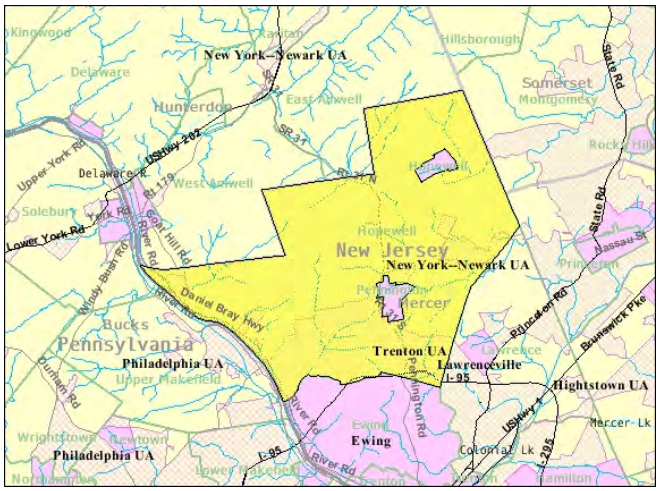
Final Report



ENGINEERING REPORT FOR HOPEWELL TOWNSHIP POWER OUTAGES

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Report on Hopewell Power Outages & Restoration
Due to Hurricane Sandy
Concord Engineering Group
October 4, 2013

Purpose

Hopewell Township on behalf of its residents engaged Concord Engineering Group to review the power restoration effort of JCP&L in Hopewell Township as a result of Hurricane Sandy and other related storms within the 2011 to 2013 time period. Concord Engineering was directed by Mr. Paul Pogorzelski, PE, Hopewell NJ Township Administrator/Engineer to review with several of the homeowners their personal experiences during the outage events and determine if there were any technical or engineering reasons why JCP&L was not able to restore service at each of the homeowner's locations in a shorter duration.

Selected Homeowners:

In order to obtain a general synopsis of information of the overall JCP&L service area within the township, Concord interviewed three homeowners in different sections of the township. The homeowners interviewed were:

1. Mr. Blair Miller, 1 Fox Run Drive, Pennington, NJ
2. Mr. Marty Nally, 250 Pleasant Valley Road, Hopewell Township, NJ
3. Mr. Edward Hoag, 12 Fabrow Drive, Hopewell Township, NJ

The locations of these homeowners within the JCP&L service territory in Hopewell Township is shown on Attachment 1. The three locations chosen for investigation were in areas represented by the largest number of complaints received by Hopewell Township about the power outages during the recent storms.

Observations:

1 Fox Run Drive –

The property at Fox Run drive is served by JCP&L via an outdoor pad mounted transformer located on Fox Run Drive. The transformer is fed from an underground radial distribution feeder from a single phase service tap of the JCP&L overhead distribution system. The tap is located on a pole at the corner of Marshal Corner-Woodsville Road and Fox Run Drive. The JCP&L distribution system feeding residential customers in Hopewell Township utilizes a 12,470 volt single phase two wire system with all residential transformers connected on a phase to phase connection to provide 240/120volts single phase to the customer's service entrance meter. The pad mounted distribution transformer is of a typical design and installation for residential customers utilized almost everywhere in the US for underground service to residential properties. On inspection there appeared to be no abnormalities in the installation of the pad mounted transformer, service to the residence or the JCP&L pole feeding the residential subdivision. The single phase 12.47 kV pole line service feeding the underground cable feeders to Fox Run Drive

also does not show any abnormalities in the service pole design or connection to the underground cable. Because the radial feed terminates at the Fox Run Drive underground cable connection, JCP&L has installed a boosting regulating transformer at the point of the connection to provide voltage control for the circuit.

Refer to pictures of the service equipment and pole in Attachment 2.

250 Pleasant Valley Road –

The property at 250 Pleasant Valley Road is served by JCP&L via an outdoor overhead aerial service drop from a service pole on Pleasant Valley Road. The service drop is fed from a pole mounted transformer fed from a single phase service tap of the JCP&L overhead distribution system also routed on the same poles along Pleasant Valley Road. The tap is located on a pole opposite the home at 250 Pleasant Valley Road. The JCP&L distribution system feeding residential customers in Hopewell Township utilizes a 12,470 volt single phase two wire system with all residential transformers connected on a phase to phase connection to provide 240/120volts single phase to the customer's service entrance meter. The pole mounted distribution transformer is of a typical design and installation for residential customers utilized by JCP&L for overhead service to residential properties. On inspection there appeared to be no abnormalities in the installation of the pole mounted transformer, overhead service drop to the residence or the JCP&L 12.47kV pole line feeding other homes along Pleasant Valley Road.

Refer to pictures of the service equipment and pole in Attachment 3.

12 Fabrow Drive

The property at 12 Fabrow Drive is served by JCP&L via an outdoor overhead aerial service drop from a service pole on Fabrow Drive. The service drop is fed from a pole mounted transformer fed from a single phase service tap of the JCP&L overhead distribution system also routed on the same poles along Fabrow Drive. The tap is located on a pole opposite the home at 12 Fabrow Drive. The JCP&L distribution system feeding residential customers in Hopewell Township utilizes a 12,470 volt single phase two wire system with all residential transformers connected on a phase to phase connection to provide 240/120volts single phase to the customer's service entrance meter. The pole mounted distribution transformer is of a typical design and installation for residential customers utilized by JCP&L for overhead service to residential properties. On inspection there appeared to be no abnormalities in the installation of the pole mounted transformer, overhead service drop to the residence or the JCP&L pole line feeding other homes along Fabrow Drive.

Refer to pictures of the service equipment and pole in Attachment 4.

Concord Engineering in the course of inspection of the three properties noted above also visited other areas of the township including JCP&L Moore Substation on Pleasant Valley Road near Route 29 and Rocktown Substation on Rocktown-Lambertville Road. In all areas of the township visited, Concord observed standard pole line designs commonly found in more populated areas as well as those found in more rural residential areas. The type of pole line

design used for a particular area is based on the electrical loading of the circuit required for the distribution of the electricity to the customers. For most residential areas of Hopewell Township where there is a limited industrial loading, the pole lines are single phase design. The design and materials used in the pole lines are defined and regulated by the National Electrical Safety Code (American National Standard C2). The C2 code is used throughout the United States by all utilities for ensuring proper design and application of the equipment used for the pole lines. While this standard governs the quality and materials of the pole lines themselves, it does not dictate the electrical characteristics of the distribution circuits. The electrical design is by the local utility. In JCP&L's case they use a two wire single phase approach for residential distribution based on 12,470 volts phase to phase. PSE&G, the other local utility in Hopewell Township uses 13,200 volts phase-to-phase, however their electrical design for residential distribution is based on a single wire phase-to-ground design. It is because of these differences in the design and voltages that the two systems cannot be interconnected together.

For most of the Hopewell Township residential distribution that is served by JCP&L, the 12,470 volt power is derived from two of three local substations. These substations; Moore Substation and Rocktown Substation are fed from 34.5kV sub-transmission feeders. The 34.5 kV is known as a sub-transmission voltage as it is most often delivered to local substations using the same distribution type pole lines that carry the 12,470 volt power. Sub-transmission power differs from regular transmission level power in that transmission level power (usually above 69kV) is distributed on towers or poles that are in specific right-of-way areas (not along roadways) that have no trees or other obstructions that would contribute to a loss of power during a storm. Because the JCP&L substations are fed from 34.5kV, they were subject to damage and outages similar to the distribution pole lines that were damaged during the recent storms.

<u>Discussions with Homeowners:</u>

1 Fox Run Drive –

Concord met with Mr. Blair Miller, homeowner at 1 Fox Run Drive on September 13, 2013 to discuss the outage concerns from Hurricane Sandy in 2012. Mr. Miller noted that the outage at his home was for an extended period of time (over 10 days) until power was restored by JCP&L. Mr. Miller noted that adjacent neighbors that live close to his home, but are served by PSE&G also experienced a lengthy outage, but were returned to normal service in a much shorter time period than his area. In general he noted that over the last two years, the area served by JCP&L near his home had experienced four significant outages and that in each case, the PSE&G served homes were returned to service in a shorter period of time. Concord inquired as to what type of notification he received either during the outages or after from JCP&L about the outage cause or when he could expect to have power returned. Mr. Miller indicated that he did not receive any notification either during the outages or afterwards from JCP&L concerning the loss of power.

Mr. Miller asked why his home could not be connected even temporarily to the PSE&G system. Concord explained that PSE&G uses a different distribution system philosophy for residential customers (phase to ground connection on the step down transformers in lieu of the phase to phase connection used by JCP&L) and that PSE&G operates their system at a different voltage (13200 volts) and therefore the two systems could not be connected together even for a short

time to provide power to outage affected areas. Mr. Miller was not aware of these technical reasons for not being able to interconnect the systems.

250 Pleasant Valley Road-

Concord met with Mr. Marty Nally, homeowner at 250 Pleasant Valley Road also on September 13, 2013 to discuss the outage concerns from Hurricane Sandy in 2012. Mr. Nally also noted that the outage at his home was for an extended period of time (also over 10 days) until power was restored by JCP&L. Concord inquired as to what type of notification he received either during the outages or after from JCP&L about the outage cause or when he could expect to have power returned. Mr. Nally also noted that he did not receive any notification either during the outage or afterwards from JCP&L. Mr. Nally also noted that a pole in the line that serves Pleasant Valley Road from the JCP&L substation (Moore substation) had significant damage during the hurricane and realized that until that pole was repaired or replaced, that he would not receive a return to normal service. Mr. Nally also noted that he has a portable generating unit which he used to maintain his home as best that he could during the outage period. Mr. Nally's understanding of why he was subjected to the long outage was due to the extent of the damage from the hurricane to the JCP&L facilities including pole line damage and substation damage. His major complaint about the process was the lack of communication on the part of JCP&L to the homeowners. He particularly noted that he has not received to date any written explanation from JCP&L as to the reasons for the outage extent or delays in returning his home to normal service. Mr. Nally noted that his expectation and hope for the future was to have better communications from the utility during long outage periods.

12 Fabrow Drive

Concord met with Mr. Edward Hoag, homeowner at 12 Fabrow Drive in the afternoon of September 13, 2013 to discuss the outage concerns from Hurricane Sandy in 2012. Mr. Hoag noted that the outage at his home was for an extended period of time (also over 10 days) until power was restored by JCP&L. Mr. Hoag noted that JCP&L serves only a portion of the homes in his residential development, and that houses further east of his home are served by PSE&G. Mr. Hoag noted that the PSE&G services were restored in a much shorter duration that the services of JCP&L. Mr. Hoag was aware of the significant damage that occurred to the pole lines surrounding the Rocktown and Moore Substations of JCP&L and understood that the damages to the lines feeding these substations caused the lengthy outage to his area of their territory. Concord inquired as to what type of notifications he may have received either during the outage or afterwards from JCP&L about the outage causes or when he could expect to have power returned. Mr. Hoag noted that he did not receive any notification either during the outage or afterwards from JCP&L. Mr. Hoag's major complaint about the process was the lack of communication on the part of JCP&L to the homeowners. Mr. Hoag voiced similar concerns as those of Mr. Nally in that he hoped that in the future better communications from the utility would be forthcoming.

Meeting with JCP&L:

Concord Engineering met with Mr. John Anderson, Area Manager for JCP&L in the JCP&L Flemington NJ regional offices on October 2, 2013. Concord Engineering discussed the purpose of the meeting and inquired about the following:

JCP&L's level of communications with homeowners about the outages
JCP&L's maintenance procedures
JCP&L's plans for improvements to the regional distribution system

In response, Mr. Anderson noted that JCP&L did provide a response to the homeowners in the form of a bill insert about the storm damage restoration efforts. Concord inquired if JCP&L sent a separate letter to every customer with an explanation of their outage restoration efforts. JCP&L responded that they did not send a specific separate letter to the homeowners, but would consider it for the future. A copy of the bill insert explaining the Sandy outage restoration effort by JCP&L is attached to this report as Attachment #5.

Mr. Anderson noted that JCP&L in 2013 has taken a number of additional steps to improve communications with their customer's in the future about storm outages. They have initiated a new website on-line that details the cause of the power interruption and an estimate of the time when restoration will be completed. Customers can view the specific information on their area of the power distribution grid to determine outage levels and expected restoration times. Additionally, JCP&L has added other on-line tools that customers may use to improve communications including email, phone applications and alerts, and text messaging services.

JCP&L noted that their standard maintenance procedures in place for Hopewell Township and other areas of their service territory include a system of customer outage reports that result in a corresponding development of a field repair procedure. Mr. Anderson noted that JCP&L has made recent improvements to their system by installing common communications tools in all of their line tucks, where each line crew assigned to a specific repair order has a lap-top computer in the line truck with current mapping software to provide the exact pole identification or outage location that requires maintenance or repair. Previously, crews not familiar with certain service areas required longer time periods to identify the exact location of the problem before outage repair work could begin. The new system installed in 2013 reduces the repair time periods by provide specific mapping and location information.

JCP&L noted that these improvements in their maintenance systems/procedures have made a difference in their response & repair times. For Hopewell Township, the <u>average time for restoration</u> has improved as follows:

2011 – 282 minutes
2012 – 207 minutes
2013 – 160 minutes

Similarly, JCP&L noted that the <u>average time of outage frequency/duration</u> for Hopewell

Township has dropped as follows:

2011 – 643 minutes
2012 – 184 minutes
2013 – 78 minutes

The most significant aspect of the Sandy outage was loss of two of the main substations in the Hopewell Township area that feed the 12.47kV distribution circuits to the customers. These two substations, Rocktown and Moore are fed by 34.5kV lines (Y727 and J712 from Flemington Substation). The 34.5kV lines are sub-transmission level lines. These lines are generally run on poles that may or may not be in right-of ways and are usually routed along public highways either on dedicated pole lines or as an overbuild above the normal 12.47kV power distribution. During the Sandy hurricane event a significant number of these 34.5kV poles were lost due to tree and wind damage. As a result both Rocktown and Moore substations were lost for a significant period of time and the length of the outage for many customers in Hopewell Township was significantly longer due to the time it took to restore these pole lines feeding the substations.

JCP&L informed Concord that they have in place a planned project to improve the power sources to Rocktown Substation and subsequently Moore Substation. The "Rocktown Substation Expansion" project will provide a 230kV source to the Rocktown substation from the regional 230kV system in Flemington. This expansion presently under approval request to the DEP is scheduled for an in-service date December of 2014. This expansion will greatly improve the reliability of the Rocktown substation and the service feeding Hopewell Township and others areas of Northern Mercer County and Southern Hunterdon County. The 230kV system is all in right of ways and is generally constructed on steel towers or poles and is not subject to tree or wind damage. The result should provide improved service to Hopewell Township customers and further reduce the outage events and durations due to storms.

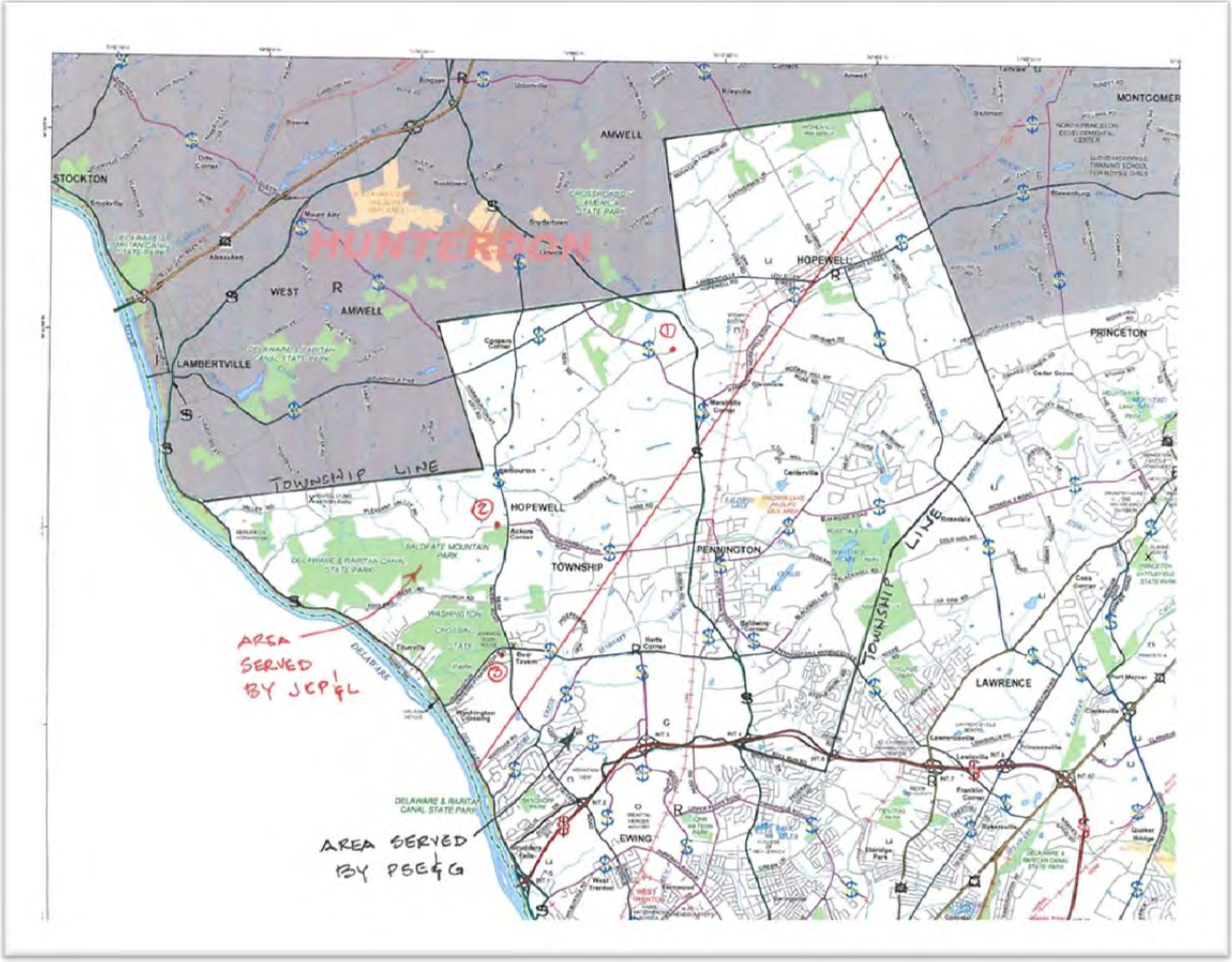
Summary and Recommendations

Concord Engineering Group has reviewed from a technical viewpoint the general service conditions in the township including a review of three specific locations where complaints were received from local homeowners about the JCP&L service. Concord did not find a sub-standard installation at any of the locations observed, and no sub-standard overhead distribution was observed anywhere in the township. JCP&L is providing acceptable and expected normal power services to all customers in the Township in accordance with the BPU rules and regulations and within the expected ANSI C2 service requirements for overhead and underground distribution.

Concord met with JCP&L to obtain information on their path forward to improve the service record of repairs and outages in Hopewell Township. JCP&L informed Concord that additional specific improvements to the existing 34.5 kV distribution system are planned for the 12.47kV services to Hopewell and that in the future loss of these services should be reduced because of the planned improvements.

Concord recommends that Hopewell Township continues to monitor the specific JCP&L planned

improvements to ensure that the dates for the improvements and upgrades to the Rocktown substation are not delayed and that the funding is in place to carry out the work. After this upgrade is completed, there should be significant improvement in the event of another major storm to the restoration period duration due to the increased reliability of the service to the major substations feeding Hopewell Township.



Attachment #1 – Map of JCP&L & PSE&G Areas Served in Hopewell Township, NJ

Note – Areas north of red line is JCP&L territory, south is PSE&G

Location 1 - 1 Fox Run Road

Location 2 - 250 Pleasant Valley Road

Location 3 - 12 Fabrow Drive

Underground Service Transformer Feeding 1 Fox Run Road

Underground Feeder Service tap at Marshall Corner Woodsville Road & Fox Run Road

Service Pole information for tap to o12.47kV underground feeder to Fox Run Road

Overhead feed to Fox Run Road tap pole at opposite corner of Marshall Corner Woodsville Road

Secondary service transformer on pole on south side of 250 Pleasant Valley Road

Transformer Detail on service pole at 250 Pleasant Valley Road

Pole at north side of 250 Pleasant Valley Road with secondary service at top of pole.

Pole identification with service transformer for secondary overhead service to 250 Pleasant Valley Road

Service transformer on pole on south side of Fabrow Drive

Pole identification for service transformer pole at 12 Fabrow Drive

Detail of pole feeding secondary service to 12 Fabrow Drive

We'd like to thank our customers

for their patience and understanding during the massive effort to restore service following Hurricane Sandy and the nor'easter.

The storms caused more damage than 2011's Hurricane Irene and October snowstorm combined. And the resulting 1.3 million power outages throughout our New Jersey service area led to the largest restoration effort in our company's history.

We understand the frustration of those of you who were without power. We can assure you that, despite facing similar hardships, our employees were totally focused on the restoration effort and remain dedicated to providing you with the level of reliability you expect and deserve.

More than 8,600 line workers – including crews from JCP&L and other utilities and contractors across the country – were on the ground in New Jersey restoring power to our customers.

There's always room for improvement, and we intend to use the lessons learned from this effort. For example, we're looking at opportunities to make our system more resistant to storm damage – especially as we move forward with the major reconstruction effort that will be required to bring back service to some coastal areas and the barrier islands.

We were inspired by the many ways our customers came together to help one another throughout this difficult crisis – from sharing your homes with neighbors in need, to your selfless contributions to disaster relief efforts.

Times like these demand the best from everyone, and your sense of community helped all of us weather the storm.

Homeowners, renters, and business owners who suffered disaster-related damage or loss in New Jersey as a result of Hurricane Sandy should register with the Federal Emergency Management Agency (FEMA). Online registration is available at www.DisasterAssistance.gov. Smartphone users may register at m.fema.gov; click on "Apply Online for FEMA Assistance." To register by phone, call toll-free at **800-621-FEMA (3362)**. Those with a speech disability or hearing loss, who use TTY, may call **800-462-7585**; or use 711 or Video Relay Service (VRS) to call **800-621-3362**.

Attachment #5