Hurricane Irene
Electric Response Report

12-14-11

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Executive Summary

Hurricane Irene arrived as a Category 1 storm on Sunday morning August 28th as the first hurricane to make landfall in New Jersey since 1903, and disrupted service to 1.9 million of the State's 3.9 million customers. The historic scope of the storm led to a massive restoration effort that brought most customers back within 5 days, but left many without power for as long as 8 days after the storm. Governor Chris Christie requested that the Board of Public Utilities President direct Board Staff to conduct an investigation of the electric utilities' restoration decisions and actions taken prior to, during and after Hurricane Irene.

Two months later, a severe snowstorm hit New Jersey on Saturday, October 29, 2011. Statewide approximately 1.0 million customers lost power, with some out for up to 7 days.

These two 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 went without electricity and heat, with entire communities disrupted and stretched to the limit of their emergency management capabilities.

At subsequent hearings which were held by the Board of Public Utilities, many testified as to the impact including spoiled food, loss of water service, cold showers, loss of telephone/internet, heat, and inability to pump water out of basements which in many cases caused flooding in homes. Communities which experienced both flooding and power outage sustained even greater impact. Staff's investigation also included examination of written and verbal inquiries with each of the electric utilities, as well as meetings with local elected and emergency management officials.

This report creates 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, to the October weather event. This report also identifies areas warranting further review by staff with the assistance of a consultant. JCP&L has developed an emergency communications strategy and estimated restoration process that can be employed during any weather event. This plan will be subject to further review by a consultant.

A brief examination of past Board actions in response to extended weather outages substantiated that the Board has, in the past, directed specific actions utilities must take in preparation for severe weather, and in the execution of an outage restoration effort. Past Board Orders have addressed issues, such as:

- Communications with customers and emergency management officials
- Restoration priorities
- Outage assessment methodology

- Well dependent and special needs customers
- Vegetation management
- Supplemental crew acquisition
- Equipment inspection and upgrades
- Employee training

What recent storms have shown is that some of these existing practices were not effective in a larger scale event, resulting in performance issues during the restoration process. Existing infrastructure design and tree trimming also factored into the cause and duration of the outages and are addressed in this Report.

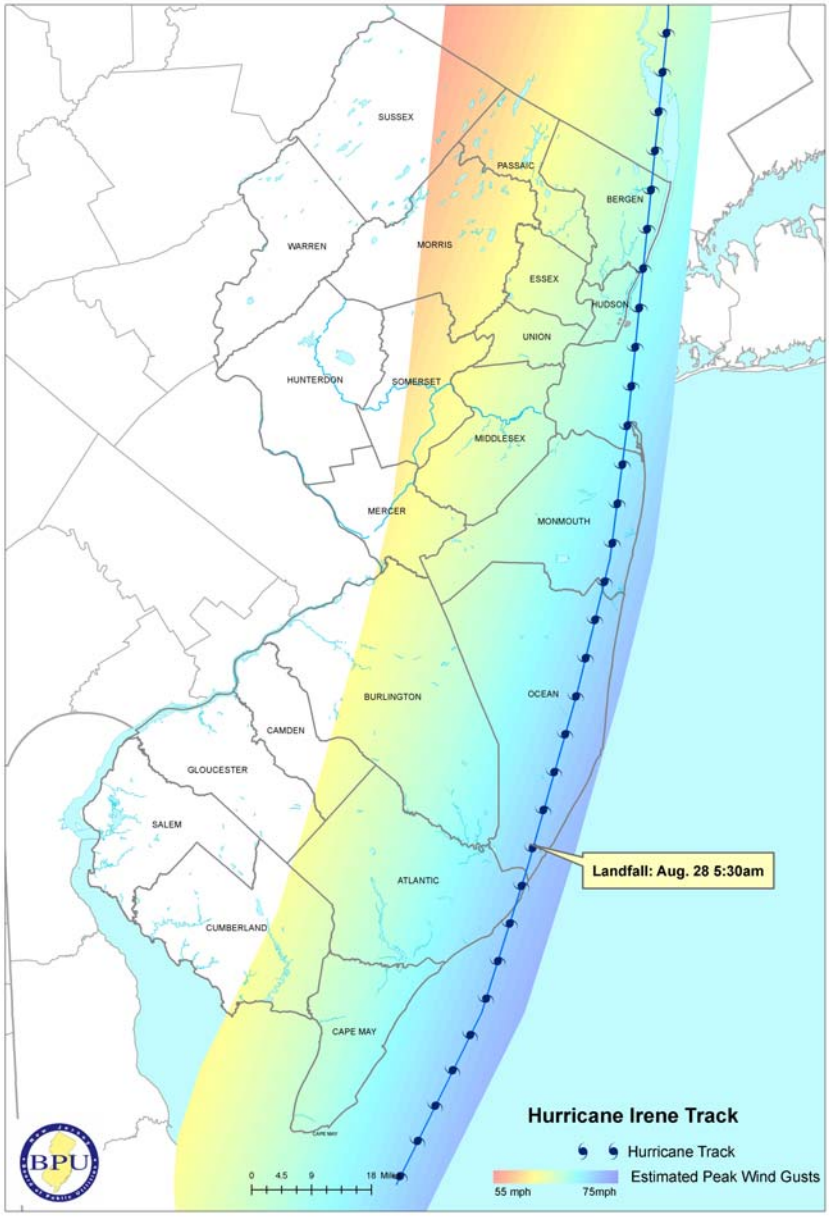
While all of the utilities experienced challenges during these severe weather events, it was apparent that JCP&L, in particular, was deficient in its storm restoration process, especially during Hurricane Irene.

Certain practices of the electric utilities, particularly JCP&L, must be reexamined and the planning and preparation scaled up to drive a higher level of performance, particularly in the area of communications, estimating outage restoration, supplemental crew mobilization and mitigation of tree related damages.

The major findings and recommendations of Board Staff's preliminary investigation into Hurricane Irene are summarized on page 25.

Weather Summary

Hurricane Irene made landfall at Little Egg Inlet as a Category 1 hurricane at 5:30 am on Sunday morning of August 28th. In the weeks prior to the arrival of Hurricane Irene, New Jersey had several heavy rainfalls which had saturated the ground and had rivers running high. Prior to making landfall, the outer bands of the storm produced heavy rains and wind as early as midday Saturday. Rainfall totaling 6-12 inches throughout the State caused widespread record setting flooding which inundated many electric substations. 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. This, combined with the saturated soil, caused many trees and limbs to be brought down. As Hurricane Irene left the State Sunday evening, there was a peak of approximately 930,000 customers without power.



Storm Impact

While the peak number of customers out simultaneously was about 930,000, statewide approximately 1.9 million of the 3.9 million total customers were affected by outages due to this storm at some time during the event. PSE&G reported 872,792 customers affected, JCP&L - 780,000, ACE - 273,898 and Rockland Electric had 27,220 affected by Hurricane Irene. The majority of affected customers were restored by Friday, September 2nd; however, JCP&L had approximately 20,000 customers without power going into the weekend. All customers were restored by Monday, September 5th except for those directed to be shut off by public officials due to flood water inundation.

Restoration Profiles

PSE&G

PSE&G had 872,492 of its approximately 2.2 million customers (nearly 40%) experience outages due to the hurricane. 95% of these customers were restored by 7pm on August 31 (98 hours) and the last customer was restored by 12:50 am on September 4 (176 hours). There were approximately 7500 trouble locations (individual repair jobs, each requiring the assignment of a crew).

JCP&L

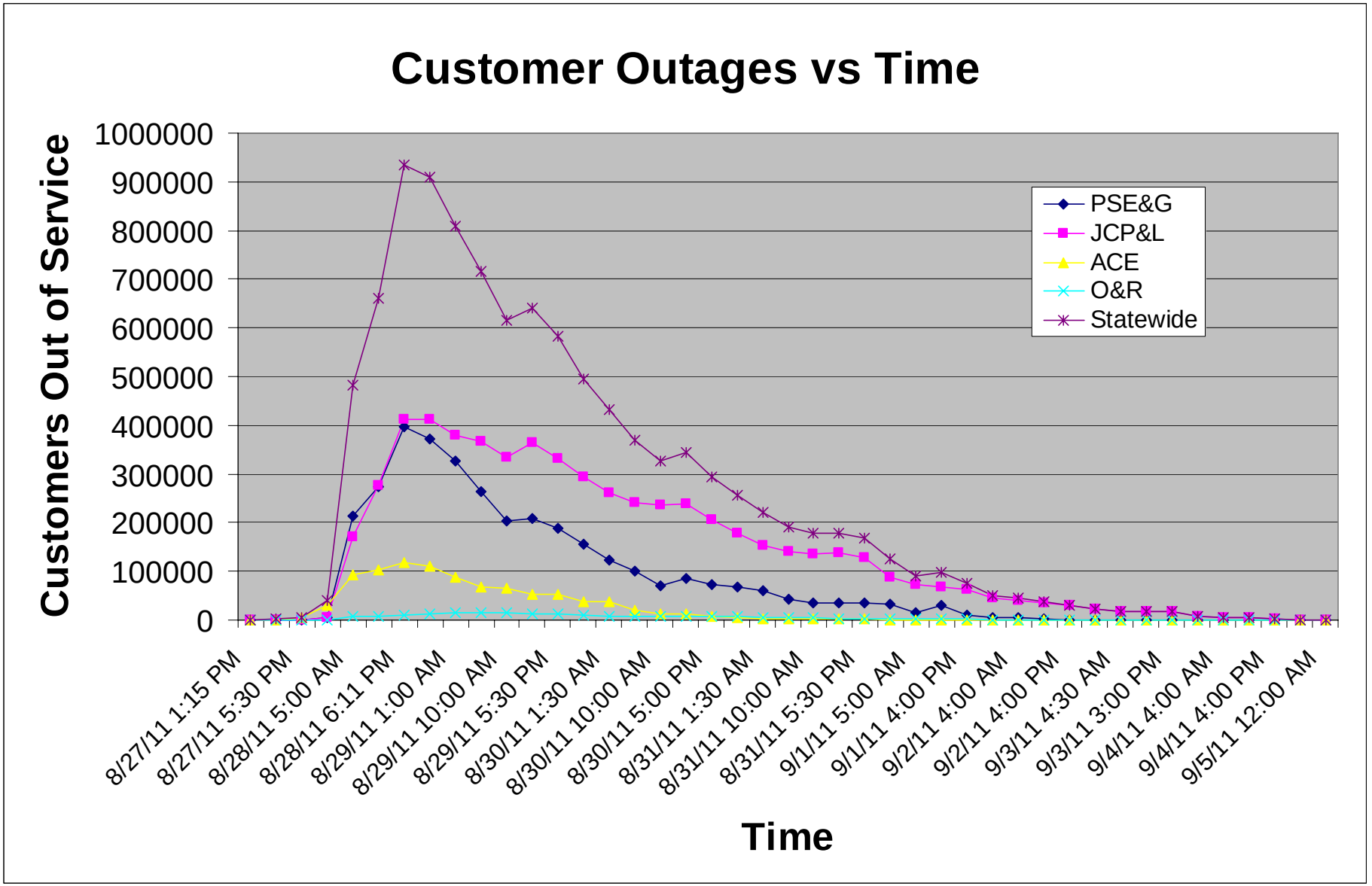
JCP&L had 780,000 of its approximately 1.1 million customers (nearly 71%) experience outages due to the hurricane. 98% of these customers were restored by 8pm on September 3 (172 hours) and the last customer was restored by 11:59 pm on September 5 (224 hours). There were approximately 31,302 trouble locations.

Rockland Electric

Rockland Electric had 27,220 of its approximately 70,900 customers (about 38%) experience outages due to the hurricane. 95% of these customers were restored by 2pm on September 1st (109 hours) and the last customer was restored by 5 pm on September 4 (184 hours). There were approximately 875 trouble locations.

ACE

ACE had 273,898 of its approximately 530,000 customer (nearly 51%) experience outages due to the hurricane. 97% of these customers were restored by approximately 8pm on August 29 (56 hours) and the last customer was restored by 11:47 pm on September 1 (132 hours). There were approximately 2,588 trouble orders.


Customer Outages vs Time
Customers Out of Service
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
PSE&G
JCP&L
ACE
O&R
Statewide
8/27/11 1:15 PM
8/27/11 5:30 PM
8/28/11 5:00 AM
8/28/11 6:11 PM
8/29/11 1:00 AM
8/29/11 10:00 AM
8/29/11 5:30 PM
8/30/11 1:30 AM
8/30/11 10:00 AM
8/30/11 5:00 PM
8/31/11 1:30 AM
8/31/11 10:00 AM
8/31/11 5:30 PM
9/1/11 5:00 AM
9/1/11 4:00 PM
9/2/11 4:00 AM
9/2/11 4:00 PM
9/3/11 4:30 AM
9/3/11 3:00 PM
9/4/11 4:00 AM
9/4/11 4:00 PM
9/5/11 12:00 AM
Time

Analysis and Recommendations

Public Hearing Findings

To receive input from the public regarding New Jersey's public utilities' preparations and restoration performance relative to Hurricane Irene, the Board of Public Utilities conducted six public hearings. These hearings were convened in the various service territories at Scotch Plains, Mahwah, Morris Plains, Galloway, Manalapan, and Bordentown. In addition, two hearings were held with mayors and municipal officials in Morristown and Redbank. The Board also received numerous letters, calls and emails which were made part of the record and considered as part of this investigation.

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 Rockland Electric. 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

Communications

Emergency Management Sector

Following any major storm, it is common practice for the companies to provide representatives to either the hardest hit counties and/or local OEMs during the restoration process. This "boots on the ground" approach provides informed, direct and clear communications between the municipalities and utilities, establishing a direct link to the company's restoration management team. This allows the local officials and emergency management coordinators to provide guidance to the restoration effort to address local priorities for public safety and tends to result in a more coordinated response to heavily damaged areas. Restoration prioritization for major critical infrastructure is still performed at the State Emergency Operations Center (SEOC) level given the SEOC's situational awareness of needs statewide.

Following Hurricane Irene, nearly all of the counties in the State had sustained significant damage and had activated their county OEMs. PSE&G provided staff to 11 of the 12 counties that it serves and to some municipal OEMs as well. JCP&L provided representatives to the Monmouth, Morris, Ocean and Somerset County OEMs. ACE provided staff to all of the county OEMs that it serves. Rockland Electric supplied a representative to the Bergen County OEM.

Recommendation – The companies shall continue to provide a representative to be physically present at any activated county OEM at the OEM's request.

Local Officials

Many community officials may prefer to receive and convey outage information and prioritize restoration through their OEM structure; however, in a large scale event, it is recognized that local elected officials need to establish and maintain constant communications with the utilities as well. Local officials have the closest contact with their constituencies and need the most up to date information to make decisions regarding sheltering, evacuations and other health and public safety issues in conjunction with their emergency management officials. Regular contact with the companies also helps to coordinate resources to open roads and clear debris due to downed trees and wires.

Through any disaster, the response and recovery efforts follow the structure of the Incident Command System. When the needs of the local responders exceed their capabilities, the command structure expands to the next jurisdictional level. This scales up from the municipality and the local OEMs to the county and then to the State OEM and is the same path that requests for resources follow and are fulfilled. It also allows the State and counties, in very large events like Hurricane Irene, to address high level

statewide priorities and for the local authorities to still effectively address the needs of their municipalities.

PSE&G's Regional Public Affairs department was in direct communications with local and county officials, providing e-mail and Fax updates several times a day. JCP&L used its Area Managers to make contact with local officials. ACE used its public affairs personnel to make contact before the storm and provided e-mail updates through the restoration, as well as through a series of conference calls. Rockland also used its public affairs department to make local contacts and provided multiple scheduled daily updates via e-mail throughout service restoration.

Through the public hearing process and meetings with county, local OEMs, and elected officials, the recurring complaint was an inability to communicate with JCP&L. While the root cause is still unclear at this stage of the investigation, it appears that either area managers were overwhelmed, unable to provide the information requested or a combination of both. The common theme among the complaints was that the municipalities were not being heard by JCP&L and that effective and accurate communications were sparse.

It should be noted that staff and JCP&L have developed a revised communications plan protocol to address these issues. The plan has elements to address communications with elected officials, OEMs and customers. It also includes the use of social media and a process for improving ETRs.

Recommendation – The companies shall have the scalable capacity to handle the number of calls and requests required by county and local officials during any size event, even when addressing weather outages such as Hurricane Irene. The companies shall include scalable communications capabilities in their annual exercises.

Recommendation – JCP&L shall fully implement its Preliminary Communications Plan that has been under review with Board staff so that there is a full communications strategic plan in place for any subsequent severe weather events.

Electronic Media Use

The use of social media has emerged as an effective tool for providing general restoration related updates to electric customers. Customers without power can access this information from smart phones, laptops or other computers with internet access to stay up to date on the restoration progress in their neighborhoods. The use of the companies' websites and social media outlets worked as an effective supplement to traditional television, radio and newspaper messaging, but these were effective only to the extent that current, accurate information was available.

PSE&G used e-mail, the company website, Twitter and Flickr to provide general updates to its customers. ACE used the company website, with some additional enhancements, Twitter and Facebook for its messaging. Rockland used e-mails and its

website for its electronic updates. JCP&L only used its company website for electronic messaging.

While each company maintains an outage website, the amount of information provided varies greatly by company. ACE and Rockland display outages down to the street level and include an ETR when available. While JCP&L provides the actual number of outages by municipality only, PSE&G provides ranges of customer outages within a given municipality.

Recommendation – The companies should use social media in addition to company websites when providing restoration updates to the public. The companies shall participate in discussions with Board staff to develop best practices and changes to their outage websites.

Estimated Time of Restoration

The ability to provide timely and accurate estimated restoration times is critical to customers and the community at large. Estimates are critical to customers in determining what measures are necessary to provide for shelter and continual sustenance for their families, and to give guidance to retail establishments and industry. The use of global or system wide ETRs early in the restoration effort is useful in managing the expectations of the public and empowering people to make decisions accordingly. As the restoration progresses, the need for area specific ETRs increases for those customers that have already been out of service for several days and bear the greatest hardships in not knowing when they will be restored.

Following Hurricane Irene, the companies could only provide global ETRs early in the restoration and some provided more targeted ETRs later in the week, although the accuracy of early ETRs needs to be examined.

Recommendation – The utilities shall meet with staff to discuss improvements that can be made to the process of creating more accurate and timely ETRs. The companies should develop plans to enhance their ability to provide local and more geographically targeted ETRs earlier in the restoration process. While some efforts to produce these are already underway, this area was identified as one which needs to be further investigation by our consultant.

Automated Customer Callbacks

Customers reporting outages by phone typically receive a call back from the company to verify power restoration. According to information received during the public hearing process, these messages were confusing as customers were interpreting the calls as stating that the company had restored power, when in fact it had not. In addition, some of these automated calls assume the customer has power if the answering machine or

voicemail receives the call. Once the system makes this assumption, the customer is removed from the restoration cue and not contacted again. This practice was the cause of great frustration since some customers were left without service longer and forced to call in their outages again. This practice has clearly emerged as an issue with JCP&L and may be one with the other electric utilities.

Recommendation – Review and revise customer call back scripts to better convey the messaging from the companies. While one company is already making certain protocol changes, this area has been cited for additional investigation by our consultant.

Supplemental Crew Acquisition

No matter how well prepared an electric utility is for an event, the speed of restoration is largely dependent upon the number of restoration personnel that an electric utility can muster and stage pre-event, and then put in the field to effectively perform specific duties during and after the event. Other factors such as weather conditions, impassable roads, inefficient allocation of resources and inadequate preparations may cause additional delays in the restoration, but a deficit in the number of restoration personnel will impact the restoration rate and lengthen the overall outage duration. What follows is a summary of each company's crew acquisition efforts as disclosed through investigative discovery. As discussed below, questions emerged regarding JCP&L's methodology and rationale in acquiring crews.

The effects of Hurricane Irene moved through the State from Saturday evening of August 27th through Sunday afternoon of August 28th.

Realizing the potential impacts to its system, PSE&G requested 200 line crews during a Mid-Atlantic Mutual Assistance (MAMA) group conference call on August 23rd. The request was again repeated during a conference call on Thursday, August 25th. When the requests could not be accommodated, PSE&G secured contractor line crews so that the company had 100 contractor line crews on its properties by August 27th. An additional 29 contractor line crews arrived on August 29th, as well as 4 mutual aid utility crews. Finally on August 30th, 54 contactor and mutual aid crews arrived. By 8 AM on Sunday, August 28th, PSE&G was able to put approximately 365 overhead line, service repair, troubleshooters, mutual aid and contractor line crews in the field. That number peaked at approximately 475 aggregate crews on Thursday, September 1st.

ACE, through its parent company Pepco Holdings, Inc. (PHI) made an initial request for 450 mutual assistance personnel on August 23rd. A subsequent request for an additional 300 personnel was made on August 24th. Realizing the scarcity of mutual aid resources, ACE began to request contractor line crews on August 25th. By 3 PM on August 28th, 58 contactor line crews and 12 mutual aid crews were on company property. An additional 80 mutual aid crews arrived by 11 AM on August 29th. Finally on August 31st, 27 more mutual aid crews arrived. By 4 PM on Sunday, August 28th, ACE was able to put approximately 120 line and tree crews in the field.

Rockland Electric initially requested mutual aid crews on August 25th which arrived during the evening of August 27th. Additional mutual aid crews were requested on August 28th which arrived for duty on August 29th and 30th. At 7 AM on Sunday, August 28th, Rockland Electric had 109 line and service crews in the field including 36 mutual aid crews.

On August 28th, JCP&L was able to put 166 crews in the field at 8 AM on Sunday, in the wake of the storm. JCP&L made its initial request for mutual assistance post storm on August 29th via the MAMA group. Due to the large number and broad geographical

scope of the areas impacted, no mutual assistance crews within a 2 to 3 day travel time were available. The first mutual assistance crews arrived in JCP&L territory on Friday, September 2nd. The first contractor crews also arrived on Friday, September 2nd. However, JCP&L did initially receive 71 crews from other First Energy affiliated companies by 8 AM on Monday, August 29th, bringing the total to 213 crews in the field. During the course of the restoration, JCP&L received assistance from approximately 500 First Energy affiliated linemen. Met-Ed, a sister company to JCP&L which had approximately 225,000 affected customers, received 189 lineman from other First Energy affiliated companies. Penelec, another sister company which had 60,000 affected customers, received 20 lineman from other First Energy affiliated companies.

JCP&L has indicated in discovery that it expected more First Energy crews to be supplied sooner, but this expectation was grounded in the belief that the Pennsylvania based Met-Ed and Penelec service areas would not be as affected as they were by the hurricane. The allocation of First Energy affiliated lineman to Penelec, Met-Ed and JCP&L does not seem to be proportional to the number of customers of each of the utilities that were affected by the storm. In other words, based on the number of outages in these three service areas, staff concludes that New Jersey should have received more crews from First Energy.

While the other three electric utilities had requested and secured mutual aid or contractor assets prior to the hurricane and had them staged in State either before or during the hurricane hitting New Jersey, JCP&L did not. JCP&L failed to secure any mutual aid, contractor or affiliate crews until Monday August 29th, nearly a full day after the other utilities had their crews working.

Staff notes that after an August 2002 thunderstorm that affected approximately 180,000 JCP&L customers, the Board entered into a Memorandum of Understanding with JCP&L in Docket No. EX02120950 dated 2/5/2003 regarding several items including crew mobilization. The Memorandum of Understanding requires that "*during a major event, defined as an incident that results in more than 65,000 customers without power for more than 24 hours, JCP&L shall have at least 200 hazard responders responding to an event within 8 hours and 150 restoration crews responding within 12 hours, of notification by the PowerOn system.*" In JCP&L's Major Event report submitted to the Board in accordance with N.J.A.C. 14:5-8.8, charts show that the 65,000 customer threshold was reached by 11:59 PM on Saturday, August 27th.

In compliance with the Memorandum of Understanding, JCP&L reportedly had mobilized 166 line, substation, cable and relay crews as of 8 AM on Sunday, August 28th and 230 hazard responders as of 6 AM on that same day.

While PSE&G had approximately 90,000 more affected customers than JCP&L, its response before, during and after the hurricane with respect to crews, in part, allowed PSE&G customers to have a total outage duration that was approximately 48 hours shorter than JCP&L's customers.

Staff will focus on a more intense review of this crew mobilization response with the consultant as crew mobilization remains an area of concern with JCP&L.

Recommendation – The Board's consultant shall analyze actions with respect to crew acquisitions to identify procedural, economic or other issues surrounding timely crew acquisition by the electric utilities, and specifically focus on the process used by JCP&L.

Restoration Prioritization

To manage a restoration process that addresses damage to many different levels of equipment, from transmission lines and substations to the individual customer's service line, each electric utility generally follows a similar top – down approach to outage restoration. The first priority is worker and public safety, which entails the clearing of downed wires and other hazards to the public. The restoration of hospitals, fire and public safety facilities, emergency shelters, food distribution centers, water and wastewater plants and other large facilities supporting community function are typically the first to be restored. This is then followed by repairs to equipment that will restore the largest blocks of customers and continues down until individual customer outages are addressed. Throughout this process, county and local government representatives are requesting priority restoration, while the State and sometimes federal authorities are directing restoration of critical facilities to support the overall disaster response effort and situation awareness statewide.

Special Needs Customers

In the context of power outages and disconnection prohibitions, special needs customers are usually viewed as customers with medical conditions requiring the use of life sustaining equipment in their homes. The loss of power to this equipment may create a life or death situation for these customers requiring immediate action on their part to either wait for power restoration, if possible, or to evacuate to a shelter or hospital to meet their health needs. All of the companies are required by N.J.A.C. 14:3-3A.4(d) to "*on a semi-annual basis, solicit information from their residential customers in order to determine the presence of any life-sustaining equipment on the customer's premises.*" In addition, a Board Order (DKT No. EX98101130) dated 12/16/1998 requires the companies to contact customers having "*a serious medial condition during an outage lasting more than 24 hours and advise them of the probable time of restoration of service.*"

While the companies are required to solicit this information, only JCP&L shares it with local or county OEMs. Both JCP&L and PSE&G give priority restoration to these customers once the restoration process has reached the local distribution and single no-light level, while Rockland and ACE reportedly do not. In some cases these customers were given early notification to prepare for potential extended outages before the storm and were provided with updates during the restoration process.

These programs exist primarily to protect customers with life sustaining equipment from intentional service shutoff (for example, shutoff for nonpayment) and have created expectations of priority restoration for a wide variety of special needs customers. In staff's view, it may not be practical to restore individual special needs customers as a first priority; to do so could lengthen the restoration of larger customer areas and community functioning. Staff recommends that the course of action would instead be to engage the medical emergency management community to address this issue through

sheltering or other support. Staff is also currently working with NJOEM to further address this issue. However, by providing accurate ETRs, the utilities can aid in the decision making process for these customers about whether to wait for restoration, seek shelter or take other protective measures. More accurate ETRs are addressed in another section.

Recommendation – The utilities will work with staff to reevaluate how special needs customers are handled. Special needs customers shall be informed about the restoration process and advised on how they should seek aid during a long duration outage. Special needs customers shall be identified to the extent practical and given a level of priority restoration based on the scale of the outage balanced against other restoration priorities.

Well Water Dependent Customers

The majority of customers reliant on well water are completely dependent on power to maintain water supply and sanitation. The companies were required by prior Board Order in DKT No. EX98101130 dated 12/16/98 to "*identify areas of their service territory in which customers using private wells may lose their water supply during an electric outage*" and "*direct them to alternative water sources in conjunction with local municipal OEM's.*" At this time, none of the companies identify individual well dependent customers and do not give any priority to the restoration of these customers. Given that a significant percentage of the population uses wells, it is not practical to prioritize well customers. However, more needs to be done to inform well dependent customers about power reliance.

Recommendation – Well water dependent customers shall be identified and provided with restoration information on a regular basis. Better communications with these customers needs to occur, as well as an annual information packet in their bills that highlight steps that can be taken in a long duration outage.

Debris Management

The response effort immediately following a storm centers around reestablishing public safety and opening the roadways for response vehicles. An important part of this process involves coordination between the Board, NJDOT, NJDEP, municipal public works crews, police and the electric utilities to clear debris and downed power lines from roads. Downed trees cannot be removed until power lines they have brought down are made safe and utility crews cannot reach the wires if the roads are not otherwise opened.

A common complaint from local officials was an inability of JCP&L to coordinate the shutoff of downed power lines with debris removal crews so that repair work could begin once the lines were made safe. In some cases, local tree removal crews had to wait for JCP&L line crews that did not arrive for hours or at all, or JCP&L crews would complete the work without the knowledge of municipal crews leaving them to believe the lines

were still live. This lack of coordination caused roads to be closed for longer periods than necessary.

Recommendation – The utilities shall coordinate more closely with State and local crews working to clear roads and remove storm debris. This can be achieved through working with the State and county OEMs to form debris removal task forces including utility crews to quickly open major roadways early in the storm response effort.

Infrastructure Issues

Substations:

There are hundreds of substations in the systems that are operated by the four Electric Distribution Companies (EDCs) in New Jersey. The distribution substations are used to transform higher voltage into lower distribution voltages that directly feed customers' premises. Faults or problems that occur with the operation of these substations will have a direct impact on supply to customers, especially if there is not a secondary feed into an area. This could further result in damage to equipment servicing and protecting the transmission and sub-transmission lines that feed these substations. In turn, transmission substations feed the local distribution substations. Damage to those facilities would results in the same effect as stated above.

During the hurricane event, two of the four EDCs (JCP&L and PSE&G) had several substations that were overcome by water and flooding which affected their operation. The number of substations damaged due to flooding is listed below:

Company	Substations affected by flooding
JCP&L	7
PSE&G	8
ACE	0
RECO	0

Substations with operations impacted by flooding	
JCP&L	PSE&G
Morristown	Cranford
Pequannock	Somerville
Sussex	Marshall Street
Canoe Brook	Garfield Place
Windsor	Hillsdale
Monmouth Consolidated Water	New Milford
Sea Bright	River Edge
	Scotch Plains *

*Interrupted due to shutdown of Cranford Substation

This water intrusion resulted in damage to and failure of equipment, protective apparatus for the equipment and the control houses within the substations, leaving part or all of the substations inoperable.

Recommendations regarding substations:

1. As part of the Board ordered investigation, a consultant will be employed to review the preparedness and response of the EDCs to the hurricane.

a. Utilize the consultant to determine how many substations in the EDCs were constructed at or below the 100 year flood plane level and within Riparian Zones as defined by NJDEP.
b. Utilize the consultant to determine what physical protection is in effect or was placed in effect for the event at each substation constructed at or below the 100 year flood plain i.e. flood walls, sand bags, etc. Determine the adequacy for these mitigation measures.

2. Based on the results of the consultant's investigation, the Board should instruct EDCs to review and develop plans to mitigate potential flooding of these substations (where deemed inadequate by the consultant) for future events. Consider the feasibility of mitigation by:
    a. switching to other sources
    b. deployment of mobile units
    c. construction of flood walls
    d. raising equipment
    e. relocation of facilities (understanding that this option is extreme and could require years to implement and result in significant costs)

   The review should include timeframes to implement the recommended measures and cost estimates for each scenario considered.

Vegetation Management:

Significant damage to the electrical infrastructure, as well as to private property, that occurred during Hurricane Irene, can be attributed to interference by trees and vegetation. More importantly, several lives were reported lost due to falling trees. In a typical storm event, trees falling or breaking can damage overhead electric facilities. This is usually due to (or a combination of) improper siting of vegetation by townships or property owners, lightning strikes, high winds, wet ground conditions and improper vegetation management by either the EDCs or the property owners. The extent of the damage is also dependent on the condition of the trees. Damages to electrical facilities can include; broken wires, phase-to-phase and phase-to-ground contacts, pulling up underground cables, knocking down utility poles, and damage to pole top and pad mounted transformers. If the circuit lines or services are broken, power cannot be fully restored until the wires and facilities are repaired or in certain instances replaced in their entirety. The extent of damage caused by vegetation for each EDC is listed below.

Tree related orders for each EDC as a result of Hurricane Irene:

Company	Tree related orders**
JCP&L	5,555
PSE&G	2,321
ACE	1463
RECO	263*

* RECO has 93 additional contacts that did not result in outages
note: These orders were either confirmed interruptions, trouble locations to the systems or orders worked by Forestry crews

Pursuant to N.J.A.C. 14:5-9, the EDCs must comply with established rules outlining the requirements for vegetation management of transmission and distribution facilities. The EDCs are required to perform vegetation maintenance on their transmission and distribution facilities (any facilities that operate at or above 600 volts) to allow safe, reliable and efficient operation. A vegetation management program includes ensuring access, proper electrical clearances and elimination of "danger" trees.

Recommendations regarding vegetation management:

1. In the interim, the Board should consider outreach to the municipalities discouraging the plantings, by both the Townships, developers and constituents, underneath or near electrical lines and circuits as well as placing structures or recreational areas in the easements and Right-of-Ways (ROW) for these facilities.
2. The Board should consider rule changes to N.J.A.C. 14:5-9 and/or legislation further restricting vegetation in the ROW and easements of transmission and distribution lines.
3. As part of the Board ordered investigation, a consultant will be employed to review the preparedness and response of the EDCs to the hurricane. The consultant should review the following:
    a. Determine/verify with the EDCs the extent of damage to the electrical facilities caused by trees and vegetation.
    b. Determine/verify with the EDCs the extent of property damage and personal injury caused by trees and vegetation.
    c. EDC vegetation management cycles to determine if they are in conformance with the current rules. This information should be available per N.J.A.C. 14:5-9.7, which requires that records of all vegetation management that the EDC performs is to be retained for no less than five years.
    d. Ensure that the EDCs have been performing the required annual public education program pertaining to vegetation management per N.J.A.C. 14:5-9.9.
    e. Review all vegetation related Hurricane Irene occurrences and develop plans to mitigate future interferences with an emphasis on the distribution systems and sub-transmission systems.

General:

There have been several audits initiated by the Board since 1997 that have investigated reliability and infrastructure items for the EDCs. In an effort to avoid lengthy and repetitive efforts, the continued investigation should be focused on the above issues or newly determined deficiencies. It should be noted, however, that if the investigation uncovers systemic problems within the system of an EDC, drastic or intensive changes to address major deficiencies would likely have significant costs which could be borne by the ratepayers.

Customer Communications

Effective communication in these weather related situations involves many elements, such as having reliable communications paths and maintaining a proper emergency plan for disseminating updated and accurate information to customers and the media. Use of media plays a part as well. It appeared that some of these processes failed in some measure during Hurricane Irene. Staff believes that there could have been much better preparation and execution of the utilities' communications obligations to manage and communicate vital information. In this new age of social media, staff believes that the utilities should utilize more social media outlets, i.e. Facebook and Twitter, to communicate with customers, especially during power outages.

As part of the Board's investigation, the Division of Customer Assistance through discovery and responses, performed a review of the utilities' communications with customers through their Call Centers. The following is a synopsis of Customer Assistance's staff investigation:

In the days following the August 27, 2011, Hurricane Irene event, the Division of Customer Assistance received numerous inquires and/or complaints from residents affected by the storm's damage. The Division of Customer Assistance tallied and reviewed its storm-related Call Center statistics following Hurricane Irene, Monday, August 29 through Friday, September 2, 2011. The results are as follows:

Total Calls Received:	3,851
Information Calls:	21
After-Hour Hotline Calls:	25
Email Inquiries:	383
Verbal & Written Complaints:	348

Note: The total includes calls unrelated to Hurricane Irene.

Many of the customers contacting the Division Call Center complained that they were given inaccurate information as to restoration and no explanation of why there were no work trucks in their particular area. Customers further complained that the utilities 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. The customers also expressed concern that the utility had no knowledge that their power was not restored and felt that the utility should have known.

Staff subsequently, by letter dated October 26, 2011, sent discovery requests to all of the EDCs. The responses to the discovery were made a part of Staff's review and are included in the following report of actions taken by the utilities in their call centers as a result of Hurricane Irene:

ACE

The Division of Customer Assistance received and processed 9 outage related ACE complaints from August 27, 2011 through August 31, 2011. According to information provided through discovery, on August, 25, 2011, prior to the arrival of Hurricane Irene, all ACE customers enrolled in the Emergency Medical Equipment Notification Program received an automated outbound telephone call warning that the hurricane could lead to extended, multiple-day outages. These customers were urged to make emergency arrangements ahead of time to prepare for extended outages due to Hurricane Irene.

On August 26, 2011, automated calls were made to all residential customers of ACE, including those enrolled in the Emergency Medical Equipment Notification Program, warning customers that the storm could cause wide-spread, multiple-day outages. Customers were encouraged to plan appropriately.

As indicated in discovery, the ACE Call Center received 115,316 total calls from August 27 to September 1, 2011. There were 89,460 outage related inquiries. The Call Center performance was monitored on a real-time basis throughout the event using the Call Management System to ensure that calls were being handled as effectively as possible. Regular Call Center staff was scheduled for extended shifts and Second Roles (cross trained staff from other departments) were also activated to supplement normal staffing levels. Second Role staff also worked extended shifts. In addition, ACE utilized resources from mutual assistance companies. The chart below provided by ACE indicates the number of Customer Representatives available to answer calls from August 27, 2011 to September 5, 2011.

	8/27	8/28	8/29	8/30	8/31	9/1
Staffing	238	229	251	257	255	177

JCP&L

The Division of Customer Assistance received and processed 139 JCP&L outage related complaints from August 27, 2011 through August 31, 2011. JCP&L, through discovery responses, reported that during Hurricane Irene its Contact Centers provided customers with information updates through three methods; Interactive Voice Response System (IVR), its website, and Customer Service Representatives. Communications were more general in nature at the beginning of the storm and became more specific as additional information became available during the restoration effort. The Director of the Customer Contact Centers is responsible for ensuring that the IVR is updated properly based on information provided by the regional dispatch offices. Customer Service Representatives were given the same information as was provided through the IVR and website.

As indicated in discovery, First Energy Contact Centers received 410,625 calls from August 27 to September 5, 2011, at an overall average speed of answer (ASA) of 25

seconds. The majority of the First Energy Contact Center calls were outage related. In addition, there were 4,300 police/fire calls. During a typical week the Company answers an average of 50,000 calls at an ASA of 60 seconds.

According to discovery, JCP&L's Call Center staffing normally consists of 400 to 500 Customer Representatives on a weekday and 24 Customer Representatives on a weekend. The chart below provided by JCP&L indicates the number of Customer Representatives available to answer calls from August 27, 2011 to September 5, 2011.

	8/27	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
Staffing	137	590	695	643	665	673	620	84	89	66

PSE&G

The Division of Customer Assistance received and processed 31 PSE&G outage related complaints from August 27, 2011 through August 31, 2011.

PSE&G's entire service territory was affected by Hurricane Irene with the initial effects of the storm impacting its Southern Division in the evening on Saturday, August 27, 2011. According to information provided through discovery responses, PSE&G's preparation activities between August 23rd and August 26th were as follows:

Tuesday, August 23rd

- Internal storm conference calls were to begin August 24th;
- Contacted Verizon to exchange contact numbers; and

Wednesday, August 24th

- 72 hour storm preparation list reviewed by the Divisions' and the General Office's personnel;
- Internal assignments of personnel started;

Thursday, August 25th

- Long range scheduling of personnel started; 2/3 days, 1/3 nights;

Friday, August 26th

PSE&G's storm outreach and communications plan was implemented and consisted of the following:

- Customers: ten email alerts were sent to nearly 40,000 businesses, 1,100 organizations and 600,000 customers. The company also leveraged social media, Twitter, Flickr and the PSEG Website, to communicate with customers.

- Company Associates: storm updates were communicated multiple times each day using "In Case You're Asked," Outlook Online, executive emails to associates, internal blogs in addition to physical handouts.

According to discovery, in addition to the existing Customer Service Centers, PSE&G deployed Mobile Customer Service Centers to allow customers with electric and gas services impacted by flooding to have face-to-face discussions with Company employees. More specifically, the Mobile Customer Service Centers were deployed as follows:

- On August 31, 2011, the first Mobile Customer Service Center (CSC) was established in Manville.
- By Thursday, September 1st, PSE&G had mobile CSC units deployed in Bound Brook, Manville, Pequannock, Pompton Lakes, Fairfield, and Wallington.
- By the Labor Day weekend, a total of twelve centers were open across the PSE&G service territory. Additional centers were opened in Little Falls, Saddle Brook, Paterson and three in Wayne. The centers had various hours of operation but they were typically staffed from 7:00 a.m. to 8:00 p.m.
- Each center was staffed by four PSE&G associates from various departments.
- The effort assisted nearly 2,500 customers.

According to discovery, PSE&G utilized the Varolii calling system to make approximately 71,000 calls to specific customers: 1,088 calls to customers whose electric service was disconnected due to flooding and 42,000 calls to customers who were asked to reduce their electric consumption if possible to aid in restoration efforts.

During the period from August 28th through September 1st, PSE&G's High Volume Call Answering (HVCA) process was active. This process allows high volume calls from the same municipality to be routed to an Interactive Voice Response where customers can listen to recorded messages or reach a Company representative if an emergency situation exists such as downed wires.

In addition, PSE&G utilized a contractor to contact over 43,000 customers concerning such issues as flooding and energy conservation. PSE&G also called almost 16,000 customers who had reported an individual "no light" call to verify the state of their electric service.

Pursuant to discovery, PSE&G provided the chart below detailing a statistical summary of call center activity from August 28, 2011 to September 4, 2011. Staffing level includes PSE&G agents as well as Emergency Response agents. ASA signifies the "average speed of answer" to incoming calls. SL% indicates the "service level percentage," and AR% stands for "abandoned rate percentage."

	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4
Staffing	243	398	419	348	340	243	96	34
Total Calls	400,172	160,637	56,197	37,612	35,463	28,975	11,483	6,440
ASA	15	50	141	45	91	139	416	420

HVCA	357,336	108,012	12,145	367	16	4	4	21
SL%	97.5%	92.4%	81.4%	70.9%	71.9%	71.7%	72.4%	71.9%
AR%	2.1%	3.5%	11.5%	14.7	5.6%	10.4%	28.9%	22.1%

RECO

The Division of Customer Assistance received and processed 5 RECO outage related complaints from August 27, 2011 through August 31, 2011.

Rockland indicated in discovery that prior to the storm event, Call Center management attended meetings with the Storm Director to discuss the forecast for the event and prepare staffing schedules. Throughout the event, Call Center management attended the Electric Operations Storm Director's morning and afternoon status meetings and provided updates to the Customer Service Representatives based upon information received. Information included the number and location of outages, number of available crews, the number of customers affected and global estimated restore times.

According to discovery, Call Center management worked with the Public Affairs department to prepare informational messages throughout the storm to be recorded and communicated to customers. The VRU message was updated with information regarding the declared state of emergency, the number of customers affected, the number of crews working, progress of the restoration effort, ice locations and distribution times, the availability of the Company's Internet and mobile applications for reporting outages, and public safety tips.

Rockland staffed its Customer Service Call Center by noon on Saturday, August 27th so that adequate resources would be on hand once the high volume of calls generated by the storm began. Rockland received approximately 200,000 calls from Saturday, August 27th through Friday, September 2nd. Rockland indicated that on a normal busy day the company receives approximately 3,500 calls, and approximately 800,000 customer calls per year, for comparison purposes. Rockland received 108,000 calls on Sunday August 28th averaging 12,000 calls per hour from 5 p.m. to 7 p.m. On Monday August 29th, Rockland received 55,000 customer calls.

Recommendation – Staff recommends that the consultant be given the task of reviewing the types of communications as well as the content of information relayed to customers during the hurricane and other severe weather related outages.

Past Order Summary

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. When necessary, internal Board Staff reports containing improvement recommendations have been generated and implementation subsequently ordered by the Board. At times, 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 Staff's review of previous Board Orders with respect to their application during Hurricane 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 and
6) PSE&G June 7-16, 2008 Equipment Failures/Storms.

A number of re-occurring themes permeate the reports and Orders, including the following:

- Communications with customers and emergency management officials
- Restoration Priorities
- Outage Assessment Methodology
- Well dependent and special needs customers
- Vegetation Management
- Supplemental crew acquisition
- Equipment Inspection and upgrades
- Employee Training

Utilities have integrated the recommendations from past investigations into their restoration process. However, because the impact of Hurricane Irene was unprecedented in New Jersey's history, it will require a review of the main areas to see if the recommendations put in place are scalable to an event of this magnitude or if new recommendations are needed to incorporate the lessons learned from this event. Clearly, some areas are known to be in need of improvement.

While the issues raised during this storm are some of the same addressed in previous orders, the scale of Hurricane Irene stressed the restoration and communications processes to a new level which warrants a closer look.

Recommendation – The Board's consultant shall analyze the recommendations from the Orders listed above and determine if recommendations and directives need to be updated to reflect the scope of Hurricane Irene.

October 29th Snow Storm

A severe snowstorm hit New Jersey unusually early in the season on Saturday afternoon, October 29th, 2011. The combined factor of having unusually heavy and wet snow along with most trees retaining foliage caused an extremely large number of downed tree limbs, branches, and power lines. As a result this storm caused more individual incidents of damage to New Jersey's electric infrastructure than Hurricane Irene, although the majority of the damage was concentrated in Northern New Jersey during this event.

Initial numbers are showing that statewide approximately 1,031,000 customers were impacted at some time. PSE&G had approximately 571,000 customers impacted from over 11,000 trouble locations. JCP&L had approximately 425,000 customers impacted from approximately 25,000 trouble locations. O&R had approximately 35,000 customers impacted from approximately 1,550 trouble locations. The peak reported for any single point in time for each company: PSE&G - 346,000 customers out, JCP&L - 272,000 customers out, and O&R - 28,000 customers out.

The damage caused by the October 29 snow storm was comparable in scale to the damage caused by Hurricane Irene. By far there was much more tree related damage caused by the October 29 Snow Storm; however, there was no flooding of substations. Communications and acquisition of supplemental repair crews was improved in comparison to Hurricane Irene. Prioritizing repairs for special needs customers and providing accurate ETRs continue to be a concern.

Prior to the October 29 snow storm staff had been working with JCP&L to address some of the communications issues from the Hurricane Irene restoration. This resulted in a preliminary communications plan that was initiated for the snow storm on October 31st. It included daily conference calls with municipal officials, increasing the number of personnel to communicate with municipal officials, use of electronic/social media and providing enhanced ETRs. While the communications plan addressed some of the prior issues, its implementation still needs work. For example, some local public officials still had difficulty reaching area managers for outage information, there were so many complaints regarding JCP&L's automated call back process that the Governor requested it be stopped and postings on JCP&L's website did not appear to provide an adequate level of detail.

The consultant will be reviewing this additional storm restoration profile as part of the review process and assessment of each of the four electric utilities.

Summary of Recommendations

This report creates a preliminary action plan for implementation of lessons learned which readily emerged in an after action review of responses to Hurricane Irene and, to a limited extent, to the October weather event. It also identifies areas warranting further review by staff with the assistance of a consultant which staff is in the process of retaining. Below is a summary of recommendations we are making at this time.

Communications

- The companies shall continue to provide a representative when requested to physically staff any activated county OEM at the OEM's request.

- The companies shall have the scalable capacity to handle the number of calls and requests required by county and local officials during any size event, even when addressing weather outages such as Hurricane Irene. The companies shall include scalable communications capabilities in their annual exercises.

- The companies shall use social media in addition to company websites when providing restoration updates to the public. The companies shall participate in discussions with Board staff to develop best practices and changes to their outage websites.

- The utilities shall meet with staff to discuss improvements that can be made to the process of creating more accurate and timely ETRs. The companies should develop plans to enhance their ability to provide local and more geographically targeted ETRs earlier in the restoration process. While some efforts to produce these are already underway, this area was identified as one which needs to be further investigation by our consultant.

- Review and revise customer call back scripts to better convey the messaging from the companies. While one company is already making certain protocol changes, this area has been cited for additional investigation by our consultant.

- JCP&L shall fully implement its Preliminary Communications Plan that has been under review with Board staff so that there is a full communications strategic plan in place for any subsequent severe weather events.

Supplemental Crew Acquisition

- The Board's consultant shall analyze actions with respect to crew acquisitions to identify procedural, economic or other issues surrounding timely crew acquisition by the electric utilities, and specifically focus on the process used by JCP&L.

Restoration Prioritization

- The utilities will work with staff to reevaluate how special needs customers are handled. Special needs customers shall be informed about the restoration process and be advised on how they should seek aid during a long duration outage. Special needs customers shall be identified to the extent practical and given a level of priority restoration based on the scale of the outage balanced against other restoration priorities.

- Well water dependent customers shall be identified and provided restoration information on a regular basis. Better communications with these customers needs to occur, as well as the EDCs providing an annual information packet with their bills that highlights steps that can be taken in a long duration outage.

- The utilities shall coordinate more closely with State and local crews working to clear roads and remove storm debris. This can be achieved through working with the State and county OEMs to form debris removal task forces including utility crews to quickly open major roadways early in the storm response effort.

Infrastructure Issues

<u>Recommendations regarding substations:</u>

1. As part of the Board ordered investigation, a consultant will be employed to review the preparedness and response of the EDCs to the hurricane.
    a. Utilize the consultant to determine how many substations in the EDCs were constructed at or below the 100 year flood plane level and within Riparian Zones as defined by NJDEP.
    b. Utilize the consultant to determine what physical protection is in effect or was placed in effect for the event at each substation constructed at or below the 100 year flood plain i.e. flood walls, sand bags, etc. Determine the adequacy for these mitigation measures.
2. Based on the results of the consultant's investigation, the Board should instruct EDCs to review and develop plans to mitigate potential flooding of these substations (where deemed inadequate by the consultant) for future events. Consider the feasibility of mitigation by:
    a. switching to other sources
    b. deployment of mobile units
    c. construction of flood walls
    d. raising equipment
    e. relocation of facilities (understanding that this option is extreme and could require years to implement and result in significant costs)

    The review should include a timeframe to implement and cost estimates for each scenario considered.

Recommendations regarding vegetation management:

1) In the interim, the Board should consider outreach to the New Jersey municipalities discouraging the plantings, by the Townships, developers and property oweners, underneath or near electrical lines and circuits as well as placing structures or recreational areas in the easements and ROWs for these facilities.
2) The Board should consider rule changes to N.J.A.C. 14:5-9 and/or legislation further restricting vegetation in the ROW and easements of transmission and distribution lines.
3) As part of the Board ordered investigation, a consultant will be employed to review the preparedness and response of the EDCs to the hurricane. The consultant should review the following:
    a. Determine/verify with the EDCs the extent of damage to the electrical facilities caused by trees and vegetation.
    b. Determine/verify with the EDCs the extent of property damage and personal injury caused by trees and vegetation.
    c. EDC vegetation management cycles to determine if they are in conformance with the current rules. This information should be available per N.J.A.C. 14:5-9.7, which requires that records of all vegetation management that the EDC performs is to be retained for no less than five years.
    d. Ensure that the EDCs have been performing the required annual public education program pertaining to vegetation management as required by N.J.A.C. 14:5-9.9.
    e. Review all vegetation related Hurricane Irene occurrences and develop plans to mitigate future interferences with an emphasis on the distribution systems and sub-transmission systems.

There have been several audits initiated by the Board since 1997 that have investigated reliability and infrastructure items for the EDCs. In an effort to avoid lengthy and repetitive efforts, the continued investigation should be focused on the above issues or newly determined deficiencies. It should be noted, however, that if the investigation uncovers systemic problems within the system of an EDC, drastic or intensive changes to address major deficiencies would likely have significant costs which could be borne by the rate payers.

Customer Communications

- The consultant shall be given the task of reviewing the types of communications as well as the content of information relayed to customers during the Hurricane and all weather-related outages.

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- The Board's consultant shall analyze the recommendations from the Orders listed above and determine if recommendations and directives need to be updated to reflect the scope of Hurricane Irene.