation of the process of requesting, deploying and integrating mutual assistance workers, and mobilization of company workforce; assessment of damage and outages by Outage Management Systems and workforce; and how work orders were identified, assigned, completed and closed.

3.13 DAMAGE ASSESSMENT

Before crews can be assigned to repair damage, the restoration team needs a damage assessment to determine infrastructure damage. For major storms, personnel who have other primary roles within the EDC perform some of the damage assessment. Challenges to effective performance of damage assessment include weather conditions, travel impediments, securing enough personnel with advanced training in the temporary roles, advance notice and staging for rapid mobilization, and provision of proper transportation and communications equipment.

Damage data can be transmitted most effectively to the restoration team through remote digital communications technology, including mobile data terminals. Damage information is also obtained from municipal, county and state public works, police and fire personnel. Proactive community relations efforts can help prepare these resources to assist in this effort by training them to report specific conditions (road and bridge conditions, safety situations, pole locations, etc.) and by designating dedicated communications channels for their use. On the receiving end, this intelligence needs to be analyzed by the EDC to provide effective work prioritization and dispatch.

Rapid assessment is important to situational awareness – an EDC needs to understand the scope of the damage in order to plan effectively. Rapid assessment takes place within hours after an incident, and provides a quick evaluation of the extent of the damage to utility infrastructure. This information provides input to the analysis process, leading to estimates of the resources needed for response to life-threatening situations and restoration.

A detailed damage assessment is generally performed to assign specific work to crews. The detailed damage assessment is performed by damage assessors specifically trained to observe the conditions of the distribution system during a patrol or when dispatched directly to a specific incident. In a major event, many times the damage assessment role is supplemented by second role personnel

The information received from the damage assessment process is instrumental to restoration planning. Specifically, restoration planning necessitates an accurate identification of the work load, materials required, and the type of personnel required to perform the repairs. Technological enhancements that could speed up the assessment process and provide more detailed information would be a benefit to the restoration process. In a major event, second role personnel often supplement the damage assessment role.

Damage assessment information, or actually the lack of damage assessment data, became especially critical during Irene and the October snow storm

Global Observations

Road conditions hampered Initial field damage assessments during both storms. During Irene, there was significant flooding and blocked roads. During the snow storm, many roads were impassable until the roads were plowed and trees cleared.

Technological enhancements which could speed up the assessment process, provide more detailed information, and support rapid entry into the OMS system would be a benefit to all EDCs.

Global Recommendation

13-G-1 Each EDC should develop technology solutions that will enable more efficient reporting and/or processing of damage assessment information. This could include a smart phone app concept or providing mobile data terminals for those who do not have them already.

Atlantic City Electric

Observations:

The ACE Damage Assessment protocol is clearly defined in its Incident Response Plan. Additional details are outlined in the job summaries of the Planning & Analysis Leader, OMS Support, Restoration Analysts, and Patroller – Damage Assessor and Patroller Driver.

Once conditions in the field are safe, assessment and restoration personnel are deployed. For a significant weather event, such as a hurricane, field deployment occurs as soon as conditions improve allowing personnel to safely travel or perform the assigned work task.

Initial estimates of load lost and customers out of service are based on information from the Energy Management System (EMS) and Outage Management System (OMS). Information from these systems provides a determination of the priority and extent of transmission patrols and substation checks required. This information also helps to determine the initial focus of damage assessment assignments on the distribution system. When appropriate, aerial patrols are used for a general assessment of the physical damage. Specific information that can aid in the assessment of damage is communicated with the ACE Regional Operations Centers (ROCs) or the ACE Regional IMT.

ACE has a defined rapid assessment process. For Level 3 and 4 incidents, four-hour patrols may be implemented to determine the state of the system and provide information for first estimates of system restoration time, including general restoration resource requirements. The Planning and Analysis team uses the four-hour patrol to supplement information from OMS, EMS and other available information to assess system damage. The Planning and Analysis team uses established man-hour estimates for storm damage for the type of damage encountered to estimate hours of work.

The Planning and Analysis team prioritized damage assessment locations and dispatched two-person teams (Patroller Driver and Damage Assessor). Most Damage Assessors were able to use Mobile Data Terminals (MDT) and input damage found in the field through the MDT and the Advantex program. All information was entered into the "Comments" field which would then display in the OMS job. Damage information was relayed by phone for those Damage Assessors without an MDT.

Assessors were primarily ACE employees (field engineering technicians, field designers, meter technicians, underground crews, substation personnel, etc.). The Patroller Driver and Damage Assessor are second roles for many of these employees and they had been trained in advance. Recent ACE retirees were hired through a contractor to work in response to Irene. ACE also utilized the services of an outside contractor.

ACE leadership determined that a 4-hour patrol was not warranted for Irene based upon initial reports from its first responders.

The Wire Down process is activated in parallel with damage assessment. These types of calls typically come into ACE's 911 call center; the information is input into OMS and coded as priority wire down. In the event the response from a troubleman was delayed, a site safety person would be dispatched to relieve any outside agency from standing by the downed wire.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendation.

Jersey Central Power & Light

Observations:

The JCP&L has a process that is designed to address hazardous situations as quickly and safely as possible and remove or stand-by any specific or immediate danger. The JCP&L Damage Assessment protocol is found in its E-Plan in two separate sections; Damage Assessment and Hazard Response. Damage is initially assessed by hazard responders who are dispatched to individual trouble locations by the hazard dispatcher. The hazard dispatcher dispatches based on reported hazards shown in the OMS. The JCP&L Damage Assessment protocol documents step by step instructions on how to enter Damage Assessment information into the system using MDT's.

For small storms, damage assessment is covered under Hazard Response and assigned as single jobs. Hazard Responders review the scene then report their findings (i.e. number of poles, spans of wire, types of wire, protective devices affected, primary vs. secondary) back to the hazard dispatcher. OMS has three categories: dispatch, hazard and forestry. Hazard Response includes broken poles, single 'no light' and wire down. This information is captured in OMS on the hazard order, and depending on the particular circumstances, a follow-up work order is created and sent to the appropriate group. Storm analysts assist the work dispatcher in the prioritization of these work orders. Once all trouble calls are assessed, the hazard organization will field-assess the outage calls.

The Regional Director of Operations Services (or designated representative) determines the need to assemble and assign Damage Assessment Teams to affected areas or circuits. According to the E-Plan, Damage Assessment Teams can provide timely and useful assessment of damages to overhead distribution and sub transmission systems. Once all of this information is gathered and summarized, the Regional Director of Operations Services calls a meeting of the Damage Assessment Team(s) to determine the amount of damage found and the total amount of repair work required. OMS can be used to estimate the crew hours.

During both storms JCP&L utilized distributed dispatching where all storm organizations utilized the same OMS system to dispatch and document findings. Both trouble crews dispatched by the RDO and hazard crews dispatched by Engineering investigated outages and hazard locations. After performing a field analysis, the employees contacted the hazard dispatcher and relayed all damage information. This information was then documented in the OMS. If follow-up work was needed by another organization such as line, service, dispatch, or forestry, then additional work orders were created for the appropriate organization to address.

JCP&L does not always activate damage assessment. Damage assessment for both events did not take place immediately because personnel were focused on the hazard jobs (downed wires and public safety issues). A prior Board Order following the JCP&L August 2002 storms requires that JCP&L assign a specific number of personnel to the hazard process, and this limits the resources available to conduct damage assessment.

Recommendations:

13-JCP&L-1 JCP&L should develop a rapid damage assessment process to be used during major events. This should describe the prioritization of areas to be assessed, how personnel will be assigned and the timeframe (4 to 6 hours) that they have to report back with their findings.

13-JCP&L-2 JCP&L should ensure that it has enough trained personnel to conduct the damage assessment process in parallel with the hazard process. This could include contract damage assessors, second role personnel or other alternative staffing methods. The quantity of personnel needed to support these processes should be identified using information from the outage prediction model.

13-JCP&L-3 JCP&L should establish a dedicated planning function to analyze information coming in from damage assessment.

Public Service Electric and Gas

Observations:

PSE&G Electric Operations is comprised of four operating divisions plus a construction division. Restoration is decentralized to the four regional divisions. Each division has 40 engineering technicians that normally handle assets (write work orders, etc.). They are considered first for "look-up" and patrol assignments based on incidents that are reported in the Outage Management System (OMS). Lookup is the term used for damage assessment at PSE&G and this process is directed by each Division. The process is initiated by the entry of incidents into the OMS assumes the use of trained technicians to perform the damage assessment process focused by OMS information. Sub transmission is normally patrolled (to avoid loss of the circuit) since damage may not be reported.

The Initial Storm Assessment Program uses data extracted from PSE&G's SCADA System and OMS to calculate initial storm data critical to the decision making process on the work force requirements best suited to address the storm damage. The data (from SCADA) includes the number of 4 kV, 13 kV and sub transmission trip-outs and lock-outs. The initial count of damaged poles, tree on locations, wire down locations pole to pole, and wire down locations pole to building come from the OMS-based storm assessment. Based on this data, the program is able to estimate the number of

customers interrupted, primary locations, lookup locations, and service locations. The model also calculates an estimate of man-hours to repair based on unit items and weather factors; this is useful for work forecasting.

PSE&G has 500 trained damage assessors, 160 from the Divisions and 340 from electric operations (field experienced); all were activated for both storms. During the snow storm, nested outages were challenging to deal with as the Lookup process focuses on incidents and does not require patrolling a circuit.

If a damage assessor comes across a live or dead wire, they are instructed not to leave. The damage assessor will contact the Division where a designated (storm role) gas supervisor will assign a gas operations employee to the wire down role. The damage assessor tapes off the scene and leaves when relieved by the wire down employee. A designated gas supervisor manages the wires down personnel (food and relief).

The magnitude of the two 2011 storms forced PSE&G to add additional damage assessment personnel, some of whom were trained just in time and on the job. An assessment of data provided by PSE&G indicates that 98% of the potential knowledgeable volunteers (including departmental management) from Asset Management were pressed into service during the storms. This indicates that PSE&G was near the limit of their internal resource capabilities.

Damage Assessors have to call or radio their information to a senior tech in the division office so that it can be entered into OMS. They do not use mobile data terminals. PSE&G is evaluating a smart phone app concept that would provide GPS position and a picture of damage that could be used by a damage assessor or the public.

Damage assessors double up at night or when dangerous conditions are present. PSE&G used a small number of contract personnel with distribution experience as damage assessors during the snow storm. Using a skilled damage assessor as a driver when an alternative resource would suffice is not an efficient use of resources.

Recommendations:

13-PSE&G-1 PSE&G should use a less experienced person who could perform the role of damage assessment driver, instead of doubling up damage assessors at night or in dangerous conditions.

Rockland Electric

Observations:

The purpose of the damage assessment organization is to identify and provide detailed reports of damage to the overhead distribution system. This process assists the Control Center to define the scope of the work and establish well-defined jobs for the Restoration Organization.

At the onset of a storm, the first priority for damage assessment personnel is to investigate locked out circuits to determine the cause(s) of the lockout. If practical, two-person spotter teams are utilized to patrol locked out circuits from the substation exits to the end of the circuits. Spotters will then systematically patrol the three phase mainline, followed by the three phase radials and finally the single phase lines. Using information from OMS, Damage Assessment Coordinators will then assign specific outages to be investigated for spotters (damage assessors). Spotters patrol an assigned area and document the damage found on the Spotter Information Form. The information captured on the form is then called in for entry into the OMS. In order to ensure that information is relayed as often as possible, spotters call in damage after verifying 3-5 of the assigned locations or after 2 hours have elapsed.

RECO used contractors to augment the damage assessment forces; the contractors currently work for O&R conducting stray voltage checks as part of the annual requirement for New York. The contractors are trained and available for use during an emergency event. They still went through the same mutual aid safety training for an emergency event as all other contractors working during the storm.

Because there were so many damage assessors and limited phone lines, the supervisors called the damage assessors to get updates. When a damage assessor completed their assignments, they were given more work. They used contractors familiar with system to do damage assessment and provided some training to them before they went out.

The Site Safety process is activated in parallel with damage assessment. Site Safety personnel are dispatched to wire down locations based on OMS. They are also notified by Damage Assessors of a wire down and need for Site Safety. Site Safety personnel use red tape and cones to block off the area; if flagging is needed, then the gas department is called upon to help.

The Site Safety Team has 17 management employees and 65 meter readers plus personnel from three separate contractor firms. They had 50 contractors for Irene and 100 for the snow storm. The contractors relieved RECO personnel so they could be assigned to damage assessment. Meter readers use company vehicles. During the two storms, four-wheel drive vehicles would have been advantageous. Contractor personnel utilized their own vehicles.

Because of the high number of Site Safety calls, RECO could have used three times the number of people. That would have required additional personnel in the office to coordinate and manage this effort. RECO has done extensive process improvement work following both storms, and has addressed this issue.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendation.

3.14 RESPONDER SYSTEMS, TOOLS AND JOB AIDS

EDCs rely heavily on Outage Management Systems (OMS) to receive, record, map, display and report outage conditions. An OMS makes it possible for most utilities to feature "outage maps" on its publicly available websites to show customers and other stakeholders the general location and extent of outages. This technology also has predictive and data modeling capabilities. OMS can receive and process data from digital communications devices in the field, or through the company's website, and combines restoration jobs for effective execution. However, the best technology performs only as well as its human interface. For maximum effectiveness, crews in the field must feel comfortable using digital communications terminals to communicate with the OMS, and these remote devices must work well. Information received must be reviewed frequently, validated and updated. Robust IT support before and throughout the restoration, is an absolute necessity for this complex system to operate properly.

Outage processing for all four EDC starts when a customer call is received by an Interactive Voice Response (IVR) System or customer service representative. The IVR system is designed to interview the customer using key questions that will help determine the type and cause of call (outage or non-outage). Information is then passed on to the Customer Information System (CIS) where supplemental information specific to the customer is retrieved from its own database. Once this step is completed a unique job is created and routed to the OMS as an outage or non-outage. A non-outage could be a report of partial service.

During most events the customer will also have an option to opt out of the IVR and talk directly to a Customer Service Representative (CSR). Should this occur, the representative will interview the customer and populate the information into an electronic form which queries the CIS to collect customer specific information and then routes the created job to the OMS. During larger events, customer calls may also be routed to external call centers. These may be affiliate call centers or contract call centers located remotely. In either case, once the customer is queried the data flows through the CIS and into the OMS.

Once a job is created in the OMS it must be analyzed and dispatched to the appropriate crew or resource. A dispatcher or analyzer will determine the best resource to respond to the job. A construction crew may be assigned to a job where damage is known. A troubleman may be assigned the job if it is determined a recloser or breaker is open. During declared storm events a damage assessor (patroller) may be assigned to a job where a wire is reported down but very little information beyond that is known. These jobs, in turn, are dispatched by two-way radio or by a Mobile (also referred to as Computer Aided) Dispatch System (CAD/MDS).

Field personnel will then report to the job location and report back by two-way radio or through Mobile Data Terminals (MDT) the cause of the outage or non-outage call. In the case of construction crews and troublemen, they will provide estimated times of restoration (ETRs) and will

restore service, if they can, and report back when the work is complete. If additional resources are required to complete the job a request is made. All this information is routed back to the OMS and then to the CIS so that it is then available to respond to additional customer inquiries.

In the case of the damage assessor, they will report their findings via phone call or MDT. If a hazard has been identified they will stay on site until a crew arrives to make the situation safe or make repairs. If there is no hazard identified they will typically return to their home base or move on to their next job location. The information reported back by the Damage Assessor also feeds back to the OMS and then the CIS so that the customer can be provided updates when requested.

In addition to customer calls, the outage process can also be initiated by Supervisory Control and Data Acquisition (SCADA) data from the Energy Management System (EMS). The EMS will send a signal to the OMS identifying that a SCADA controlled protective device has operated and locked open on the distribution network. This signal from EMS will trigger the same processing in OMS that a customer call generates.

A Geographic Information System (GIS) is a platform that links data from multiple information technology systems to a geographic location on a map. This provides a way to manage data and aid with situational awareness.

During Irene and the snow storm, these helpful technologies caused confusion. Specifically, the call back technology, and the scripts used to convey the message, while meant to check in with customers actually caused more confusion and frustration. Many customers complained that the EDCs made automated outbound calls advising that service was restored, although it was not, and requested that the customer contact the utility if service was not restored. These customers were upset, concerned and frustrated because they were unable to reach anyone when making the return call, or were given more inaccurate information when they did reach someone. Customers also expressed concern that the utility had no knowledge that their power was not restored and felt that this is something the EDC should have known. This is covered in more detail in Section 3.22 – Customer Service / Call Center.

The Electronic Tools / Systems utilized by the New Jersey EDCs are listed below.

ELECTRONIC TOOLS / SYSTEMS UTILIZED				
SYSTEM	**ACE**	**JCP&L**	**PSE&G**	**RECO**
Outage Management System (OMS)	Yes	Yes	Yes	Yes
Mobile Dispatch System (MDS)	Yes	No	Yes	Yes
Geographic Information System (GIS)	Yes	Yes	Yes	Yes
Customer Information System (CIS)	Yes	Yes	Yes	Yes
Supervisory Control and Data Acquisition (SCADA)	Yes	Yes	Yes	Yes
Interactive Voice Response (IVR)	Yes	Yes	Yes	Yes
Call Overflow - High Volume Call Answering	Yes	Yes	Yes	Yes
Auto Crew Call out	Yes	Yes	No	Yes
Work Management System (WMS)	Yes	Yes	Yes	Yes
Automatic Vehicle Location (AVL)	Yes	No	No	No

Global Observations

During major events, EDCs collect large amounts of data across multiple functional areas. Successful integration of this information can improve analysis capabilities and communication. The ability to rapidly transfer information from the field to those that are responsible for communications ensures that stakeholders get the most accurate information that they need to make decisions.

Customers are asking for additional ways to communicate and receive individualized outage information, beyond the traditional methods currently in use. Government officials are asking for more specific information regarding the location of crews, particularly at the municipal level.

Global Recommendations

14-G-1 Each EDC should evaluate a cell phone app so that the customer can report outages and receive system outage information.

14-G-2 Each EDC should identify ways to efficiently and decisively track and report crew (internal, contractor and mutual aid) locations during restoration events.

Atlantic City Electric

Observations:

The ACE IRP clearly defines the systems, tools and job aids that are used. Position descriptions, checklists and eLearning modules help ensure that employees are prepared when they assume their storm roles. Process flow charts describe how the various systems interconnect.

The use of a Mobile Dispatch System and Mobile Data Terminals allows field personnel to respond more quickly to a job site and respond back with their field assessments. The IVR and Call Overflow System enabled ACE to handle a large volume of customer calls and create jobs in OMS with all the necessary information.

ACE utilizes a crew call out system which allows leadership to quickly determine the availability of resources and then mobilize those resources within minutes.

The OMS performed well and slowed down only when a large number of users had logged in. To alleviate this problem, personnel that did not need to enter data into the system were asked to use the web version which would allow the user to have 'read only' access to the OMS data.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observations:

JCP&L utilizes an OMS that links to the GIS and the customer call in systems. Job aids are geared towards the use of these systems.

JCP&L utilizes a crew call out system which allows leadership to quickly determine the availability of resources and then mobilize those resources within minutes. A crew call out system automates the process of calling in personnel in the off hours, eliminating the need for supervisory personnel to make individual phone calls to request personnel. The system also records when the call was received by personnel and keeps track of the percentage of time a person responds to such requests.

JCP&L does not utilize Mobile Data Terminals and therefore must dispatch jobs by radio and paper job packages. This process of getting information to and from the field can be done more efficiently through the use of Mobile Data Terminals.

Recommendations:

14-JCP&L-1 JCP&L should implement the use of Mobile Data Terminals to relay data to and from the field quickly and efficiently.

Public Service Electric and Gas

Observations:

PSE&G has documented processes and procedures through its various job aids, checklists and job descriptions.

PSE&G utilizes a number of systems. A customer information system is used to manage customer information and interactions. An IVR is used to handle inbound calls as well as outbound customer calls. A high volume call answering system is in use to handle inbound calls.

The OMS is used to predict device operations based upon customer calls and GIS maps. This information is linked to the network communication system and the call center. The GIS maps plot the electrical network, location of devices and the customers served by a transformer.

The Computer Aided Dispatching system is used to dispatch jobs to crews and to capture field conditions (plant damage field reports).

Recommendations:

There are no specific recommendations for PSE&G beyond the global recommendations.

Rockland Electric

Observations:

RECO uses an OMS that communicates with the GIS, SCADA and EMS. RECO also uses a Work Management System, Customer Information Management System and an IVR system. RECO uses a crew call out system which allows leadership to quickly determine the availability of resources and then mobilize those resources within minutes.

During the 2011 events RECO lost power to several of its communications towers in New York; they are now installing generators at the communication tower locations. RECO also experienced minor slowdown issues with its OMS. Based upon employee interviews these issues have since been fixed.

Additional fixes and new releases include an OMS Lite for viewing / read only and OMS Mobile for crews. This will minimize slowdown issues with OMS. As a lesson learned following the two storms, RECO has since acquired a call overflow system.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendations.

3.15 ESTIMATED RESTORATION TIMES

Once the storm has passed, customers need a realistic appraisal of Estimated Time of Restoration (ETR) to make arrangements for their families' welfare, and local governments likewise need this information to conduct its business. Facilities that have to rely on backup emergency generators need to know if they will have enough fuel to get them through the outage. School officials need to judge when they will be able to reopen. Commercial and industrial customers need to be able to plan work and process schedules. The entire community is dependent on power and information about power restoration is vital.

Estimated restoration time is affected by the total damage to the EDC's facilities; the available workforce immediately available to the EDC; the travel time for "foreign" crews to arrive, be briefed and start to work; and the availability of materials.

Providing consistent, frequent ETR updates, issued through all available media is the best way an EDC can serve its customers' need for this information. Describing when people can expect to have ETR related information in enough detail for them to make decisions is critically important. No matter how successfully an EDC conducts its restoration activities, poor and inaccurate communications will outweigh any of the positive aspects of those efforts. Timely and accurate ETR are a significant driver of customer satisfaction; poor customer satisfaction becomes a major factor in regulatory scrutiny and intervention.

Yet, for all the technological advances that have been made, and the rising public expectations that have accompanied those advances, accurately predicting ETR's is still difficult and imperfect due to changing field conditions, staffing level variations and restoration prioritization. Even with sound modeling criteria and the most exacting algorithms, an ETR is still an estimate. Release an underestimation too soon and customers will be misled. Wait too long for complete damage assessments and customers will become anxious and question the storm team's competence. Early in a restoration event, while damage is being assessed, the level of detail at which an ETR can be determined is Global. Global means the total time to restore every customer that was impacted by the event. As more information becomes available, and crews are assigned, more detailed information becomes available.

During Irene and the snow storm, EDCs could only provide global ETRs early in the restoration process, and then more targeted ETRs as the restoration efforts progressed.

Global Observations

EDC use an automatically generated ETR during normal operations. This is calculated based on the estimated time to travel to a location and then fix the problem under normal circumstances. During

a major event, these estimates are no longer valid and it is common practice to turn off the automatically generated calculations. Analysts are assigned to the ETR process to develop estimates when the automatically generated ETR is turned off.

EDC can do a better job of setting expectations of when more detailed ETRs should be expected based on the magnitude of the storm damage. They can also do a better job of tracking ETR accuracy, particularly during a major storm event when customers need accurate information the most.

Global Recommendations

15-G-1 Each EDC should establish a Global ETR within 24 hours of the end of the event.

15-G-2 The EDCs, working with Board Staff, should establish a schedule of when more granular levels of ETRs should be expected based upon the magnitude and severity of the event.

15-G-3 Each EDC should conduct a study of the accuracy of its ETRs during "Major Events" during the last three years.

Atlantic City Electric

Observations:

The ETR process consists of three types of ETRs, depending on the magnitude of the event: global, tiered and individual order.

A Global ETR represents the time at which ACE expects to have restored 100% of all customers experiencing outages as a result of a given storm event. The ACE Incident Management Team (IMT) develops and communicates a Global ETR to affected customers once a storm has left the service territory, initial damage assessment activities have been completed, and mutual assistance resources have been secured. The success in meeting a Global ETR target date and time is monitored throughout the restoration process by the ACE IMT, and is reviewed during post-storm lessons learned activities.

Tiered and individual order ETR's are assigned once an accurate assessment is completed, and then assigned by OMS. The Restoration Analysis personnel receive initial order damage assessment from the Patroller Coordinator and update the ETR's. A dedicated person is assigned to keep track of all information coming in and being entered into the system. ETR can also be assigned by field crews

once they have assessed the job. System Operations maintains staffing resources, received updates and applies these to the ETRs.

Tiered and individual order ETRs are measured in terms of actual restoration time as compared to the final predicted restoration time provided to the customer. A tiered or individual order ETR is considered accurate if a customer is restored any time within the time period of 120 minutes preceding and 0 minutes following the last ETR provided to the customer. ETRs are also monitored for multiple changes.

The automatic calculation of ETRs in the OMS was shut off at the beginning of the event, and then turned back on as accurate damage assessments were completed. Personnel interviewed felt that ETRs were handled in a timely manner during Irene. By Monday morning ACE had a good handle on a global ETR and as assessments were completed the ETRs were updated.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observations:

The process for determining restoration times is constantly reviewed and monitored by the Company throughout a storm event. The Storm Director sets the global ETR for the storm, and then informs the RDO and the Call Center. This is a documented FirstEnergy process, but is not described in the JCP&L E-Plan.

Towards the end of an event, when the numbers of outage orders are more manageable, personnel manually update the ETR and populate the OMS. This can be done by the line shops and the storm analysts. Local management develops the ETR using historical data and guidelines. Auto ETR was turned back on after the event when all the orders in the Outage Management System were resolved.

In general, JCP&L considers several factors as well as uses judgment based on experience to determine the restoration estimate. These factors include the following: historical results based on storms of similar size and impact; total number of crew resources available; total number of orders a crew completes on average per day; total number of outage orders in the Outage Management System (OMS); scope of damage in the field; field knowledge and input; weather; and the restoration trends of current storm.

Estimated restoration times were reviewed and updated on a daily basis throughout the storms. The Auto ETR was turned off on August 27 (during Irene). When Auto ETR is turned off, the system is still calculating ETRs but the communications feed to the call center is turned off so that customers do not receive incorrect information. As updated information is received, the ETRs are manually updated by the dispatcher. Call Center personnel can tell if an ETR was manually updated; allowing them to provide that information to a customer.

During Irene, JCP&L developed a new approach, with support from the OMS Support Team, for detailing the ETR for each affected community. This approach included providing estimated daily restoration progress. This information was well received and numerous requests were made to have this information available for future catastrophic events.

After Irene, and in response to these requests, JCP&L worked to further enhance the development and presentation of these reports. When the snow storm hit, JCP&L implemented these enhancements and continued to evolve the process. The ETR process at JPC&L is evolving, but needs to be formalized and documented.

Recommendations:

15-JCP&L-1 JCP&L should develop a standardized process for the calculation of ETR at multiple levels of granularity and document this process in the E-Plan.

15-JCP&L-2 JCP&L should centralize the responsibility for the ETR process to a single function.

Public Service Electric and Gas

Observations:

PSE&G has 3 levels of ETR; global, OMS calculated with weather multiplier, and OMS calculated.

Initially ETR is generated by OMS using call types and equipment grouping (fuse, feeder, recloser, etc.) criteria. These ETR are based on historical values. During an average storm or weather event a multiplier will be put on the ETR calculation to allow for delays which may be caused by weather, traffic, work volume, and workforce availability. For a significant event, a global ETR will be set for all jobs to reflect when the "Last customer should be restored".

PSE&G uses a module (developed in 2000) that takes data from the OMS and generates an ETR based on the location and severity of the incidents, resource availability, time of day and operating conditions such as weather. During periods of extensive damage DERC can override this process and calculate and promulgate a global ETR.

As further information is developed the ETR can be tailored for each Division. As the restoration progresses and the Global ETR is approaching PSE&G will change back to an OMS calculated ETR with a weather multiplier and eventually back to the basic OMS generated ETR. When resources arrive at the site of an incident the supervisor can provide a specific ETR over PSE&G's MDT for a PSE&G crew. In the case of foreign crew work, the PSE&G "birddog" (a PSE&G supervisor assigned to a group of foreign crews to oversee their safety, work and interface with PSE&G's restoration process) can provide a specific ETR via an MDT.

More emphasis is needed on day three and four to ensure that crews are making updates to OMS as work begins on specific jobs that they are assigned. OMS has a warning for incidents approaching the ETR.

PSE&G issued its first ETR on August 26, before Irene's landfall. This was a global ETR of between one and three weeks. For both Irene and the snow storm, PSE&G set a global ETR based on a combination of system-generated information and a weather multiplier. Records are not kept locally or within OMS to document when weather multipliers are applied to system generated ETR, however detailed records of the ETR and the time it was set are available.

For Irene, a global ETR of September 4, was set on August 28, and then changed to September 2, on August 30. Later the ETR shifted to Division-specific dates/times.

For the snow storm, a global ETR of October 31, was set on October 29, and then changed later that day to November 2. For three of the four Divisions on November 2, the ETR was set to November 4, and then further changed to November 5, on November 4. The extension of the ETR may have been the result of continuing outage reports and the nature of the storm (heavy snow impacting tree branches).

Recommendations:

There are no specific recommendations for PSE&G beyond the global recommendations.

Rockland Electric

Observations:

A detailed overview of the RECO ETR process is located in the O&R Electric System Emergency Plan. RECO's ETRs are based on the information that is entered into OMS through damage assessment, SCADA, customer calls, etc. For smaller storms, ETR are generated by the OMS. For larger storms global ETR are generated by the VP Operations, Storm Director and EM Department.

RECO follows the guidelines required by the New York State Public Service Commission (NYS PSC) for determining and establishing estimated restoration times. At the onset of an event, and consistent with the ETR guidelines, prior to the establishment of formal ETR, O&R will set incident-based ETR by outage size/classification. For example, all outages affecting 1,000 or more customers will be restored by XX:YY; all outages affecting from between 500 and 999 customers will be restored by ZZ:AA, etc.

On the Monday night after the snow storm, RECO realized that the ETR estimates were inaccurate due to the number of embedded outages discovered when crews went to repair damage. They also determined that the automatic generation of ETR by OMS is not turned off as part of their pre-storm preparations. The automatically generated ETR are based on a normal day, not a major storm event. Further, a need was identified to develop municipal ETR for local government officials.

RECO indicated that it is in the process of making enhancements to its ETR protocol in order to provide more granular information. It is currently working on a new ETR system for global, regional and local ETR. It is also working on a process to provide municipal ETR to local government officials.

Recommendations:

15-RE-1 RECO should continue its ETR enhancement project.

15-RE-2 RECO should develop a process to ensure that the automatic ETR generation feature is turned off during a major event.

3.16 CREW / WORK MANAGEMENT / WORKFORCE LEVELS

Effective storm restoration requires coordination on a significant scale. Personnel send in damage intelligence, objectives are prioritized, crews are deployed accordingly, and communication about progress must be constant. Sometimes the "reserve units" (second role personnel, mutual assistance and contractors) must be mobilized. Doing all this without wasting time or money requires a great deal of advance organization, well-established processes, and detailed training. Great care must be taken to keep people fresh. Up-to-date technology must be available to assist in workforce management, both in the "war room" and in the field.

In order to complete a restoration effort the utility must have adequate resources (linemen, operators, dispatchers, technicians, meter personnel, meter readers, etc.), customer service personnel, logistics personnel (materials, fleet and facilities), and supervision and administration (communications, engineers, managers and executives).

Crew location is an important factor in the work management process. Knowing where crews are working is important from a safety perspective, to ensure that no one is injured by a switching error. It also facilitates more efficient crew deployment, minimizing travel time. And equally important, stakeholders expect that a utility knows where all of its crews are working at any given time, and will be able to communicate that information when requested.

During Irene and the snow storm, many customers expressed frustration when they didn't see any crews in the area, or when crews would drive by their location, not stopping to restore their service. Customers also reported seeing crews 'sitting around' or at local restaurants.

The safety of the public and EDC personnel is paramount; therefore field crews working extended hours need to have adequate rest time or breaks during their shift to remain focused. In some cases, work processes require field personnel to await switching instructions to ensure that no one is injured when a line is re-energized. This can sometimes look like a crew is sitting around. More robust communications from the EDCs describing the situations a customer might see during a major restoration event could alleviate some of the criticisms.

Some EDC personnel use their personal vehicles for work. These vehicles may not have an identifying logo or decal, so it is not always apparent when an EDC employee is in the field working. EDC can use decals or magnetic signs to identify these personal vehicles. Vehicles used by the mutual aid crews and contractors do not have the EDC logo on them and this can also contribute to the concern about the number of resources an EDC has deployed. Temporary magnetic EDC signage should be used with caution due to security concerns; they are easily stolen and have been used to impersonate EDC personnel in other areas.

Global Observations

Resource estimates are based upon damage reports received from the field. Personnel are dispatched based upon EDC restoration priorities and public safety concerns. EDCs need to be aware of crew locations at all times to build credibility with stakeholders.

Describing the impact or severity of a storm to external stakeholders can be difficult. Many times the only factor that people focus on is the number of customers out of service. During Irene and the October snow storm, external stakeholder groups compared EDC performance based upon the number of customers out of service. EDCs are staffed to handle its customer base on a normal day, so the higher the percentage of an EDC's customers are out of service (as a percentage of the total), the more significant and challenging the problem is.

Comparing storm severity based solely on the total number of customers out of service is not appropriate since other factors such as service territory terrain and customer location also complicates restoration. Because damage is not reported in consistent defined categories across all the EDCs, making direct comparisons is difficult. A recommendation to normalize the data into a 'severity index' is included in Section 20 – Storm Restoration Process Metrics. This will circumvent the differences in reporting categories.

During Irene and the snow storm, there were many customer complaints regarding field crew productivity, crews sitting around, etc. EDCs can improve their customer education process to describe the situations a customer might see during a major restoration event. This could alleviate some of the criticisms.

During major restoration events, crew personnel are deployed to support municipal and State road opening efforts that are impeded by downed wires. The large number of requests, and competing priorities can exhaust EDC personnel, can cause delays in response. A more effective approach to individual municipal level requests would be to centralize the process at a County level, with State oversight for the most critical public safety issues.

Global Recommendations:

16-G-1 EDC should develop a common damage "glossary" for reporting damage to the BPU during and after events.

16-G-2 Each EDC should be able to report crew locations to the BPU Staff at the level of detail requested by Board Staff. This could include via a web portal.

16-G-3 Each EDC should be able to report crew locations at the municipal level for other stakeholder audiences.

16-G-4 Each EDC should participate in a debris management / road opening initiative organized by the BPU in conjunction with other key stakeholders. This initiative should establish a process to provide more structure to the determination of roadway access prioritization, efficient utilization of EDC resources, and provide for input and enlistment of local DPWs in the debris management and roadway access process.

16-G-5 Each EDC should develop and provide improved customer education regarding field restoration work processes.

A. Crew / Work Management

Atlantic City Electric

Observations:

Issues that ACE addressed to mobilize field personnel were: safety of the personnel and the public; degree of physical damage; site conditions; staging of resources; circuit lead; boundaries of control; restoration priorities; permit and tagging procedures; ETR; updating of OMS with restoration data; and ongoing and continuous communications.

During normal conditions, all work is dispatched from the Regional Operations Center (ROC) – this is where the monitoring and control of the electric system takes place. According to the activation process, when a decision is made to decentralize, the District IMT is activated and takes control of the work dispatching process. At that time, all work is dispatched and closed out at the District level. This helps to speed up the information flow and supports a more efficient management of the field resources.

The process for prioritizing work projects for crew assignment is managed by the Planning and Analysis teams in the District Incident Management Team (IMT). During the overnight hours, any completed assessments are packaged so that they can be distributed to crew guides who manage multiple crews. This process continues each day with new packages created overnight until the remainder of the system is restored.

District Planning and Analysis Teams will be in close contact with the ROC throughout the event to maintain a flow of orders to the field personnel. The dispatch of work will concentrate on the large

customer outages and will limit the number of jobs that a first responder receives, ideally between 6 and 8 orders. The goal is to keep first responders moving and working efficiently.

ACE defines two methods of restoration: Order Based Restoration and Circuit Based[25] Restoration. Once the initial assessments were made, the ACE IMT could make additional decisions regarding internal staffing, requests for mutual assistance, the need for staging areas and whether Circuit Based Restoration should be implemented for its system. Circuit Based Restoration could be implemented for the entire system or a specific geography. During Irene ACE started out with an Order Based Restoration until initial damage assessments were made and then continued with this approach.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observations:

On a normal day, the Regional Dispatching Office (RDO) manages the restoration efforts for its respective responsibility areas. When the workload requires the Storm Management Team to be assembled, it may be necessary to reassign some of the dispatching activities. The RDO will continue to manage the outage management system and the Operations Manager(s) will monitor open cases, assign crew work and close completed cases. In these instances, communication from operating areas to the Storm Management Team will be maintained at a high level and customer calls will continue to be handled through the phone centers.

When the amount of work is identified by the damage assessment process, and it is determined that additional personnel are required, the Regional Dispatching Office (RDO) may be divided functionally and geographically in order to balance the workload. Storm Analysts in the RDO review outages and determine if duplicate orders are in the system. The work in OMS is sorted by line, substation, meter, hazard or service work. Then these jobs were given to the appropriate first lines to distribute and track. Crews use either a cell phone or radio to call back to the line shop, and then support people closed out the jobs in OMS. JCP&L uses first line leaders to manage the field crews. General Managers, in turn, managed the first line supervisors. For foreign crews, bird dogs managed the crews and called in the completed work to Dispatch or Operations, depending on where the order originated.

[25] A restoration method used when a particular circuit has multiple points of damage and it is more effective to provide local control of the circuit to the restoration task force assigned specifically to that circuit.

For Irene, a decision to move to a quarantine restoration approach was made on Sunday August 28, and the process was fully operational on Monday, August 29, when circuits were identified by Dispatch and the Storm Director. The quarantine process entails de-energizing the entire circuit, from beginning to end, to make it safe for crews to work on the circuit until finished. Then the entire circuit is re-energized once all the work is finished. In this approach, each circuit was assigned to a Lead Lineman, and lockouts were patrolled from the substation to the end of the circuit. The first time this process was used at JCP&L was during Irene.

For the snow event, the quarantine process was modified to fix, restore and move on. This process resulted in bringing customers back more quickly than the previous method. The quarantine process used during the snow storm reflects part of the refinement process that was underway as a result of lessons learned. A detailed process for use of the quarantine process for large scale emergency events has now been documented.

JCP&L brought in a significant number of service crews for the snow storm. Service crews are qualified to work with secondary and service voltages, and having them start on service work early during the restoration ensured that once the primary lines were restored, many customers were restored at the same time.

Additional resources were brought in to supplement the office staff, including: RDO Dispatchers, Storm Analysts, Hazard Dispatchers and clerical support. This allowed the Regional Dispatcher to concentrate on trouble analysis and dispatching

The Regional Dispatchers and Storm Director have too many diverse responsibilities. They are charged with managing the operational component of the restoration as well as the analysis and planning functions. Performing multiple roles does not allow them to focus on key strategic activities. A recommendation to move the entire JCP&L organization to the Incident Command System structure is discussed in Section 3.18 – Organizational Structure, Roles and Responsibilities.

Recommendations:

16-JCP&L-1 JCP&L should conform to a system such as the Incident Command System and develop a Planning Team to reduce some of the duties currently performed by the Operations personnel. An individual should not assume more than one role in the ICS during the event.

16-JCP&L-2 JCP&L should ensure that the approved Quarantine process of circuit restoration is integrated into the E-Plan and that appropriate personnel are trained.

Public Service Electric and Gas

Observations:

The control of the restoration is decentralized to the Divisions. Priority Control is staffed by each Division's construction function and prioritizes work packages according to a set procedure focusing on public safety, priority facilities and maximizing the number of customer restored by each work package. Substation personnel are dispatched and controlled by the Division. Through the three daily conference calls DERC can assess the workload and progress of each of the four Divisions and allocation and/or transfer resources between the four Divisions.

PSE&G uses experienced line personnel to manage foreign crews ("birddogs"). They also used substation supervisors as "birddogs" and the duties include tagging, clearances and work completion. Only a "tag holder" (person taking the line clearance) can release the clearance for restoration when the work has been completed. This process is necessary to ensure that no one is injured why performing restoration work on a circuit.

PSE&G's Computer Aided Dispatch (CAD) takes damage assessment information from the OMS and allows Priority Control to slot or manage work packages. PSE&G resources can receive its work packages through the MDT, while foreign resources receive paper-based assignments through its PSE&G birddogs. Work packages are created for the foreign crews on the overnight shift; birddogs pick them up at the Division or they were sent out to the Staging Area.

There is a designated construction supervisor at the Division to coordinate with foreign crews through the PSE&G coordinator. Generally, an entire circuit is assigned to foreign crews to avoid conflicts and maintain control. The goal is to balance the ETR across the four Divisions.

Early in both storms, damage assessment was still ongoing and restoration was limited. During Irene, the biggest problem was flooding. During the snow storm, the major problem was getting around in the heavy wet snow. At the beginning of the restoration, PSE&G employed the cut and run process using both an increased number of troubleshooters and line crews.

On occasion PSE&G employed the circuit restoration process to deal with many outages on a single circuit. This entails shutting an entire circuit off to allow crews to work without having to wait for switching orders or line clearance. This is used when there is significant damage to a circuit, and it would be more efficient to de-energize the line to allow work to go more quickly. This is an effective concept but the transition to this method is not described in the OMS Manual.

PSE&G has a company-wide escalation process designed to capture, analyze and process requests for priority restoration. The escalation ground rules were set by the Storm Director. The escalation process team is staffed by groups such as key accounts, marketing, and large customer support. This escalation process was not in the OMS Manual.

The Division Control Group is responsible for the coordination of all restoration activities within the division. The Division Control Group will also coordinate efforts with the System Group to manage companywide restoration efforts.

Recommendations:

16-PSE&G-1 PSE&G should define the process of circuit based restoration in its OMS Manual.

16-PSE&G-2 PSE&G should define the escalation process in its OMS Manual.

Rockland Electric

Observations:

Initial workforce estimates are based on the O&R Storm Classification Matrix in the Plan. As the storm restoration progresses and additional damage assessment information is obtained, the Planning Team will present their analysis of workload to the Storm Director. The information obtained from the damage assessment process assists in developing staffing needs and establishes well-defined jobs for the restoration process. The Storm Director, Emergency Management team and the Storm Officer determine if additional crews / personnel are needed.

During the overnight hours, work packets are created in the Control Center. The Restoration Leader puts work packets in priority order and determines the work assignments for the mutual assistance crews. These work packets are provided to the Outside Resource Coordinator prior to the arrival of the workforce.

The Construction Restoration Lead provides work to the Supervisors, who then assign work to the field crews. Crews report in when the work is completed. A bird dog is assigned to foreign crews, and they report in when work is completed.

Vegetation management crews get work from OMS. Vegetation management crews can work with or ahead of the line crews. All emergency tree-related work will be dispatched from the appropriate Team Leader to the Line Clearance Supervisor who will assign the workforce. Once this work is completed, the Supervisor will update the status in OMS, and then a restoration crew will be assigned as required.

Line crews may complete service restoration if it can be done easily within an appropriate amount of time. If it can't be completed quickly, service restoration crews will follow and complete service restoration if more extensive service work is required.

During a storm event, additional support services may be obtained from Con Edison Shared Services. These services could include crew guides, CDL-qualified drivers, generators, telecommunications, hotel assistance, remote site logistics, field delivery of equipment, and materials procurement. O&R will receive restoration crew assistance from Con Edison on a priority basis depending on availability.

RECO also employs a Supplemental Workforce (internal employees from the gas division) to support Electric Operations in the restoration of single services and provide support for other restoration functions as needed (i.e. traffic control, operation of construction equipment, groundmen duties, driving line construction equipment as required, etc.)

Recommendations:

There are no specific recommendations for RECO beyond the global recommendations.

B. Workforce Levels

For normal business, an EDC staffs its internal line resources (line personnel) by planning and evaluating the capital and maintenance work requirements needed to operate the utility's infrastructure on a normal day, and can respond to moderate levels of weather impact using these resources. This planning and evaluating of all internal work keeps the EDC's internal line resource levels at economic and reasonable numbers to complete this work. If additional line resources are needed to supplement the workforce the EDC may use contract line personnel or pay overtime to its internal resources.

In order to complete a restoration effort, the EDC will need to supplement its field forces (linemen, operators, dispatchers, technicians, meter personnel, meter readers, etc.), customer service personnel, logistics personnel (materials, fleet and facilities) and supervision and administration (communications, engineers, managers and executives). Mutual assistance and EDC employees with a storm assignment fill these resource needs.

During Irene, the level of mutual assistance staffing was not adequate in the early stages of the restoration efforts for any EDC due to the widespread nature of the event.[26] Once Irene made landfall in New Jersey, resources became available and started to arrive within two to three days.

[26] This is described in detail in Section 3.9, Mutual Assistance.

Global Observations

Each EDC uses different position descriptions (with different duties and requirements), has differing labor contracts, has access to resources from affiliates or associated divisions such as gas operations and has varying levels of automation and technology. This makes direct comparisons difficult. Each EDC provided its staffing levels for the years 2002 through 2011. The staffing trends are summarized in the individual sections below. Additionally, each EDC reports operational staffing levels to the BPU in the annual reliability filing.

Day-today field staffing levels are driven by the anticipated amount of new construction and maintenance work at each EDC. For a storm event, an EDC can ramp up staffing with additional line personnel, but staffing for many of the supervision level positions can be an issue. Some EDC counter that by sending support from the holding company. Other options include requesting field supervision along with mutual assistance crews.

Global recommendations

16-G-6 BPU should review the annual reliability report filings for each EDC to determine if staffing level trends have some correlation to reliability.

Atlantic City Electric

Observations

The number of operations personnel decreased approximately 19% over the ten year period from 2002 to 2011. There has been no effective decrease in the number of customer service personnel and the number of logistics personnel has decreased 14% over the ten-year period. Supervision and administration have remained stable.

Recommendation

16-ACE-1 ACE should provide a detailed staffing review that explains the decreases in headcount and any technology, assignment shifts or other offsetting changes.

Jersey Central Power and Light

Observations

The number of operations personnel decreased approximately 12% from 2002 through 2005 and then remained relatively constant through 2011. There has been a decrease in the number of customer service personnel of approximately 27% and the number of logistics personnel has decreased 26% over the ten-year period. Supervision and administration have remained stable. The decreases in customer service and logistics are the result of shifts of duties to the holding company affiliates.

Recommendation

16-JCP&L-3 JCP&L should provide a detailed staffing review that explains the decreases in operations headcount and any technology, assignment shifts or other offsetting changes.

Public Service Electric and Gas

Observations

The number of operations personnel has remained constant over the ten year period from 2002 to 2011. The logistics function was included within the operations data. There has been an increase in the number of customer service personnel of approximately 8%. Supervision and administration has decreased by 28% over the ten year period.

Recommendation

There are no specific recommendations for PSE&G.

Rockland Electric

Observations

The number of operations personnel increased by approximately 5% over the ten year period from 2002 to 2011. There has been no effective decrease in the number of customer service personnel. Supervision and administration have decreased 18% over the ten year period.

Recommendation

There are no specific recommendations for RECO.

3.17 FOLLOW-UP WORK (POST-EVENT)

Restoration crews work as quickly as safety will allow. Sometimes, timeliness requires temporary repairs that must be made permanent later on. EDC's need to have sound processes in place to track temporary fixes, inspect and evaluate the work done, and expedite permanent repairs. This will minimize the potential for temporary repairs to cause problems during future events. Many times an EDC will keep foreign crews working past the end of a restoration event to expedite the permanent repairs, if possible.

During Irene and the snow storm, many temporary repairs were made to expedite the restoration process. Having a process in place to follow-up on the temporary repairs and make them permanent is an important part of the post-storm processes.

Global Observations

Each EDC has a process to fix temporary repairs; they do not have a documented process for describing how this is supposed to happen.

Global Recommendation:

17-G-1 Each EDC should have a clearly defined section in its plans outlining the follow-up "temporary repairs" work process and responsibilities including post storm patrolling and inspection.

17-G-2 Each EDC should develop a storm quality assessment process to track the locations of all temporary repairs and the date the temporary repair was made permanent.

Atlantic City Electric

Observations:

Temporary repairs and follow-up work orders are placed in a separate queue in OMS. These orders are dispatched to the field crews. ACE's goal is have all of this type of work completed in 3-5 working days.

It has not been ACE's past practice to maintain documentation on quality assurance processes associated with storm restoration activities. However, it is the general responsibility of the Crew Guide for external contractors / mutual assistance personnel and the Work Leader / Supervisor for

internal crews to ensure that all restoration work is performed in accordance with ACE's construction standards.

Statistics for follow up work that was reported by first responders during Irene were provided and may not include other follow up work that was identified, tracked and completed locally within a specific operating district.

It appears that ACE has an acceptable procedure for tracking and making permanent repairs. However, this procedure should be described in the plan.

Recommendation:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observations:

Following both Irene and the snow storm, JCP&L made temporary repairs in order to quickly restore as many customers as possible. Immediately following each storm (after restoration efforts were complete), crews continued to work 16 hours per day to make permanent repairs. While the specific number of repairs cannot be easily queried in the Company's system, it took 60 days after Irene to bring the system back to normal.

JCP&L performs post storm follow-up inspections on circuits based on five guidelines; however it appears that JCP&L does not have a process to easily track the number of temporary repairs that are made. There were no references in the E-Plan regarding temporary repairs. However, for these two events, where JCP&L knew it had a large number of temporary repairs, it held crews over (JCP&L and FirstEnergy) to work on them.

Recommendation:

There are no specific recommendations for JCP&L beyond the global recommendations.

Public Service Electric and Gas

Observations:

During a major restoration some repairs may have been performed in a less than complete manner. PSE&G does not maintain any statistics regarding temporary repairs.

There is a section in the restoration workforce schedule form that indicates if temporary repairs have been made.

As part of the normal work practice, jobs repaired temporarily in the storm process would be referred to the query for normal "Blue Sky" construction for making permanent repairs. PSE&G also has a report that will list any job with comments, cause or repair codes that indicate a temporary repair was made.

The Construction Manager is responsible for maintaining accurate records indicating what work has been completed and what work remains and forwards this information to the Division Restoration Manager on a regular basis.

Recommendation:

There are no specific recommendations for PSE&G beyond the global recommendations.

Rockland Electric

Observations:

RECO does not have a defined quality control process regarding temporary repairs. However, as defined in the Storm Emergency Plan. The Restoration Manager is responsible to maintain an up-to-date list of temporary repairs and make safe service wires. All lines are patrolled at the end of storm restoration and any additional work is noted. Work is scheduled with RECO crews and tree contractors to be completed.

After full restoration has been completed, the Control Center Manager ensures that line crews patrol all primary circuits, as required. The crews will then make all necessary follow-up repairs at that time. Questions regarding construction standards and or work practices are handled as they arise at specific jobs or incidents.

Recommendation:

There are no specific recommendations for RECO beyond the global recommendations.

3.18 ORGANIZATIONAL STRUCTURE, ROLES AND RESPONSIBILITIES

Proper organizational structure for storm restoration provides personnel, policies, procedures, facilities, and equipment, integrated into a common organizational structure designed to improve emergency response operations of all types and complexities. According to the United States Center for Excellence in Disaster Management & Humanitarian Assistance, the Incident Command System (ICS) provides the best model for this type of organization. Organizations structured according to basic ICS principles: can cope with incidents of varying complexities (i.e. expand or contract as needed); allow personnel from a wide variety of agencies to meld rapidly into a common management structure with common terminology; provide logistical and administrative support to operational staff; avoid duplication of efforts by ensuring clear roles and responsibilities; provide a unified, centrally authorized emergency organization; ensure a manageable span of control; and provide for improved communication and coordination with State, county and local responders by use of consistent terminology.

Implementation of the ICS will result in a more efficient restoration process, providing a flexible and scalable approach. It will also facilitate communications with emergency management personnel and first responders, minimizing confusion. The ICS is the best practice standard among emergency management organizations, and many EDC have adopted the ICS principles as part of their emergency management programs.

During a major storm event, it is critical to mobilize all company personnel to fill appropriate roles. Many organizations call this the “second role” or “storm role” process. Organizations with a best practice in this area have pre-established “second role” assignments for all personnel.

During daily or non-storm operations, the utility’s Emergency Management / Emergency Preparedness function should be a stand-alone department within the organization with the requisite authority to ensure compliance with readiness-related initiatives across the Company. An effective storm organization also provides for sound shift management; tools and job aids like checklists and job descriptions; and record keeping and documentation policies.

To manage a restoration event like Irene and the snow storm, an EDC needs to have a scalable organizational structure to expand its ability to manage the influx of resources. This type of structure would ensure that external communications programs are staffed appropriately to manage the information needs of key stakeholders during events of this magnitude.

Atlantic City Electric

Observations

ACE follows the Incident Command System principles and organization. Once activated for an event the Incident Management Team (IMT) is established. This team consists of the Incident Manager and his/her support staff; this includes Safety, Corporate Communications, Chief of Staff, the Planning, Operations, Logistics, and Finance. These teams are established for each region (ACE, Delmarva, and Pepco). Similar teams are also established at the district level, and the district teams report to the IMT. In a large scale event such as Irene, each of these regional IMTs report to the Corporate Incident Support Team (IST). This team then reports to the PHI Crisis Management Team, if needed.

The IMT determines shift schedules and staffing at the onset of the event and modifies them as the needs of the event warrant. A conference call schedule is established, and minutes of the calls are documented and distributed following each call. The Incident Response Plan clearly describes position roles and responsibilities. Team members utilize checklists, which they sign and date upon completion of the checklist activities. Activity logs are used to record events that occur during the shift.

ACE has an Emergency Management department that is responsible for all aspects of preparedness for the company. It is supported by counterparts in the other PHI companies.

ACE has a clearly defined second role program and the Emergency Preparedness Team utilizes a detailed process to facilitate the management of employee role assignments. An Incident Response Role Database is utilized to consolidate and maintain all PHI role assignment information; this is linked to the Human Resources database.

All employees have a role in the Incident Response Plan. If their normal job is associated with emergency response (i.e. line personnel), that role does not change during a major event. All other employees are assigned a primary and secondary storm assignment. New hires are assigned a storm assignment within one month of their hire date. Changes to Incident Response Role assignments are managed using a Change Request Form which must be approved by the impacted managers.

Prior to the onset of storm season, the Emergency Preparedness Team reviews the Incident Response Role assignments to ensure that all resource requirement needs are met at the Regional and District levels. Reports are generated for the Regional IMTs, District IMTs and training organizations.

Recommendations:

There are no specific recommendations for ACE.

Jersey Central Power & Light

Observations

JCP&L does not follow the Incident Command System principles and organization. Instead the JCP&L Regional Director of Operations Services has the responsibility for storm management and service restoration within their Region.

The Regional Dispatching Office (RDO) directs restoration activities associated with the distribution system. Servicemen/troubleshooters, assessment personnel, hazard responders and line crews operate under the jurisdiction of the RDO. The dispatcher directs crews from the line, substation maintenance and meter sections. If contractors or other utility company crews are used, the RDO will direct the restoration effort through the use of company personnel assigned to these crews.

The System Control Center (SCC) directs restoration of transmission lines and transmission substation component outages (including customers served directly from those systems). The field personnel normally directed by this office are from the substation organizations, line servicemen/troubleshooters, and line crews.

The JCP&L E-Plan includes organizational charts and position descriptions for all functions. However, the organizational chart located in the storm plan was not used during the event; personnel were spread thin handling multiple responsibilities. It is not clear that the plan identifies resource level needs for the event levels defined in the Plan.

There were not enough people to fill storm management leadership roles for a multi-shift operation for a long-term storm event. In some instances, one individual filled multiple roles within the storm organization; filling one role during the day shift, and another role on the night shift. Clearly, personnel are not effective working lengthy shifts with minimal time for rest.

Emergency management is not a stand-alone position or department at JCP&L. It appears to be spread throughout the organization, with no clear authority or accountability. Specific processes are assigned to personnel who also have responsibility for a number of other functions. This approach does not provide centralized oversight and control, or the appropriate focus and attention.

Second role assignments are located in the plan. The Plan also includes a list of all employees along with their primary and secondary storm role. It appears that the majority of the second role assignments are related to operational needs. The storm leadership positions lack depth in terms of the number of backup personnel available to fill the roles.

The current JCP&L organizational structure and plan is primarily focused on the operational aspects of storm restoration; it is not inclusive of the other important functional areas such as Finance and Planning. The communications organization is also not clearly defined from a reporting standpoint –

the plan includes a flow chart that shows the communications process, but not the reporting structures. Assessing resources, incident status and developing suitable plans is fragmented throughout the organization and should be centralized.

A conference call schedule is established. During the Irene and the snow storm, no minutes were kept of the JCP&L Operations Calls; however an Area Manager kept a high level outline of the call summarizing key status data. This data was shared with the balance of JCP&L Area Managers (AMs) following the Operations Calls and the notes served as an easy and consistent reference sheet for the AMs to use in their communications with municipalities, other officials and major customers. The data in these notes were not actual minutes, but rather a "snapshot" in time, which did not constitute, and are not, a formal report regarding the storm event.

JCP&L provides the command and control of the storm restoration process within its service territory, but FirstEnergy controls mutual assistance, communications and logistics support.

JCP&L does not use logs to track key activities during an event (see recommendation in Section 3.4).

Recommendations

18-JCP&L-1 JCP&L should reorganize the emergency organization to follow the ICS organization, principles and concepts. Update the E-Plan to reflect the changes.

18-JCP&L-2 JCP&L should develop an Emergency Management / Emergency Preparedness role as a stand-alone function within JCP&L with the requisite authority to ensure compliance with readiness related initiatives.

Public Service Electric and Gas

Observations

The OMS Manual describes an Incident Command System organizational structure for dealing with major restoration events; however the ICS was not followed during storms or exercises. PSE&G has 26 teams on call that it can call upon to open and run the DERC. It is unclear exactly who becomes the incident commander.

Emergency management is not a stand-alone position or department at PSE&G. The responsibility for emergency management / storm restoration falls under the direction of the Manager – Delivery Operations Support. This position also has responsibility for a number of other functions. This approach to emergency preparedness dilutes the effectiveness of the PSE&G program by not providing the appropriate organizational focus.

PSE&G has a process to assign personnel to "second roles" for operational roles (lookup, etc.). However, it appears that the process for assignment of second role personnel for non-operational roles is less defined and employees were solicited as part of a "recruit or volunteer process." The current organizational structure and plan is heavily focused on the operational aspects of storm restoration; it does not appropriately reflect the scalability of non-operations functional areas.

PSE&G utilized almost 86% of its available personnel in response to Irene, and approximately 82% during the snow storm.

A standard conference call schedule is established for each event. Logs are kept when DERC is activated, but copies of checklists are not.

Recommendations

18-PSE&G-1 PSE&G should reorganize the emergency organization to follow the ICS organization, principles and concepts. Update the OMS Manual to reflect the changes.

18-PSE&G-2 PSE&G should develop an Emergency Management / Emergency Preparedness role as a stand-alone function within PSE&G with the requisite authority to ensure compliance with readiness related initiatives.

18-PSE&G-3 PSE&G should develop a more robust second role process to identify staffing needs, pre-assign appropriate personnel and provide training in advance of a storm event.

Rockland Electric

Observation:

RECO follows the Incident Command System principles and organization. The O&R Electric System Emergency Plan (ESEP) includes organization charts for each function as well as position descriptions. Based on interviews, this Plan and organization were followed for both storms.

RECO has a dedicated Emergency Management department; it is responsible for all aspects of preparedness for the company. They are supported by counterparts at Con Edison.

RECO has a clearly defined second role process, and all employees are assigned a storm assignment. A database is used to maintain assignment information and this is linked to the Human Resources system.

Resource records for internal personnel are maintained and OMS maintains Outage records. Operations reviews and approves external crew / contractor records. Regular conference calls are

held (4 to 6 hours apart or about 3 or 4 times a day) and follow an established agenda. Conference call minutes were summarized and distributed.

All external, internal, emails, reports, lessons learned and post storm reports are maintained. Team members utilize checklists, but activity logs are not kept (see recommendation in Section 3.4).

Recommendations:

There are no specific recommendations for RECO.

3.19 LOGISTICS AND FIELD SUPPORT

During the restoration process crews generally work shifts of up to sixteen hours (or longer) and therefore proper support of the crews is essential to keep the restoration on track. Logistic includes Staging Areas, Food & Lodging, Materials Management, Fleet Management and Fueling and Employee Support. Logistics provides the "fuel" that runs the entire restoration machine.

In addition to foul weather, poor road conditions and damage to facilities, an outage restoration can be hampered by logistics failures; inadequate Staging Areas or Receiving Centers; poor arrangements for Lodging and Meals insufficient or ineffective supply or distribution of materials; fleet shortages; and employee distractions. Organizations with a best practice in this area have detailed plans and checklists, established staging areas, advance contracts with service providers and adequate personnel to manage the logistics process.

Irene and the October snow storm caused a significant number of logistical challenges ranging from housing and feeding the thousands of personnel, to keeping crews stocked with materials needed for the repairs.

A. Staging Areas

While an EDC's native crews can work from its existing operations centers, foreign crews must be provided with a location for assembly, distribution of assignments, distribution of materials and refueling of vehicles. The site may also be used for early morning distribution of food for lunches and snacks, as well as lodging. As safety is paramount during all utility operations, the Staging Area may also provide a location for the safety briefing upon arrival and at the beginning of each shift.

Optimally, the Staging Area is at a predetermined location that has a specific layout designed to enhance productivity. The area should be near major access roads, lodging facilities and have security, power and sanitary facilities. Depending on expected weather, major functions should be housed within mobile offices or tents. There should be a strong communications link (voice and data) to the host EDC's systems.

Global Observations:

Many of the Staging Areas used during Irene and the snow storm were not predetermined by the EDC and only some of the sites had formalized contracts. If Staging Areas are not predetermined, the site layout cannot be developed to optimize the operations, safety and security of the Staging Area. This can impact crew access, travel times, fueling and materials management. Predetermined Staging Areas also allow for the integration of the area within a County OEM plan to insure proper access as needed to support a major operating location.

Predetermined Staging Areas should be placed under contract before an outage occurs or is approaching. There are a number of issues or concerns that a property owner may raise and these issues are best resolved well before a storm occurs through education and structured agreements.

Site specific layouts for Staging Areas have not been developed. The use of site specific layouts assists in the optimum operation of Staging Areas. Developing a layout as the area is being set up or after operating limitations are discovered creates additional bottlenecks in a facility that should be designed to minimize confusion and resource needs.

EDCs have not documented site-specific layouts for Staging Areas. Developing layouts as the area is being set up or after operating limitations are discovered creates additional bottlenecks in a facility that should be designed to minimize confusion and meet resource needs.

Global Recommendations:

19-G-1 Each EDC should predetermine Staging Areas sufficient to support restoration from an outage equal to 75% of total customers. This should include location specific layouts.

19-G-2 Each EDC should, if needed, have contractual arrangements in place for the use of the predetermined Staging Areas to resolve issues such as liability, access, security and existing support services at the site before an outage occurs.

Atlantic City Electric

Observations:

ACE has detailed instructions (including checklists) for the operation of Staging Areas. The plan includes selection criteria for Staging Areas, a universal suggested Staging Area layout, organization charts with defined roles and a specific logistics materials checklist.

For Irene, ACE opened a predetermined Staging Area (selected from several identified sites) with security provided by the host along with local police. Employees were assigned only to the Staging Area. There was wireless communications and various trailers for specific functions (operations, storeroom, procurement and supply) at the Staging Area. The Staging Area provided a wide-range of facility services along with a daily safety briefing.

ACE has identified fifteen staging area locations. Eleven are under verbal agreement, four are under written agreement. One was used during Irene. ACE was not impacted by the snow storm.

ACE STAGING AREA LOCATIONS	USED DURING IRENE	USED DURING SNOW STORM	PREDETERMINED LOCATION	VERBAL AGREEMENT IN PLACE	WRITTEN AGREEMENT IN PLACE
			As of 8/15/11		
15	1	0	15	11	4

Recommendations:

There are no specific recommendations for ACE beyond the global recommendations.

Jersey Central Power & Light

Observations:

JCP&L has position descriptions and checklists for logistics and field support for staging area management.

During Irene, JCP&L set up staging areas in the North and Central Regions; for the snow storm, in the North Region. An outside vendor managed and provided services for housing, food, sanitation, fuel, and fork trucks. JCP&L managed the Operations and Stores functions and provided a liaison between the company and the staging contractor. An office trailer was planned for the Staging area including communications equipment and a generator.

JCP&L has identified 11 staging area locations. Nine are under verbal agreement, two are under written agreement. Two sites were used during Irene and three sites were used during the snow storm. Three sites have detailed site plans developed.

JCP&L STAGING AREA LOCATIONS	USED DURING IRENE	USED DURING SNOW STORM	PREDETERMINED LOCATION	VERBAL AGREEMENT IN PLACE	WRITTEN AGREEMENT IN PLACE
			As of 8/15/11		
11	2	3	Yes	Verbal	No

Recommendations:

There are no specific recommendations for JCP&L beyond the global recommendations.

Public Service Electric and Gas

Observations:

PSE&G set up one Staging Area per Division, some were predetermined and others were not. The Staging Areas had little cover and some material was exposed. PSE&G employees worked out of hotel rooms or lobby and most had computers or cell phones. Restoration personnel worked out of their cars, hotel lobbies and on tables exposed to the elements. Facilities provided at the Staging Area for PSE&G supervision and birddogs would have been inadequate for a long restoration if post storm conditions were adverse. A mobile command post was used at one location and pop-up tents were used at other areas.

Corporate Security engaged contractors for staging area security. Buses were used to transport foreign crews to and from hotels because parking for large vehicles was not available at the hotels. Volunteers were trained on the job by shadowing or buddy system. The set-up of staging areas is not in the OMS Manual.

PSE&G has identified nine staging area locations. Five are under verbal agreement, one is a PSE&G location, and none are under written agreement. Four were used during Irene and three were used during the snow storm.

PSE&G Staging Area Locations	Used During Irene	Used During Snow Storm	Predetermined Location	Verbal Agreement in Place	Written Agreement in Place
			As of 8/15/11		
9	4	3	9	5	0

Recommendations:

19-PSE&G-1 PSE&G should develop a standard Staging Area resource complement to ensure that operations can be managed effectively if adverse weather conditions occur during an extended restoration. The resource complement could include rental of office trailers, the use of cell or satellite phones and data communications capabilities.

19-PSE&G-2 PSE&G should update the OMS Manual to include a detailed Staging Area plan.

Rockland Electric

Observations:

RECO is in the process of developing specific Staging Area layout maps for the current locations. Con Edison provided its mobile command vehicle as a supplemental workspace, but employees also worked out of the hotels. There were no specific facilities planned for the Staging Areas.

RECO has identified four staging area locations. None are under verbal or written agreement, and one is an O&R facility. Three were used during Irene and four were used during the snow storm.

RECO STAGING AREA LOCATIONS	USED DURING IRENE	USED DURING SNOW STORM	PREDETERMINED LOCATION	VERBAL AGREEMENT IN PLACE	WRITTEN AGREEMENT IN PLACE
			As of 8/15/11		
4	3	4	2	0	0

Recommendations:

There are no specific recommendations for RECO beyond the global recommendations.

B. Food & Lodging

After a 16 hour work shift of physical labor, personnel must have proper rest. Foreign crews expect suitable lodging (including showers) and reliable food if conditions permit. The lodging process must track the crews and provide them with suitable lodging within a reasonable distance from the staging area (or worksite). If truck parking is not available at the lodging site then transportation between parking and lodging must be provided.

Foreign crews are often volunteers and away from home, so a best practice is for the host utility to provide adequate food and lodging to ensure future response to mutual aid requests. Another best practice is to have the Staging Area or lodging as close to the work location as possible to minimize travel time.

Optimally, the food and lodging will be provided under contracts negotiated in advance of the storm season. As the restoration progresses and work sites move, the host utility may need to move the lodging for crews to new facilities closer to the work sites, thus requiring a flexible tracking system.

The host utility is in competition with its displaced customers and therefore reservations must be made as soon as the need for foreign crews is established. In a widespread event that causes hotel

room shortages, an EDC may have to establish sleeping accommodations for its personnel at a Staging Area.

Global Observations:

All EDC provided adequate food and lodging for its personnel.

Global Recommendations:

There are no recommendations that apply equally to each EDC; all the observations are included in the EDC specific area below.

Atlantic City Electric

Observations:

ACE has food and lodging checklists of roles and responsibilities. Meals for external resources (breakfast and dinner) were done at the staging area. Foreign crews were transported daily by bus to dinner and hotels. ACE provided boxed lunches before going into the field ensuring that crews did not have to travel away from their work location in order to have a meal.

Recommendations:

There are no specific recommendations for ACE.

Jersey Central Power & Light

Observations:

An outside vendor managed and provided staging area services (i.e. housing, food, sanitation, fuel, fork trucks, etc.). A contract had been established in advance for these services.

Contractors were given lists of places to stay and had to make their own arrangements. Forestry personnel made their own arrangements for lodging, and some personnel stayed in the staging areas. Since the acquisition of lodging is not centralized within an EDC, competing requests for services resulted. Therefore, it is best to centralize this process within the EDC.

Recommendations:

19-JCP&L-1 JCP&L should assume the responsibility for lodging for foreign contractors. Centralizing this responsibility along with its efforts for mutual aid crew lodging will eliminate competition for potential scarce lodging.

Public Service Electric and Gas

Observations:

Direct support of PSE&G field forces and foreign resources is decentralized to PSE&G's four operating Divisions which issue purchase orders for hotels with meals and adequate parking. Purchase orders are put in place for hotels with meals and adequate parking. The logistical team (part of the Division's administration function) coordinates with operations for crew count and lodging requirements as foreign crew tracking sheets usually arrived on day three. Some minor lodging conflicts occurred between Divisions, but were resolved by the Division personnel. During the snow storm a list of every hotel in the area was created; due to the high number of crews some mediocre vendors had to be used.

Boxed lunches for the foreign crews were coordinated by the Division personnel and prepared by outside contractors for PSE&G. The PSE&G birddogs for the foreign crews are responsible for returning to the Staging Area, picking up the lunches and transporting them to the work location.

Recommendations:

19-PSE&G-3 PSE&G should examine the assignment of lunch delivery to "birddogs" during major restorations as "volunteers or recruits" can accomplish this task and free up birddogs for foreign crew management, work planning, coordinating switching, safety oversight and dealing with the public on-site.

19-PSE&G-4 PSE&G should maintain an up-to-date list of lodging accommodations.

Rockland Electric

Observations:

During Irene and the snow storm, there was some competition with Con Edison for hotel rooms. This is an item that is being worked on as part of the process improvement initiatives. Contractors obtained their own rooms. Again, when the acquisition of lodging is not centralized within an EDC, competing requests for services can result. Therefore, it is best practice to centralize this process within the EDC.

Recommendations:

19-RE-1 RECO should assume the responsibility for lodging for foreign contractors. Centralizing this responsibility along with its efforts for foreign crew lodging will eliminate competition for potential scarce lodging.

C. Materials Management

Utilities have its own specific distribution design standards and therefore should be prepared to provide all materials needed for a major restoration. Generally, a utility will reserve "storm stock" in its storerooms, at its suppliers or through a shared consortium. Storm stock consists of material most often used during a restoration event (poles, cross arms, fuses, etc.).

The host utility must have provisions in place to distribute the needed materials to the foreign crews at the Staging Area or work location. The Staging Area must be continually replenished and this is usually accomplished at night. At the Staging Area, materials handling equipment must be available and a process for matching materials to work assignments should be predetermined. To maximize productivity, poles may be delivered directly to the worksite to avoid the need for transport by foreign crews through unfamiliar territory with cumbersome pole trailers.

At the end of the restoration, a process should be in place to retrieve unused materials from departing crews and prepare the final cost accounting for restoration materials used. Surprisingly, many utilities have found that automated materials management systems can delay the restoration process and a predetermined workaround should be in place or the Materials Management System (MMS) - a system that EDCs use to track its inventory - can be severely stressed.

Global Observations:

There were no indications that material shortages affected the restoration process.

Global Recommendations:

There are no recommendations that apply equally to all EDC.

Atlantic City Electric

Observations:

There were no indications of material shortages that affected the restoration. Materials management is a clearly defined process within the plan, and there are critical material checklists that ensure that appropriate materials are available.

ACE has identified the need to add internal stores support staff at the staging area, and have incorporated that into their staging area plan.

Recommendations:

There are no specific recommendations for ACE.

Jersey Central Power & Light

Observations:

There were no indications of material shortages that affected the restoration. For Irene, FirstEnergy set up a group of procurement people in Akron to ensure that supplies were adequate and to relieve pressure from JCP&L logistics people.

Recommendations:

There are no specific recommendations for JCP&L.

Public Service Electric and Gas

Observations:

There were no indications of material shortages that affected the restoration. Storm kits are used to maintain a stock level for restoration. The Staging Areas were replenished from the Division storeroom during the night based on a visual review and entries into the Materials Management System were handled at the Division Storeroom.

PSE&G has a predetermined Emergency Storm Material List for Staging Areas. The use of storm kits proved not as useful as providing pallets of single items to be disbursed as needed. Materials required were determined by the foreign crew supervisor to match the job requirements and PSE&G

storekeepers or volunteers led them to the materials. There was no preloading of materials during the night. Staging Area inventory was managed visually. At the end of the restoration, foreign crews were told to return materials at the Staging Area.

For Irene, PSE&G opened its storerooms 24 by 7; opened a command center and set up a material staging area for each Division for foreign crews. For the snow storm, three affected Divisions set up sites.

Recommendations:

There are no specific recommendations for PSE&G.

Rockland Electric

Observations:

There were no indications of material shortages that affected the restoration. Storm kits worked well for crews and other personnel. Con Edison brought a trailer full of supplies and parked it in the staging area. This assisted with the material distribution process.

Recommendations:

There are no specific recommendations for RECO.

D. Fleet Management & Fueling

The host utility's fleet management operation must maintain specialized heavy equipment used during a major restoration. Since this equipment operates 16 or more hours per day, operations typically repairs and maintains it at night or other downtimes. This is in addition to making field repairs, supporting heavy towing and testing specialized equipment such as aerial lifts which is generally performed at the existing operations centers.

Foreign crews should be accompanied by their own repair crews that travel with them to maintain productivity. The host utility should be prepared to provide information on other repair services available in the area and assist as needed.

Optimally, the host utility will provide fueling for foreign vehicles to maximize productivity. During an extreme outage fueling facilities such as truck stops may not be in service and fuel sources such as refineries and distributors may be impacted. Use of mobile fuel tankers to refill foreign vehicles

during the rest period at the Staging Area eliminates the need for foreign crews to search for fuel and maximizes productivity. As a best practice, fueling and fuel supply contracts should be in place as part of preplanning.

Global Observations:

There were no indications that fleet management issues or fuel shortages affected the restoration process.

Global Recommendations:

There are no recommendations that apply equally to all EDC.

Atlantic City Electric

Observations:

The ACE staging areas were staffed with mechanics, all company garages were open during the events, and field maintenance was performed as required. ACE employees assisted outside crew mechanics, and most assistance involved towing. Four wheel drive vehicles were rented, as necessary, to supplement the ACE fleet. ACE uses a vehicle resource management checklist with clearly defined roles and responsibilities.

Recommendations:

There are no specific recommendations for ACE.

Jersey Central Power & Light

Observations:

JCP&L fleet availability during the two restorations was about 90% compared to 95 – 98% for normal operations. Most mechanical work was performed at night. Mechanics assisted foreign crews if requested, although many foreign crews brought their own mechanics with them. An outside contractor was used for fueling truck at night in the Staging Areas.

Recommendations:

There are no specific recommendations for JCP&L.

Public Service Electric and Gas

Observations:

The PSE&G fleet includes 300 hybrid 4WD vehicles, although additional vehicles were rented for the two storms respectively. These vehicles were primarily used for damage assessment.

As required by the union contract, mechanics are entitled to the same hours as foreign crews. Therefore, to be cost effective, preventive maintenance is performed during the back hours on PSE&G vehicles. Normal fleet availability is 99.2% and for the storm there was no change. PSE&G has shifted its vehicle inspections to spring and fall to avoid the storm seasons and enhance fleet availability.

There were no fueling contracts in place for foreign vehicles and PSE&G used an existing relationship for fueling during Irene. However, after examining the costs, PSE&G engaged a different vendor for the snow storm. PSE&G owns 21 fuel tankers. Truck fueling was done at night at the staging area using mobile trucks.

Recommendations:

There are no specific recommendations for PSE&G.

Rockland Electric

Observations:

During Irene and the snow storm, RECO set up contracts with local vendors to provide additional vehicles. Company mechanics assisted foreign crews with minor repairs as needed. Fueling was done at night at the staging areas and RECO be obtaining a fuel vendor for future events. Foreign trucks were refueled at their hotels at night; however tracking the hotel locations where crews were staying is an area they identified as part of their process improvement initiative.

Recommendations:

There are no specific recommendations for RECO.

E. Employee Support

Utilities recognize that employees and their families are just as likely as their fellow customers to sustain damage to their homes and other property. The utility may provide lodging for displaced employee families so the employee can report to work. Forward thinking utilities provide a contact point for employee's families to assist the family in obtaining repairs for their homes and property (at the employee's expense).

Every utility manager and employee follows the safety mantra that their fellow employees should return home tonight in the same condition they arrived this morning. To enhance safety, the utility should try to remove any distractions or obstacles that prevent an employee from reporting to work.

During Irene and the snow storm, many EDC personnel were also without power at their homes. They experienced flooded basements, damage to their homes, and spoiled food. An EDC employee is expected to work during a restoration event, regardless of what their personal circumstances are.

Global Observations:

No EDC reported that personnel did not report to work as a result of difficult personal circumstances.

Global Recommendations:

None

Atlantic City Electric

Observations:

ACE's plan provides a wide range of employee emergency support services including transportation assistance, grocery and prescription delivery services, childcare and a contractor.

During Irene, ACE relocated employees' families from flooded areas, provided hotel rooms and assisted with contractors. The Company maintains an employee hot line for families that is staffed by Human Resources.

Recommendations:

There are no specific recommendations for ACE.

Jersey Central Power & Light

Observations:

JCP&L and FirstEnergy do not have a formal program regarding employee assistance during major events; however, JCP&L management has the discretion to make accommodations, as appropriate, with respect to a given situation.

Recommendations:

There are no specific recommendations for JCP&L.

Public Service Electric and Gas

Observations:

If an employee needed lodging as a result of long travel distances, PSE&G would arrange it.

PSE&G did not have an organized process to support employees engaged in the restoration that may have sustained damage to their homes or family issues, however in 2012 PSE&G did put an employee support process in place using an outside contractor.

Recommendations:

There are no specific recommendations for PSE&G.

Rockland Electric

Observations:

RECO made contractors available to respond to family needs, but this was not a formal process.

Recommendations:

There are no specific recommendations for RECO.

3.20 STORM RESTORATION PROCESS METRICS

Successful storm restoration can be measured in many ways, such as, no public or employee injuries, accurate global ETR cost per customer restored, length of restoration effort, and call center contacts per customers affected. Whatever metrics are tracked, there should be a common understanding of what a successful storm restoration looks like.

Internal metrics can be established that measure how successfully an organization prepares and implements its restoration plan. This could include resources utilization, training completion, response to call outs, etc. This provides an organization with a process to measure its internal readiness, and when tied to corporate goals, can be an effective motivator. Organizations with a best practice in this area have established criteria to measure their performance.

From an external reporting point of view, describing the impact or severity of a storm to external stakeholders can be difficult. Many times the only factor that people look at is the number of customers out of service.

During Irene and the October snow storm, external stakeholder groups compared EDC performance based upon the number of customers out of service. An EDC is staffed to handle its customer base on a day-to-day basis, so the higher the percentage of an EDC's customers are out of service (as a percentage of the total), the more significant and challenging the problem is. An EDC with 50% of its customers out of service has a much bigger job than an EDC with 25% of its customers out of service. However, comparing storm severity based solely on the total number of customers out of service is not appropriate since other factors such as service territory terrain and customer location also complicates restoration.

Global Observations:

There are no common metrics for the EDCs to communicate to the State the magnitude of the outages or restoration. Reporting categories are not standardized as part of the BPU Major Event Report format; a recommendation to standardize this is included in Section 3.12.

Global Recommendations:

20-G-1 In addition to an ETR, the EDC's should jointly develop and then consistently report the estimated crew hours (or man hours) of restoration work required to restore all known or estimated customers out of service for a major storm. This value can be developed from the EDCs' OMS, SCADA and other information sources after the initial damage assessment has been performed (within the first 24 hours after a storm). In essence this becomes a severity index to compare a storm's impact on a consistent basis.

Atlantic City Electric

Observations:

ACE measures the accuracy of the ETR provided to customers. ACE has a goal to respond, make safe or standby hazardous conditions within 40 minutes of the report and tracks its performance.

Recommendations:

There are no specific recommendations for ACE beyond the global recommendation.

Jersey Central Power & Light

Observations:

JCP&L tracks customers affected, circuit lockouts, order status, crews working and orders by category.

Recommendations:

There are no specific recommendations for JCP&L beyond the global recommendation.

Public Service Electric and Gas

Observations:

PSE&G reported that it did not have process metrics for the storm restoration process. However, during its drill several restoration metrics were observed including the number of customers out of service, circuit lockouts, and crews available. The OMS develops a restoration metric estimating the total repair time for all incidents. For major outages (defined as greater than 10% of customers or the shifting of resources to a Division) work packages are assigned a priority by Priority Control and worked within that order. There are indications that comparisons or evaluations of metrics were made during the storm.

The damage assessment process reviews an OMS incident and confirms it through the Lookup process. There is no metric for those confirmations, but the metric was observed as reported during the 2012 drill.

PSE&G has a severity appraisal process, which uses its initial storm assessment tool to compute a crew hour estimate during the initial stages of the restoration. Work backlog is tracked at the Division level and managed by Priority Control.

Recommendations:

There are no specific recommendations for PSE&G beyond the global recommendation.

Rockland Electric

Observations:

RECO uses a scorecard to track a number of restoration parameters including ETR accuracy, call center response, workforce availability and logistics.

RECO keeps track of number of poles replaced, number of transformers replaced, feet of primary wire put up and number of tree jobs by storm.

Recommendations:

There are no specific recommendations for RECO beyond the global recommendation.

3.21 SAFETY

An overriding concern of all storm management decisions must be maintaining the safety, health and well-being of all who toil to restore power and customers affected by storm damage. Special care must be taken to see that mutual assistance and contractor personnel are familiar with the local EDC's safety requirements and procedures. Pressure to modify safety procedures to speed restoration only increases the risk of injury. Also, restoration efforts must not create conditions that create increased public safety personnel or customers risk.

Utilities with a best practice in this area have a documented process to train incoming personnel on the EDC safety standards and procedures. And restoration personnel receive a daily safety briefing describing the hazards they can expect to encounter while working in the field.

Irene and the October snow storm posed numerous safety challenges. Irene caused significant flooding and road closures. The October snow storm created treacherous driving conditions. Downed trees created hazards during both events.

Global Observation

During both storm events, many EDC personnel worked extended hours in treacherous and sometimes challenging conditions. These restoration efforts were completed without any serious or life threatening injuries to the workforce or public. The practice of conducting safety briefings with all external crews prior to their shifts is important. Providing external resources with material describing safety procedures, system characteristics and contact information is also important. Distribution of daily safety messages to all employees that address current hazards provides continuous reinforcement that safety is paramount.

Global Recommendations

21-G-1 All EDC should continue their current safety programs and practices.

Atlantic City Electric

Observations:

ACE's safety functions are clearly defined in its Incident Response Plan. ACE has a Utility Operations Contractor Safety Orientation Guidebook that each contractor and mutual assistance resource is issued. This guidebook outlines the safety requirements and procedures.

ACE's Media Relations organization issues public safety messages to its customers prior to an event and during an event. They use public service announcements, print information as well as social media, to disseminate these safety messages.

The Regional Safety Coordinator is responsible for coordination and monitoring of all aspects of safety during the incident response or restoration efforts. The Safety Coordinator also ensures compliance with governmental and corporate safety and environmental rules and regulations. If the incident requires the activation of environmental experts, these resources will report to the Safety Coordinator.

Prior to the daily field work all ACE field employees, contractors, mutual assistance crews are given a daily safety briefing (tailgate talk) at the staging area.

There was one minor accident during Irene. A tree limb hit a worker in the shoulder.

Recommendations:

There are no specific recommendations for ACE.

Jersey Central Power & Light

Observations:

JCP&L's E-Plan references safety multiple times throughout checklists, job descriptions and attachments. The Crew Movement Expectations document clearly outlines the expectations of all FirstEnergy employees when working any restoration event. JCP&L maintains records of all mutual assistance and external resource employees who were given a safety briefing upon their arrival.

JCP&L documented ten safety-related incidents during Irene. These were primarily minor motor vehicle incidents and during the snow storm, there were fifteen similar incidents recorded.

Recommendations:

There are no specific recommendations for JCP&L.

Public Service Electric and Gas

Observations:

PSE&G places a high regard on safety. In the OMS Manual safety is mentioned numerous times. Two of these pages reference the responsibilities of the Safety Coordinator.

Each day starts with a safety briefing and each work package is expected to start with a tailboard briefing. For foreign resources, PSE&G has a mandatory introductory safety briefing and distributes three pages from its OMS Manual. This minimal handout describes, but does not illustrate, PSE&G's construction methods.

During Irene, there were three injuries and six motor vehicle accidents, all of which were reported as minor. During the snow storm, there were four reported injuries and ten motor vehicle accidents, all reported as minor.

Recommendations:

There are no specific recommendations for PSE&G.

Rockland Electric

Observations:

RECO's safety functions are clearly defined in its plan under the Health and Safety Department's responsibilities. RECO maintains records of all Mutual Assistance and external resource employees who were given a safety briefing upon their arrival. RECO issues each Mutual Assistance employee a handbook. A section in this handbook deals with safety.

The Health and Safety Chapter of O&R's Storm Restoration Plan, which RECO follows, contain the policies, procedures and checklists for the Health and Safety organization.

The Corporate Communications Coordinator works closely with the Information Officer to communicate weather, storm preparedness, storm safety, storm damage, storm response, and service restoration information to employees, customers and other stakeholders so they can respond appropriately. Safety messages are included in communications to employees and customers. Safety personnel monitor operations in the field during the storm, and safety personnel give safety messages to all external crews and contractors before work can begin.

There were no recordable incidents reported during both events**.**

Recommendations:

There are no specific recommendations for RECO.

D. COMMUNICATIONS

The EDCs ability to provide timely and accurate information at the level of detail expected by the customer has a direct link to customer satisfaction. Explaining the restoration efforts and process can prevent or answer unsubstantiated rumors, preserve the EDC's reputation, and minimize complaints to public officials at all levels. Transparency in communications enhances credibility and builds trust with all stakeholder groups.

Best practice organizations understand that the communications aspect of a restoration event is a key priority. Without accurate and timely communication, the positive aspects of the restoration are often overlooked.

As was noted in the BPU Hurricane Irene Report, there were significant problems with the EDCs' internal and external communications. It was clear that public officials and residents had difficulty obtaining basic information from their EDC, such as estimated restoration times and efforts to ensure the safety of downed electrical wires. This was particularly disruptive to local governments trying to manage the disasters, and residents anxious to make decisions about shelter, sustenance, property security, and maintenance.

RFQ SECTION	RFQ REQUIREMENT
3.3.4	**Communications** The contractor shall review and analyze the effectiveness of communications between each EDC and its customers addressing outages, including but not limited to, estimated times of restoration. The contractor shall review effectiveness of communications between each EDC, and Local, County, and State Office of Emergency Management agencies (OEMs) and with community and elected officials and the public sector. The contractor shall review and analyze the effectiveness of intra-company communications relating to the flow of information to work crews and to those interacting with customers and local officials. The contractor shall identify solutions to any shortcoming found.

3.22 CUSTOMER SERVICE / CALL CENTER

The utility call center is where customers can obtain information, discuss billing and report outages. Call volume is statistically predictable and the utility can adjust its staffing to meet established performance metrics for customers care.

During a major outage event the role of the call center changes drastically. The focus becomes providing the most timely and accurate information possible, and in some cases reassurance, to customers facing utility outages for an unknown duration of time. Customers need and want to know how long the disruption will last so they can plan accordingly. Further, in instances where outages lead to conditions that could potentially be life threatening and/or present a risk to property, the ability to receive accurate information about restorations becomes critical.

Call center technology enables the use of a blend of methods to communicate with customers in order to provide helpful information and collect valuable outage information from customers. The use of Interactive Voice Response Unit (IVRU) technology makes it possible for call centers to receive thousands of incoming customer calls and deliver thousands of outbound messages to customers simultaneously. Customers can provide their own outage information without waiting for an available representative, or receive helpful information such as safety tips and Estimated Time of Restoration (ETR) without waiting for a customer service representative (CSR).

If call volume exceeds the capabilities of the utility's IVRU and its CSR operations, then high volume call answering (HVCA) services can be activated. Calls can be transferred to the remote HVCA contractor and a very high volume of calls can be handled providing automated responses (such as ETR) and outage information taken by voice recognition, Caller ID or by prompting callers to press specific numbers for different options. Utilities may also contract with a remote services provider using trained CSRs during an outage to supplement the utility's own staff. With proper training and access to the utility's systems, these trained CSRs can effectively provide services similar to company CSRs.

Call center staffing can also be augmented by designating and training second role employees familiar with the customer information system, such as collectors, field representatives and employees with previous call center experience, to take emergency and outage calls.

However, for many customers who need help solving a problem, especially those in distress or who have not received promised relief, there may be no effective technology substitute for assistance from a live company representative.

A utility should have a call center performance plan designed to complement the utility's communications plan and established performance metrics that recognize the concerns and distress levels of outage customers. Metrics such as average speed of answer (ASA) and percentage

abandonment rate (AR) are often used. Emergency calls such as wires down and gas leaks are given highest priority by the IVRU, while normal business calls for billing assistance can be rejected. Customers asking billing related questions can be asked to call back after the restoration is complete.

The utility should carefully monitor its call center staffing as the end of the restoration approaches. The utility may be using outbound messaging and various forms of media to confirm if a customer's service has been restored and also to gain reports from customers with downed service lines not yet reported. This messaging will increase call volume from agitated customers. Improper staffing levels during this period may lead to increased ASA and AR metrics as well as additional customer frustration.

During major events, like Irene and the snow storm, customers needed accurate information in order to plan. A majority of customers turned to the Call Center for help. However, the inability to reach a live person, or obtain accurate ETR information, caused significant frustration and anger.

Global Observations

Call volumes from customers were very high for both storms and customer tolerance of VRU or IVR messaging as a substitute for live agent contact decreased as the storm events lengthened. Automated messaging did not always provide customers with useful information that would help them plan and prepare.

Call center staffing and performance followed predictable patterns concerning call volume and Average Speed of Answer (ASA) related to the outages, and these are summarized in the table below.

CALL CENTER STAFFING – IRENE				
Date	**ACE**	**JCP&L**	**PSE&G**	**RECO (Peak)**
27-Aug-11	238	165	92	N/A
28-Aug-11	229	630	244	56
29-Aug-11	251	823	398	51
30-Aug-11	257	767	419	55
31-Aug-11	255	792	348	52
1-Sep-11	177 ACE restoration completed 9/1/11	785	340	49
2-Sep-11	Not applicable	733	243	45
3-Sep-11	Not applicable	93	96	11
4-Sep-11	Not applicable	97	34 PSE&G restoration completed 9/4/11	9 RECO restoration completed 9/4/11
5-Sep-11	Not applicable	75	Not applicable	Not applicable

CALL CENTER STAFFING - SNOW STORM				
Date	**ACE**	**JCP&L**	**PSE&G**	**RECO (Peak)**
10/29	NA	275	121	18
10/30	NA	441	162	43
10/31	NA	831	314	62
11/1	NA	801	366	66
11/2	NA	757	387	69
11/3	NA	778	372	69
11/4	NA	756	297	60
11/5	NA	183	80	32

Note: The October snow storm was not a major event for ACE.

IRENE PEAK CALL CENTER PEAK STATISTICS				
IRENE	**ACE**	**JCP&L**	**PSE&G**	**RECO**
Highest Call Volume for Agent Handled Calls	Data not provided	21,991 8/31/2011	33,546 8/29/2011	7286 8/29/2011
Highest Average ASA (minutes)	1.3 9/1/2011	1.95 9/3/2011	7.0 9/4/2011	4.7 8/29/2011
Highest Average AR	0.78% 9/1/2011	Data not provided	28.9% 9/3/2011	4.3% 8/30/2011

SNOW STORM CALL CENTER PEAK STATISTICS				
SNOW STORM	**ACE**	**JCP&L**	**PSE&G**	**RECO**
Highest Call Volume for Agent Handled Calls	Not applicable	25,724 10/31/2011	34,644 10/31/2011	8462 10/31/2011
Highest Average ASA (minutes)	Not applicable	2.3 11/5/2011	2.15 11/3/2011	11.2 10/29/2011
Highest Average AR	Not applicable		10.3% 11/2/2011	6.4% 11/1/2011

EDCs do not have a separate set of metrics for call center performance during major outages. Establishment of performance metrics that recognize the concerns and distress levels of outage customers would ensure that performance levels support the expectations of customers. Metrics such as average speed of answer (ASA) and percentage abandonment rate (AR) are often used.

Global Recommendations:

22-G-1 Each EDC should set reasonable call center performance standards for ASA and AR during major outage events.

22-G-2 Each EDC should manage call center staff to meet its performance standards throughout the outage event, including the critical end of restoration period.

22-G-3 Each EDC should develop IVR/VRU messages to provide customers with as much immediate help and advice as is possible (that is accurate) during each point of the storm and restoration and regularly update that information.

Atlantic City Electric

Observations:

ACE's has a call center in New Jersey; ACE also has the capability to direct overflow calls to PHI's Maryland call center. PHI also uses an outside vendor as an emergency backup call handler, and contracts with another vendor to assist with High Volume Call Answering (HVCA) capability. Under normal conditions, total Call Center staffing includes 13 Supervisors, 15 Senior Call Center Representatives and 147 Call Center Representatives. In addition to this regularly assigned call center staffing, ACE can mobilize 130 trained "Second Role" staff members, most are from the billing and credit departments. During Irene, call center staff were deployed in overlapping 12-hour shifts to assure full coverage. On the last day of restoration, these shifts were reduced to 10 hours. The call center was open on a round the clock basis throughout restoration.

ACE has a detailed plan in place for the call center including roles, second roles, checklists, scripts for notifying employees and numerous scripts for customer communications. The call center plan is a stand-alone plan and is reviewed and updated as needed.

The Customer Service Call Center prepared for Irene according to the plan; all staffing plans were in place and the Voice Response Unit (VRU) was tested and functional. The other PHI call centers were available to take overflow calls as well as the outside overflow contractor and a HVCA contractor. Post storms, ACE examined how these plans and processes worked by conducting a post-event lesson learned process, including the CSRs as well as supervisors, managers and the Incident Management Team.

ACE tracks performance metrics and has a 30 second answering service level during normal business days. While this standard was not met post storm, undoubtedly due to the severity of the event, it appears this highest average speed of answer and abandoned call rate were on Thursday, September 1, when staffing was reduced by 30% compared with the previous day. However, an ASA of 1.3 minutes, and an AR of less than 1% is not unreasonable given the level of damage caused by Irene. Staffing was managed using a 12 hour shift and the call center was open 24/7.

ACE's communication and message strategy is well defined in its plan and encompasses various levels of estimated restoration time communication and advice about managing without electricity. The call center received early global ETR, and the plan calls for increasing area specificity on restoration times when incidents reach a certain level. Outgoing messages provided tips targeted to set restoration expectations and brief safety messages. The VRU messages mentioned a "global" estimate for restoration without defining what global means to a customer.

Recommendations:

22-ACE-1 ACE should review its messaging to ensure that it is understandable to customers and does not slip into jargon such as global or complete restoration.

Jersey Central Power & Light

Observations:

Through FirstEnergy, JCP&L has interconnected Contact Centers in a "virtual state," with locations in Ohio, PA, and WV. Outage calls take priority throughout this virtual call center system; outage handling is the first skill Contact Center personnel learn. FirstEnergy contracts with an outside vendor to handle excess High Volume Call Answering (HVCA) and IVR support.

JCP&L follows a Storm Communications Plan for Customer Support, contained in the FirstEnergy Emergency Communication Plan. This plan provides guidelines for mobilizing Contact Center Resources, establishing Key Messages and Deliverables, handling 911 and outage calls, reporting call volume and post-storm summary reporting of storm activity.

ETR's come from Operations and the Communications organization and are fed to Call Centers. A team of 12 analysts are assigned to work on the ETR's, as they monitor data in a software module, the overall health of the system and customer connections.

During the two events, JCP&L operated the virtual call center system where calls were directed to multiple FirstEnergy locations in PA and OH. After the events, it opened up a third location in West Virginia. Live agent staffing was organized in 12-hour shifts throughout the restoration events. The virtual call center system technology performed according to specifications.

The Total ASA for Irene peaked on Saturday, September 3. This coincided with a reduction in live agent call volume from 15,000 on 9/2 to 3,400 on 9/3, and a reduction in live agent staffing.

IRENE CALL CENTER DATA – JCP&L		
Date	**Live Agent Calls**	**Total ASA (seconds)**
8/27	2,968	8.6
8/28	34,904	2.7
8/29	24,287	12.2
8/30	20,086	61.3
8/31	21,991	66.1
9/1	19,192	58.5
9/2	15,348	74.9
9/3	3,464	117.2
9/4	3,132	52.7
9/5	2,343	47.9

SNOW STORM CALL CENTER DATA – JCP&L		
Date	**Live Agent Calls**	**Total ASA (seconds)**
10/29	10,410	21.5
10/30	14,357	22.8
10/31	25,724	77.7
11/1	23,526	80.4
11/2	21,923	78.5
11/3	21,217	63.2
11/4	18,614	108.9
11/5	6,611	136.7
11/6	3,416	14.0

Irene and the snow storm tested the Emergency Response Phone Center and system. As a result JCP&L decided to upgrade the emergency phone system and provided dedicated numbers for public officials to access information. Additional enhancements include expanding the current seating capacity in both New Jersey Emergency Response Phone Center locations, as well as establishing additional capacity in Ohio. The Emergency Response Phone Center will operate around-the-clock when activated.

The IVR provided overly optimistic global ETR messages for Irene and the snow storm. Provision of optimistic ETR information led customers to believe that they would be restored sooner than they were, causing a delay in customer preparation efforts. Specific recommendations related to ETR are located in Section 3.15.

Recommendations:

22-JCPL-1 In large-scale outage restoration events, IVR and Live Agent ETR messages should be based on worst case estimates to encourage customers to take steps necessary to care for their households' welfare.

22-JCPL-2 IVR messages should include guidance to customers to help them find tips and resources for coping with extended outages (e.g. informational websites, support agency phone numbers, etc.).

Public Service Electric and Gas

Observations:

PSE&G has two call centers located within its service territory that are staffed with employees having from three to over thirty years of experience. An IVR is also utilized and is supported by PSE&G's telecommunications network supplier thus call capability and handling is not limited by call center trunk lines. Additional call handling capability is provided by an outside supplier with two locations in Georgia, with 50 full time CSRs, and the ability to shift its resources from other utility contracts. There is also a high volume call answering capability (HVCA) provided by an outside vendor. PSE&G has the capability to transfer calls to its billing employees and multiple customer service centers (which normally do not function as call centers except in emergency circumstances) as further backup. Additionally, the call center uses employee volunteers to supplement personnel for major storms.

Customer calls or entries into the IVR are sent from the Customer Information System (CIS) to the Outage Management System. The CIS will show the estimated restoration time for the customer then this information can be provided by the customer service representative during a subsequent call.

Annual goals for the call center include a 4% AR, but it is not clear if that applies during outages. Most significant is the jump to a 28.9% AR on 9/3 as both Public Service calls and CSR staffing dropped sharply. Notably, on 9/3 and 9/4, ASA reached 7 minutes. The average speed of answer is not included in the tables below because PSE&G measures this performance metric differently than the other utilities. However, the jump in ASA on these days further illustrates the impact of the staffing levels.

SNOW STORM CALL CENTER DATA – PSE&G			
Date	**PSE&G Calls**	**Abandonment Rate (%)**	**PSE&G and Outside Staffing**
8/27	7,942	1.7	106
8/28	25,647	2.1	243
8/29	33,546	3.5	398
8/30	24,512	11.5	419
8/31	21,942	14.7	348
9/1	19,126	5.6	340
9/2	13,769	10.4	243
9/3	4,790	28.9	96
9/4	2,664	22.1	34

SNOW STORM CALL CENTER DATA – PSE&G			
Date	**PSE&G Calls**	**Abandonment Rate (%)**	**PSE&G and Outside Staffing**
10/29	12,250	4.7	140
10/30	21,367	3.7	176
10/31	34,644	2.6	376
11/1	30,024	4.0	420
11/2	26,936	10.3	428
11/3	22,873	9.2	413
11/4	18,562	6.3	327
11/5	6,411	6.3	91

Given the daily volume of PS calls, staffing during the snow storm appears to have more closely tracked call demands than Irene. ASA remained below 2 minutes for most of the event.

No official lessons learned effort was made.

Recommendations:

22-PSE&G-1 PSE&G should manage staffing levels to reach call center outage performance standards and a lessons-learned effort needs to occur after every major event

Rockland Electric

RECO has a Call Center at the SVOC, with backup from Customer Service Representatives at multiple Con Edison Call Centers. The average experience of RECO Call Center staff is 9.5 years, ranging from

less than one year to more than 30 years. In addition, there is a contingency team of 12 RECO customer accounting personnel to staff the phones, and a Special Response Team of 20 management personnel for escalated calls.

Restoration status is communicated to Call Center staff through the following: OMS, meetings with the communications team, internal emails, verbal communications with supervisors and managers, news releases distributed via email or as handouts, and through RECO's intranet site.

Call volume is managed through technology; the systems in place start in the cloud, drop down to the VRU, to the number of lines and live resources.

RECO has contracted with an outside vendor for an automated method for customers to report outages. This is a mirror IVR with data sent by internet to the OMS.

RECO's Customer Assistance Center (CAC) brings in extra CSRs before a storm if there is warning, or after the storm hits. CAC coordinates customer callbacks to confirm service restoration. The CAC mobilizes the Special Response Team (SRT), which communicates with Life Support Equipment (LSE) customers, handles special needs and escalated level calls and is the liaison with regulatory agencies requesting outage information.

IRENE CALL CENTER DATA – O&R

Date	Live Agent Calls	Agent AR %	(Peak) Staffing
8/28	7,248	9.8	56
8/29	7,286	24.2	51
8/30	5,818	11.1	55
8/31	3,997	1.3	52
9/1	3,110	1.1	49
9/2	2,886	5.5	45
9/3	446	8.1	11
9/4	179	2.2	9

SNOW STORM CALL CENTER DATA – O&R			
Date	**Live Agent Calls**	**Agent AR %**	**(Peak) Staffing**
10/29	4,161	54.7	18
10/30	7,891	35.3	43
10/31	8,462	26.4	62
11/1	7,553	21.4	66
11/2	6,841	16.4	69
11/3	5,374	7.6	69
11/4	4,213	9.2	60
11/5	423	0.23	32
11/6	50	6.0	18

During both storms, all incoming calls were directed to RECO's network provider platform and answered with a RECO broadcast message that all callers received. As IVR and system capacity became available calls were released to the system to allow reporting of outages by IVRU or CSR.

During Irene, RECO had 210,000 calls to the CAC and 245,000 in the snow storm. This peaked at 12,000 calls per hour. The annual rate is 900,000 calls per year and the system was overwhelmed. Only 37% of calls were unique (not duplicate). Fifteen percent of callers were able to speak with a CSR and another 15% wanted to speak to CSR but could not. There was a capacity issue on the number of phone lines and VRU capacity. Some storm calls bled over through the gas emergency line when customers could not get through the normal channels. The number of customers wanting to talk with a live person increased with the duration of the storms.

During Irene all outage calls were handled by internal RE resources. During the snow storm some calls were handled by Con Edison. On August 30, lengthy messages describing O&R's restoration efforts and the extent of damage greeted customer calls, yet there was no indication or advice to the customers regarding re-calling RECO if the customer was still out of power.

There was a significant one and a half hour delay from the time a customer reported an outage to a CSR or through IVR before it showed up on website outage map. This delay caused many customers to call in again because they believed the reported outage was not recorded.

RECO did not make any outbound IVR calls during Irene. Some customers were contacted by live agents towards the end of restoration efforts to verify that power had been restored in an effort to identify those affected by a single service outage. During the snow storm, limited outbound campaigns were made using both RECO and Con Edison automated systems.

RECO has taken steps to increase its call handling capacity including the number of phone lines to handle a peak of 60,000 calls per hour. That capability has been tested to a level of 30,000 calls per hour. A HVCA contractor has been engaged and the number of CSRs that can handle calls at their

homes has been expanded. Additional network capabilities allow for calls to be sent to Con Edison or a contractor.

Recommendations:

22-RE-1 RECO should continue implementing the process enhancements currently in progress and ensure that the enhancements will support the call center standards developed for major outages.

22-RE-2 RECO should examine the potential issue related to the planned use of its affiliate's resources if simultaneous large-scale events occur in both service territories.

3.23 EXTERNAL COMMUNICATIONS

Effective communications is a key component of the restoration process. Advance communications provide customers with knowledge of what to expect and predicted duration of outages, allowing customers essential time to make appropriate plans. Preparation is especially important for special needs customers and their caregivers. Safety advice to customers is vitally important to prevent life-threatening accidents involving downed wires. Early warning and communication regarding expected weather conditions and potential damage assists local police, fire and public works departments' efforts to prepare available resources to protect their communities, communicate preparatory requirements to constituents, and facilitate restoration efforts.

The process of external communications has shifted from a deadline (TV, radio or newspaper) driven process to a round-the-clock dissemination of unfiltered information. A wide variety of stakeholders (County and City Offices of Emergency Management, police and fire, public works, municipalities, elected officials and business organizations) also retransmit restoration information along with their messaging.

Well-designed external communications can help minimize call center phone traffic, allowing for better flow of information to and from customers, and more efficient handling of customers requiring special attention.

Customer satisfaction is directly related to the ability of the utility to provide timely and accurate information at the level of detail expected by the customer. By providing an explanation of the restoration efforts and process, external communications can prevent or answer unsubstantiated rumors, preserve the EDC's reputation, and minimize complaints to public officials at all levels. Transparency in communications will enhance credibility and build trust with all stakeholder groups.

Best practice organizations understand that the communications aspect of a restoration event is a key priority. Without accurate and timely communication, the positive aspects of the restoration are often overlooked.

During a major event like Irene and the snow storm, an external communications program can become taxed with the volume of communications needed and requested. Programs need to be scalable and able to expand to fill the needs.

Global Observations:

All EDCs agree that safety and the customers' ability to prepare for extended outages are paramount. Yet in most communications, these messages are issued as secondary to explaining

how hard the EDC's are working to restore power. In many instances, VRU or IVR channels are not transmitting safety and preparedness advice as often or as well as possible.

All EDCs either have or are in the process of adopting the use of Social Media as "force multipliers" for message dissemination.

Press releases have a limited ability to effectively portray the challenges, limitations and processes necessary for customers to understand restoration processes. These messages are best portrayed in graphic first person accounts by front line employees.

Following is a table describing the communications channels used by each EDC.

EXTERNAL COMMUNICATIONS CHANNELS AND USAGE				
IRENE	**ACE**	**JCPL**	**PSEG**	**RECO**
Media:				
Media Spokespersons	1	5	4 full-time + 11 auxiliary	3
Press Releases/ Advisories	9	14 Press Releases; 10 Media Advisories	8 Press Releases; 36 Media Advisories	24
Human Interest Features	Not reported	Not reported	2 "Behind The Headlines" stories	Not reported
Media Calls Handled	59	275	Yes	130
Press Conferences	1	1	Not reported	Not reported
Local Officials:				
Outbound Emails	Yes	Emails and Faxes	10	Status Updates 3/day via email
Meetings/ Contacts w Public Officials	Yes	1500 documented contacts	Status Updates at least 3/day	Yes
Outbound phone calls	Yes	Yes	Yes	To 21 municipalities
Staffed County OEM's	All 8 Counties	4 Counties	Started contacting 8/24; Staffed All 11	Bergen County and Closter PD

EXTERNAL COMMUNICATIONS CHANNELS AND USAGE				
IRENE	**ACE**	**JCPL**	**PSEG**	**RECO**
Customers:				
IVR/VRU	Yes	Yes	Yes	13 messages, 8/26 - 9/2
"Storm Page" on Website	Yes	Launched dedicated outage info page 8/28; updated 2/day	66,498 visits	Yes
Twitter	109 mentions of ACE across all social media 8/26	Not reported	57 Tweets - 300% increase in followers during Irene	In initial stages of being used, but not promoted
Flicker	No	No	Yes	No
Facebook	Yes	Not reported	Not reported	Not reported
Outbound Emails	Not reported	Not reported	10 X 800,000 addresses	3 X 38,000 addresses; 40% open rate
Mobile / Temporary Localized Customer Service Centers	No	No	12; assisted almost 2500 customers	No
Outbound Phone Calls	Not reported	Not reported	8/30/2012 Outbound 911 used for Bergen County load shedding	Not reported
Employees:				
Talking Points	Yes	Yes	Yes	Yes
Executive emails	Not reported	Not reported	Yes	Not reported
Internal Blogs	WordPress	Not reported	Yes	Not reported
Hard copy handouts	Yes	Yes	Yes	Yes
Intranet	Yes	Yes	Yes	Yes

CURRENT OUTAGE PAGE WEBSITE CONTENT FEATURES				
	ACE	JCPL	PSEG	RECO
Outage Safety & Survival Tips	Text & YouTube	Text & Leaflet PDF	Text	Text & Graphic
Restoration Process Explanations	Text & YouTube	Text & Video/YouTube	Text	Text & Graphic
LSE Navigational Link or Information	Yes	Not Found	Yes	Yes
Shelter/Community Support Navigational Link	Yes	No	Yes	No
Generator Hookup Advice	Text & Graphic	Text	Text	Text & Graphic
Online Phone # Validation	Yes	Not on outage page	Not on outage page	Yes
Online outage reporting capability	On Outage Map	Yes	Login Required	Yes
Outage Map shows weather conditions	No	No	No	Yes
Outage Map shows Municipality affected	Yes	Yes	County first	Yes
Outage Map shows crew status	Yes	No	No	No
Outage Map shows ETRs	Yes	No	No	Yes
Language options	No	Multiple	Spanish	No

Global Recommendations

23-G-1 Each EDC should review its customer communications and outage website to reflect the following concepts:

- Customer safety and ability to cope should be the primary focus of all messages, especially in the beginning of major events.
- All communications channels at an EDC's disposal should be mobilized as soon as potential major outage events are forecasted.
- Worst case projections should be issued from the outset of any major event to effectively portray a sense of urgency.

Outage websites should be optimized to show:

- Number of customers out of power by county and municipality (not by zip code)
- Number of customers served by county and municipality
- Percentage of customers out of power by county and municipality

- Total number of outage locations (work locations) by municipality
- Time outage reported
- Crew en route or on scene working per outage location
- Cause of outage per outage location
- Estimated Time of Restoration per outage location
- Directive information about alternative shelter resources, community support, online telephone validation, and secondary language options.
- Outage websites should include graphics and video to help depict safety and preparedness messages.
- Provide a web portal for BPU Staff to view additional details related to the outages.
- Provide a mechanism to automatically notify BPU Staff via e-mail or text message when certain outage thresholds are reached.

23-G-2 Each EDC should consider designating second role employees to fill the role of crew spokesperson. A crew spokesperson travels with a block of crews and is able to explain the restoration process in general and the work at hand in particular, while the line crews make the repairs. This position can increase crew productivity, increase customer safety, answer customers' specific questions and educate the public.

23-G-3 Each EDC should provide additional methods to report and check on the status of an individual outage. This could include an option on the website, through a mobile version of the website via a Smart Phone, or through text messaging.

23-G-4 Each EDC IVR, if not currently done, should have the ability to accept multiple customer telephone numbers, including a cell phone number.

Atlantic City Electric

Observations:

ACE has an Incident Response Plan (IRP) that establishes a framework to enable ACE, and supported by PHI, to manage effective communications during a major incident affecting the company. During a major event, PHI establishes a Crisis Information Center (CIC) to provide for a heightened level of communications support and coordination. The center's role is to ensure that customers and community leaders have access to timely, accurate and consistent information to help ease the inconvenience and disruption caused by a widespread extended power outage or provide the public with important information during other major events affecting the company. The plan provides a

protocol through which one or more CICs serving PHI, Atlantic City Electric (ACE), Delmarva Power (Delmarva) and Pepco can mobilize until the incident has been addressed and resolved. The plan is supported by a staff of Coordinators and Liaisons that are led by the Regional Liaison Team Leader.

ACE had ample lead time to prepare for Irene, allowing them to communicate with all print and electronic news media outlets. An open line of communications was maintained with all users and customers throughout the event using social media, prepared updates, and posted media outage maps. The PHI Executive Communications Team had enough staff to be deployed to any region if required. Communications leadership expressed a desire for more writers to take care of news releases and talking points.

Messages

ACE's advance messages warned customers repeatedly for 3 days prior to its landfall that Irene would cause widespread damage and that restoration would be a multi-day event. News releases prior to Irene's landfall contained preparation and safety tips for customers to follow. At least one release after landfall included safety advice. After landfall, messages updated ACE's restoration progress, ETR and repeatedly advised customers to continue calling the company to report outages.

OEM

ACE has established a rapport with all OEMs within their territory. Irene was the first storm event in which ACE staffed all eight county OEMs and the State OEM. Throughout the restoration, ACE communicated updated ETRs to the State and local OEM's via their own representatives. At one point, police tried to commandeer crews to clear wire down locations, but ACE OEM Representatives stopped the issue quickly in the OEMs. The OEM Representative team meets and participates in drills with the OEM's throughout the year, and was well-prepared.

Municipalities

ACE communicated frequently with outside agencies and municipalities and inquiries were answered in a timely manner. An issue with driving restrictions and waivers developed, but this issue was rectified and while it did slow down restoration briefly, it did not hamper the overall restoration effort.

The Government Affairs department that acts as OEM Representatives could use additional personnel during events to assist with the daily workload involved with keeping local and county officials informed.

Electronic Messaging

Social media is playing an important part in external communication to customers during an event as ACE utilizes both Facebook and Twitter. ACE has a staff of people dedicated to updating and receiving information through these mediums. They posted electric safety videos as well as storm preparation videos.

The ACE website was redesigned the day before Irene made landfall in ACE territory, adding buttons to report an outage, including a view for outage maps, and providing storm safety tips and FAQs.

ACE's reports noted that many customers used social media to express their anxiety and concern about outbound "robocalls" about potential for deactivating power, as they did not initially understand the rationale behind the warning calls.

Recommendations:

23-ACE-1 ACE should review its messaging construction to ensure that advice to customers for coping with outages and staying safe are comprehensive, easy to understand, and given the highest priority.

23-ACE-2 ACE should review its staffing plan with regard to message writers and Government Affairs personnel to ensure enough personnel to fill these roles in a major event.

Jersey Central Power & Light

Observations:

JCP&L has an emergency communications plan that is designed to establish mechanisms for communicating the status of the restoration effort to customers, governmental bodies and the news media.

The FirstEnergy Vice President (VP) of Communications is responsible for all phases of corporate communications. The total staff for communications for all of FirstEnergy is 64; 10 are assigned to Media Relations, and 14 are in Internal Communications. Shortly before Irene, the Communications Group was reorganized along business unit lines, following an agency model.

The external communications staff designated for JCP&L is also assigned to support other FirstEnergy EDC's. The lead for external communications for JCP&L is located in Ohio and the plan calls for this position to deploy to JCP&L in major storms or events. Backup roles are two deep to assure enough coverage for shifts.

After Irene's impact, JCP&L's media representative was overwhelmed by media inquiries, primarily from New York City metro market news media. Corporate then sent media resources to New Jersey to augment JCP&L's media relations efforts. FirstEnergy's VP of Communications arrived in New Jersey two days after Irene's impact, on Tuesday, August 30, and arranged a news conference in Morristown. The V.P. of Communications remained in the area for two days; other communications staff stayed for five to six days.

Two days after Irene hit, JCP&L started to provide two media updates per day scheduled at 5:00 a.m. and before 9:00 p.m., providing restoration numbers. Corporate staff composed news releases.

The Communications Group assigned internal staff to take photographs of JCP&L restoration personnel at work and provide them to news media; this is an effective practice. The communications plan states that media will be given access to the storm center for background footage. Communications representatives let news media know the location of crews so they could get photos and stories.

FirstEnergy's external communications focused too much on the company's image and not enough on providing information to its customers. FirstEnergy's VP of Communications described the company's messages for external communications as primarily focused on messaging to help customers and media understand what it takes to restore power; specifically describing "our [FirstEnergy's] process and why we do it as we do. That our people are skilled, trained, dedicated and will do what's necessary to restore power. And that we understand and acknowledge our customers' frustrations." FirstEnergy's messages, with such an internally focused view, did not resonate with customers or elected officials. Consequently, many customers and elected officials complained that the company did not provide effective and accurate communications. Acknowledging customer concerns should take a higher priority for FirstEnergy's external communications.

After Irene, due to stakeholder complaints, the BPU Staff worked with JCP&L to develop an improved Storm Restoration Communications Implementation Plan. Four major focus areas are included in the plan:

A. Direct Communications with Mayors and other Local and State Officials
B. External Communications
C. Contact Center Communications
D. Operations

Each area includes a section on commitments, a descriptive narrative and implementation plans. Implementation of this plan would positively address many of the issues experienced by JCP&L's external communications group during Irene and the snow storm.

JCP&L started preparation for the snow storm the Friday before the storm hit. As soon as the threat was seen, its impact was discussed and four to five staff members transferred from other FirstEnergy EDC's to JCP&L, (earlier than with Irene) and staged in Red Bank and Morristown. The FirstEnergy VP of Communications was in New Jersey after the storm hit. The snow storm was handled differently, more quickly, and with more aggressive outreach to the news media.

Of the key messages released during Irene as press statements, priority was given to corporate image needs, describing what FirstEnergy was doing and reassuring customers that substantial resources were being devoted to restoration. The company's first two news releases, on Thursday, August 25, and Sunday, August 28, gave no indication that restoration could take several days or longer. Advice to customers appeared to have secondary importance. A 60-second radio announcement explaining JCP&L's restoration process was complex, focused mostly on preserving corporate image and provided little helpful advice, tips or ETRs for customers. The announcement discussed attempting to "cut through the noise of public officials' statements to get our story through to the newspapers," FirstEnergy cited its $200 million investment in JCP&L and their ongoing projects.

During the snow storm, there was little change in messaging from Irene. FirstEnergy's press release on Friday, October 28, gave no indication that restoration could take several days or longer.

Media relations staff numbers specifically assigned to JCP&L appears to be low. The reorganization shortly before Irene may have impacted communications effectiveness. A lean media relations staff, as defined in the communications plan, may not be able to effectively handle simultaneous major events within the FirstEnergy system. The New York City metro media market is among the most demanding in the nation and needs to be supported as such. A neighboring utility has at least twice the number of trained media spokespersons available.

Two media updates per day appears to be insufficient given the contentiousness of the media market and the trend toward a 24/7 news cycle.

The most difficult challenges during the storms included communicating with a major regional daily newspaper and independent local online news sites—both of which should have been routine.

The communications plan notes that if needed, secondary communications storm rooms would be set up in Pennsylvania or Ohio. Given the contentious nature of media coverage in JCP&L's media market, remote communications centers in other states could exacerbate local media image problems.

OEM

JCP&L had representatives staffed at the Monmouth, Morris, Ocean and Somerset County OEMs during the Irene event.

Municipalities

JCP&L did not hold conference calls with the affected mayors during Irene, but learned from that event and held conference calls during the snow storm. After the snow storm, JCP&L's President took the lead role in delivering messages and later held informational meetings with newspaper editorial boards.

FirstEnergy Communications supported JCP&L operations during briefing calls to public officials. FirstEnergy started running ads on the local news sites during the snow storm. The ads described the restoration process, safety as a priority, and thanking customers for their patience.

Logs show more than 1,500 documented contacts before, during and after Irene between the company and county OEMs and municipal officials, including mayors and public safety officials. During Irene, additional FirstEnergy Area Managers came to New Jersey to assist JCP&L staff, but didn't have local area knowledge. Therefore, briefing sheets had to be developed for their use in navigating the numerous municipalities and local officials.

Elected Officials

A recurring complaint by elected officials was an inability to communicate with JCP&L. JCP&L and FirstEnergy's response to elected officials complaints, which primarily alleged that municipalities were not being heard or provided with effective and accurate communications, further aggravated the situation. Instead of addressing the lack of local contact, JCP&L and FirstEnergy attempted to counter public officials' statements by repeatedly citing a $200 million investment in JCP&L and ongoing projects. To address, in part, issues with communications with elected officials, JCP&L, in consultation with the BPU, developed and began implementing a revised communications plan.

Electronic Messaging

The communications department learned from Irene, and afterwards launched a social media platform, starting with Twitter for informational updates.

For the snow storm a "darksite" took over the homepage during the snow storm. A dark site is a pre-developed, non-public website that can be published in the event of a crisis. JCP&L's web page provided a link to storm information, including advice and tips helpful to customers to prepare and cope with outage conditions.

Major Accounts

JCP&L assigns a representative to Major Account customers. If the customer called in via the call center, the Major Account representative gets a text message. Customers with on-site generation

were not considered as high a priority as a customer without generation. This interaction did not appear to be captured in the customer information system.

Messaging

There is evidence that the IVR restoration confirmation call-back script caused confusion. The recommended script changes in the Storm Restoration Communications Implementation Plan developed by JCP&L and the BPU Staff should prevent this confusion in the future.

Recommendations:

23-JCP&L-1 JCP&L should enhance media coverage staff to provide deeper backup in the event of simultaneous or consecutive major events within the FirstEnergy system. In major events, augment local media staff quickly to meet the demands of this media market.

23-JCP&L-2 JCP&L should make key messages customer-centric, giving priority to advice about potential for "worst case" event impact and helpful advice.

23-JCP&L-3 JCP&L should provide more frequent and accurate updates throughout an event to meet the demands of 24 hour information cycle and the demanding media market. Utilize social media, augment press releases with additional media advisories, promote human interest stories and reach out proactively to the media.

23-JCP&L-4 JCP&L needs to eliminate IVR callback confusion with the follow-up call regarding confirmation of restoration. The messaging should be designed to be clear and concise.

Public Service Electric and Gas

Observations:

PSE&G developed defined emergency communications plans that recognize media, municipal/legislative, customer and internal stakeholders. The plan is executed by a communications department consisting of five individuals and subject matter experts that can be accessed for additional information. The Emergency Communication plan is detailed and granular, defining the audience, vehicle, message and when to be issued.

PSE&G's communications process is highly centralized and driven off of thrice-daily DERC conference calls. A "war room" operated on the fourth floor of the general office and translated the conference calls into a series of coordinated messages disseminated to the various external

stakeholders. This war room concept was developed during the restoration from Irene. The intent is to ensure consistent messaging.

PSE&G issued media releases and responded to media questions from television, radio and the press. PSE&G also used twitter and its home page for communications to and from customers.

PSE&G's messaging focused more on the impact of the restoration from the customer's viewpoint as opposed to justifying its activities. Before the storm PSE&G provided estimates of the length of the restoration (as much as 7 to 21 days) along with safety recommendations for its customers. During the restoration the focus was on the restoration process, progress and impact on customers.

OEM

PSE&G staffs 11 County OEMs, two City OEMs, and the State ROIC with regional public affairs employees. During Irene, PSE&G's OEM representatives required backup on Days four and five. However, the backup personnel were not adequately trained and lacked knowledge of OMS. OMS training will be expanded to OEM "volunteers". Regional Public Affairs should now be able to use laptops during an event since air cards have been purchased.

Municipalities

Each April, communications are sent to elected officials, OEM's, fire departments, etc. with contact information for PSE&G.

Elected Officials

Elected officials using multiple channels to request information and support from PSE&G impacted the communications effort. The same requests were received multiple times, which may have delayed response times in certain instances.

Major Accounts

Subsequent to the storms, to provide customers with an understanding of restoration priorities and methods, PSE&G has conducted a webinar for the New Jersey Food Council, a session for hospitals, and is working through trade groups to reach larger customers, while addressing smaller customers through the local Chamber of Commerce.

Electronic Messaging

PSE&G has over 800,000 customer email addresses and used them to send out ten status emails. Larger customers were also contacted by emails with a message coordinated with Corporate Communications.

Customers can obtain information through the PSE&G website including an outage map that has been available for two years and "My Account", which can provide an ETR.

PSE&G successfully experimented with Twitter to provide customers with information.

Other Channels

PSE&G was not aware of and did not use the crew spokesperson position.

To address customers impacted by flooding after Irene, PSE&G set up and staffed a dozen mobile customer centers to provide technical and customer support. While some of the staff at the mobile customer service centers were customer service employees, additional staff were recruited by email and trained on the job. A post-storm review developed that the lines of authority could have been clearer at these mobile customer centers.

Messaging

A Press Release issued August 26 had an effective explanation of restoration process.

A longer news feature, "Behind the Headlines", explained the New Milford and Cranford Substation shutdowns and illustrated the human side of PSE&G work.

PSE&G provided rapid response to adverse stories by correcting misinformation or observations.

PSE&G used one of its birddogs (an experienced PSE&G foreign crew manager) to take news crews to work sites and demonstrate the amount of devastation.

After the October 29 snow storm, PSE&G used its existing contacts at charitable organizations to arrange Halloween parties (financed by PSE&G) designed to keep children off the streets and safe for Halloween.

Recommendations:

23-PSE&G-1 PSE&G should review its second role process and designate, train, equip and drill backup representatives for staffing the OEM to ensure the quality of information flowing from PSE&G through the OEM to municipalities and its elected officials is consistent.

23-PSE&G-2 PSE&G, in coordination with the County OEM, should develop and execute a plan to inform elected officials about the restoration process and how information flows through the County OEM to the municipalities.

Rockland Electric

Observations:

RECO's emergency communications plan is designed to provide timely and effective communications, during severe events. The Corporate Communications Coordinator works closely with the Information Officer to communicate weather, storm preparedness, storm safety, storm damage, storm response, and service restoration information to employees, customers and other stakeholders so they can respond appropriately.

The plan is supported by seven professionals. RECO has done extensive work to revise and upgrade its entire restoration plan, including its external communications process.

In emergencies, the corporate communications function utilizes a broad range of communications technologies to reach its intended audiences and communicate information in a timely, effective and efficient manner. Communications vehicles and tools that may be used during an event include a Web Site Outage Map, Web Site Storm Advisories, Web Site Storm Information Center, Electric Outage Status Reports, and advertising.

RECO's Information Center (IC) is responsible for all news and designed to be the single source of information for all stakeholders. The staff schedules media visits to RECO or field locations to give reporters access to work scenes. Press release templates and pre-taped video are used to facilitate the release of routine messages, such as preparation and coping tips. Press releases were sent to local and NYC media, with online releases sent to the "Mahwah Patch" (Patch.com local online news site). During the restorations there was not enough room for the communications teams, so public information was moved to another room.

For Irene, the first press release projected extensive damage and a virtual rebuilding of much of the electric system. The impact of this projection produced a great deal of attention from all media serving RECO's area, and a heavy demand for comment from RECO's media team. Press releases served as talking points and source material for Community Relations blast faxes to public officials and public advisories on RECO's storm website.

Initial messages on August 27 concentrated on informing callers that RECO was aware of outages and working to restore power. The first safety tip messages were issued on August 28, including advice that "you will need to make plans to address your immediate issues of health, safety and comfort." RECO also sent emails to 38,000 customers starting August 26, featuring links to its website. These emails had a 40% open rate.

For the snow storm, the first release included outage numbers and tips for coping, including warnings about the inoperability of cordless phones whose base stations require power to operate.

Coming just before Halloween and elections, public safety for Halloween was an issue and communications focused on public safety.

OEM

RECO builds relationships with municipalities, police, fire, elected officials and OEMs throughout the year. The Emergency Management department trains police and fire on electrical safety for downed wires, and works with OEMs as needed during the year. In an emergency, RECO sends Community Response Team (CRTs) to the OEMs. CRTs are responsible for two way communications between RECO and OEM. The department will also communicate with OEMs and get involved with escalated issues if they arise.

Municipalities

The Community Relations group is responsible for keeping municipal leaders and community agencies, such as OEMs, police, fire, and school districts, informed. RECO serves 24 municipalities in New Jersey. Two managers are responsible for the 24 municipalities. O&R's President meets with County Executives at least once per year. Company executives are in the field and visible, and are available for on-site interviews during a storm.

Elected Officials

In addition to the CRT in the OEM, during the snow storm RECO held a daily conference call with municipal officials. All mayors and State elected officials were invited to participate in these calls through a blast email in the morning. This call provided status and an opportunity for officials to share their problems and situations. RECO also gave officials an 800 number to use to facilitate two-way information flow. RECO received positive feedback from mayors after Irene, but not after the snow storm.

Major Accounts

RECO designates major account customers as its Large Sensitive Customer Group. The Large Sensitive Customer Coordinator reviews and updates the Electric System Emergency Plan during the first quarter of every year. New Construction Representatives are responsible for the Large Sensitive Customers during an emergency event. These representatives monitor OMS for priority coded customers' outages and advise the restoration team of these priorities. They also answer phones established for Large Sensitive Customers.

Electronic Messaging

RECO supplements other channels with information included on its "Storm Page" website. This channel includes both text and graphic content about outage safety, coping with outages, RECO's

restoration process and portable generator usage. It is unique among New Jersey EDC storm pages in that it also shows projected weather conditions on its storm map.

Social media was used little during these storms.

Recommendations:

23-RE-1 RECO should implement the improvements in its revised restoration plan

23-RE-2 RECO should assure that ample space for the communications team's efforts is available during restoration efforts.

3.24 INTERNAL COMMUNICATIONS

There are many moving parts involved in effective Internal Communications. Reminders about work safety rules and advice are of paramount importance. Advance communication with employees alerts them to increased staffing needs and allows them to make appropriate plans for their families' welfare.

Keeping all employees and contractors informed of restoration conditions and progress helps to pre-empt rumors, provide recognition of efforts "above and beyond the call," and promote storm team morale, an important factor in assuring employee commitment over a long restoration.

The unofficial messages delivered by utility and contract employees during an emergency restoration often put a "human face" on a frustrating situation. Relatives, neighbors and customers will reach out to any and all utility workers during an emergency, and workers who have at least some information to share will creative a more positive impression with those stakeholders.

During Irene and the snow storm, when many customers had no phone or internet contact with the EDCs, many crews served as the de-facto public relations department for the EDCs.

Global Observations:

Special audiences, like foreign crews, were not targeted for distinct communications treatment.

Global Recommendations:

24-G-1 Each EDC should develop messaging specifically for foreign crews to recognize their voluntary service and build relationships to support future restorations.

Atlantic City Electric

Observations:

ACE's Internal Communications plan and organization is described in the PHI Crisis Communications Plan. ACE notes that this is a living document based upon the principle of continuous improvement and the development of this plan is an ongoing effort to refine, streamline and standardize the process. Internal Communications responsibility is a second role for the Senior Project Manager - Process Improvement – Customer Experience.

During Irene, employees received progress updates via emails, newsletters, hotline, and tailgate briefings. The External Communications organization provided content for updates. Employees

could also access to ACE's online outage "storm page" website and social media, including Twitter and Facebook.

ACE provided numerous examples of press releases, but did not provide logs or examples of internal communications efforts.

There was no evidence of any special effort made to target communications to foreign crews.

Recommendations:

24-ACE-1 ACE should keep logs and samples of internal communications to assist in lessons learned and as tools for future preparedness.

Jersey Central Power & Light

Observations:

The JCP&L Corporate Communications section has 14 full time staff dedicated to internal communication. The Emergency Communication Plan shows Internal Communications as part of the Critical Information Team (CIT) via the operating company Directors. The CIT is designed to provide a consistent, reliable and timely flow of information to a variety of key stakeholders during a major storm event. As part of this team, operating company Directors are provided with talking points, press releases and storm data for dissemination to employees. The plan also calls for the use of social media tools such as Twitter and YouTube.

Internal Communications provides key messages to the leadership team and employees during major storms through email blasts, newsletters, portal posting, videos, FE-TV, presentations and talking points for managers and others to use. Crews are equipped with leaflets to help explain to customers how the company's restoration process works and the company's priorities.

During Irene, internal staff was assigned to take photographs of JCP&L restoration personnel at work.

Recommendations:

There are no recommendations for JCP&L beyond the global recommendation.

Public Service Electric and Gas

Observations:

PSE&G's communications process is highly-centralized and driven off of the thrice-daily DERC conference calls. A "war room" operates on the fourth floor of the general office and aims to ensure consistent messaging by translating the conference calls into a series of coordinated messages disseminated to the various internal stakeholders.

Special communications were developed for employees to answer their questions and also to provide clear information through "In Case You Are Asked" and other vehicles. Additional channels developed to reach employees included OUTLOOK ONLINE, handouts, company intranet, emails, the "BUZZ" internal blog, Power Point presentations, open letters from executives, "Fossil Outlook," "Outlook Newspaper", and a video storm recap. PSE&G's development of multiple Twitter channels – one each for outage information, news and community interaction - is a dynamic information resource for employees as well as customers.

PSE&G quickly followed up about an erroneous negative video about crews.

Additional internal messages included:

- Hurricane Safety Tips & Readiness
- Restoration updates, key information, call handling tips, appreciation, encouragement
- Shared Storm stories, experiences, kudos and thank you messages
- Employee Crisis Fund available
- Crisis fund seeking donations from employees
- Employee Assistance Program resources available
- PSE&G did not provide any specialized communication to foreign crews restoring PSE&G's customers but did feature the contribution of foreign crews in PSE&G's media releases.

Recommendations:

There are no recommendations for PSE&G beyond the global recommendation.

Rockland Electric

Observations:

The Employee Communications Manager is part of the Emergency Restoration Team and had input into the revision of the Emergency Restoration Plan. Normally, this position is responsible for the

weekly newsletter, and writes and develops other programs to communicate to employees. Responsibilities during major events are similar, but expanded. This position is also a second-role backup for Media Relations.

After media messages are prepared, the Employee Communications Manager prepares employee messages to ensure consistency. Employees have access to E-Boards (15 monitors in 7 RECO building locations), which are web based and showed the radar tract of Irene, outage maps, safety information, emergency phone numbers for family and photos of disaster. Messaging goals for internal communications are to inform employees of what is happening, what the work conditions are like, and help employees to stay safe.

During future events, Employee Communications will do more video updates, to document work by field forces.

There is no indication of any special communications with foreign crews to provide special guidance or information

Recommendations:

There are no recommendations for RECO beyond the global recommendation.

3.25 BENCHMARKING / EXTERNAL ANALYSIS

A utility should keep lines of communication open within the electric distribution industry to discover and then adopt best practices that have been validated in past restorations by other utilities. External analysis is typically undertaken on a regular basis by an internal team in place to support the restoration process.

Best practice organizations use of external consultants, attend restoration conferences, conduct utility to utility communications and use a structured process to analyze methods and procedures discovered when the utility provides mutual aid to another utility.

Events like Irene and the snow storm are not frequent occurrences, so an EDC can leverage the experiences of other utilities to aid their planning and response efforts.

Global Observations:

All EDCs report numerical benchmarking of reliability indices (including or excluding major storms), although the information has limited value in respect to the performance of a restoration effort.

Variations in distribution system design, construction, failure mechanism, weather effects and other variables make high level performance benchmarking between utilities (performed during or after a storm and internally) of limited value. An example of the variables that would have to be considered for a high level numerical benchmark is shown below. More granular benchmarking of discrete operations during a restoration may have some limited value.

Numerical benchmarking of restoration processes, procedures and performance is challenging because the damage assessment of a major storm is primarily focused on the extent of the damage and leaves the detailed construction steps to the work leaders or crews. One measure consistently used between all utilities is the number of customers out of service.

Speed of customer restoration is impacted by five key areas: issues out of the utility's control; the volume and nature of the work; historic decisions; operating decisions; and business organization.

Issues out of the utility's control consist of the storm itself – the path and intensity in the service territory, and the amount of advance warning time. Another factor is the geography and nature of the service territory. Is it urban, suburban or rural? What are the elevations and what is the nature of any bodies of water? What is the density of the tree cover and the predominant species? What is the status of the out-of-ROW trees? What type of transmission system support is there – is the territory along the ocean where there is no support? What is the customer density--how many customers per mile of distribution and how many customers per square mile? During a storm, how quickly does the State, City or Municipal department clear roadways of debris?

The volume and nature of work consists of: the number of outage orders / jobs / trouble locations; amount of physical plant that needs to be repaired / replaced; damage on roadway vs. off-road or backyard construction; physical damage to public infrastructure; and access to public right-of-ways.

Historic decisions are related to system design. This can include system redundancy issues like radial vs. loop vs. network construction, distribution automation and AMR. It can also include system construction issues like overhead vs. underground, pole classification standards, conductor size and construction, and telephone and cable on the poles.

Operating decisions consist of on-call field forces, which impact small outage response time. This has minimal impact in large, mass outages. It also includes vegetation management trimming cycles.

Business organization consists of restoration forces held within the holding company. Their value depends on geography versus the storm impact. Are there gas or power generation personnel in the organization?

Taking all of this into consideration, there are simply far too many variables to develop a numerically-based restoration benchmark between utilities.

No EDC reported using an organized or defined process of external analysis to transfer restoration experiences from other utilities. RECO did report a program at its affiliate.

Global Recommendations:

25-G-1 Each EDC should develop a process to analyze and transfer restoration experiences from other utilities where appropriate. An organized process to communicate with other utilities beyond New Jersey that have experienced a major restoration can provide important insights.

Atlantic City Electric

Observations:

ACE does not perform any relevant benchmarking for major storm restoration with the exception of some high-level customer satisfaction studies.

Recommendations:

There are no recommendations for ACE beyond the global recommendation.

Jersey Central Power & Light

Observations:

JCP&L does not perform any relevant benchmarking for major storm restoration.

Recommendations:

There are no recommendations for JCP&L beyond the global recommendation.

Public Service Electric and Gas

Observations:

PSE&G has participated in one benchmarking exercise focused on ETR in the last three years. PSE&G has not attended any benchmarking conferences in the last three years and did not cite any use of outside consultants within the last five years.

PSE&G has sponsored a major benchmarking project since 1993 focusing on many aspects of utility operations.

Recommendations:

There are no recommendations for PSE&G beyond the global recommendation.

Rockland Electric

Observations:

RECO reports that its affiliate Con Edison implemented a benchmarking program to compare processes and procedures in areas related to emergency management. In the past three years the program has included meetings, conference calls, surveys and studies. The program has focused on peers within major urban centers. Con Edison has identified practices from the benchmark program covering crew callout, improved exercise design, risk mitigation and response protocols, substation flood response, damage assessment and site safety, vendors for crew support services and enhanced second role emergency assignments. RECO did not cite any use of outside consultants within the last five years.

Recommendations:

There are no recommendations for RECO beyond the global recommendation.

E. BPU

3.26 PRIOR ORDERS

Board Orders

Over the past fifteen years, New Jersey has experienced a variety of natural and man-made disasters that have affected millions of electric customers. The Board has reviewed the electric utilities' performance before, during and after these events. Internal Board Staff reports containing improvement recommendations have been generated and implementation subsequently ordered by the Board. Due to the magnitude of the event or the technical complexity of the issues, consultants have been engaged to review, analyze and make recommendations to improve the electric utilities' performance. As part of the BPU Hurricane Irene Report, Staff reviewed previous Board Orders with respect to their application during Irene. The following events and associated docket numbers were reviewed:

1) GPU 1997 Storms- Docket No. EX97080610
2) Labor Day 1998 Thunderstorms- Docket No. EX98101130
3) July 1999 Outages- Docket Nos. EX99100763, EX99070483, EA99070484, EA99070485, EA99070486 and EA99070487
4) August 2002 Storms- Docket No. EX02120950
5) JCP&L Seaside Heights- Docket Nos. EX03070503 and EO04050373
6) PSE&G June 7-16, 2008 Equipment Failures/Storms.

A number of re-occurring themes permeate the reports and Orders, including: communications with customers and emergency management offices; restoration priorities; outage assessment methodology; well dependent and special needs customers; vegetation management; supplemental crew acquisition; equipment Inspection and upgrades; and employee training.

EDCs have integrated the recommendations from past Board Orders and investigations into their restoration process. A review of the main areas is necessary to see if the recommendations put in place are scalable to events of this magnitude or if new recommendations are needed to incorporate the lessons learned from these events. Certainly the impact that power outages had on New Jersey warrants a new review.

Recommendations

26-BPU-1 BPU should review all past Orders and determine which Orders are still relevant.

26-BPU -2 Orders should specify an end result and not describe the specifics of the EDC implementation process.

3.27 ENFORCEMENT AUTHORITY

Over the past fifteen years, state regulatory agencies have increased their scrutiny of EDC performance, particularly in the wake a major storm events. Since the role of the regulatory agency is to protect the public interest and ensure that a fair rate of return is earned based on reliability and service levels, some agencies feel that the best way to do this is to apply a penalty if a desired result is not met.

Penalty categories can range from a reliability target, restoration targets for all conditions other than catastrophic events, and call center performance targets. Comparing and evaluating utility performance against agreed-upon standards requires a significant amount of effort on the part of the regulatory agency. Establishing reliability penalties requires careful attention and complex calculations. For instance, variations in weather from year-to-year can have significant impacts on traditional reliability metrics. Current programs in New Jersey are to monitor and measure by setting quality of service reliability targets.

Developing straightforward and reasonable mechanisms to monitor performance in New Jersey will be the BPU's biggest challenge.

At the present time, the BPU does not have an adequate level of penalty authority to ensure minimum standards of behavior and performance for EDCs and other regulated utilities. For instance, the penalty for a utility's failure to comply with a Board order, including those related to health and public safety is $100 dollars for each day the default continues.[27] In contrast, the Board's authority underlying its Pipeline Safety and Underground Facility Protection Programs allows enforcement based penalties ranging up to $1 million in certain circumstances. Other State agencies have far greater penalty authority for enforcement purposes than BPU's current, statutory enforcement authority for failure to comply with Board orders. Increased enforcement authority will improve service reliability and create disincentives for poor service.

Similarly, BPU should evaluate seeking statutory authority to increase its penalty capabilities for EDCs non-performance or under-performance relative to performance metrics. The $100 fine that the Board may impose on an EDC that fails to comply with a Board order is hardly a deterrent. Accordingly, to ensure that EDCs are appropriately deterred from acting in non-compliance with Board orders, BPU should evaluate seeking statutory authority to increase its ability to levy civil administrative penalties against non-compliant or underperforming EDCs. Indeed, other New Jersey departments have well-established administrative procedures that, via a discretionary ability to impose civil, administrative fines, have successfully ensured regulatory compliance and

[27] N.J.S.A. 48:2-42 Penalty for noncompliance with orders.

deterred conduct detrimental to the public health, safety, and well-being. BPU should be similarly empowered.

Irene caused catastrophic damage up and down the East Coast. Community functioning was disrupted due to the extensive damage caused by the storm. The snow storm wreaked havoc on the region with record breaking snowfall in October. The magnitude of the response and recovery from these two storms resulted in policy makers taking a renewed focus on electrical infrastructure and performance of the EDCs. The BPU has an obligation to review regulatory alternatives, EDC performance, and determine a course of action that makes sense for New Jersey.

Recommendations

27-BPU-1 BPU should investigate the options for penalty categories. BPU should evaluate seeking statutory authority to increase its penalty capabilities for EDCs non-performance or under-performance.

F. PERSONAL PREPAREDNESS

3.28 PERSONAL PREPAREDNESS

No utility service, including electric, can be guaranteed to be available even for high priority needs. The electrical distribution system is designed to be highly redundant at the generation and transmission level but at the distribution level this decreases significantly due to the cost of providing redundant distribution facilities. This cost increases as customer density decreases making suburban or rural locations much more costly to add redundancy.

In many cases the customer's cost to add redundancy is lower than the EDC's costs. A good example is an uninterruptable power supply that allows time for a computer to be safely shutdown; these can be obtained for less than $100.

Customers subject to an increased inconvenience or hardship if electric service is lost may consider generators as a cost effective alternative, if they can be safely installed and operated without adverse impacts on adjoining neighbors.

Irene and the snow storm were catastrophic storm events. The damage caused by these two events was the worst in New Jersey history, disrupting community functioning and electric utility service to almost half of all customers. These storms can't be prevented, but it is possible to prepare for them.

The following suggestions are provided for consideration.

Residential customers

- Residential customers should be prepared to be self-sufficient for at least 72 hours without normal services such as electricity, natural gas and water. The American Red Cross recommends its Power Outage Checklist[28] to be used when a power outage may occur. This checklist supports the "Be Red Cross Ready" Plan which the Red Cross recommends all Americans have in place before disaster strikes.
  - The 72 hour time period is recommended by FEMA (Federal Emergency Management Agency).[29]

[28] http://www.redcross.org/www-files/Documents/pdf/Preparedness/PowerOutage.pdf
[29] www.fema.gov

- Suggestions for home emergency plans can be reviewed at the website of the New Jersey Office of Emergency Management (NJOEM), FEMA (www.fema.gov and www.ready.gov), or your electric company's website home page.

Life Sustaining Customers

- Customers that depend on electricity and/or water to maintain their medical conditions should have a backup plan that can be implemented before an outage occurs.
  - Customers using oxygen generators or concentrators should contact their supplier to determine if oxygen bottles are provided as a standby supply; the standby supply should be sufficient for at least 72 hours.

Customers on Private Wells or Private Water Systems

- Customers that depend on electric driven pumps for their water supply should have a backup plan for the storage of water for sanitary needs.
  - Water can be stored in bathtubs and large water containers if used solely for non-potable uses.

Customers Requiring Sump Pumps

- Customers that require electric driven sump pumps to maintain dry conditions should investigate backup pumps driven by city water pressure, fuel (gas, diesel or natural gas) or generators.

Customers Installing Backup Generators

- Customers installing backup generators should ensure that
  - The generator is installed according to the electrical code requirements of their municipality.
  - The installation is inspected by the appropriate electrical inspection service.
  - An adequate fuel supply is stored safely.
  - Their local EDC is notified of the installation of the generator.
  - The generator is tested and maintained regularly.
  - The generator is never run indoors or in a garage.
  - The generator is secured against theft.

4.0 CONCLUSIONS

Tropical Storm Irene and the October snow storm were catastrophic weather events that fully challenged the New Jersey EDCs impacted by these storms. Hundreds of additional utility employees were pressed into service and repair crews traveled from around the country to support the restoration efforts. The duration of outages was not unexpected given the severity of these events, but that is little comfort to those who went without power for multiple days. The difficulties and frustrations customers and government officials faced were further compounded by the lack of accurate and timely information.

Catastrophic events disrupt entire communities, stretching emergency management capabilities to the limit. Schools and businesses were closed, family routines disrupted and critical facilities activated emergency contingency plans. Response and recovery from a catastrophic event requires a strong partnership between public and private entities.

EPP's examination of each company's methods, plans and processes used both during and after the storm provides helpful insights into what went right and where improvements are needed. While, some of the noted improvements can be implemented in the near term, there are many that will require a long-term commitment from EDC leadership, BPU and community stakeholders. BPU will determine the appropriate course of action going forward.

5.0 SUMMARY OF RECOMMENDATIONS

5.1 ATLANTIC CITY ELECTRIC (ACE)

1-ACE-1 ACE should modify the organization charts (in the Incident Response Plan appendix) so that they show only position titles and not names. Maintain the organization charts with positions and employee names outside of the plan document where frequent updating is easier.

2-ACE-1 ACE should continue its current exercise and drill program.

3-ACE-1 ACE should develop training requirements (curriculum, frequency, initial, refresher, etc.) for all positions, not just technical or system training, within the storm restoration organization.

3-ACE-2 ACE's training should be developed and conducted in accordance with the requirements of the position.

3-ACE-3 ACE should develop a centralized repository for training records to ensure compliance with the training requirements of each position.

9-ACE-1 ACE should add a section to its Plan to describe how mutual assistance crews will be allocated between affiliated companies (Atlantic City Electric, Delmarva, and Pepco) when simultaneous large-scale events occur in multiple service territories.

16-ACE-1 ACE should provide a detailed staffing review that explains the decreases in headcount and any technology, assignment shifts or other offsetting changes.

22-ACE-1 ACE should review its messaging to ensure that it is understandable to customers and does not slip into jargon such as global or complete restoration.

23-ACE-1 ACE should review its messaging construction to ensure that advice to customers for coping with outages and staying safe are comprehensive, easy to understand, and given the highest priority.

23-ACE-2 ACE should review its staffing plan with regard to message writers and Government Affairs personnel to ensure enough personnel to fill these roles in a major event.

24-ACE-1 ACE should keep logs and samples of internal communications to assist in lessons learned and as tools for future preparedness.

5.2 JERSEY CENTRAL POWER & LIGHT (JCP&L)

1-JCP&L-1 JCP&L should ensure that individually developed job aids and checklists are included in the E-Plan so that all E-Plan users can benefit from them. They should also ensure that the Construction Restoration Lead's plan is included in the JCP&L E-Plan.

2-JCP&L-1 JCP&L should conduct an annual exercise. This exercise should include participation of personnel from all functions / departments with a restoration role, as well as external agency partners, in order to test the limits of the restoration plan and systems. Outside agencies such as BPU, OEM's, and County leaders should be invited to participate and observe the exercise.

2-JCP&L-2 JCP&L should participate in FirstEnergy corporate-wide exercises to ensure that roles and responsibilities are clearly understood.

2-JCP&L-3 JCP&L should prepare a written post exercise report, providing a summary of the exercise, objectives, who participated, what occurred, and recommendations for improvement.

3-JCP&L-1 JCP&L should revamp its training program to include opportunities to train personnel on the interdependencies between functional areas and storm roles. This should be accomplished during include exercises and drills.

3-JCP&L-2 JCP&L should develop training requirements (curriculum, frequency, initial, refresher, etc.) for all positions (not just technical or system training) within the storm restoration organization.

3-JCP&L-3 JCP&L should track on-the-job training participation.

4-JCP&L-1 JCP&L should implement the use of logs to track activities and decisions by storm team members.

4-JCP&L-2 JCP&L should establish a process to ensure timely completion and final approval of process improvement items noted during post storm debriefings / lessons learned.

4-JCP&L-3 JCP&L should identify one responsible party who will review all lessons learned, meet with the submitting department, finalize action items, assign responsibility for the action items, track action item completion and report progress to leadership.

6-JCP&L-1 JCP&L should develop an activation criteria and procedure for all functions as a clearly defined process in its emergency response plan.

6-JCP&L-2 JCP&L should evaluate the risks inherent in their plan which requires large movements of personnel between affiliates in different states. These risks include severe weather that would restrict or prohibit travel, and large numbers of personnel traveling in the same vehicle or mode of transportation.

7-JCP&L-1 JCP&L should develop staffing contingency plans to deal with a storm event where FirstEnergy corporate support is limited.

8-JCP&L-1 JCP&L should continue to implement and build upon the recommendations of the improved Storm Restoration Communications Implementation Plan, developed in conjunction with the BPU Staff.

8-JCP&L-2 JCP&L should launch its storm website as soon as significant threats are declared, and notify customers that the website is activated.

8-JCP&L-3 JCP&L should determine the proactive role for IVR messages as soon as significant threats are determined.

9-JCP&L-1 JCP&L should have FirstEnergy develop an appendix in its E-Plan to provide guidance on when FirstEnergy resources can leave the FirstEnergy affiliate companies to mutually assist non-FirstEnergy companies. This appendix should describe triggers that determine when and how many personnel can leave, along with a plan to replace these personnel if they are unable to return to FirstEnergy as rapidly as they may be needed by a FirstEnergy affiliate company.

9-JCP&L-2 JCP&L should have FirstEnergy develop a plan to manage at least two or three major simultaneous restoration events on its system at the same time.

9-JCP&L-3 JCP&L should have FirstEnergy add a section to its E-Plan to describe how mutual assistance crews will be allocated between companies when simultaneous large-scale events occur in multiple service territories.

11-JCP&L-1 JCP&L should develop and institute a vegetation management pre-event, activation, and demobilization checklist to document institutional knowledge.

13-JCP&L-1 JCP&L should develop a rapid damage assessment process to be used during major events. This should describe the prioritization of areas to be assessed, how personnel will be assigned and the timeframe (4 to 6 hours) that they have to report back with their findings.

13-JCP&L-2 JCP&L should ensure that it has enough trained personnel to conduct the damage assessment process in parallel with the hazard process. This could include contract damage assessors, second role personnel or other alternative staffing methods. The quantity of personnel needed to support these processes should be identified using information from the outage prediction model.

13-JCP&L-3 JCP&L should establish a dedicated planning function to analyze information coming in from damage assessment.

14-JCP&L-1 JCP&L should implement the use of Mobile Data Terminals to relay data to and from the field quickly and efficiently.

15-JCP&L-1 JCP&L should develop a standardized process for the calculation of ETR at multiple levels of granularity and document this process in the E-Plan.

15-JCP&L-2 JCP&L should centralize the responsibility for the ETR process to a single function.

16-JCP&L-1 JCP&L should conform to a system such as the Incident Command System and develop a Planning Team to reduce some of the duties currently performed by the Operations personnel. An individual should not assume more than one role in the ICS during the event.

16-JCP&L-2 JCP&L should ensure that the approved Quarantine process of circuit restoration is integrated into the E-Plan and that appropriate personnel are trained.

16-JCP&L-3 JCP&L should provide a detailed staffing review that explains the decreases in operations headcount and any technology, assignment shifts or other offsetting changes.

18-JCP&L-1 JCP&L should reorganize the emergency organization to follow the ICS organization, principles and concepts. Update the E-Plan to reflect the changes.

18-JCP&L-2 JCP&L should develop an Emergency Management / Emergency Preparedness role as a stand-alone function within JCP&L with the requisite authority to ensure compliance with readiness related initiatives.

19-JCP&L-1 JCP&L should assume the responsibility for lodging for foreign contractors. Centralizing this responsibility along with its efforts for mutual aid crew lodging will eliminate competition for potential scarce lodging.

22-JCPL-1 In large-scale outage restoration events, IVR and Live Agent ETR messages should be based on worst case estimates to encourage customers to take steps necessary to care for their households' welfare.

22-JCPL-2 IVR messages should include guidance to customers to help them find tips and resources for coping with extended outages (e.g. informational websites, support agency phone numbers, etc.).

23-JCP&L-1 23-JCP&L-1 JCP&L should enhance media coverage staff to provide deeper backup in the event of simultaneous or consecutive major events within the FirstEnergy system. In major events, augment local media staff quickly to meet the demands of this media market.

23-JCP&L-2 JCP&L should make key messages customer-centric, giving priority to advice about potential for "worst case" event impact and helpful advice.

23-JCP&L-3 JCP&L should provide more frequent and accurate updates throughout an event to meet the demands of 24 hour information cycle and the demanding media market. Utilize social media, augment press releases with additional media advisories, promote human interest stories and reach out proactively to the media.

23-JCP&L-4 JCP&L needs to eliminate IVR callback confusion with the follow-up call regarding confirmation of restoration. The messaging should be designed to be clear and concise.

5.3 PUBLIC SERVICE ELECTRIC and GAS (PSE&G)

1-PSE&G-1 PSE&G's OMS Manual should be revised to reflect the specific level of effort needed to deal with a significant restoration event. The roles and responsibilities defined in the OMS Manual should be followed.

1-PSE&G-2 PSE&G should maintain contact names and phone numbers in a document separate from the OMS Manual where frequent updating is easier.

1-PSE&G-3 PSE&G's OMS Manual should be reviewed, updated, and distributed annually.

2-PSE&G-1 PSE&G should continue to conduct an annual exercise and enhance its annual exercise to deal with much larger scale events. Participation in this exercise should be expanded to include personnel from all functions / departments with a restoration role in order to test the limits of the restoration plan and systems. Lessons learned from real events should be incorporated in the exercise. Outside agencies such as County leaders should be invited to participate and observe the exercise.

2-PSE&G-2 PSE&G's post-exercise reports should be expanded to include the role of the participants as well as recommendations for improvement.

3-PSE&G-1 PSE&G should ensure readiness of personnel with a storm restoration role by expanding its training program to include opportunities to train personnel on the interdependencies between functional areas and storm roles. This could be accomplished during exercises and drills.

3-PSE&G-2 PSE&G should develop training requirements (curriculum, frequency, initial, refresher, etc.) for all positions (not just technical or system training) within the storm restoration organization.

3-PSE&G-3 PSE&G should develop a centralized repository for training records to ensure compliance with the training requirements of each position.

3-PSE&G-4 PSE&G should ensure that, when applicable, second role personnel attend refresher training prior to a pending event.

4-PSE&G-1 PSE&G should perform a lessons learned after each major storm to find and reward innovative actions, understand training requirements, correct errors or omissions in the Plan, foster a culture of continuous improvement, and establish a timeframe when these post event reviews will be completed.

4-PSE&G-2	PSE&G should identify one responsible party who will review all lessons learned, meet with the submitting department, finalize action items, assign responsibility for the action items, track action item completion and report progress to leadership.
5-PSE&G-2	PSE&G should add a section describing the weather monitoring, analysis and dissemination process to the OMS Manual.
6-PSEG-1	PSE&G should describe the process to mobilize supplemental skilled personnel to support major storm activation, and identify what employees would be available to support the restoration efforts for a significant event.
7-PSE&G-1	PSE&G should follow the ICS organizational model endorsed in the OMS Manual.
7-PSE&G-2	PSE&G should revamp its OMS Manual and define a clear role for the executives separate from the Incident Commander and in accordance with ICS principles.
8-PSE&G-1	PSE&G should keep basic high-level logs of all media contacts to assist with lessons learned and post event analysis.
9-PSE&G-1	PSE&G should review and add more detail to the mutual assistance section in the OMS Manual. At a minimum this should include a description of who is responsible for: estimating resources needs, participating in RMAG conference calls, making the decision to send or obtain mutual assistance.
9-PSE&G-2	PSE&G should participate in RMAG calls even when its mutual assistance needs are not met by the RMAG.
9-PSE&G-3	PSE&G should utilize the term personnel instead of crews in order to more accurately portray the number of personnel that assisted during weather events.
10-PSE&G-1	PSE&G should complete the flood mitigation validation and implement appropriate recommendations from its consultant's report to mitigate substation flooding.
13-PSE&G-1	PSE&G should use a less experienced person who could perform the role of damage assessment driver, instead of doubling up damage assessors at night or in dangerous conditions.
16-PSE&G-1	PSE&G should define the process of circuit based restoration in its OMS Manual.

16-PSE&G-2 PSE&G should define the escalation process in its OMS Manual.

18-PSE&G-1 PSE&G should reorganize the emergency organization to follow the ICS organization, principles and concepts. Update the OMS Manual to reflect the changes.

18-PSE&G-2 PSE&G should develop an Emergency Management / Emergency Preparedness role as a stand-alone function within PSE&G with the requisite authority to ensure compliance with readiness related initiatives.

18-PSE&G-3 PSE&G should develop a more robust second role process to identify staffing needs, pre-assign appropriate personnel and provide training in advance of a storm event.

19-PSE&G-1 PSE&G should develop a standard Staging Area resource complement to ensure that operations can be managed effectively if adverse weather conditions occur during an extended restoration. The resource complement could include rental of office trailers, the use of cell or satellite phones and data communications capabilities.

19-PSE&G-2 PSE&G should update the OMS Manual to include a detailed Staging Area plan.

22-PSE&G-1 PSE&G should manage staffing levels to reach call center outage performance standards and a lessons-learned effort needs to occur after every major event

23-PSE&G-1 PSE&G should review its second role process and designate, train, equip and drill backup representatives for staffing the OEM to ensure the quality of information flowing from PSE&G through the OEM to municipalities and its elected officials is consistent.

23-PSE&G-2 PSE&G, in coordination with the County OEM, should develop and execute a plan to inform elected officials about the restoration process and how information flows through the County OEM to the municipalities.

5.4 ROCKLAND ELECTRIC (RECO)

2-RE-1 RECO should prepare a written post exercise report, providing a summary of the exercise, objectives, who participated, what occurred, and recommendations for improvement.

3-RE-1 RECO should revamp its training program to include opportunities to train staff on the interdependencies between functional areas and storm roles. This could be accomplished during exercises and drills.

3-RE-2 RECO should develop a centralized repository for training records to ensure compliance with the training requirements of each position.

3-RE-3 RECO should ensure that, when applicable, second role staff attend refresher training prior to a pending event.

4-RE-1 RECO should implement the use of logs to track activities and decisions by storm team members.

4-RE-2 RECO's Emergency Management Department should review all the lessons learned, meet with the submitting department, finalize action items, assign responsibility for the action items, track action item completion and report progress to leadership.

9-RE-1 RECO should add a section to its Plan to describe how mutual assistance crews will be allocated between affiliated companies (Con Edison and O&R) when simultaneous large-scale events occur in multiple service territories.

15-RE-1 RECO should continue its ETR enhancement project.

15-RE-2 RECO should develop a process to ensure that the automatic ETR generation feature is turned off during a major event.

19-RE-1 RECO should assume the responsibility for lodging for foreign contractors. Centralizing this responsibility along with its efforts for foreign crew lodging will eliminate competition for potential scarce lodging.

22-RE-1 RECO should continue implementing the process enhancements currently in progress and ensure that the enhancements will support the call center standards developed for major outages.

22-RE-2	RECO should examine the potential issue related to the planned use of its affiliate's resources if simultaneous large-scale events occur in both service territories.
23-RE-1	RECO should implement the improvements in its revised restoration plan
23-RE-2	RECO should assure that ample space for the communications team's efforts is available during restoration efforts.

6.0 GLOSSARY OF TERMS

AMI: Advanced metering infrastructure is the use of two-way communications between a customer's meter and the EDC, which allows for measuring the customer's usage over small intervals (such as 15 minutes) to provide the customer and the EDC with increased information about a customer's aggregate usage for that location. AMI may include the ability to turn service on or off remotely, provide for pay as you go billing, and allow a customer to view usage history and analyze that usage. AMI can also notify the EDC that power has been lost at the meter and manage load during restoration (cold load pickup).

Automated Distribution Switching: The automatic or remote control of distribution switches or reclosers located on feeders external to a substation in order to return customers to service after an outage.

Appliance Cycling: The customer approved, remote control by an EDC of a customer's appliance or other load such as air conditioning, water heating, electric vehicle charging, pool water pumping or other uses. Appliance Cycling can be used to reduce loads when they are transferred to a different circuit to restore service to customers.

Branch: A branch is a fused single-phase, two-phase, or three-phase open wire distribution circuit connected to the main run of the feeder.

Circuit Based Restoration: A restoration method used when a particular circuit has multiple points of damage and it is more effective to provide local control of the circuit to the restoration task force assigned specifically to that circuit.

Clearances: The formal process designed to ensure safety when a line crew is working on a circuit, by limiting the ability to reenergize a circuit to one single individual that assumes responsibility for the safety of all crews involved on that circuit.

Computer Aided Dispatch (CAD): A term used by some utilities to denote programs that serve as an interface to manage workflow and send jobs electronically to field personnel by way of Mobile Data Terminals.

Commercial Operations: The EDC unit that is responsible for contacting large commercial customers to advise them of storm activities, repair status, and other information that will help customers make informed decisions about their operations during the storm.

Community Relations Organization: The EDC unit that notifies and maintains timely communications with municipal officials and agencies and county Emergency Management Offices regarding potential storm damage and repair updates. Community Relations ensures that public officials have current contact information for requesting special assistance from the Company. When warranted, the Community Relations Group will activate and deploy company representatives to municipal or county

offices to assist in coordinating response to storm damage and to help provide public safety and restoration of communications.

Crew Leader (Bird Dog): The EDC employee that is responsible for escorting Mutual Assistance and/or foreign contractor crews to work locations and provides support including fuel, material and equipment needs, food, and lodging arrangements.

Crisis Management Plan (CMP): A documented set of policies and related procedures that provides a framework for the EDC's senior corporate management response to an actual or potential crisis by providing corporate-level direction, response coordination, and support.

Crisis Management Team (CMT): A corporate-level organization composed of designated senior executives and support staff that identifies, evaluates, and manages strategic issues that hold the potential for significant negative corporate consequences.

Customer: A single location, home or facility generally receiving service through one meter.

Customer Assistance Center (Also known as a call center or contact center): Storm responsibilities are to answer customer calls promptly, process trouble requests accurately and efficiently, provide information to customers concerning storm damage and restoration status, and assist customers in making informed decisions.

Customer Average Interruption Duration Index (CAIDI): Average duration of an outage that any given customer would experience or also viewed as average restoration time.

Customer Information System (CIS or CMS): The EDC system that manages the relationship with its customers. The CIS performs billing, payment and work order management. During an outage the CIS can generate an outage incident report, transfer that report to the OMS, receive the ETR from the OMS and provide a repository for all information. Customers can often access the CIS directly through the EDC's website or call center IVRU or indirectly through a customer service representative.

Cut and Run (or Cut and Clear): The process of making the hazard safe by rolling up the wire and tying off above reach or cutting the conductor above and out of reach. Then the area can be left without leaving behind a safety standby person

Damage Assessment: The EDC unit responsible for the prompt and accurate assessment of damage to the electrical system. Damage Assessment personnel also are assigned to patrol targeted overhead circuits to assess and report storm damage that may not have been reported by customers such as subtransmission circuits. They may also be dispatched to wire down locations or other potentially hazardous field conditions and initiate the actions needed to ensure public safety.

Distribution Management System (DMS): A distribution SCADA system that monitors and controls the distribution system by controlling switching from control room or automatically on distribution system. Deliverables include reducing outage time and maintaining voltage levels.

Division or District: The operating unit of an EDC covering a region determined to be appropriately sized for the management of field forces.

Drill: An exercise activity requiring the performance of selected response actions by individuals or response teams. A drill may involve limited mobilization of response resources.

Dry/Wet Ice: Providing dry/wet ice to residential customers (for refrigerated food storage) who are expected to be without electric service for greater than 48 hours.

EEI Mutual Assistance: The Edison Electric Institute Mutual Assistance Program allows for the exchange of qualified field personnel among participating companies during storm emergencies. Utilities that participate in this program are able to provide field crew assistance, based on its own emergency status, to other participating utilities who request aid in repairing overhead transmission and distribution systems to restore customers. This program provides for a standard contract and terms and conditions to expedite the commitment of resources to the requesting utility.

Emergency Response: The tactical deployment of human and material resources, and the application of procedures and techniques to mitigate or limit the consequences of an emergency.

Emergency Response Plan (ERP): A documented set of policies and related procedures governing the detection of, response to, and recovery from incidents that can reasonably be anticipated. Emergency response plans generally provide for an incident management system, concept of operations, predetermined response procedures, and the identification and allocation of necessary supporting resources

Environmental Coordinator: The EDC unit responsible for notifying the appropriate department and contractor personnel, and staffing the designated area with necessary manpower required to perform environmental response coordination.

Escalation: An organized process to evaluate and potentially raise the priority of a customer or site within the restoration process.

Exercise: An activity requiring the performance, integration, or coordination of planned response activities by individuals and teams to facilitate training and provide a basis for evaluating the effectiveness of plans or procedures. Exercise formats include drills, full-scale exercises, and tabletop exercises.

Facilities Coordinator: The EDC unit responsible for the maintenance and operation of all Company buildings which are occupied during the emergency.

Federal Emergency Management Agency (FEMA) : Agency of U.S. Department of Homeland Security whose purpose is to coordinate the response to a disaster that overwhelmed the resources of local and state authorities.

Handbook for Mutual Assistance Workers: This handbook serves as a tool to communicate safety and health policies, system design standards and general procedures for any mutual assistance crews that assist the company in the restoration efforts.

Health and Safety Coordinator: The EDC unit that ensures that all health and safety work practices are adhered to by all Company and non-company (foreign) forces. The Coordinator directs Safety staff to conduct work site inspections, monitors and reports on safety incidents, and distributes and displays safety reminders at Company locations.

Human Resources: The EDC unit that works with all storm recovery organizations to ensure each organization is adequately staffed for the event with the proper personnel to respond in a timely manner. May also be responsible for interfacing with the Local Union, dealing with pay issues, and other HR functions.

Incident Management Team (IMT):An on call management team that may be activated to carry out tactical level response to incidents. Activities may include, but are not limited to the planning and deployment of all field resources to assess, respond and mitigate incidents.

Incident Support Team (IST):An on-call corporate or business unit organization that may be activated during corporate crisis and/or facility-level emergencies to provide corporate and other external resources that may be required to mitigate or recover from an incident. Support activities may include, but are not limited to, deploying senior executives to incident scenes, providing personnel or equipment from corporate or contract sources, and coordinating business continuity and recovery issues arising from an incident.

Information Technologies (IT): The EDC unit responsible for computer application and hardware support including local area networks, internal and external data, computer hardware and all other technical support associated with the Company's business systems.

Line Clearance: The organization and activity engaged in trimming (removal) of trees to maintaining the proper right-of-ways. During storm events they are associated with the cutting/trimming of branches and trees to allow storm recovery participants and provide clear access for restoration field crews to the overhead system.

Life Sustaining Customers (LSE): Customers who require electricity to maintain emergency life support equipment.

Load Shedding: The predetermined, emergency, involuntary process used by the EDC to reduce load by removing customers, facilities or other discrete loads from the system.

Logistics: The setup and operation of Staging Sites for the use of foreign crews; the provision of food and lodging for workers during the recovery from an incident; the management of materials for damage repair; the fueling and repair of vehicles; and the provision of support services for employees and their families to maximize their productivity.

Loop Circuit: A circuit designed to be interconnected through the use of a manual or automatic switch to provide energy to that circuit from a secondary source. Looped circuits reduce restoration times.

Major Storm: For BPU annual reliability reporting a major storm or major event is: a sustained interruption of electric service resulting from conditions beyond the control of the electric distribution company, which may include, but is not limited to, thunderstorms, tornadoes, hurricanes, heat waves or snow and ice storms, which affect at least 10% of the customers in an operating area.

Mid-Atlantic Mutual Assistance (MAMA): The Mid-Atlantic Mutual Assistance group is comprised of representatives from each of the Maryland, New Jersey and Pennsylvania electric investor owned utilities along with Consolidated Edison (Orange & Rockland). The goal of the group is to share information and, in disaster situations when assistance for electric restoration is needed, provide restoration resources. (see EEI Mutual Assistance)

Mainline: The three-phase open wire portions of primary distribution feeders.

Make-Safe/Cut and Run: Make-Safe and Cut and Run (also referred to as Cut and Clear in some utilities) is the process of isolating overhead wires that have knocked down or entangled with adjacent equipment during a storm. These wires are made safe by de-energizing, removing or moving them to eliminate public safety hazards.

Mobile Data Terminal (MDT): A portable or vehicle mounted laptop computer that is designed to be used by field personnel (line crews, patrollers, etc.) to receive and transmit information in the field.

Mobile Substation: A portable substation (usually on a trailer) includes transformers, breakers, and switches. The mobile is transported to an existing substation, which is out of service due to damage or for scheduled maintenance, and connected to transmission and distribution busses to replace existing substation equipment.

Momentary Average Interruption Frequency Index (MAIFI): Average number of momentary interruptions that a customer would experience during a given period.

Mutual Assistance: The voluntary provision of field forces, personnel or crews from one EDC to another to support restoration activities.

Mutual Assistance Coordinator: Responsible for the mobilization of Mutual Assistance crews and contractors, supplies, assignment of Crew Leaders, coordination of work assignments, and arrangements for meals and lodging accommodations with the Facilities Coordinator.

Network Circuit: An interconnected circuit design that provides multiple feeds to a location or facility including the automatic switchover between feeds to maintain service.

New York (NYISO): The Independent System Operator (ISO) responsible for operating a reliable system and efficient wholesale markets. RECO operates in NYISO.

North American Electric Reliability Council (NERC) : A council consisting of nine Regional Reliability Councils, encompassing virtually all of the power systems in the U.S. and Canada, which promotes reliable and adequate supplies of bulk electric power.

Office of Emergency Management (OEM): In New Jersey there are State, county and municipal OEMS, which are responsible for planning for and responding to all manner of disasters, whether man-made or natural.

Outage Management System (OMS): An EDC computer application that facilitates the resolution of electric system related field problems and is especially useful during storms when the management of vast amounts of data is required. The OMS groups trouble calls into "Incidents" that are then presented in a way that allows an efficient method to analyze, prioritize, assign, track, and report on each Incident. The OMS produces real-time reports that summarize outstanding work, completed work, and in some cases crew status.

Overhead Circuit: The overhead distribution wires connected electrically to a substation circuit breaker or electrical isolating device.

Patroller (also damage assessor or Lookup): Person who performs damage assessment (see Damage Assessment).

PJM: The Independent System Operator (ISO) responsible for operating a reliable system and efficient wholesale markets. ACE, JCP&L and PSE&G operate in PJM.

Post-Incident Review ("Lessons Learned"):The analysis of an organization's response to an incident for the purpose of identifying both positive and negative aspects of the response. The review also documents lessons learned and recommends corrective actions, where appropriate.

Priority Customers: Customers that impact public safety and community functioning (hospitals, water treatment plants, emergency management offices, shelters, sewer treatment plants, emergency radio towers).

Public Affairs and Corporate Communications: This EDC unit is responsible for communicating storm-related information to the news media and employees. They produce press releases, conduct phone interviews with reporters and prepare print and electronic communications for dissemination to employees. They also assist other functional coordinators by preparing correspondence and Voice Response Unit [VRU] messages.

Radial Circuit: A feeder or electric circuit fed from one end only. This can be transmission or distribution..

Resources: Personnel, supplies, or equipment that is available, or potentially available, for assignment to an incident.

Restoration: The labor-intensive construction work that is required to repair storm-related damages and to restore service.

Restoration Managers: Organize areas of storm damage into manageable geographic areas and determine the deployment of resources to most effectively achieve restoration of service for customers by initiating crew rotation schedules to maximize coverage and assigning construction crews. Open lines of communication with other storm recovery organizations are maintained.

Right of Way (ROW): Easement for certain purpose over land such as vegetation management.

Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model : Model used by National Weather Service (NWS) to produce storm surge guidance.

Second Role: Utility employees who fill a job during storm that differs from their day-to-day job.

Southeastern Electric Exchange (SEE): The SEE Mutual Assistance Committee is comprised of representatives from investor owned utilities from New Jersey to Texas. The goal of the group is to share information and, in time need when assistance for electric restoration is needed, provide restoration resources. Atlantic City Electric is a member of SEE. FirstEnergy (parent company of JCP&L) has applied to join the SEE in 2012.

Service or Service Line: The electric conductor from the secondary distribution circuit to customer home or facility.

Site Safety (also wires down standby): Responsible for deploying assigned personnel to field situations where damaged electric facilities pose a threat to public safety. Site Safety Representatives will secure the area and remain on site until relieved by a restoration crew.

Staging Site: Location for crews, vehicles, materials and emergency management staff to work from during an emergency usually not on company property and closer to system outages.

Stores: The EDC unit that ensures that adequate inventories are available, issues materials, contacts vendors and suppliers.

Storm Center (also Delivery Emergency Response Center): The primary location from which the EDC's storm recovery effort is managed. All storm recovery organizations are represented at this location.

Storm Emergency Kit: These kits contain material needed to perform field storm duties. They contain equipment such as wire, connectors, tape, maps, and safety items. Different kits are made available based on need.

Storm Staffing Matrix: The storm staffing matrix provides a guideline for minimum resource levels for events of various magnitudes. This matrix can be used for pre-mobilization or mobilization efforts.

Substation: The EDC unit that transforms voltages to higher or lower levels. Substations include transformers, circuit breakers, switches, busses, protective relays and communications equipment.

Supplemental Workforce Coordinator: The EDC Coordinator who, in consultation with the Storm Director and the Control Center Manager, will determine the work requirements for the Supplemental Workforce. The Supplemental Workforce restores individual electric services, act as Groundmen, and complement the CDL-driver workforce.

Supervisory Control and Data Acquisition (SCADA), (Distribution System Telemetry): SCADA electronic monitoring equipment reports the status of transmission and/or distribution equipment. In some cases, remote control of that equipment is possible.

System Average Interruption Duration Index (SAIDI): Average outage duration for each customer served.

System Average Interruption Frequency Index (SAIFI): Average number of interruptions that a customer would experience.

System Job: The result of the OMS process whereby the EDC Restoration Team groups trouble ticket reports that relate to a system problem into a single job.

System Operations: The EDC unit that establishes priority service restoration on the overall electric transmission system, and directs all transmission and substation switching.

Tabletop Exercise: A scenario-based simulation for a crisis management or emergency response team that uses facilitated discussion to analyze one or more hypothetical situations, develop courses of action, and discuss issues of coordination.

Tagging: Safety process of installing a physical or remote tag on a field/substation devise when that devise has been placed in a temporary position (open, closed or removed from service) to provide line clearance to a line/substation crew(s). These tags include the date, time, devise number and person taking the clearance. These tags can only be removed and the devise operated by the persons who name is on the tag.

Telecommunications: The EDC unit that provides communications support for all emergency requirements and are responsible for the operations of all corporate telephone, microwave, radio, data and Telephone Company (TELCO) networks, As part of the emergency response and recovery, Telecommunications is required to set up and test emergency phones throughout designated areas.

Transmission Vegetation Management Program (TVMP): The NERC VM standard required for transmission circuits operated at 200 kV and above. It requires minimum clearances; schedule for, and methods of, vegetation inspections; and an annual plan for vegetation management work to ensure reliability.

Transportation: The EDC unit that ensures that transportation facilities, mobile equipment, provide field delivery of fuel, and maintain adequate inventories, issue material and equipment.

Trouble Ticket (also called Incident Ticket): Generated by the Outage Management System (OMS). The tickets provide the location, name, phone number, trouble type, and other information for each job.

Voice Response Unit (VRU): A VRU is an electronic means of answering and handling phone calls. The Customer Assistance Center VRU enables customers to initiate a trouble ticket, provides the option to speak with a Customer Service Representative, and communicates restoration updates.

Work Management System (WMS): System used to manage work projects including planning, scheduling, cost / budget management, resource allocation and documentation.

Incident Command System (ICS) Glossary of Terms:

Administration/Finance Chief: Responsible for compiling and reporting all costs related to an incident. The Administration/Finance Chief oversees the Human Resources and Financial Planning functions.

Customer Operations Officer: Assesses customer activity including incoming calls, claims, and priority and special needs customers.

Emergency Management Officer: Once a declaration to mobilize for an event is made, it is the responsibility of the Emergency Management Officer to oversee the mobilization of all required functions and ensure that all Functional Coordinators have established and activated their function.

Environmental Health & Safety (EH&S) Officer: Oversees the response to safety and environmental concerns and monitors company/non-company crews for compliance with established Utility and Environmental procedures.

Incident Commander: Responsible for the strategic management of an incident or emergency and the coordination of the response efforts.

Incident Command System (ICS) Command Staff: Consists of the Incident Commander, Customer Operations Officer, Environmental Health &Safety Officer, Emergency Management Officer, Information Officer, and Liaison Officer. They are responsible for their respective sections.

Incident Command System (ICS) General Staff: Consists of the Incident Commander, Operations Chief, Planning Chief, Logistics Chief, and the Administration/Finance Chief. They are responsible for their respective sections.

Information Officer: Oversees the functional groups that are responsible for communication of information to the news media, functional coordinators and employees. These areas produce press releases, conduct phone interviews with reporters and prepare print and electronic communications for dissemination to employees.

Liaison Officer: Oversees the Utility's interaction with municipal officials, agencies, and county Emergency Management Offices.

Logistics Chief: Responsible for the areas that purchase and provide material, supplies, and transportation needs associated with an incident response, as well as, overseeing remote assembly areas. In addition, the Logistics Chief oversees Shared Services, Security, Facilities, Telecommunications, Food/Lodging and Information Technology.

Operations Chief: Responsible for the labor-intensive work that is required to repair the electric system infrastructure and to restore service. In addition to overseeing the transmission and distribution restoration groups, the Operations Chief also oversees, ECC/DCC, Outside Resources and the Supplemental Workforce groups.

Planning Chief: Responsible for the areas that analyze incidents, provide incident damage assessment, outage management system support and workforce planning.