

State of New Jersey

New Jersey Board of Public Utilities



**Review and Assessment of Electric Utility
Performance**

August 4, 2020 Tropical Storm Isaias Weather Event

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Contents

Executive Summary _____ **1**

1 Weather Event and Storm Impact _____ **7**

2 Pre-Storm Preparations: Weather Forecasting and Resource Acquisition ____ **9**

2.1 ACE _____ **9**

2.2 JCP&L _____ **9**

2.3 PSE&G _____ **10**

2.4 RECO _____ **11**

2.5 Assessment of Utility Performance _____ **11**

3 Communication and Outreach _____ **13**

3.1 Pre-Storm Notification and Customer Outreach _____ **13**

 3.1.1 ACE13

 3.1.2 JCP&L13

 3.1.3 PSE&G14

 3.1.4 RECO15

3.2 Estimated Time of Restoration Notifications _____ **15**

 3.2.1 ACE16

 3.2.2 JCP&L16

 3.2.3 PSE&G16

 3.2.4 RECO16

3.3 Customer Call Center Operation _____ **17**

 3.3.1 ACE17

 3.3.2 JCP&L17

 3.3.3 PSE&G17

 3.3.4 RECO18

3.4 Communication with Local Officials and the BPU _____ **18**

3.5 Assessment of Utility Performance _____ **18**

4 Restoration of Service _____ **21**

4.1 Storm Impact on Utility Infrastructure _____ **21**

 4.1.1 ACE21

 4.1.2 JCP&L21

 4.1.3 PSE&G22

 4.1.4 RECO23

4.2 Damage Assessment Process and Restoration Priorities _____ **23**

4.3	Workforce Deployment and Span of Control	25
4.3.1	ACE	25
4.3.2	JCP&L	25
4.3.3	PSE&G	26
4.3.4	RECO	26
4.4	Outage Response and Restoration Timeline	27
4.4.1	ACE	27
4.4.2	JCP&L	27
4.4.3	PSE&G	28
4.4.4	RECO	29
4.5	Restoration Issues: COVID – 19 Considerations	30
4.6	<i>Assessment of Utility Performance</i>	30
5	<i>Utility Infrastructure Hardening and Resilience</i> _____	32
6	<i>Compliance with Prior Board Orders and Directives</i> _____	33
7	<i>Conclusion and Recommendations</i> _____	34

Executive Summary

On August 4, 2020, New Jersey was struck by Tropical Storm Isaias (“Isaias”), a major weather event with destructive wind gusts that disrupted electric utility service to over 1.3 million customers at its peak and impacted approximately 1.6 million customers overall within the State. Isaias formed into a tropical storm near the Bahamas on July 30, 2020 and strengthened to a Category 1 Hurricane on July 31, 2020. Isaias reached a peak intensity of 85 mph winds before changing back to a tropical storm as it made landfall along the North Carolina coast on August 3, 2020.

On Tuesday morning, August 4, 2020, Isaias reached New Jersey in the form of heavy rain followed by strong, persistent winds. Western areas of the State received the heaviest rainfall as its center clipped western Warren County before heading into New York. Rainfall was heaviest in Salem County, reaching a high of 7.86 inches. Statewide, Isaias’ winds were the strongest since Superstorm Sandy in 2012, toppling countless trees that brought down power lines, blocked roads and caused widespread damage to buildings and vehicles. Eight weather stations in New Jersey recorded wind gusts of 60 to 69 mph with one station in Cumberland County recording wind gusts of 71 mph.

Isaias’ impact on New Jersey was especially devastating due to its unusual track as it reached the State. As the storm moved into New Jersey in a northerly direction, it veered inland towards the western part of the State exposing most of New Jersey to the storm’s right front quadrant where its winds were strongest. Multiple tornadoes were also observed as Isaias moved up the East Coast. Two tornadoes formed in New Jersey, with the first in Upper Township and the second in Manahawkin Bay between Ship Bottom and Brant Beach.

All of New Jersey’s 21 counties and each of the State’s four electric distribution companies (EDCs) experienced power outages with the most damage seen in Monmouth, Morris and Union counties. As is characteristic of high wind/high precipitation events in the State, the electric overhead infrastructure sustained thousands of tree impacts, which in turn caused power disruptions and extended restoration times. The EDCs acquired and deployed over 13,000 utility workers and support personnel in response to this weather event.

Over 70 percent of utility customers had their service restored within 72 hours (by August 7, 2020), and full restoration of service to all customers impacted by Isaias was virtually completed on the evening of August 11, 2020, approximately seven days from the time the storm left the State.

Given the magnitude of the damage and severity of the storm, Governor Murphy and Board of Public Utilities’ (“Board” or BPU) President Fiordaliso directed Board Staff (“Staff”) to initiate a review of actions and activities undertaken by each EDC before, during, and after the weather event. The purpose of this review is to identify areas for improvement so that the impacts of future storms are minimized and restorations are conducted with the utmost efficiency and effectiveness. Staff reviewed Major Event Reports (MERs), Emergency Management Plans, and other documentation provided to the Board by the EDCs.

Staff also considered its direct experience with the electric utility sector while engaged with the weather event, and evaluated comments and complaints submitted by customers and elected officials. Last, Staff examined each EDC's performance for compliance with requirements and directives issued by the Board following Hurricane Irene, Superstorm Sandy and the March 2018 nor'easters.

For a damaging weather event which caused well over one million outages, in a COVID-19 pandemic environment, the **overall restoration of electric utility service was reasonable** in Staff's view. The weather event was closely tracked, mutual assistance acquisitions and deployments were prompt and effective, and the pace of restoration was reasonable given the damage. The one exception was Rockland Electric Company's (RECO) slow pace, and that is addressed in Section 4.6 of this report.

With respect to **communication** with customers and maturing Estimated Times of Restoration (ETRs), **more improvement is needed**. All decision making is based on information, and customers and elected officials need better information in order to make the right choices for their families, businesses and community when faced with a power outage. This was an area of concern during this storm event, especially in the Jersey Central Power & Light (JCP&L) territory. This report strongly recommends that JCP&L improve their communications protocols, particularly with regard to direct communications with customers about ETRs.

Staff has worked with the utilities on **COVID-19 protocols** over the past six months. In response to the pandemic, the EDCs updated their Emergency Operations Plans (EOPs) and developed guidelines and protocols for working in a COVID-19 environment when participating in mutual assistance. As part of the pandemic protocols during the restoration process, the EDCs designated COVID-19 testing sites for utility workers and virtual staffing of county Offices of Emergency Management (OEMs). For workers not able to work remotely, additional hygiene and social distancing measures were implemented by the EDCs. The pandemic also presented communication challenges by preventing some of the normal person-to-person, on-site exchanges that typically occur during large scale disasters. For instance, EDCs needed to "virtualize" deployment to county OEMs and other interactions with local entities. Overall, the utilities managed the COVID-19 element of the restoration process surprisingly well and should be credited with exceptional planning in this regard.

With regard to **utility resilience projects**, Staff notes that in response to the widespread damage caused by Hurricane Irene and Superstorm Sandy, on March 20, 2013, the Board issued an Order initiating a generic proceeding to investigate possible avenues to support and protect the State's utility infrastructure so it can better withstand the effects of major weather events. In 2014, Public Service Electric & Gas (PSE&G) received approval for its Energy Strong Program that included investment of over \$600 million in electric infrastructure upgrades, of which \$400 million was related to a flood mitigation program for substations. Since Superstorm Sandy, PSE&G and other electric utilities have subsequently filed for and were approved for infrastructure hardening projects in all totaling over \$1.5 billion.

To further encourage investment in utility infrastructure, in 2017, the Board adopted Infrastructure Investment Program (IIP) rules to allow a utility to construct, install, or remediate utility plant and facilities related to reliability, resiliency, and/or safety and recover costs on an

accelerated basis. The effectiveness of recent EDC hardening and resilience projects is difficult to measure without sufficient evaluation time, even in the context of a weather event. However, it appears the post-Sandy completed projects experienced less damage than older more vulnerable overhead infrastructure. PSE&G, for example, indicated that its 69kV system upgrade, which was constructed after Superstorm Sandy, experienced very little damage. Similarly, RECO's 2017 selective undergrounding project consisting of 3.4 miles of underground feeder in Ringwood was also unaffected by the storm.

Given the amount of investment in recent years on infrastructure upgrades, Staff is making a recommendation to evaluate the **weather resilience value of Board approved infrastructure hardening projects** as related to mitigation of damage from major weather events. Staff makes a recommendation to initiate collection and analysis of the data to support this review.

Some experience was gained concerning the use of **Advanced Metering Infrastructure (AMI)**. RECO has deployed AMI technology and demonstrated a capability to communicate with customer meters and gain situational awareness about outage status. Atlantic City Electric (ACE) too offered some limited experience through its affiliated Exelon companies, Commonwealth Edison Company ("ComEd") and Delmarva Power and Light Company ("Delmarva"), which is promising in the context of discerning customer outages. JCP&L, PSE&G and ACE have all filed AMI plans with the BPU and they are under evaluation.

It is Staff's position that the electric utility sector has been responsive to the Board's ongoing reviews, recommendations and particularly its Orders. For the most part, the sector has become more transparent with the measures it is taking, and has implemented the actions as the Board has directed.

Moreover, the **Board has been driving improvement** from several directions: EDC preparedness actions, restoration actions, communications, and infrastructure resilience. While all utility ratepayer costs are scrutinized routinely, the Board has made it clear that legitimate expenditures for weather preparedness and response, including mutual assistance efforts, are acceptable expenditures. We need the EDCs to lean forward on acquisition of resources in response to these disasters and that was apparent during this weather event. The exception to this was RECO; its mutual assistance efforts are coordinated by Orange & Rockland Utilities in New York (ORU) through Con Edison. Staff points to a slower mutual assistance effort for RECO and a restoration rate that must improve, as it is out of sync with the electric utility sector in New Jersey. A recommendation is made to address this disparity in Section 7 of this report.

Trees continue to be the primary cause of outages during major weather events, and elongate the outage restoration process. Staff is recommending more aggressive vegetation management. Until and unless we reckon with the relationship between severe weather and widespread tree-related damage to utility infrastructure, large scale outages, especially in heavily forested areas of the State will continue to occur.

While it is our general conclusion that the EDCs have demonstrated compliance with the Board Orders and directives, there are still areas of performance where improvement is both warranted and achievable in Staff's view.

The key areas of improvement Staff's report focuses on are:

- EDC communication and outreach with customers and public officials
- State-wide deployment of AMI to identify outages and reduce outage response time
- Enhanced vegetation management in targeted areas
- Tracking and valuing infrastructure hardening and resilience projects
- Reports and other metrics

Recommendations by Staff are summarized below:

EDC communication and outreach with customers and public officials

- Staff recommends the Board direct the EDCs improve the ETRs automatically generated by their Outage Management System (OMS), and in particular, to test the OMS under stressed conditions. Staff recommends that each utility file a plan to improve the accuracy of the ETRs, in order to provide more reliable information for elected officials and customers.
- Staff recommends the Board direct the EDCs to update the content of the automated outgoing ETR messages and add a customer response option for customers who are unaware of the status of their power at their residence.
- Staff recommends the Board direct all EDCs to provide a plan to improve the management of peak Call Center volume during major outage events. The plan should be completed within 60 days and include standardized information such as number of calls per hour, number of calls answered, call drops, and other metrics as requested.
- Staff recommends the Board direct JCP&L to survey its customers to determine whether the level of dissatisfaction warrants changing the method of distribution of water and ice. The survey should be completed within 90 days and the results should be shared with the BPU within 60 days after the completion of the survey with a plan to make improvements following within 60 days after the results are submitted.
- Staff recommends the Board direct the EDCs to develop a plan that proactively educates customers and elected officials on the restoration process. The plan should address how customers and elected officials will be informed while restoration is ongoing. This plan shall be submitted within 60 days.
- Staff recommends the Board direct JCP&L to establish a process of communicating with elected officials and providing situational awareness about real time restoration activity in their community. This process should include, but not be limited to:
 - Major restoration work
 - Any staging area activity
 - Concerns regarding critical community needs
 - Road closure issues

- Staff recommends the Board direct EDCs to update contact information for municipalities and elected officials on a quarterly basis to ensure that updates and notices are reaching the correct contacts.

State-wide deployment of AMI to identify outages and reduce outage response time

- As part of the investigation of the EDCs' response to the March 2018 nor'easters, Staff recommended that the EDCs submit feasibility studies for AMI, including a detailed cost-benefit analysis that focused on AMI's capabilities to effect timely restoration following major weather events. Those plans were submitted in 2019. In addition to the studies submitted by the EDCs, recently, the EDCs also submitted AMI implementation plans for BPU consideration. In this report, Staff recommends that the Board, in its review of the recently filed AMI plans, continue to consider AMI's potential in reducing the length of prolonged customer outages following a major weather event.

Enhanced vegetation management in targeted areas

- Staff's 2018 investigation of the March nor'easters also made two recommendations to the Board to address tree-related damage. The recommendations included revisiting the current vegetation management rules and new legislation designed to allow EDCs more flexibility in their ability to trim off right-of-way (ROW) trees. Staff recommends the Board continue its stakeholder process to update the 2015 vegetation management rules to include reporting of indices specific to tree-related outages and major events, with a focus on circuits heavily damaged by trees. Circuits with disproportionately high indices of tree-related damage and outages should be targeted for enhanced vegetation management to address off-ROW hazard and danger trees.
- The Board should consider evaluating potential legislative solutions to address the EDCs' rights to perform trimming or removal of off-ROW "hazard trees" where they threaten overhead facilities. Additionally, permission for the trimming or removal of off-ROW "danger trees" should be limited to the property owner and the EDC performing the work.

Tracking and valuing infrastructure hardening and resilience projects

- Staff recommends the Board direct utilities to routinely evaluate the resiliency impact of storm hardening projects as part of the MERs.
- Staff recommends the Board direct each of the EDCs to evaluate their five worst performing circuits or other metric to determine whether portions of the circuits would be candidates for undergrounding. The EDCs should submit a cost/benefit analysis within 90 days to the BPU.

Reports and other metrics

- Staff recommends the Board direct RECO, for any major event that affects the company's service territory in New York and New Jersey, to have an average daily restoration rate in New Jersey that is approximately equal to the average daily

restoration rate for the New York territory. The Board should reserve the right to take additional action on this subject.

- Staff recommends the Board direct RECO to document and provide for all major events, a complete breakdown of all equipment damage that occurred specifically in New Jersey (poles, transformers, cross arms, switch disconnects, feet of primary wire, feet of secondary wire, fuse cutouts, etc.) in the company's MERs.

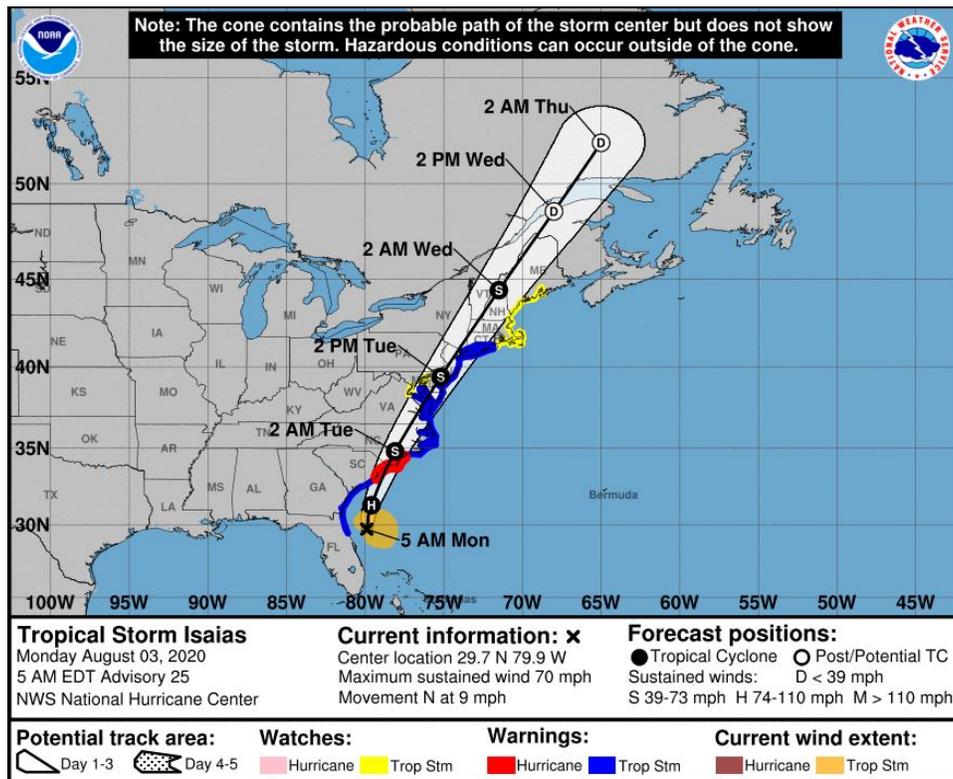
In the full report that follows, Staff analyzed:

- Pre-Storm Preparations
- Customer Communication/ ETRs
- Vegetation Management
- Storm Impact on Utility Infrastructure
- Workforce Deployment
- Outage Response and Restoration Timelines
- Utility Hardening and Resilience
- Compliance with Prior Orders
- Advanced Metering Infrastructure
- Pandemic Challenges

1 Weather Event and Storm Impact

On August 4, 2020, New Jersey was struck by Tropical Storm Isaias (“Isaias”), a major weather event with destructive wind gusts that disrupted electric utility service to over 1.3 million customers at its peak, and impacted approximately 1.6 million electric utility customers overall within the State.¹ Isaias organized into a tropical storm near the Bahamas on July 30, 2020 and strengthened to a Category 1 Hurricane on July 31, 2020. Isaias reached a peak intensity of 85 mph winds before changing back to a tropical storm as it made landfall along the North Carolina coast on August 3, 2020.

Figure 1. Isaias Storm Forecast - August 3, 2020



Source: National Weather Service

¹ On Sunday, August 2, 2020, the US Department of Energy (DOE) issued the “Estimated Potential Customer Power Outage” report. The report, developed by the Argonne National Laboratory, estimated that New Jersey would experience a peak of 160,143 customer outages. On Monday, August 3, 2020, the DOE revised the customer outage peak for New Jersey to 250,171. This is indicative of the uncertainty of the forecast for Tropical Storm Isaias.

On Tuesday morning, August 4, 2020, Isaias reached southern New Jersey in the form of heavy rainfall followed by strong winds. Western areas of the State received the heaviest rainfall as its center clipped western Warren County before heading into New York. Rainfall was heaviest in Salem County reaching a high of 7.86 inches. Isaias' winds were the strongest statewide since Sandy in 2012, toppling countless trees that brought down power lines, blocked roads and caused widespread damage to buildings and vehicles. Eight weather stations in New Jersey recorded wind gusts of 60 to 69 mph with one station in Cumberland County recording wind gusts of 71 mph.

Isaias' impact on New Jersey was especially devastating due to its unusual track as it reached the State. As the storm moved into New Jersey in a northerly direction it veered inland towards the western part of the State exposing most of New Jersey to the storm's right front quadrant where its winds were strongest.²

Multiple tornadoes were also observed as Isaias moved up the East Coast. Two tornadoes formed in New Jersey, each beginning as a waterspout, later moving inland and becoming classified as EF1 tornadoes.³ The first came ashore just north of the Strathmere section of Upper Township at 9:45 a.m., with a width of approximately 150 yards and dissipating approximately 10 minutes after it began. The second tornado began at 10:50 a.m. as a waterspout in Manahawkin Bay between Ship Bottom and Brant Beach. The second tornado had a path length of three miles, lasting about five minutes.

By late afternoon on August 4, 2020, a statewide peak of over 1.3 million electric utility customers without power was recorded, mostly due to downed power lines from tree damage caused by high winds. All of New Jersey's 21 counties and each of the State's four electric distribution companies (EDCs) experienced power outages with the most damage seen in Monmouth, Morris and Union counties. Over 70 percent of utility customers had their service restored within 72 hours (by August 7, 2020) and full restoration of service to all customers impacted by Isaias was virtually completed on the evening of August 11, 2020, approximately seven days from the time the storm left the State.

² As devastating as the eyewall region of a tropical storm can be, the right front quadrant is the most dangerous and powerful quadrant of the storm. The fastest winds, the heaviest torrential rains, the surges of the tropical storm lie in the first or right quadrant.

³ The EF-Scale rates the strength of tornadoes in order of increasing intensity. An EF1 can have wind speeds of up to 110 mph.

2 Pre-Storm Preparations: Weather Forecasting and Resource Acquisition

2.1 ACE

Atlantic City Electric (ACE) began closely monitoring the path of Tropical Storm Isaias in late July. On the morning of August 2, 2020, weather forecasts from ACE's primary weather vendors, StormGeo and Earth Networks, along with forecasts from the National Weather Service (NWS), indicated an increasing probability that the likely path of Isaias would track along the coast or directly over the Mid-Atlantic states, including New Jersey. At that time, ACE determined that the storm could have at least some impacts approaching a "Level 4 Serious Event" on the company's event level storm scale.

ACE's parent company, Pepco Holdings, LLC (PHI), in coordination with Emergency Preparedness, ACE Incident Managers and Operational Leaders, decided to activate the ACE Incident Management Team structure starting on the afternoon of August 2, 2020. Participation in mutual assistance calls with Regional Mutual Assistance Groups (RMAGs) began Friday, July 31, 2020 at 7:00 p.m. Requests for external and affiliate company mutual assistance began on Sunday afternoon, August 2, 2020. Requests were made through Southern and Northern RMAGs and non-affiliate contractors based across the United States and through Exelon-wide (PHI's parent company) mutual assistance calls.

Initial requests were made for 500 mutual assistance resources. Over 560 mutual assistance line workers and their support personnel were secured, as well as 310 affiliate utility line workers. Mutual assistance line workers, support personnel and tree trimming crews, began mobilizing on Sunday evening August 2, 2020, with an initial destination just outside New Jersey, which would keep them out of the projected path of Isaias.

Projected arrival times of mutual assistance ranged from Tuesday afternoon, August 4, 2020, through Wednesday, August 5, 2020. A second and third wave of resources was scheduled to arrive Wednesday through Friday morning, August 7, 2020.

2.2 JCP&L

Meteorological services from Jersey Central Power & Light's (JCP&L) parent company, FirstEnergy, began tracking Isaias on July 29, 2020 as the system formed in the Caribbean. JCP&L first began issuing preliminary weather alerts on July 31, 2020 regarding the potential impact of the storm. Prior to the arrival of the storm, JCP&L also ran its Outage Volume Model based on the forecasted weather, which predicted a maximum of 449,312 customers would be affected by the weather event.

On July 31, 2020, in response to the projected impact of Isaias, JCP&L expanded the Incident Command System (ICS) to include additional storm response functions. Additionally, on August 2, 2020, First Energy's Corporate Emergency Operations Center turned its focus towards Tropical Storm Isaias, conducting situation monitoring, assessment, and resource coordination activities for all FirstEnergy affiliated companies in anticipation of Isaias.

Requests for mutual assistance were initially made on August 2, 2020. JCP&L requested a total of 500 line workers and 700 hazard responders, public protectors and damage assessors from all nine out-of-state JCP&L affiliated utilities as well as from on-site contractors, off-site contractors, and through its RMAG process. JCP&L was able to mobilize more than 1,800 additional resources from outside of New Jersey in preparation for the impending storm with crews arriving on August 3, 2020. Of those 1,800 resources, approximately 740 were line workers and 725 were tree trimming personnel. As part of its pre-storm preparations, JCP&L also activated three staging sites to house and supply its workforce.

2.3 PSE&G

Public Service Electric & Gas (PSE&G) began storm response planning on July 30, 2020. Wind gusts of 55 to 65 mph and rainfall amounts of two to six inches were predicted by the company.⁴ Based on the predicted forecast, PSE&G initially classified Tropical Storm Isaias as a “Level 4” storm on its “Storm Severity Matrix” scale. PSE&G later revised the storm level to a “Level 5”, meaning the company could expect between 200,000 to 700,000 customers impacted by the impending weather event.

As part of its pre-storm planning, on July 31, 2020, PSE&G went through its 72 hours, 48 hours and 24 hours pre-storm checklists and held its internal conference call to discuss storm preparations and mutual assistance needs. PSE&G began securing mutual assistance and tree trimming resources on July 31, 2020, when 220 contractor line worker FTEs⁵ were obtained with 70 coming from as far as Nova Scotia. PSE&G also secured 383 mutual assistance tree trimming FTEs. PSE&G continued to secure contractor line workers and on August 1, 2020 received commitments for 420 FTEs.

On August 2, 2020, North Atlantic Mutual Assistance Group (NAMAG) leadership contacted the Southeast Electric Exchange Mutual Assistant Group (SEEMAG) for resources. On August 3, 2020, PSE&G was able to secure 700 line worker FTEs. Also at that time, PSE&G was able to secure an additional 275 line workers outside of NAMAG. Another call was held on August 4, 2020 at 8:00 a.m. during which PSE&G was able to secure 75 more resources. At the end of the day on August 4, 2020, PSE&G had secured 1,050 line workers through NAMAG and 384 through other means for a total of 1,434 FTEs.

⁴ PSE&G uses StormGeo for its weather forecasting and DTN weather service for its storm impact analysis.

⁵ Full-time equivalent (FTE) is a unit that indicates the workload of an employee in a way that makes workloads comparable across various contexts. An FTE of 1.0 is equivalent to a full-time worker.

2.4 RECO

Beginning on July 30, 2020, Rockland Electric Company (RECO) held operational and planning meetings and conference calls to discuss the storm forecast, forecasted outage volumes, mobilization and resource plans. In the RECO service territory, which covers parts of Bergen, Passaic and Sussex counties that border New York State, Tropical Storm Isaias arrived with an intensity much greater than forecasted as a result of the storm unexpectedly veering 30 miles west of its forecasted track. RECO corporate meteorologists noted that southeast winds of this strength have not occurred in 10 to 20 years in RECO's service territory.

As discussed earlier in Section 1, Isaias' path exposed almost the entire State to the right front quadrant of the storm where the worst weather conditions in a tropical cyclone typically occur. No major storm in more than 50 years tracked in such a manner as to expose RECO's service territory to this unusual wind direction, the most devastating part of the storm.

On August 2, 2020, RECO initially classified Isaias as a "Serious 2A" weather event pursuant to the "Storm Classification and Staffing Matrix" contained in the company's Emergency Response Plan. RECO upgraded the storm on August 4, 2020, to a "Serious 2B" at 9:30 a.m. As the level of damage to the electric distribution system became clearer, the storm classification was updated to a "Full Scale 4B" at 2:00 p.m., and ultimately to a "5 - Full Scale" mobilization at 5:00 p.m.

On August 2, 2020, RECO, through its parent company, Orange & Rockland Utilities in New York (ORU) began making requests for mutual assistance. ORU acquired 58 non-company line worker FTEs on August 2, 2020 and on August 3, 2020 an additional 58 FTEs were secured. On August 4, 2020 three separate mutual assistance calls were made with 64 Line worker FTEs acquired. ORU also began acquiring tree trimming crews on August 4, 2020 with 85 tree trimming FTEs secured. The non-company line worker and tree trimming FTEs were in addition to other support personnel acquired by ORU including restoration contractors, site safety contractors and damage assessment contractors.

2.5 *Assessment of Utility Performance*

Tropical Storm Isaias was forecasted to impact New Jersey several days before reaching the State, allowing each of the State's four EDCs to prepare for the weather event prior to its arrival on the morning of August 4, 2020.

A review of the utilities' pre-storm preparations indicates that the EDCs all tracked the storm's path several days before its arrival using a multitude of both in-house meteorologists and commercial weather forecasting services. The EDCs also conducted substation flood modeling scenarios in anticipation of heavy rains. The EDC forecasts, as well as the NWS, all predicted a severe impact on the State with potential flooding and high winds. What was uncertain in all the forecast models, however, was how far inland tropical storm force winds would extend. As noted in Section 1, Tropical Storm Isaias veered inland as it approached New Jersey exposing the State to higher than expected damaging winds from the storm's right front quadrant.

Given the forecast from both the utilities and the NWS, it appears the pre-storm measures implemented by the EDCs were consistent with one another, with the exception of RECO, and appropriate for the type of forecast being predicted. RECO was not proactive in acquiring pre-storm mutual assistance prior to the arrival of the storm on August 4, 2020. ORU, who operates RECO as a contiguous system serving approximately 300,000 customers combined, waited until August 4, 2020 to acquire tree trimming mutual assistance resources. Given the likelihood that Isaias would cause significant tree-related damage to the ORU and RECO service territory, ORU should have been more proactive in obtaining mutual assistance earlier in the pre-storm preparation.

This lack of adequate pre-storm resources appears to have manifested itself in the slow pace of restoration during the early post-storm restoration process as discussed later in Section 4.6. Staff also makes a recommendation on this issue in Section 7 of this report.

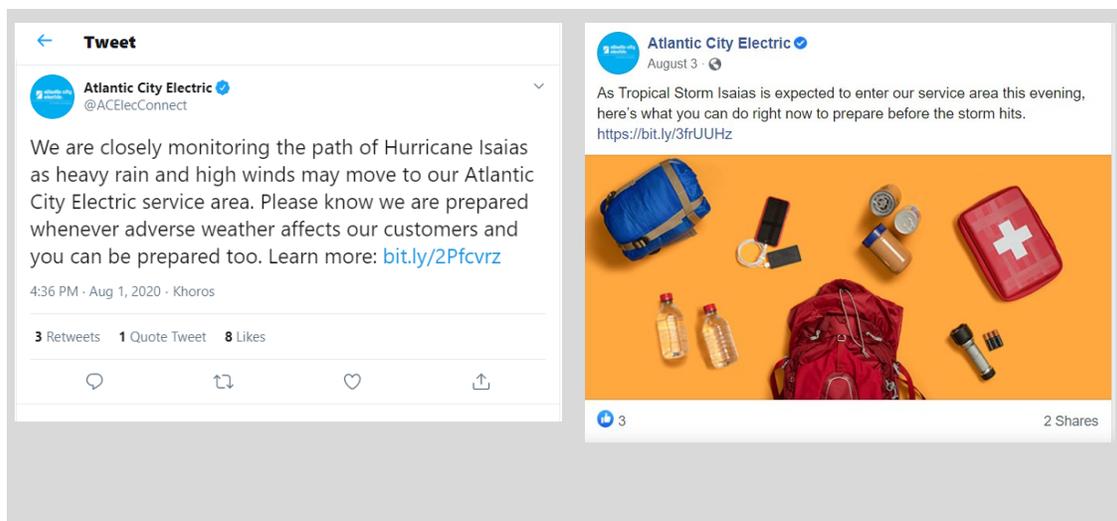
3 Communication and Outreach

3.1 Pre-Storm Notification and Customer Outreach

3.1.1 ACE

ACE began issuing pre-storm notifications to its customers on August 1, 2020 via Twitter and Facebook. Text messages were also sent to customers who opted for the service. Follow-up notifications and a press release were issued on the company’s website on August 3, 2020 that included instructions for reporting outages, downloading ACE’s app for receiving real time updates, and advisory tips for preparing for extended outages. ACE estimates that its social media posts before and during the storm restoration process resulted in 1.25 million potential impressions. Updates included safety reminders to customers to stay away from downed power lines and information on the restoration process. As part of its outreach to customers, ACE also coordinated the delivery and distribution of water and ice to four locations in the counties of Atlantic, Burlington, Cumberland, and Gloucester.

Figure 2: ACE Social Media Twitter Notices and Advisories

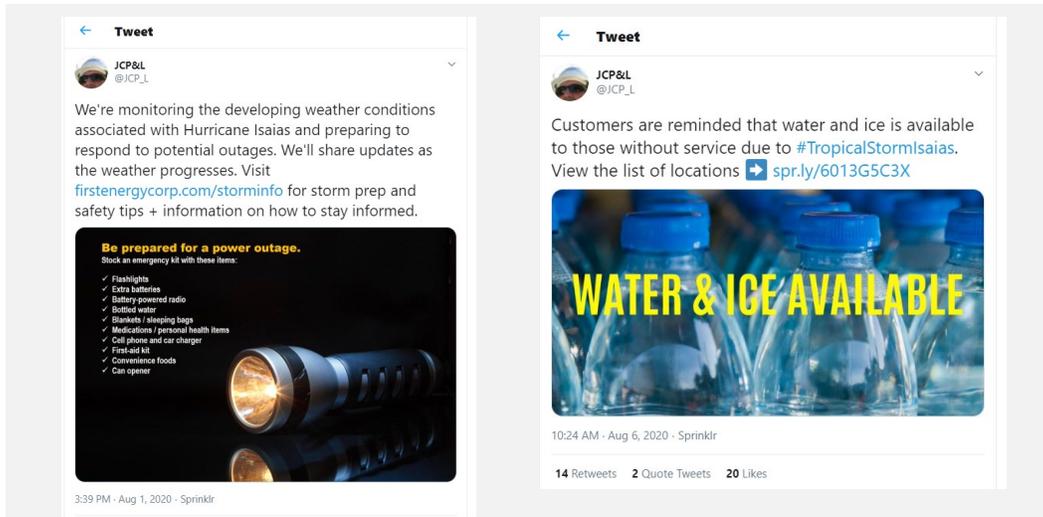


3.1.2 JCP&L

JCP&L began issuing pre-storm notifications to its customers on August 1, 2020 via Twitter, Facebook and text messages for customers who opted for the service. The company released eight news releases and media advisories beginning on August 3, 2020 focusing primarily on the status of storm restoration efforts, how customers could report outages, and safety tip information. Additionally, JCP&L representatives participated in approximately 100 media interviews about Tropical Storm Isaias. On August 2, 2020 and August 3, 2020, JCP&L notified critical care and well water customers via Interactive Voice Recorder (IVR) messaging. On August 5, 2020, JCP&L also activated more than 70 water and ice locations during the weather

event for customers experiencing outages. Water and ice locations were announced to the public via social media and blast emails.

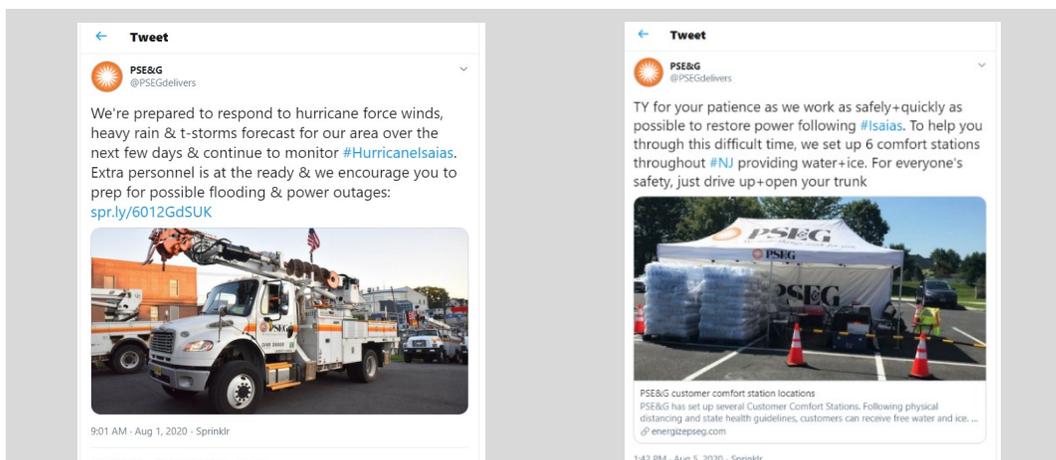
Figure 3: JCP&L Social Media Twitter Notices and Advisories



3.1.3 PSE&G

PSE&G began issuing pre-storm notifications to its customers on August 1, 2020 via Twitter, Facebook and text messages for customers who opted for the service. PSE&G's Corporate Communications Department issued advisories on its webpage, press releases and handled multiple newspaper, television and radio information requests during the storm restoration period including interviews with PSE&G executives. Social media was monitored for customer messages throughout the restoration period. As in past weather events, PSE&G also established several comfort stations throughout the service territory to supply ice and water to impacted customers.

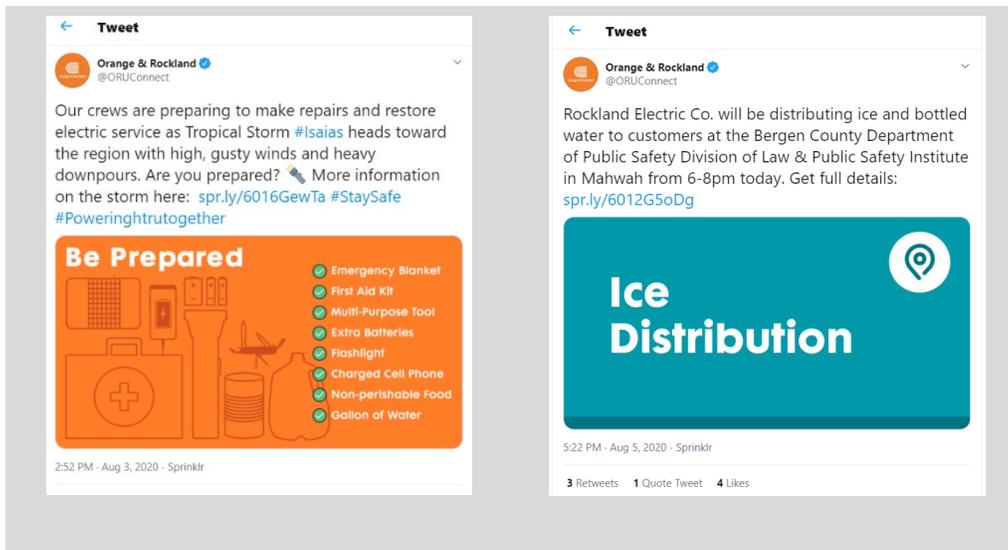
Figure 4: PSE&G Social Media Twitter Notices and Advisories



3.1.4 RECO

RECO began issuing pre-storm notifications to its customers on August 3, 2020 via ORU's Twitter, Facebook and a media advisory on the company's website. Customers were also notified through text messages for those who opted for the service. Before, during and after Tropical Storm Isaias, RECO's Emergency Information Center distributed a total of 22 press releases to the local media, fielded numerous media inquiries, proactively posted 96 social media postings, and distributed seven blast emails to customers. Throughout the event, the company's Community Response Team fielded well over a thousand calls, e-mails and text messages from municipal officials who reported outages, checked on the status of restoration and requested escalation of priority issues such as critical infrastructure. Daily water and ice distribution center locations were also posted on social media and sent over email notifications.

Figure 5: RECO Social Media Twitter Notices and Advisories



3.2 Estimated Time of Restoration Notifications

The Board of Public Utilities (“Board” or BPU) requires each EDC to issue an Estimated Time of Restoration (ETR) to its customers at different stages of restoration. The first ETR is to be issued within 24 hours from the time the storm departs the EDC’s service territory. This is the initial global ETR which is based on a preliminary damage assessment and is intended to be an estimate of when the storm-related restoration activities will end and all customers without service will be fully restored. During a major storm, the global estimate is likely to change as the utility collects and integrates up to date damage assessment information into its ETR process. The global ETR is followed by more granular localized ETRs as restoration progresses and more damage assessment information becomes available. This process is not without challenges, as utilities strive to marshal out-of-state crews and contactors into an effective recovery workforce, often during continuing bad weather. ETRs, while still estimates, are critical

to providing customers and elected officials with guidance with which to inform their personal and community actions in the face of power losses.

3.2.1 ACE

At its peak on August 4, 2020, Tropical Storm Isaias interrupted service to approximately 171,937 of ACE's customers. ACE's initial global ETR was issued on August 5, 2020 at 6:20 p.m. via automated phone calls notifying all customers impacted by the storm that their service was expected to be restored by August 8, 2020. A separate automated phone call was also sent to approximately 30,000 customers to check ACE's system for their specific ETRs. Throughout the restoration process, customers were advised via Twitter and Facebook to log on to the ACE outage map or use the company's mobile app to get updates on specific ETRs.

3.2.2 JCP&L

At its peak on August 4, 2020, Tropical Storm Isaias interrupted service to approximately 701,018 of JCP&L's customers. JCP&L's initial global ETR was issued on the afternoon of August 5, 2020 for an expected service restoration date for all customers at the end of the day on August 11, 2020. The August 5, 2020 ETR was for both the Central and Northern Regions of JCP&L. On August 6, 2020, JCP&L began issuing localized and individual customer ETRs. Throughout the restoration process, customers were advised via Twitter and Facebook to log on to the JCP&L outage map or use the company's mobile app to get updates on specific ETRs.

3.2.3 PSE&G

At its peak on August 4, 2020, Tropical Storm Isaias interrupted service to approximately 472,878 of PSE&G's customers. PSE&G's initial global ETR was issued on the afternoon of August 5, 2020 notifying all customers impacted by the storm that their service was expected to be restored by the afternoon of August 10, 2020. On August 5, 2020, PSE&G also began issuing localized and individual customer ETRs. Throughout the restoration process, customers were advised to log on to the PSE&G outage map or use the company's mobile app to get updates on specific ETRs.

3.2.4 RECO

Tropical Storm Isaias interrupted service to approximately 52,000 of RECO's customers. RECO's initial global ETR was issued on August 5, 2020 for all customers impacted by the storm to be restored by the evening of August 14, 2020. The global ETR was subsequently changed to a restoration timeline of August 11, 2020 at 11 p.m. RECO customers were also notified on Twitter to check the ORU outage map for individual customer ETRs. Throughout the restoration process, RECO customers were advised to log on to the ORU outage map or use the company's mobile app to get updates on specific ETRs. RECO also issued daily press releases on its website concerning the progress being made to restore customers.

3.3 Customer Call Center Operation

3.3.1 ACE

Direct communication with ACE's customers is primarily conducted by the company's Customer Care organization, including its Call Center representatives. The method of communication varies, depending on the situation, the content of messaging, customer preference, and volume of customers involved. Proactive communication may be conducted by automated phone calls, live phone calls, emails, and texts. Incoming customer calls are answered by company representatives in their offices located in Carneys Point, New Jersey, Wilmington, Delaware, and Salisbury, Maryland. When the company experiences a surge in call volume, ACE relies on its non-company outsourced partners to handle the additional volume.

As part of its pre-storm preparations, ACE doubled the number of Customer Care Team representatives to more than 240 employees to better manage the expected surge in call volume. During Isaias, the ACE Customer Care Team, along with the interactive voice response system, managed more than 160,000 customer inquiries between August 6, 2020 and August 10, 2020. ACE's Customer Care representatives answered each call within an average of 28 seconds.

3.3.2 JCP&L

As previously discussed in the investigation of the March 2018 nor'easters, JCP&L relies on its Call Center locations (FirstEnergy Contact Centers) in Akron, Ohio, Fairmont, West Virginia, and Reading, Pennsylvania to handle storm related incoming calls.⁶ JCP&L also has the capability to activate its third-party vendor when experiencing a surge in call volume. During a major outage event, the company uses a staffing model that estimates staffing needs based on the estimated number of customers remaining out of service for the relevant planning horizon (i.e., next shift, day, etc.). Inputs to the staffing model include, among other things, the estimated number of outages, call volume and average handle time. During the Tropical Storm Isaias restoration period, FirstEnergy's Contact Centers received approximately 559,105 outage calls at an overall average speed of answer of 11 seconds.

3.3.3 PSE&G

During major outage events resulting in high call volumes, PSE&G supplements its Call Center Customer Service Representatives (CSRs) with additional in-house CSRs from other departments such as its Credit and Collections Department. In addition to PSE&G employees, the company also has the option of using two of its Call Center contractor vendors to help handle surges in call volume. During the restoration process following Tropical Storm Isaias, PSE&G received 351,230 calls on the first day of the storm. PSE&G's storm-related one-day call volume on August 4, 2020, exceeded more than one month's non-storm related average call volume. Over the course of the storm restoration period, PSE&G handled 635,128 calls.

⁶ JCP&L is supported by three FirstEnergy-operated Call Centers, all of which are located outside of New Jersey.

3.3.4 RECO

As previously discussed, RECO is a wholly owned subsidiary of ORU. RECO has no employees and relies on ORU's two call centers which are both located in New York. The Blooming Grove Call Center is located in Monroe, New York and the Spring Valley Call Center is located in Spring Valley, New York. Staffing levels for major outage events such as Tropical Storm Isaias, are developed based on a "Storm Category/Classification" rating. This rating is based on storm severity; number of customers projected to be out of power and expected restoration.

According to ORU's Emergency Operations Plan, at the onset of an event, the company routes calls coming into its toll-free number to a third-party IVR vendor. By using the IVR platform, ORU's call handling capability increases to approximately 30,000 calls per hour. Customers receive a recorded message from ORU with information about the event and have the opportunity to report their outage and receive ETR information as the information becomes available.

3.4 Communication with Local Officials and the BPU

Providing timely and accurate outage information to elected officials and government regulators is key to their decision making, particularly in the areas of public safety, sheltering and critical care needs. This was an area of concern during the Board's investigation of the EDCs' response to Hurricane Irene in 2011. Accordingly, the Board's 2013 Hurricane Irene Order issued a directive requiring EDCs to hold daily conference calls with municipal officials of the affected municipalities prior to and during a major weather event. These calls are held to provide up-to-date information on the restoration process and to allow officials to ask questions.

Prior to the arrival of Tropical Storm Isaias, each of the State's EDCs activated their government affairs teams and began engaging local government officials and state regulators in pre-storm outreach and briefings calls. Throughout the storm restoration process, daily conference calls were held with mayors and beginning as early as July 30, 2020, EDCs began providing the BPU's Emergency Management Staff with updates on mutual assistance requests, staging sites and weather forecasts. The EDCs participated in three conference calls with BPU Staff between August 5, 2020 and August 13, 2020.

Additionally, county OEMs were either partially or fully opened in areas where the storm was most impactful. JCP&L, the largest of the four EDCs in terms of total square miles, provided representatives to 13 county OEMs.

3.5 Assessment of Utility Performance

Communication is an important element in storm response. Customers want to know how they will be impacted and when they can expect power to be restored. Local government officials want to know how and when their communities will function normally. Emergency managers need to understand restoration priorities and alert EDCs to existing hazards. For these reasons and as required by the Board, the EDCs' protocols for notifying and communicating with electric

utility customers and other stakeholders during weather events are well established and incorporated into their emergency response plans.

Effectively communicating with customers and public officials during a major weather event became a main focus for the EDCs following the Board's investigation of Hurricane Irene and Superstorm Sandy. In response to the Board's Irene and Sandy Orders, the EDCs implemented numerous recommendations designed to ensure that impacted customers and public officials are well informed about pre-event preparation measures and ongoing restoration activities undertaken by the EDCs.

Before the arrival of Tropical Storm Isaias, each of the EDCs activated a variety of messaging and notification technologies several days in advance of the storm. The timing and method of communicating and messaging were consistent with prior Board recommendations and directives. Messaging to customers with ETR updates, and safety tips continued throughout the storm restoration process.

Although pre-storm messaging and notifications were well coordinated and documented through social media posts, communication with EDC Call Centers and automated messaging presented a challenge, particularly in the first 24 hours of restoration, as customers attempted to call for outage updates or report an outage. Call Center communication issues and ETR updates were particularly challenging for JCP&L, PSE&G and RECO as they all experienced unusually high call volumes. Additionally, on the afternoon of August 4, 2020, high internet traffic caused PSE&G and JCP&L's websites to be unavailable for a few hours during which time customers were unable to access outage map information.

With regard to PSE&G's unusually high call volume, it appears that multiple inaccurate automated ETR messages sent from the Outage Management System (OMS) led to customer confusion and was partly responsible for the high call volume as customers attempted call the EDCs for updates.⁷ JCP&L customers also experienced conflicting multiple ETR updates that led to frustration and confusion. EDC Call Center performance was also impacted by customer service issues that were partly outside the utilities' control. Difficulties in managing the sudden surge in call volume were compounded by workplace limitations brought on by the pandemic. This was particularly challenging for PSE&G and RECO who had Call Center employees working from home that were impacted by the storm. As power outages soared, some of their remote workforce was forced to repopulate the offices due to a loss of power at their remote locations. Adding to RECO's communication difficulties was the inability to activate the company's third party IVR system that lagged by eight hours, resulting in a period of unanswered calls.

In addition to customer Call Center and automated customer messaging issues, customers continue to express frustration over the inaccuracy of ETRs and the overall lack of up-to-date information concerning restoration timelines. A number of public officials also criticized the

⁷ The OMS or Outage Management System is the central collection point of all damage reports and customer trouble calls. The OMS provides outage input, assessment, assignment, tracking, and data storage. The OMS also groups customer calls into orders which can be sorted for the purpose of restoration management and ETRs.

EDCs' handling of communications. Staff heard the greatest number of complaints about communication issues from JCP&L customers and elected officials. Although calls with officials were conducted daily, Staff was made aware that some elected officials were concerned about not getting updated and timely information concerning repair activities in their communities. Public officials also complained about outdated EDC contact information. In addition, Staff is aware of instances where municipalities and elected officials may have reached out to the EDC business manager as opposed to the Emergency Management contact person for storm outages, bypassing the chain of command for incident awareness. Elected officials objected to being put in a position of acting as an intermediary between customers and the utility, especially without having sufficient information and awareness about outages and the restoration process.

Elected officials representing customers served by JCP&L must have better situational awareness about recovery efforts in their communities and should not be put in the position of tracking down status reports and information for their residents. JCP&L must improve its outreach and capability to give elected officials the information needed in real time. Staff makes several recommendations on this issue in Section 7 of this report.

In terms of responding to requests for road openings from communities, the EDCs were responsive to requests from BPU Staff and the New Jersey Office of Emergency Management. Tropical Storm Isaias produced hundreds of road closures due to downed trees and wires requiring a coordinated response from the EDCs, the New Jersey Department of Transportation (NJDOT), and the county OEMs. BPU Staff followed an established standard protocol of coordinating with all responsible agencies. In coordination with the NJDOT, a priority list of road opening requests was provided by the BPU to the EDCs for their response. This information was updated and forwarded to the EDCs approximately every two hours. In general, this process worked smoothly with no major impediments.

4 Restoration of Service

4.1 Storm Impact on Utility Infrastructure

4.1.1 ACE

The ACE service territory includes all or parts of Ocean, Atlantic, Salem, Camden, Cumberland, Burlington, Gloucester and Cape May counties, encompassing nearly 3,000 square miles and providing service to approximately 546,000 customers. ACE's service territory is divided into four operating districts: Cape May, Glassboro, Pleasantville and Winslow. Large parts of ACE's service territory include New Jersey's southern coastline, where communities are vulnerable to coastal flooding from severe storms such as hurricanes and tropical storms.

On the morning of August 4, 2020, Tropical Storm Isaias struck the ACE service territory with heavy rainfall and high winds causing pole and overhead wire damage to the utility's infrastructure. In total, 210,852 customers experienced power outages as a result of the initial impact of the storm and the ongoing restoration work that took approximately five days to complete.

In terms of utility infrastructure damage, ACE's Pleasantville district sustained the brunt of the damage. Tropical Storm Isaias' high winds and wind gusts exceeding 70 mph were largely responsible for the broken tree limbs and toppled trees that took down power lines and severely damaged utility poles and pole attached equipment such as transformers, cross arms and fuses. At the height of the storm, as it passed through ACE's service territory, the area experienced tropical storm winds, straight line winds, and even tornadoes. The tree-related damage to ACE's infrastructure was directly or indirectly responsible for taking down or severely damaging 74 utility poles, 549 cross arms, 166 transformers, and approximately 18 miles of primary and secondary wire.

During the post-storm feeder patrols conducted by ACE, company personnel identified more than 1,000 follow-up work locations. No "hazard trees" meeting the BPU's vegetation management rule definition were discovered as a cause of the damage during the patrols. In other words, the tree-related damage was caused by healthy trees and tree limbs taken down by high winds. Given the severity of Isaias, ACE's vegetation management representatives have concluded that the majority of the tree-related outages were not preventable through routine maintenance.

4.1.2 JCP&L

JCP&L provides electricity to more than 1.1 million customers in 236 municipalities. Its service territory consists of two non-contiguous regions that total more than 3,100 square miles. Its Northern Region serves all or parts of Essex, Hunterdon, Mercer, Morris, Passaic, Somerset, Sussex, Union and Warren counties. The Central Region serves all or parts of Burlington, Mercer, Middlesex, Monmouth and Ocean counties.

In the morning and afternoon of Tuesday, August 4, 2020 Tropical Storm Isaias passed through the JCP&L service territory producing rainfall of four to seven inches and wind gusts upwards of 65 mph. Isaias' impact on JCP&L's infrastructure was similar to ACE, with tree-related damage taking down power lines and utility poles in heavy tree canopy areas of both the Central and Northern Regions of JCP&L. Combined, 788,000 customers experienced power outages as a result of the initial impact of the storm and the ongoing restoration work that took approximately seven days to complete. JCP&L's Central Region experienced the brunt of the storm damage. Tropical Storm Isaias was the second most impactful storm to ever hit the JCP&L service territory in terms of customer outages. Only Superstorm Sandy in 2012 caused more outages.

Based on JCP&L's hazard and damage assessments, most of the outages caused by Tropical Storm Isaias were due to tree-related damage caused by toppled trees and broken tree limbs. As part of the restoration process, JCP&L addressed approximately 8,800 locations where tree damage was discovered. Tree damage to JCP&L's overhead utility infrastructure was directly or indirectly responsible for taking down or severely damaging approximately 700 utility poles, 2,800 cross arms, over 600 transformers and approximately 80 miles of wire.

While most of the storm damage inflicted on the EDCs was to their overhead distribution infrastructure, Isaias' strong winds also had a significant impact on JCP&L's transmission and sub-transmission system. The extent of infrastructure damage to JCP&L's sub-transmission was significant when compared to recent major weather events, including Winter Storms Riley and Quinn in 2018. A total of 114 lines, or 58% of total miles of sub-transmission were impacted by the storm. As a result, nearly 400,000 customers lost service as a result of sub-transmission damage alone. JCP&L also experienced 110 transmission and sub-transmission line outages that were over one hour in duration. Of those 110 line outages, 75% were tree-related.

4.1.3 PSE&G

PSE&G is New Jersey's largest investor-owned utility in terms of total customers, serving more than 2.3 million electric utility customers. PSE&G's electric service territory covers approximately 1,400 square miles along a heavily populated, commercialized and industrialized corridor between Bergen County in the northeast and Gloucester County in the southwest. PSE&G is divided into four operating divisions: Central, Metropolitan, Palisades, and Southern.

Tropical storm Isaias affected PSE&G's entire service territory with the initial effects of the storm being felt in the early morning hours of August 4, 2020. Similar to ACE and JCP&L, Isaias struck the PSE&G service territory with heavy rainfall and high winds causing pole and overhead wire damage to the utility's infrastructure. In total, 575,000 customers experienced power outages as a result of the initial impact of the storm and the ongoing restoration work that took approximately seven days to complete. According to PSE&G, Tropical Storm Isaias ranked as one of the worst storms in PSE&G's history in terms of the number of customers interrupted.

The initial assessment from PSE&G indicates that the overwhelming majority of the infrastructure damage to primary power lines was caused by total tree failures of seemingly healthy trees, whose removal would have been outside of the utility's trimming scope as allowed by the BPU's vegetation management rules. Tree branch failures also caused primary power

line damage. Falling tree branches from privately owned non-maintained trees caused the majority of damage to house services.

From an initial review of pole damage, while extreme winds alone caused some pole damage, fallen trees caused the majority of the damage to utility poles and pole attached equipment. Tree damage to PSE&G's overhead utility infrastructure was directly or indirectly responsible for taking down or severely damaging over 900 utility poles, over 600 transformers and approximately 2,000 services.

4.1.4 RECO

RECO serves approximately 72,000 customers in New Jersey. RECO's territory covers approximately 200 square miles in parts of Bergen, Passaic and Sussex counties that border New York State. Similar to JCP&L's Northern Region, RECO's service territory is in the higher topological elevations of New Jersey with heavily treed areas. RECO's service territory is not densely populated although pockets of densely populated areas exist.

In the early afternoon of August 4, 2020, Tropical Storm Isaias arrived with an intensity much greater than forecasted, knocking out power to 51,952 electric utility customers. In terms of utility infrastructure damage to RECO's system, Isaias was second to only Superstorm Sandy. As with other EDCs impacted by Isaias, the infrastructure damage sustained by RECO was largely due to broken tree limbs and downed trees. In many cases, the damage was so extensive that portions of the overhead distribution infrastructure needed to be rebuilt. More than 80 road closures occurred as a result of Isaias. RECO and ORU combined replaced 288 poles, 328 transformers and 118,854 feet of wire.⁸

In addition to the damage sustained to the distribution infrastructure, RECO's higher voltage transmission system was also damaged by large off right-of-way trees that came down on overhead lines feeding the Franklin Lakes substation. Damage to the RECO transmission system took out service in much of Franklin Lakes, Oakland and Wyckoff for approximately 22 hours.

4.2 Damage Assessment Process and Restoration Priorities

In the aftermath of a major weather event, damage assessment is the critical first step in restoring service. Damage assessment is performed by trained employees or contractors sent to damage locations to evaluate the extent of damage and to identify the repairs that must be made at each location. These details are sent back from the field to the EDC via laptop, tablet or phone and entered into the OMS. The OMS information from damage assessors is then integrated with other relevant information to determine service restoration priorities, define the

⁸ The equipment damage is an aggregate of both New Jersey and New York numbers.

scope of work required to effect each damage repair, and prepare work orders for line crews and other service repair personnel.

In addition to facilitating crew deployments, the information contained in the EDC’s OMS database is used to produce global, then local ETRs. Damage assessment also provides for the rapid identification of hazardous situations that affect public safety, such as live wires on the ground. It is imperative that hazardous situations be made safe as quickly as possible. Until repair crews can arrive or produce other corrective action, utility personnel called hazard responders are dispatched to safeguard these locations. Hazard responders remain in place until a public protector, such as local police arrive, or the area is made safe. During a major weather event, EDCs often turn to contractors to supplement their cadre of hazard responders as well as damage assessors.

During the restoration process following Isaias, more than 1,000 damage assessors and hazard responders were deployed throughout the State. As with recent weather events including the 2018 March nor’easters, contractors constituted a large part of this workforce. For example, given the severity of the damage to its service territory, PSE&G reported that the company acquired over 200 contractors to conduct damage assessment to support its in-house assessment team. ACE, RECO and JCP&L also relied on contractors to supplement their damage assessment personnel.

In conjunction with the damage assessment process, the overarching goal for EDCs after a major outage event is to restore power as quickly and as safely as possible. To accomplish this goal, EDCs have developed emergency plans that define a restoration hierarchy. Although there are some variations, all EDCs follow the same basic principles of priority restoration, as shown in Figure 6. These classifications are not exclusive, meaning that repair efforts in lower priority levels often commence while work is still underway in higher priority categories. Without exception, safety of the public and those working to restore service is always the highest priority throughout a restoration effort.

Figure 6: Priorities During Restoration

<u>Immediate Life Threatening Situations:</u> Live primary wires down, Hazards (Make Safe), and Vital Roadway Clearing	<p>Note: Order of Restoration Often Overlaps.</p> <p>Ongoing restoration may be interrupted to repair Transmission related outages</p>
<u>Public Health and Safety:</u> Hospitals, EOCs, 911 Centers, Critical Water Supply, etc.	
<u>Priority Customers:</u> Shelters, Assisted Living, Nursing Homes, etc.	
<u>Community Needs:</u> Schools, Supermarkets, Roadways, etc.	
<u>Distribution:</u> Wires, Poles, Transformers, etc. (repair of equipment impacting the greatest number of customers first).	
<u>Individual Premise:</u> Services/Nested Outages	

4.3 Workforce Deployment and Span of Control

4.3.1 ACE

As noted in Section 4.1.1, ACE's Pleasantville District received the brunt of the storm damage. As in past storms, ACE shifted its internal workforce and outside resources into its divisions where the most damage was anticipated. ACE's workforce included internal and mutual assistance line crews, tree trimming resources, damage assessors and support personnel. After initially securing pre-storm resource support, ACE continued to secure additional mutual assistance on August 5, 2020 and August 6, 2020. At the peak of restoration activities, ACE had over 860 mutual assistance and affiliate company line workers and additional support personnel from 13 states and as far as Canada.

Restoration work began on the afternoon of August 4, 2020, as the full force of the storm began to move away from the area. The majority of the restoration crews worked in shifts aligned with daylight hours for increased safety and efficiency. That strategy was reflected in the higher restoration counts in the daytime intervals across all areas impacted by the storm. Initially, from August 4, 2020 to August 6, 2020, the majority of line crews and tree trimming crews were deployed to the Pleasantville and Cape May districts where infrastructure damage was more extensive. On August 7, 2020, as ACE turned its focus to addressing smaller and single home outages, crews were more evenly deployed throughout all four operating districts. ACE's workforce deployment reached a peak of 491 crews working the same four-hour block of time on the morning of August 7, 2020.

4.3.2 JCP&L

As one of ten FirstEnergy affiliated companies, JCP&L relies heavily on assistance from its FirstEnergy affiliates. As a result of its pre-storm requests, JCP&L was able to mobilize 1,800 additional outside resources before the arrival of Isaias, most of which came from FirstEnergy's nine other affiliated companies. The initial workforce acquired from outside resources was followed by subsequent requests, including a request on August 5, 2020 for 2,500 additional line resources.

In total, JCP&L was supported by a workforce of over 9,000 FTEs. A workforce that included approximately 6,500 FTEs dedicated to line work and tree trimming. JCP&L continued to add crews throughout the restoration period, reaching a peak of over 900 crews deployed on the afternoon of August 9, 2020. The outside crews remained throughout the restoration process, from August 4, 2020 until the last crew was released on August 14, 2020. To effectively manage line workers, hazard responders, damage assessors, and other resources, JCP&L used its span of control matrices to guide the more than 750 management and support personnel. To supply a workforce of this size, JCP&L also activated three additional staging sites as the number of incoming resources increased, bringing the total number to six staging sites. Staging areas were activated in both the Central Region and Northern Region of JCP&L's service territory.

4.3.3 PSE&G

As noted in Section 2.3, PSE&G began securing mutual assistance line workers on July 31, 2020, when 220 contractor line worker FTEs were obtained. At the end of the day on August 4, 2020, as Isaias passed through the region, PSE&G had secured 1,050 line workers via NAMAG and 384 resources via other means for a total of 1,434 FTEs. As in prior major events, PSE&G also augmented its workforce with employees from the company's gas division.

After the initial requests for resources, PSE&G continued to increase its workforce with additional requests to mutual assistance groups. During a NAMAG call on August 5, 2020, PSE&G secured an additional 287 line worker FTEs. Another NAMAG call was held on August 6, 2020 and PSE&G was able to secure 80 FTEs. At the end of the day on August 6, 2020, PSE&G had secured 1,998 line workers. The final number of FTEs secured by PSE&G was 2,019. PSE&G also made several requests for additional tree trimming resources, acquiring a total of 722 to augment the existing 270 tree trimming contractors already on the property, for a total of 992 tree trimming FTEs.

At the beginning of the restoration process, PSE&G initially deployed the majority of its line crews and tree trimming crews to the Central and Southern divisions where the storm's impact caused the most damage. As the restoration progressed, and new resources arrived, PSE&G was able to increase crew deployments in the Palisades and Metropolitan divisions. PSE&G was able to begin releasing tree trimming crews on August 9, 2020. All mutual assistance crews were released by August 12, 2020.

4.3.4 RECO

As discussed in Section 3.3.4, ORU operates RECO as an integrated utility across New York and New Jersey with three divisions spread across the northwestern corner of New Jersey and into Rockland, Orange and Sullivan counties. In New Jersey, Bergen County municipalities are contained within ORU's Eastern Division; Passaic County municipalities are contained within the Central Division; and Sussex County municipalities are contained within the Western Division.

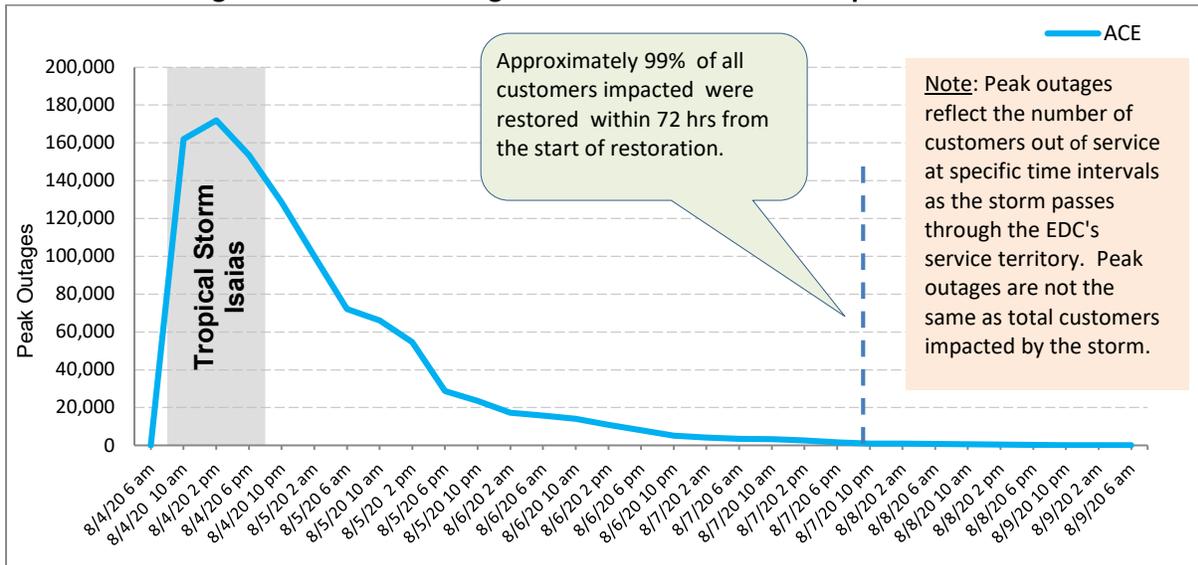
Restoration work in the RECO service territory began on the afternoon of August 4, 2020, as winds permitted and the storm began to move away from the area. The majority of the restoration crews worked in shifts aligned with daylight hours for increased safety and efficiency. Throughout the restoration process, the majority of the ORU controlled workforce was deployed on the New York side of the company due to the higher number of outages. On the New Jersey side, ORU/RECO's workforce was mostly deployed in the more populated areas of the Eastern Division in Bergen County. On August 7, 2020, RECO more than tripled its line crews in the Eastern Division. From August 7, 2020 to August 11, 2020, RECO continued to maintain a consistent number of company line crews, mutual aid crews, non-company contractor line and tree crews working on restoration activities.

4.4 Outage Response and Restoration Timeline

4.4.1 ACE

At its peak on Tuesday, August 4, 2020, Isaias interrupted power to 171,937 ACE customers. In total, there were 210,852 sustained interruptions in the ACE service territory, impacting more than 10 percent of the company’s customers, and triggering a major event response⁹. ACE’s storm response included internal and mutual assistance resources from 13 states and Canada. As with most major events, the greatest number of customers were restored in the early stages of restoration. On the morning of August 7, 2020, approximately 72 hours after the start of restoration activities, ACE had restored approximately 99% of customers impacted by the August 4, 2020 storm.¹⁰ ACE continued to make good progress after the first 72 hours and all customers impacted by Isaias were fully restored within five days. The following graph illustrates ACE’s daily progress in reducing customer outages from August 4, 2020 until virtually all customers were restored on August 9, 2020.

Figure 7: ACE Peak Outages Restoration Timeline - Tropical Storm Isaias



4.4.2 JCP&L

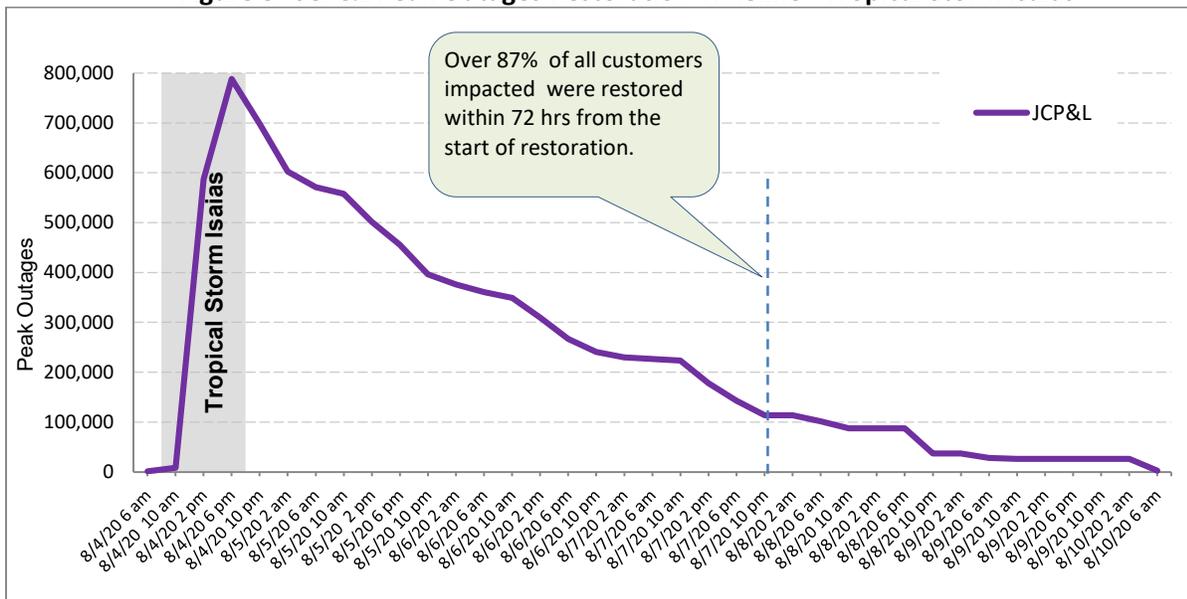
JCP&L’s peak outages reached a high of 701,018 customers on the evening of August 4, 2020. As noted in Section 4.1.2, Tropical Storm Isaias was the second most impactful storm to ever hit

⁹ A major event is defined in N.J.A.C 14:5-1.2 as a sustained interruption of electric service resulting from conditions beyond the control of the EDC, which may include, but is not limited to, thunderstorms, tornadoes, hurricanes, heat waves or snow and ice storms, which affect at least 10 percent of the customers in an operating area

¹⁰ On the evening of August 7, 2020, ACE was again struck by strong winds and overnight storms adding to the number of customer outages. A gust of 89 mph was recorded in Upper Deerfield with downed trees and wires reported in the 6 southernmost counties.

the JCP&L service territory in terms of customer outages. In total, approximately 788,000 customers were impacted by the storm, triggering a major event response. JCP&L's storm response included internal and mutual assistance resources from 17 different states. JCP&L made good progress in the early stages of restoration. On the morning of August 7, 2020, approximately 72 hours after the start of restoration activities, JCP&L had restored more than 87% of customers impacted by the August 4, 2020 storm. All customers impacted by Isaias were restored within seven days. The following graph illustrates JCP&L's daily progress in reducing customer outages from August 4, 2020 until virtually all customers were restored on August 11, 2020.

Figure 8: JCP&L Peak Outages Restoration Timeline - Tropical Storm Isaias



4.4.3 PSE&G

PSE&G reached a peak outage number of 472,878 customers out of service on the evening of August 4, 2020. As noted in Section 4.1.3, Tropical Storm Isaias ranked as one of the most impactful storms in PSE&G's history in terms of customer outages. In total, there were 575,000 customers impacted over the course of the restoration period triggering a major event response by the company. PSE&G's storm response included internal and mutual assistance resources from 12 other states and Nova Scotia.

PSE&G made good progress in the early stages of restoration. On the morning of August 7, 2020, approximately 72 hours after the start of restoration activities, PSE&G had restored 86% of customers impacted by the August 4, 2020 storm. From August 8, 2020 until the end of restoration activities, PSE&G turned its focus on the more labor-intensive repair jobs. As with prior storms of this magnitude, the tail end of the restoration process is slowed by more labor-intensive repairs as the EDCs work on repairs to single homes, backyard easements and nested outages. All PSE&G customers impacted by Isaias were restored within seven days.

The following graph illustrates PSE&G’s daily progress in reducing customer outages from August 4, 2020 until virtually all customers were restored on August 11, 2020.

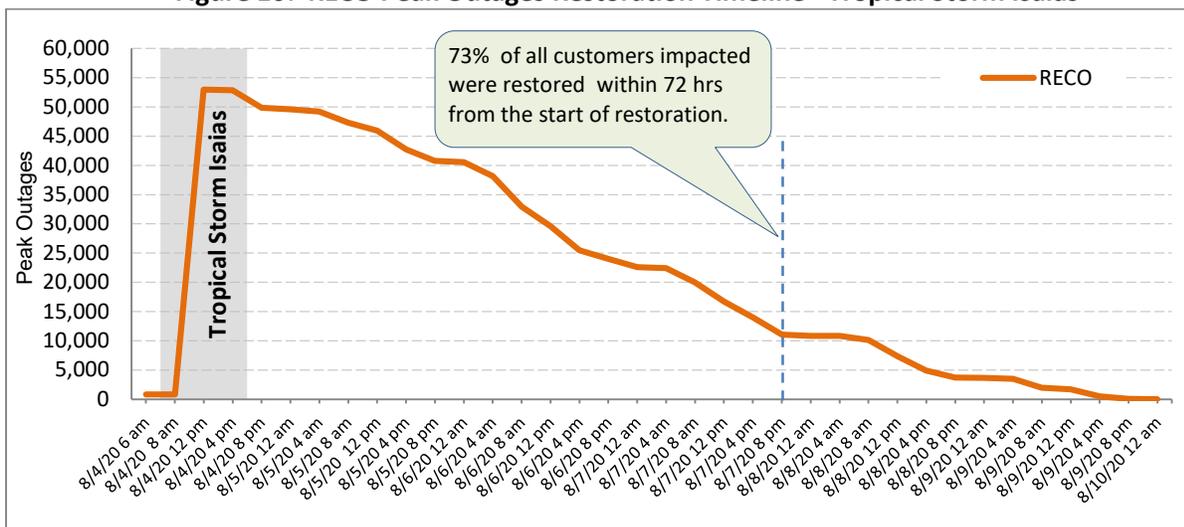
Figure 9: PSE&G Peak Outages Restoration Timeline - Tropical Storm Isaias



4.4.4 RECO

RECO’s estimated total outages reached a high of 51,952 customers, impacting more than 70% of the company’s customers and triggering a major event response. RECO’s storm response included internal and mutual assistance resources. On the evening of August 7, 2020, approximately 72 hours after the start of restoration activities, RECO had restored 73% of customers impacted by the August 4, 2020 storm, reflecting a noticeably slower pace of restoration than other EDCs in New Jersey. As noted in Section 4.3.4, RECO waited until August 7, 2020 to significantly add to its workforce. All customers impacted by Isaias were restored within nine days. The following graph illustrates RECO’s restoration timeline.

Figure 10: RECO Peak Outages Restoration Timeline - Tropical Storm Isaias



4.5 Restoration Issues: COVID – 19 Considerations

The EDCs' response to Tropical Storm Isaias was complicated by the continuing COVID-19 pandemic, presenting unique challenges for conducting restoration activities. This was an issue for consideration well before the storm struck New Jersey on August 4, 2020. In light of the large number of crews from outside the State required to respond to this weather event, the EDCs all initiated updated pandemic safety protocols consistent with their Emergency Operations Plans (EOPs). Their integration of these protocols went well.

In recognition of the COVID-19 pandemic, the EDCs updated their EOPs and developed guidelines and protocols for working in a COVID-19 environment when participating in mutual assistance. These guidelines have been developed with consideration of the Mutual Assistance Guidelines of the Electric Subsector Coordinating Council. The guidelines were developed based on best practices from industry-wide working groups including the Edison Electric Institute.

As part of the pandemic protocols during the restoration process, the EDCs designated COVID-19 testing sites for utility workers and virtual staffing of county OEMs. For workers not able to work remotely, additional hygiene and social distancing measures were implemented by the EDCs. These measures included hand sanitizing, hand washing stations, prepackaged meals, single hotel rooms, extra personal protective equipment (i.e. masks and gloves), and more frequent surface cleaning. Discussions were held with BPU Emergency Management Staff and the EDCs regarding establishing protocols for mutual aid during the pandemic.

The pandemic also presented challenges by preventing some of the normal person-to-person interaction and communication, on-site exchanges that typically occur during large scale disasters. For instance, EDCs needed to “virtualize” deployment to county OEMs and other interactions with local entities. Overall, the EDCs managed the COVID-19 element of the restoration process surprisingly well and should be credited with exceptional planning in this regard.

As of the writing of this report, the EDCs have not reported incidents of transmission of COVID-19 as a result of restoration activities following Tropical Storm Isaias.

4.6 Assessment of Utility Performance

Restoring power after a major weather event is a complex, labor intensive and time-consuming process. It requires an army of workers, many of whom must travel hundreds of miles from out of state (and in some instances, out of the country) to assist in the restoration process. When damage to the utility infrastructure is severe and widespread, as was the case with Tropical Storm Isaias, company personnel and mutual assistance crews cannot respond to every outage at once. The overarching goal, however, is the same for all EDCs: to complete restoration in the least amount of time as safely as possible.

In response to Tropical Storm Isaias, the EDCs mobilized more than 13,000 workers to restore service from over a dozen states and as far as Nova Scotia. This was the largest workforce mobilized by the State's EDCs since Superstorm Sandy in 2012. It should also not go unnoticed that the mobilization of the workforce and the work that followed all took place during a global pandemic.

When compared to other storms of this magnitude, the pace of restoration during Isaias for ACE, JCP&L and PSE&G was noticeably quicker than prior storms. JCP&L experienced the most outages with over 788,000 customers impacted, and was able to restore approximately 86% of customers within 72 hours and all customers impacted by the storm in seven days. During Superstorm Sandy, the last customers to be restored took approximately 14 days. Restoration following Hurricane Irene, a similar storm, took approximately eight days.

Although daily restoration rates can vary greatly, RECO's daily restoration progress and outage reduction was out of sync with New Jersey's other EDCs resulting in a noticeably slower pace of restoration. Combined, the ORU and RECO integrated system experienced approximately 220,000 customer outages in New York and New Jersey as a result of Isaias. As a comparison, ACE, who experienced approximately the same number of customer outages but serves an area twice the size of the ORU/RECO system restored approximately 99% of all customers in 72 hours and completed all restoration activities on August 9, 2020, at least a full day earlier than RECO. ORU/RECO's pace of restoration in New Jersey, especially in the first 72 hours, was considerably slower than ACE, and the other New Jersey EDCs, with approximately 73% of customers restored in the first 72 hours compared to ACE's 99%. Both ACE and ORU/RECO received assistance and support from their nearby affiliated companies, however, ORU/RECO was not as effective in leveraging those resources.

The slower pace of restoration was especially concerning to Staff, considering that RECO had improved its storm damage visibility through the implementation of AMI. Although RECO had the benefit of AMI, the pace of restoration progress did not reflect this as an advantage. Staff's review of the company's Major Event Report (MER) indicated that AMI did reduce truck rolls and provided customer outage information that theoretically, should have improved the pace of restoration. Per RECO's MER, "Having the ability to "ping" the Smart Meters greatly improved the efficiency of the Company's restoration process by eliminating unnecessary truck rolls and dispatching restoration crews only to actual outage locations. The Company also used this process to verify quickly partial restoration steps on larger outages, allowing the Company to then communicate its restoration activities in a timelier manner than during previous events." Given the relatively smaller size of the RECO system (approximately 200 square miles), the information and benefits gained through AMI should have led to a more rapid and effective restoration effort.

AMI deployment at ACE's affiliated companies, Commonwealth Edison Company ("ComEd") and Delmarva Power and Light Company ("Delmarva"), did provide greater efficiency and faster restoration, per their experience provided in the MER, which supports Staff's recommendation that AMI be explored as an option for improving outage restoration efforts for New Jersey. Staff makes several recommendations in Section 7 of this report on measures to improve RECO's response to major events.

5 Utility Infrastructure Hardening and Resilience

Following a series of unusually damaging weather events in 2011 and 2012, the Board issued an Order on January 23, 2013 addressing five categories of potential improvements. In the January 23rd Order, among other actions, the Board directed the EDCs to provide a detailed cost benefit analysis for a variety of utility infrastructure upgrades. On March 20, 2013, the Board issued an Order initiating a generic proceeding to investigate possible avenues to support and protect the State's utility infrastructure so it can better withstand the effects of major weather events. The Order also invited utilities to submit detailed proposals for infrastructure upgrades designed to protect the State's utility infrastructure from future major weather events.

On May 21, 2014, PSE&G was the first EDC to receive approval for a major infrastructure hardening and resilience proposal ("Energy Strong Program"). PSE&G received approval to invest over \$600 million in electric infrastructure upgrades, of which \$400 million was related to a flood mitigation program for substations. Since Superstorm Sandy, electric utilities have been approved for infrastructure hardening projects in all totaling over \$1.5 billion.

To further encourage investment in utility infrastructure, in 2017, the Board adopted Infrastructure Investment Program (IIP) rules to allow a utility to construct, install, or remediate utility plant and facilities related to reliability, resiliency, and/or safety and recover costs on an accelerated basis. The IIP is a regulatory initiative intended to create a financial incentive for utilities to accelerate the level of investment needed to promote the replacement of certain non-revenue producing components that enhance reliability, resiliency, and/or safety.

The effectiveness of recent EDC hardening and resilience projects is difficult to measure without sufficient evaluation time, even in the context of a weather event. However, it appears the post-Sandy completed projects experienced less damage than older more vulnerable overhead infrastructure. PSE&G, for example, indicated that its 69kV system upgrade which was constructed after Superstorm Sandy experienced very little damage. Similarly, RECO's 2017 selective undergrounding project consisting 3.4 miles of underground feeder in Ringwood was unaffected by the storm.

Given the amount of investment in recent years on infrastructure upgrades, the Board should develop a means of measuring the value of Board approved infrastructure hardening and resilience projects as it relates to mitigating damage from a major weather event. This report makes a recommendation to the Board on this issue which is discussed in Section 7.

6 Compliance with Prior Board Orders and Directives

From 2011 through 2013, the Board's investigation following a series of major weather events resulted in findings and recommendations that led to the issuance of a Board Order, referred to as the Irene Order, which contained 106 directives to EDCs (Board Order dated January 23, 2013, Docket number EO11090543). Many directives (a total of 65) required the EDCs to submit to the Board updated plans, processes, and procedures to improve storm preparedness and outage restoration efforts, and to address potential underlying infrastructure issues. Compliance with these directives was phased in over a period of 30, 45, 60, 90, 120, 180 and 365 days.

In 2018, following Board Staff's investigation of the three March nor'easters, the Board issued an Order (Docket Number EO18030255) which added 15 more directives designed to improve EDC response to major outage events. The additional Board directives covered many areas of restoration activities including weather forecasting, pre-storm resource acquisitions, damage assessments and workforce deployment.

Staff conducted a review and assessment of EDC compliance with prior Board directives relative to the restoration activities in response to Tropical Storm Isaias and determined each EDC to be generally in compliance with its directives. For example, communication improvements since Superstorm Sandy include the addition of outage maps available on the Internet with outage information updated every 15 minutes, real time social media (Twitter, Facebook) interaction and updates, apps to report an outage and receive information on restoration estimates and daily conference calls with elected officials. Improvements also include: intra-state mutual assistance compacts, where the utilities share resources, a road-opening priority methodology linked to the county and NJDOT. However, these prior directives should be viewed as value-added to the reliability model of the electric utility sector. There is no unambiguous "bright line" fix to weather preparedness and restoration; it is the Board's continuous review of major events which are driving what Staff views are improvements in the electric sector's approach to major weather events.

7 Conclusion and Recommendations

As noted throughout this report, Tropical Storm Isaias was one of the most impactful storms to ever hit New Jersey in terms of electric utility power outages. For JCP&L, only Superstorm Sandy caused more outages to its service territory. As previously discussed, a review of the utilities' response in the aftermath of Tropical Storm Isaias indicates a noticeable improvement in reducing the overall length of outages. All EDCs restored at least 70% of all customers impacted within 72 hours. However, Staff's review and assessment of the utilities' response and performance also revealed that there is still room for improvement in certain areas, some of which are outside the control of the EDCs. Specifically, the areas for improvement are:

1. EDC communication and outreach with customers and public officials
2. State-wide deployment of AMI to identify outages and reduce outage response time
3. Enhanced vegetation management in targeted areas
4. Tracking and valuing infrastructure hardening and resilience projects
5. Reports and other metrics

EDC communication and outreach with customers and public officials

- ***ETR Messaging Recommendations***

Outgoing customer notifications and messages on social media platforms are intended to keep customers informed before and during the restoration process. With social media, it is equally important for the EDCs to listen to customer complaints, since negative messaging can go viral. As previously discussed in Section 3.5, the EDCs' social media platforms were utilized for messaging and notifying customers and public officials about the impending storm and the restoration process that followed. PSE&G's social media platform was active in responding to customer tags, and JCP&L did a better job of being responsive during the Isaias weather event than the 2018 nor'easters. However, the EDCs did experience difficulties with Call Center call volume and multiple inaccurate automated ETR updates to individual customers.

Many customers expressed frustration over confusing and unreliable ETRs. Based on the information received from the EDCs, it appears that when certain customer ETRs expired (timed out) before customers could be restored, the OMS automated messaging system would default to the previous or global ETR, sending out often inaccurate multiple ETR messages to customers.

While Staff recognizes that ETRs are data driven "estimates" based upon average repair times, algorithms and field assessments, utilities need to pursue and improve the accuracy of information generated.

Adding to the confusion was the lack of customer options for responding to ETR messages when prompted to do so through the automated system. Under the current system, the OMS allows a customer to only indicate whether power is restored or not. Many customers leave their home after service is disrupted and may not know the status of their service when they receive automated messages on their mobile phones. Creating a third option on the automated

messaging system would enable customers who temporarily leave their home and are unaware of the status of their service to provide a response.

Recommendation # 1 (ACE, JCP&L, PSE&G, RECO)

TSI-EDC-1: Staff recommends the Board direct the EDCs improve the ETRs automatically generated by their Outage Management System (OMS), and in particular, to test the OMS under stressed conditions. Staff recommends that each utility file a plan to improve the accuracy of the ETRs, in order to provide more reliable information for elected officials and customers.

Recommendation # 2 (ACE, JCP&L, PSE&G, RECO)

TSI-EDC-2: Staff recommends the Board direct the EDCs to update the content of the automated outgoing ETR messages and add a customer response option for customers who are unaware of the status of their power at their residence.

- ***Call Center Recommendation***

Call Centers were overwhelmed by call volume during the first days of the storm. As previously discussed in Section 3.5, EDC Call Centers experienced difficulties in managing the sudden surge in call volume. This issue was compounded by workplace limitations brought on by the pandemic. The problem was particularly challenging for PSE&G and RECO who had Call Center employees working from home that were impacted by the storm. As power outages soared, some of their remote workforce was forced to repopulate the offices due to a loss of power at their remote locations. Adding to RECO's communication difficulties was their third party IVR system that lagged by eight hours, resulting in a period of unanswered calls.

Recommendation # 3 (ACE, JCP&L, PSE&G, RECO)

TSI-EDC-3: Staff recommends the Board direct all EDCs to provide a plan to improve Call Center peak volume during a Major Outage Event within 60 days, and to require EDCs to provide standardized information including number of calls per hour, number of calls answered, call drops, and other metrics as requested.

- ***Outreach Recommendation***

During the restoration process, all EDCs offered free water and ice to customers impacted by the storm. With the exception of JCP&L, stations were set up in hard hit areas to bring supplies to neighborhoods that needed relief. JCP&L instead offered vouchers that could be used at local stores. While this theoretically should have increased availability of outlets, complaints were heard that the stores were out of water and/or ice, ergo the vouchers were of no value.

Recommendation # 4 (JCP&L)

TSI-JCP&L-1: Staff recommends the Board direct JCP&L to survey their customers and elected officials to determine whether the level of dissatisfaction warrants changing the method of distribution of water and ice. The survey should be completed within 90 days

and the results should be shared with the BPU within 60 days after the completion of the survey with a plan to make improvements following within 60 days after the results are submitted.

- ***Outreach to Public Officials Recommendations***

As discussed in Section 3.5, public officials were concerned that they were not getting adequate and timely information from the EDCs, particularly JCP&L, about ongoing restoration in their communities. Some expressed concern that their community was not being given priority. After Superstorm Sandy, the EDCs were directed to host calls with elected officials on a daily basis during a storm event.

Typically, the EDCs do offer information for each municipality as requested, and outage information is available on their websites, which were a requirement by the Board after Superstorm Sandy. In addition, county OEMs are staffed with liaison personnel. Due to COVID-19, most of these were staffed remotely, however EDC staff was accessible. Based upon the complaints received, there is a concern that municipal officials are not getting accurate and timely information, whether through the OEMs, or the EDCs.

Recommendation # 5 (ACE, JCP&L, PSE&G, RECO)

TSI-EDC-4: Staff recommends the Board direct the EDCs to develop a plan that proactively educates customers and elected officials on the restoration process. The plan should be completed within 90 days and address how customers and elected officials will be informed while restoration is ongoing.

Recommendation # 6 (JCP&L)

TSI-JCP&L-2: Staff recommends the Board direct JCP&L to establish a process of communicating with elected officials and providing situational awareness about real time restoration activities in their community. This process should include, but not be limited to:

- Major restoration work
- Any staging area activity
- Concerns regarding critical community needs
- Road closure issues

Recommendation # 7 (ACE, JCP&L, PSE&G, RECO)

TSI-EDC-5: Staff recommends the Board direct the EDCs to update contact information for municipalities and elected officials on a quarterly basis to ensure that updates and notices are reaching the correct municipal and elected officials.

State-wide deployment of AMI to identify outages and reduce response time

AMI continues to have promise in reducing outage recovery time. In the report issued after the 2018 March nor'easters, Staff made the following recommendation:

“JCP&L, PSE&G and ACE each submit to the Board a feasibility study for AMI implementation, including a detailed cost-benefit analysis, for the purposes of reducing customer outages and improving EDC’s capabilities to effect timely system restoration following major weather events.”

RECO has implemented AMI throughout its service territory. RECO’s MER notes the following:

“With more than 71,000 Smart Meters deployed across the RECO service territory at the time Isaias struck, RECO was able to understand the scope and volume of affected customers more rapidly than large scale storms in the past.”

Further, the company shared “During Isaias, the Company “pinged” approximately 50,000 AMI meters associated with outages. Of those, approximately 19,000 responded to the “ping” with a power on message thus saving almost 1,000 truck rolls. AMI, with the automated power status notification and the ability to ‘ping” meters to determine power status, played a critical role in managing power outages and restoration efforts during Isaias, as well contributing to a reduction in outage duration and costs.”

Although Staff did received information regarding RECO’s use of AMI, the company’s use of the AMI information in reducing the duration of outages is questionable. This issue is discussed in Section 4.6 of this report.

Anecdotally, ACE also provided information regarding AMI and storm recovery. Per the Major Event Report:

“During TS Isaias, ACE sought to confirm the outage status of approximately 3,217 customers. Consistent with the current legacy meter capabilities, ACE placed over 5,400 phone calls to those customers. As the Company was unable to reach many of those customers, the Company required a truck roll to those sites to determine outage status. As a result, ACE performed truck rolls to 1,203 customer sites where power had already been restored. ACE’s sister utility, Delmarva Power and Light Company (“DPL”), avoided truck rolls to a total of 432 customer sites as a result of successful meter pinging for Tropical Storm Isaias. In a thunderstorm that occurred a few days later, DPL avoided truck rolls to a total of 106 customer sites due to meter pinging. Similarly, ComEd, ACE’s sister regulated utility, utilized its smart energy network to ping more than 37,000 meters early in the restoration efforts of the recent Derecho event in Illinois, reducing the number of truck rolls to assess customer outages by over 2,200, and saving hours of restoration time for customers.”

Recommendation # 8 (BPU)

TSI-BPU-1: Staff recommends the Board, in its review of the recently filed AMI plans, continue to consider AMI’s potential in reducing the length of prolonged customer outages following a major weather event.

Enhanced vegetation management in targeted areas

In 2015, the Board's vegetation management rules were revised to establish a four year trimming cycle and required the trimming of encroaching or overhanging vegetation from distribution circuits from the substation to the first protective device, also known as Zone 1. The reasoning behind this was to prevent an entire circuit or substation outage while limiting the increase in scope and cost of the EDC's vegetation management programs. JCP&L has extended this program even farther in its Reliability Plus Program with their agreement to clear overhead vegetation to the second protective device, or Zone 2. While this work should lead to improvements to day-to-day reliability and reduction in outages for routine storms, severe storms continue to result in large, long duration outages due to vegetation related damage to overhead power lines.

The dominating cause of outages in Tropical Storm Isaias, as well as winter storms Riley and Quinn, Hurricane Irene, and Superstorm Sandy, were tree-related outages, specifically off right-of-way (ROW) trees. Many of these trees were otherwise healthy trees outside of the ROW, but large enough to make contact with utility infrastructure, whether it was the EDC's, telecommunications or cable infrastructure. While the EDCs do make efforts to address "hazard trees" (trees outside the ROW that are dead, dying or in some way compromised and likely to fail that can contact electric utility infrastructure), this is not uniform across all of the EDCs' vegetation management plans. In addition, "danger trees" (otherwise healthy trees outside the ROW that could contact electric utility infrastructure) are not regularly addressed by the EDCs.

During its investigation of the March 2018 nor'easters, Board Staff made the following recommendations:

"To address these root cause issues, Staff recommends that revisions to the Board's Vegetation Management rules be considered that emphasize a targeted, risk-based tree trimming and removal program that includes tree branches beyond the distribution lock out zone. Staff also urges the consideration of more permanent legislative solutions to reduce potential infrastructure damage from trees outside of utilities' rights of way."

More recently, on October 26, 2020, Staff held an initial discussion with vegetation management stakeholders and interested parties to address obstacles to improving the State's vegetation management policies and regulations as they relate to reducing storm-related utility outages during major weather events. This was the beginning of a collaborative effort initiated by Staff to attempt to resolve the vegetation management issues raised.

Recommendation # 9 (BPU)

TSI-BPU-2: Staff recommends the Board continue its stakeholder process to update the 2015 vegetation management rules to include reporting of indices specific to tree related outages and major events, i.e. CAIDI and SAIFI, with a focus on circuits heavily damaged by trees. Circuits with disproportionately high indices of tree related damage and outages should be targeted for enhanced vegetation management to address off ROW hazard and danger trees. This work should be performed as part of each EDCs

normal trimming cycle and should focus on circuits with the worst performance indicators from tree related outages.

Recommendation # 10 (BPU)

TSI-BPU-3: The Board should evaluate potential legislative solutions to address the EDCs' rights to perform trimming or removal of off-ROW "hazard trees" where they threaten overhead facilities. Additionally, permission for the trimming or removal of off-ROW "danger trees" should be limited to the property owner and the EDC performing the work. In lieu of such legislation, the Board Staff will continue its stakeholder process to continue to coordinate between all parties (DEP, the League of Municipalities, state and local shade tree commissions and EDCs) to develop a process by which hazardous vegetation can be addressed while still being cognizant of proper forestry management principles and environmental stewardship.

Tracking and valuing infrastructure hardening and resilience projects

With recognition that each storm has a different profile, the hardening measures to protect substations from flooding, as occurred during Superstorm Sandy were not directly tested by a storm like Isaias where heavy winds and rain knocked down trees which impacted power lines.

The Board's Energy Division already tracks investments through utility filings, however, Staff recognizes there is a need for more battle-hardened, specific information. This information should be tracked by the EDCs and reported in the MERs submitted to the BPU following a major event, which will provide details about the impact of hardening and resiliency investments.

Recommendation # 11 (ACE, JCP&L, PSE&G, RECO)

TSI-EDC-6: Staff recommends the Board direct utilities to evaluate the resiliency impact of storm hardening projects as part of the MER.

- ***Undergrounding***

As discussed in Section 5, infrastructure hardening and resilience may include the undergrounding of overhead circuits in certain areas of the State more vulnerable to tree-related damage. This is an area that may warrant further evaluation by the Board. The Board should develop a means of measuring the value of undergrounding projects on a limited basis for infrastructure hardening and resilience purposes. Staff makes the following recommendation in this regard.

Recommendation #12 (ACE, JCP&L, PSE&G, RECO)

TSI-EDC-7: Staff recommends the Board direct each of the EDCs to evaluate their five worst performing circuits or other metric to determine whether portions of the circuits would be candidates for undergrounding. The EDCs should submit a cost/benefit analysis within 90 days to the BPU.

Reports and other metrics

As discussed in Section 4.6, RECO's pace of restoration, especially in the first 72 hours, was noticeably slower and out of sync with New Jersey's other EDCs. Additionally, the information provided in the company's MER following a major outage event is mostly aggregated for both ORU and RECO, making it difficult for Staff to evaluate RECO's response to a major event. Staff makes the following recommendations to address these issues.

Recommendation # 13 (RECO)

TSI-RECO-1: Staff recommends the Board direct RECO/ORU, for any major event that affects their service territory in New York and New Jersey, to have an average daily restoration rate in New Jersey that is approximately equal to the average daily restoration rate for their New York territory. Additionally, RECO/ORU should report the average daily restoration rate of both states in their major event report. The Board should reserve the right to take additional action on this subject.

Recommendation # 14 (RECO)

TSI-RECO-2: Staff recommends the Board direct RECO to document and provide for all major events, a complete breakdown of all equipment damage that occurred specifically in New Jersey, and New York specific infrastructure facilities directly impacting New Jersey (poles, transformers, cross arms, switch disconnects, feet of primary wire, feet of secondary wire, fuse cutouts, etc.) in the company's Major Event Report.