State of Florida

Public Service Commission

CAPITAL CIRCLE OFFICE CENTER • 2540 SHUMARD OAK BOULEVARD
TALLAHASSEE, FLORIDA 32399-0850

-M-E-M-O-R-A-N-D-U-M-

DATE: July 24, 2018

TO: Carlotta S. Stauffer, Commission Clerk, Office of Commission Clerk

FROM: Emily Knoblauch, Engineering Specialist, Division of Engineering EK RG

RE: Docket No. 20170215- EU - Review of electric utility hurricane preparedness and restoration actions.

Please file the attached "Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018" in the above mentioned docket file. Pursuant to the Commission's instructions at the July 10, 2018 Internal Affairs meeting the docket should be closed.

Thank you.

EK/pz

Attachment

Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018

July 2018

State of Florida
Florida Public Service Commission

Table of Contents

List of Figures iii
List of Tables iii
Terms and Acronyms v
Executive Summary 1
Key Findings 1
Commission Actions 2
Legislative Considerations 3
Section I: Background 5
The 2006 Order 5
2016-2017 Hurricanes 6
Section II: Hurricane Preparedness Practices 9
Commission Role 9
Utility Preparedness and Storm Hardening Activities 9
Underground Facilities 11
Storm Hardening Cost Recovery 12
Section III: Summary of 2016 and 2017 Storms 13
Hurricane Hermine 13
Hurricane Matthew 14
Hurricane Irma 16
Hurricane Nate 18
Section IV: Review of Outage Restoration Activities 21
Restoration Process 21
Hurricane Irma Restoration 22
Outage Causes 24

Mutual Aid 24
Impediments to Restoration 26
Storm Restoration Cost Recovery 26
Section V: Storm Hardening Performance 29
Forensic Analysis 30
Section VI: Customer Communication 31
Public Comments to the PSC 32
Stakeholder Comments to the PSC 35
Section VII: Commission Actions 37
Appendix A Summary of Stakeholder Comments 41
Appendix B Peak Number of Account Outages 43
Appendix C Utility Reported Weather Data - Hurricane Hermine 44
Appendix D Utility Reported Weather Data - Hurricane Matthew 45
Appendix E Utility Reported Weather Data - Hurricane Irma 46
Appendix F Utility Reported Weather Data - Hurricane Nate 47
Appendix G FPL Outage Data - Hurricane Irma 48
Appendix H Utility Reported Repairs- Hurricane Irma 49

List of Figures

Figure 3-1 Hurricane Hermine – Tropical Storm and Hurricane Force Winds 13
Figure 3-2 Hurricane Matthew – Tropical Storm and Hurricane Force Winds 15
Figure 3-3 Hurricane Irma – Tropical Storm and Hurricane Force Winds 17
Figure 3-4 Hurricane Nate – Tropical Storm and Hurricane Force Winds 19
Figure 4-1 Hurricane Irma – Percent of Florida's Total Customers without Power 22
Figure 4-2 Hurricane Irma – Percent of Affected Customers without Power 23
Figure 6-1 PSC Portal – Timeline of Consumer Comments Received 33

List of Tables

Table 2-1 Vegetation Clearing from Feeder and Lateral Circuits (in Miles) 10
Table 2-2 Wooden Pole Replacement 11
Table 3-1 Hurricane Hermine – Five Counties with Highest Maximum Outages 14
Table 3-2 Hurricane Matthew – Five Counties with Highest Maximum Outages 16
Table 3-3 Hurricane Irma – Five Counties with Highest Maximum Outages 18
Table 3-4 Hurricane Nate – Five Counties with Highest Maximum Outages 20
Table 4-1 FPL – Outage and Restoration Data for Hurricanes Wilma and Irma 24
Table 4-2 Hurricane Irma – Utility Coordination, Injuries, and Fatalities 26
Table 5-1 FPL Outage Rates for Facilities Impacted by Hurricane Irma 29
Table 6-1 Total Number of Utility and Third-Party Customer Contact Representatives 31
Table 6-2 Total Customer Contacts 31
Table 6-3 Average Number of Customer Contacts per Utility Representative 32
Table 6-4 PSC Portal – Customer Comments 34
Table 6-5 PSC Portal – Customer Comments by Utility Type 34
Table 6-6 PSC Portal – Most Prevalent Topics Discussed in Customer Comments 35

Terms and Acronyms

APPA	American Public Power Association
CIAC	Contributions-in-Aid-of-Construction
Cooperative	Rural Electric Cooperative Utility
DEF	Duke Energy Florida, LLC
DEM	Florida Department of Emergency Management
EEI	Edison Electric Group
EOC	Emergency Operation Center
ESF-12	Emergency Support Function 12
F.A.C.	Florida Administrative Code
FECA	Florida Electric Cooperatives Association, Inc.
FEMA	Federal Emergency Management Agency
FIPUG	Florida Industrial Power Users Group
FMEA	Florida Municipal Electric Association
FPL	Florida Power & Light Company
FPUC	Florida Public Utilities Company
FRF	Florida Retail Federation
F.S.	Florida Statutes
GIS	Geographic information system
GPC	Gulf Power Company
IOUs	The five investor-owned electric utilities: DEF, FPL, TECO, GPC, and FPUC
Municipal	Municipal Electric Utility
NRECA	National Rural Electric Cooperatives Association
OPC	Office of Public Counsel
PURC	Public Utility Research Center – University of Florida
RMAG	Regional Mutual Assistance Groups
TECO	Tampa Electric Company

Executive Summary

The Florida Public Service Commission (PSC or Commission) has broad authority over the adequacy and reliability of the state's electric transmission and distribution grids. In addition, the Commission's jurisdiction extends to rate setting and all cost-recovery matters for investor-owned electric utilities (IOUs).

To promote strengthening of Florida's electric infrastructure and to reduce the frequency and length of outages following the intense 2004 and 2005 hurricane seasons, the Commission adopted extensive storm hardening initiatives, such as wooden pole inspection and replacement. The Commission ordered IOUs to file updated storm hardening plans for Commission review every three years. Those initiatives and the utilities' hardening plans have been the roadmap for aggressively improving resilience during the past 12 years. There were no major storm landfalls in Florida until the four hurricanes of 2016-2017, making the last two storm seasons the first opportunity to gather performance data.

On October 3, 2017, the Commission opened Docket No. 20170215-EU to review electric utility storm preparedness and restoration actions, and to identify potential areas where infrastructure damage, outages, and recovery time for customers could be minimized in the future. Commission staff issued several data requests to all utilities and sought input from non-utility stakeholders and customers, including a customer comments portal on the PSC website.

On May 2-3, 2018, the Commission held a workshop during which information was presented by utilities, customers and their representatives, and local governments. All of the IOUs provided data at the workshop that showed hardened facilities performed better than non-hardened facilities. There were clearly fewer outages for underground than overhead circuits.

The utilities suggested improvements such as targeted undergrounding projects for certain lateral circuits, possible legislation to require inspections and hardening of non-electric utility poles, and additional coordination and communication regarding vegetation outside of the utilities' rights of way. Non-utility stakeholders, including local governments, suggested increased coordination and more utility staffing at local Emergency Operations Centers (EOCs).

Key Findings

- Florida's aggressive storm hardening programs are working. (Section V)
- The length of outages was reduced markedly from the 2004-2005 storm season. (Section IV)
- Hardened overhead distribution facilities performed better than non-hardened facilities. (Section V)
- Very few transmission structure failures were reported. (Section V)

- Underground facilities performed much better compared to overhead facilities. (Section V)

- Despite substantial, documented improvement, some customers were dissatisfied with the extent of Hurricane Irma outages and restoration times. (Section VI)

- Rising customer expectations are that resilience and restoration will have to continually improve. (Section VI)

- The primary causes of power outages came from outside the utilities' rights of way including falling trees, displaced vegetation, and other debris. (Section IV)

- Vegetation management outside the utilities' rights of way is typically not performed by utilities due to lack of legal access. (Section IV)

- In some instances, following Hurricane Irma, estimates of restoration time proved inaccurate, and consumer communication systems were overwhelmed. (Section VI)

- Some local governments see a need for better coordination and communication with utilities during and after storms. (Section VI)

Commission Actions

At the July 10, 2018 Internal Affairs meeting, the Commission directed its staff to initiate the following:

- Open storm hardening plan review dockets earlier than previously scheduled, for all five IOUs and begin collecting additional details related to:

    - Meetings with local governments regarding vegetation management and the identification of critical facilities.

    - Utility staffing practices at local emergency operations centers.

    - Planned responses to roadway congestion, motor fuel availability, and lodging accommodation issues.

    - Alternatives considered before selecting a particular storm hardening project.

    - The collection of more uniform performance data for hardened vs. non-hardened and underground facilities, including sampling data where appropriate.

    - The impact of non-electric utility poles on storm recovery.

- Begin collecting data related to the targeted undergrounding projects of Florida Power & Light Company (FPL) and Duke Energy Florida, LLC (DEF) as part of the staff's annual distribution reliability review.

- Initiate a management audit to examine the procedures and processes used by the IOUs to estimate and disseminate outage restoration times following a major storm.

- Initiate a management audit to examine the procedures and processes used by the IOUs to inspect and schedule maintenance on transmission structures.

Legislative Considerations

The Commission also identified several issues outside its jurisdiction that the Legislature may consider:

- Revision of vegetation management policies to improve the ability of electric utilities to conduct vegetation management outside of rights of way to reduce outages and restoration costs.

- Possible legislation to require inspection and hardening of non-electric utility poles.

- Enhanced statewide public education regarding tree trimming and problem tree placement and removal on private property. This program could be similar to a Right Tree, Right Place initiative already used by several utilities.

- Implementation of emergency procedures regarding roadway congestion, motor fuel availability, and lodging accommodations for mutual aid personnel.

Section I: Background

In response to the intense impact that the 2004 and 2005 hurricanes had on the state, the 2006 Florida Legislature directed the Commission to ". . . conduct a review to determine what should be done to enhance the reliability of Florida's transmission and distribution grids during extreme weather events, including the strengthening of distribution and transmission facilities." Based on its review of the 2004 and 2005 hurricane seasons, the Commission provided three recommendations in a 2007 report to the Legislature:[1] (1) maintain a high level of storm preparation; (2) strengthen the electric infrastructure to withstand severe weather events with the use of hardening activities; and (3) establish additional planning tools to identify and implement instances where undergrounding is appropriate as a means of storm hardening. As discussed in the 2007 report to the Florida Legislature, ". . . the Commission has been careful to balance the need to strengthen the state's electric infrastructure to minimize storm damage, reduce outages, and reduce restoration time while mitigating excessive cost increases to electric customers."

The 2006 Order

In 2006, after considering recommendations from the utilities, the Commission ordered IOUs to inspect wooden poles every eight years to assure weakened ones are replaced, and to implement 10 storm preparedness initiatives:

- Three-year Vegetation Management Cycle for Distribution Circuits
- Audit of Joint-Use Attachment Agreements (shared use of poles with telecom)
- Six-year Transmission Structure Inspection Program
- Hardening of Existing Transmission Structures
- Development of Transmission and Distribution Geographic Information System
- Collection of Post-Storm Data and Forensic Analysis
- Collection of Detailed Outage Data Differentiating Between the Reliability Performance of Overhead and Underground Systems
- Increased Utility Coordination with Local Governments
- Collaborative Research on Effects of Hurricane Winds and Storm Surge
- Development of Natural Disaster Preparedness and Recovery Program Plans

The Commission also ordered electric utilities to file updated storm hardening plans every three years, and began annual Hurricane Season Preparation Workshops, which allow the IOUs, Municipals, and Cooperatives to share individual hurricane season preparation activities. These practices continue today.

---

[1] Report to the Legislature on Enhancing the Reliability of Florida's Distribution and Transmission Grids During Extreme Weather, July 2007, http://www.psc.state.fl.us/Files/PDF/Utilities/Electricgas/EnergyInfrastructure/UtilityFilings/docs/stormhardening2007.pdf.

The Commission requires all IOUs to file an Annual Distribution Reliability Report with the PSC. This report includes updates of utilities' hardening efforts to allow the Commission to monitor progress. Additionally, each IOU updates its tariff as necessary to reflect the Commission requirement that the cost of conversion from overhead to underground, as well as the benefits of storm hardening, be incorporated into the Contributions-in-Aid-of-Construction (CIAC) calculation as outlined in Rules 25-6.0342 and 25-6.064, Florida Administrative Code (F.A.C.).

Also in 2006, the Commission required Florida's local exchange telecommunications companies to implement inspections of their wooden poles.[2] The Commission's authority to impose that requirement was subsequently repealed in 2011 as part of a number of deregulatory changes made to Chapter 364, Florida Statutes.

2016-2017 Hurricanes

During 2016, Florida was impacted by two hurricanes: Hermine and Matthew and in 2017, Hurricanes Irma and Nate impacted Florida. The largest storm, Hurricane Irma, made landfall in Florida on September 10, 2017, as a Category 4 hurricane in Monroe County; then made a second landfall as a Category 3 hurricane in Collier County, providing the first major test to the system since 2005.

On October 3, 2017, the PSC opened Docket No. 20170215-EU to identify potential areas where infrastructure damage, outages, and recovery time for customers could be minimized in the future. In order to identify these areas, Commission staff issued several data requests to all utilities in the areas of preparation, restoration practices, customer communication, outage causes, facility performance, meteorological data, and suggested improvements.

Commission staff also sought comments from non-utility stakeholders and customers. A summary of the non-utility stakeholders' comments are provided in Appendix A. On October 9, 2017, a customer portal was opened on the Commission's website, allowing customers to submit comments regarding their reaction to utility restoration/communication efforts. The portal was closed on May 1, 2018, with 701 customer comments and 14 non-utility stakeholder comments received.

On May 2-3, 2018, the Commission held a workshop. Leading up to the workshop, staff provided topics for utilities to address, which included preparation and restoration processes, hardened vs. non-hardened facility performance, underground vs. overhead performance, impediments to restoration, customer/stakeholder communication, and suggested improvements based on lessons learned.

[2] Order No. PSC-06-0168-PAA-TL, issued March 1, 2006, in Docket No. 20060077-TL, *In re: Proposal to require local exchange telecommunications companies to implement ten-year wood pole inspection program.*

At the workshop, the following provided input:

- FPL
- DEF
- Tampa Electric Company (TECO)
- Gulf Power Company (GPC)
- Florida Public Utilities Company (FPUC)
- Florida Electric Cooperatives Association, Inc. (FECA)
- Florida Municipal Electric Association (FMEA)
- Office of Public Counsel (OPC)
- Florida Industrial Power Users Group (FIPUG)
- Florida Retail Federation (FRF)
- City of Dunedin
- St. Johns County
- City of Monticello

The IOUs provided data at the workshop that showed hardened facilities performed better than non-hardened facilities. There were clearly fewer outages for underground than overhead circuits.

The utilities suggested improvements such as targeted undergrounding projects for certain lateral circuits, possible legislation to require inspections and hardening of non-electric utility poles, and additional coordination and communication regarding vegetation outside of the utilities' rights of way. Non-utility stakeholders, including local governments, suggested increased coordination and more utility staffing at local EOCs.

Section II: Hurricane Preparedness Practices

Commission Role

No amount of preparation can eliminate outages in extreme weather events, so utility regulators work to reduce and shorten outages. In support of sharing individual hurricane preparation activities among IOUs, Municipals, and Cooperatives, the Commission has held annual Hurricane Season Preparation Workshops since 2006. These workshops provide an opportunity for electric utilities to discuss their storm preparation and restoration processes, coordination with local governments, and public outreach.

The Commission's Division of Engineering is responsible for staffing the Emergency Support Function 12 (ESF-12) in the State's Emergency Operations Center. ESF-12 coordinates with the electric and natural gas utilities operating in Florida to ensure the integrity of their energy supply systems are maintained during emergency situations. In this role, Commission staff also participates in an annual hurricane preparedness drill and other EOC related exercises.

The Commission provides information to consumers regarding storm preparedness, such as hurricane survival kits, portable generator safety, and ways to prepare your home before a storm. In the event of a storm, links to current Florida Division of Emergency Management (DEM) information are highlighted on the PSC website (www.floridapsc.com), as well as links to the Federal Emergency Management Agency (FEMA) and the National Hurricane Center. The PSC issues statewide news releases at the beginning of each storm season regarding hurricane workshops, or Commission decisions on utility storm preparedness plans. All of this information is distributed via the PSC's Twitter account (https://twitter.com/floridapsc) at appropriate times throughout the year.

Utility Preparedness and Storm Hardening Activities

Throughout the year, utilities participate in hurricane exercises and drills in order to better prepare for a storm event. Prior to hurricane season, utilities ensure that they have the required internal materials on hand, as well as commitments for external resources which may be needed following a storm. Utilities also partake in hurricane preparedness exercises and meetings with local governments and the state Emergency Operations Center, and they ensure that the proper critical facilities (i.e., hospitals, water and wastewater treatment plants, and fire stations) are identified.

The activities outlined in each IOUs' storm hardening plan vary to a degree; however, all are grounded in substantive strengthening and protection of the utility's electric facilities. Programs include tree trimming, pole inspections, hardening of feeders and laterals, and undergrounding.

Utilities typically focus hardening efforts on transmission infrastructure, as these can impact large numbers of customers. Hardening efforts are also prioritized for infrastructure that serves critical facilities, which are generally restored first following a storm event.

IOUs complete tree trimming of their distribution circuits, composed of laterals and feeders, in three- to six-year cycles. Feeders run outward from substations and have the capability of serving

thousands of customers. Laterals branch from the feeder circuits and are the final portion of the electric delivery system, serving a smaller portion of customers, and are typically associated with residential areas.

Each year, IOUs trim a certain percentage of their total lateral and feeder miles as part of their hardening plans; however, the trees trimmed only include those that are in the utilities' rights of way. Most IOUs trim overhead feeder circuits over a three-year trim cycle, excluding TECO which is currently on a four-year trim cycle.[3] For overhead laterals, IOUs must complete all trimming during a maximum six-year cycle.[4]

Table 2-1 lists the number of miles of vegetation cleared or trimmed that each IOU has completed for its feeder and lateral circuits since 2006. The number of miles provided includes planned tree trimming and may not include hot-spot or mid-cycle trimming. Hot-spot tree trimming occurs when crews are sent to specific areas that require unscheduled trimming due to rapid growth.

Table 2-1
Vegetation Clearing from Feeder and Lateral Circuits (in Miles)

	DEF		FPL		FPUC		GPC		TECO	
	Feeders	Laterals	Feeders	Laterals	Feeders	Laterals	Feeders	Laterals	Feeders	Laterals
2006	723	2,703	10,094	825	-	-	-	-	268	840
2007	2,112	2,203	4,454	2,215	-	-	1,878	675	363	945
2008	708	2,544	4,262	2,078	59	86	274	821	374	806
2009	467	3,178	4,151	2,768	63	96	274	821	374	806
2010	787	4,139	5,222	2,741	65	84	281	1,060	617	1,634
2011	2,370	1,132	4,337	3,367	68	205	259	1,530	606	1,514
2012	196	3,228	4,045	3,703	52	123	240	857	435	1,282
2013	476	3,810	4,637	4,124	67	129	240	1,293	374	1,098
2014	3,297	2,782	4,249	3,685	52	145	241	1,294	465	1,161
2015	1,024	3,579	4,209	3,817	51	134	241	913	454	1,146
2016	1,016	2,173	4,418	3,745	62	188	241	331	386	926
2017	2,106	1,909	4,381	3,560	29	86	241	446	199	627

Source: IOUs' 2006-2017 distribution reliability reports.

[3] Order No. PSC-12-0303-PAA-EI, issued June 12, 2012, in Docket No. 20120038-EI, *In re: Petition to modify vegetation management plan by Tampa Electric Company*.
[4] Order No. PSC-07-0468-FOF-EI, issued May 30, 2007, in Docket No. 20060198-EI, *In re: Requirement for investor-owned electric utilities to file ongoing storm preparedness plans and implementation cost estimates*.

As part of each IOUs' storm hardening plan, the Wooden Pole Inspection Program requires each utility to inspect and assess the strength of all of its installed wooden poles over an eight-year period. IOUs also have wooden pole replacement programs in place where a select number of existing poles are replaced with hardened poles. The National Electrical Safety Code Extreme Wind Loading standards are used in designing replacement poles. Table 2-2 shows the number of transmission and distribution wooden poles replaced from 2006 through 2017.

Table 2-2
Wooden Pole Replacement

	DEF		FPL		FPUC		GPC	TECO	
	Trans.	Distr.	Trans.	Distr.	Trans.	Distr.	Distr.	Trans.	Distr.
2006	-	-	307	2,334	-		-	-	-
2007	956	1,130	1,471	8,164	-		185	494	1,536
2008	866	1,903	1,966	7,533	47		736	781	2,056
2009	704	3,018	3,206	7,342	34		969	713	1,640
2010	-	-	1,409	10,639	215		418	900	2,815
2011	635	2,887	1,559	9,942	215		1,060	1,060	3,328
2012	803	4,670	816	10,454	242		1,032	683	4,957
2013	1,347	5,722	1,106	13,639	135		380	866	6,572
2014	2,028	5,597	2,070	12,777	536		790	720	6,038
2015	1,738	8,420	1,888	15,089	382		676	649	5,392
2016	698	4,429	1,737	12,067	254		693	940	6,701
2017	530	2,654	1,934	8,486	-		746		
Total	10,305	40,430	19,469	118,466	2,060		6,939	7,806	41,035

Source: Document Nos. 01516-2018, 01517-2018, 01518-2018, 01519-2018, 01520-2018, DEF's 2006-2017 distribution reliability reports.

Underground Facilities

The Commission's 2006 storm hardening initiatives included collaborative research efforts involving the electric utilities and the Public Utility Research Center (PURC), Warrington College of Business at the University of Florida. Specifically, the research provided three reports addressing material relevant to the modeling and assessment of the costs and benefits of relocating existing overhead electric distribution systems to underground. The effort reflects the state of facts that existed at that time and the results of this research remain available to the general public and local communities that are interested in relocating existing overhead electric distribution facilities.

In response to staff's data requests, the three largest IOUs stated that approximately 40 percent of all distribution lines are underground and that the majority of recent underground projects were for new construction, rather than the conversion of overhead to underground. Since 2006, the installed underground facilities have increased by approximately 5,300 miles for the IOUs. The

total amount of installed underground facilities during the past five years was approximately 2,200 miles for an average rate of 440 miles/year.

The construction of underground electrical distribution systems, when compared with overhead systems, is more expensive. For construction of underground, the customer is responsible for the difference in the costs between underground and overhead, which often results in an installation barrier. Pursuant to Rules 25-6.0342 and 25-6.064, F.A.C., the costs and benefits of storm hardening are factored into the cost difference calculation for new construction or conversion to underground facilities, as reflected on each IOUs' tariff.

In an effort to further the deployment of underground facilities, DEF and FPL have initiated targeted undergrounding programs over the next few years. Both programs are scheduled to begin in 2018, focus on historically poor performing lateral circuits to replace several hundred miles of overhead lines, and are being funded through current base rates including any previously approved step increases. DEF's program is scheduled over a period of ten years and FPL's pilot program is currently scheduled for three years. The goal for each program is to test different construction techniques and identify impediments to converting these targeted overhead facilities to underground.

Storm Hardening Cost Recovery

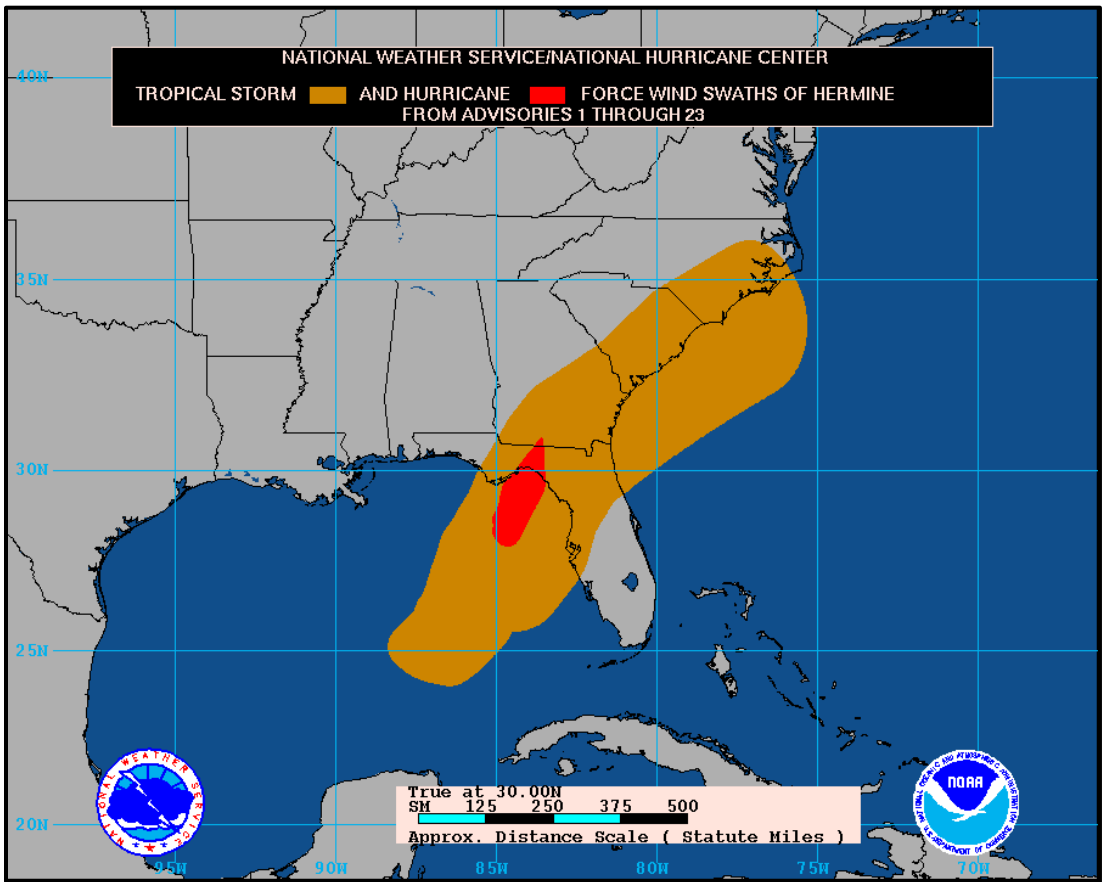
While an IOU's storm hardening plan must be approved by the Commission, this does not guarantee an IOU the recovery of all incurred costs for the implementation of the plan. Storm hardening costs are addressed during an IOU's general rate case proceeding, and those costs are covered in base rates since they are considered a part of providing electric service in Florida. During a general rate case, the costs for storm hardening are taken into consideration and the Commission makes a ruling on whether the costs were prudently incurred.

Section III: Summary of 2016 and 2017 Storms

Hurricane Hermine

Hurricane Hermine made landfall on September 2, 2016, near Wakulla and Jefferson counties. Hurricane Hermine was a Category 1 hurricane when it made landfall, primarily affecting the Big Bend area. Figure 3-1 illustrates the path of Hurricane Hermine, and the areas that experienced tropical storm and hurricane force winds. The National Hurricane Center defines tropical storm force winds as winds between 39 miles per hour (mph) to 73 mph. Winds that are equal to or exceeding 74 mph are defined as hurricane force winds.

Figure 3-1
Hurricane Hermine – Tropical Storm and Hurricane Force Winds



Source: NOAA's National Hurricane Center

Wind, rainfall, and storm surge data was requested from IOUs, Municipals, and Cooperatives for each hurricane. A total of 36 utilities provided data and the maximum reported sustained winds, wind gusts, rainfall, and storm surge for Hurricane Hermine, summarized in Appendix C. The three counties that experienced some of the highest sustained winds and wind gusts from Hermine were Jefferson, Madison, and Taylor. These counties also received high levels of

rainfall; however, the two counties with the largest amounts of rainfall were Manatee and Sarasota. These two counties did not rank highest for any other category, and appear to be outliers in the reported weather data. The reason for the large amount of rain experienced in Manatee and Sarasota counties may have been due to strong storm bands that hit that part of the state. The three counties that had the largest storm surges were Dixie, Taylor, and Wakulla. All of these counties, with the exception of Manatee and Sarasota, were located in the area where Hurricane Hermine made landfall.

Table 3-1 provides the five counties with the highest number of outages for Hurricane Hermine. This outage data was reported to the state EOC by IOUs, Municipals, and Cooperatives at set intervals of reporting times. The percentages of accounts without power were calculated based on the peak number of customer accounts without power divided by the total number of customer accounts for that county, which includes IOUs, Municipals, and Cooperatives' customers. The total peak percentage of accounts in the state without power was approximately 3 percent for Hurricane Hermine. Appendix B provides a comprehensive list of the peak number of customer accounts by county that were without power for each hurricane.

Table 3-1
Hurricane Hermine – Five Counties with Highest Maximum Outages

	Max. Account Outages	Max. Percent of Account Outages
Hamilton	5,864	87.9%
Jefferson	5,762	71.5%
Lafayette	2,965	71.5%
Madison	7,278	69.0%
Wakulla	14,009	93.0%

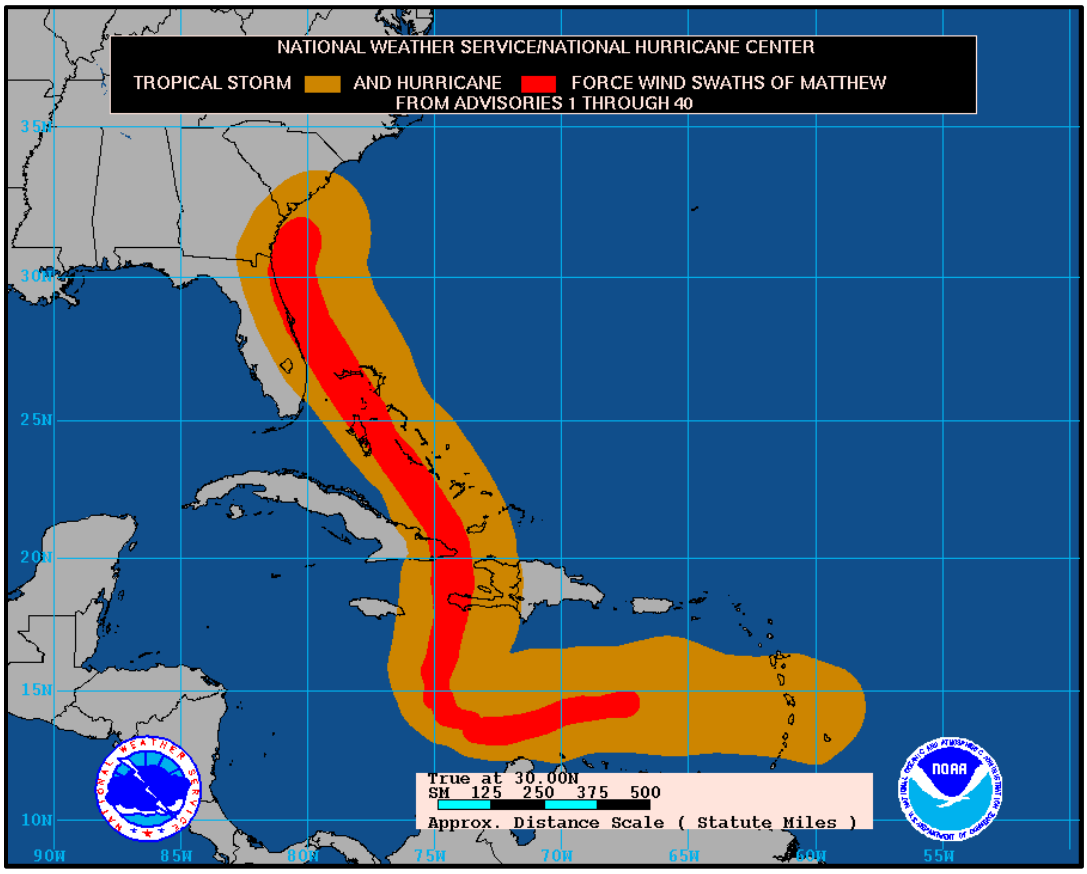
Source: State EOC power outage reports.

The outages for Jefferson, Madison, and Wakulla counties correlate to the reported weather data as they were among the counties that experienced the highest winds, rainfall, and storm surges. Wind data was not reported for Hamilton and Lafayette counties, though they both received large amounts of rainfall.

Hurricane Matthew

While Hurricane Matthew never made landfall in Florida, it passed along Florida's east coast shoreline, where some areas experienced sustained hurricane force winds. Hurricane Matthew began as a Category 4 hurricane on October 7, 2016, but weakened and later became a Category 2 hurricane northeast of Jacksonville Beach on October 8, 2016. Figure 3-2 illustrates the path of Hurricane Matthew, and the areas that experienced tropical storm and hurricane force winds.

Figure 3-2
Hurricane Matthew – Tropical Storm and Hurricane Force Winds



Source: NOAA's National Hurricane Center

Wind speed, rainfall, and storm surge data for Hurricane Matthew is contained in Appendix D. The three counties that experienced some of the highest sustained winds and wind gusts for Hurricane Matthew were Brevard, St. Johns, and Volusia. From the reported rainfall data, the counties with the three highest amounts of rainfall were Brevard, Indian River, and St. Lucie. The three counties that had the largest storm surges were Flagler, Nassau, and St. Johns. All of these counties are located on Florida's east coast and correspond to the path of the storm. Table 3-2 provides the five counties with the highest number of outages for Hurricane Matthew. The total peak percentage of customer accounts in the state without power was 11 percent.

Table 3-2
Hurricane Matthew – Five Counties with Highest Maximum Outages

	Max. Account Outages	Max. Percent of Account Outages
Flagler	57,016	100.0%
Indian River	59,244	67.2%
Putnam	27,393	66.8%
St. Johns	78,610	89.6%
Volusia	257,718	92.0%

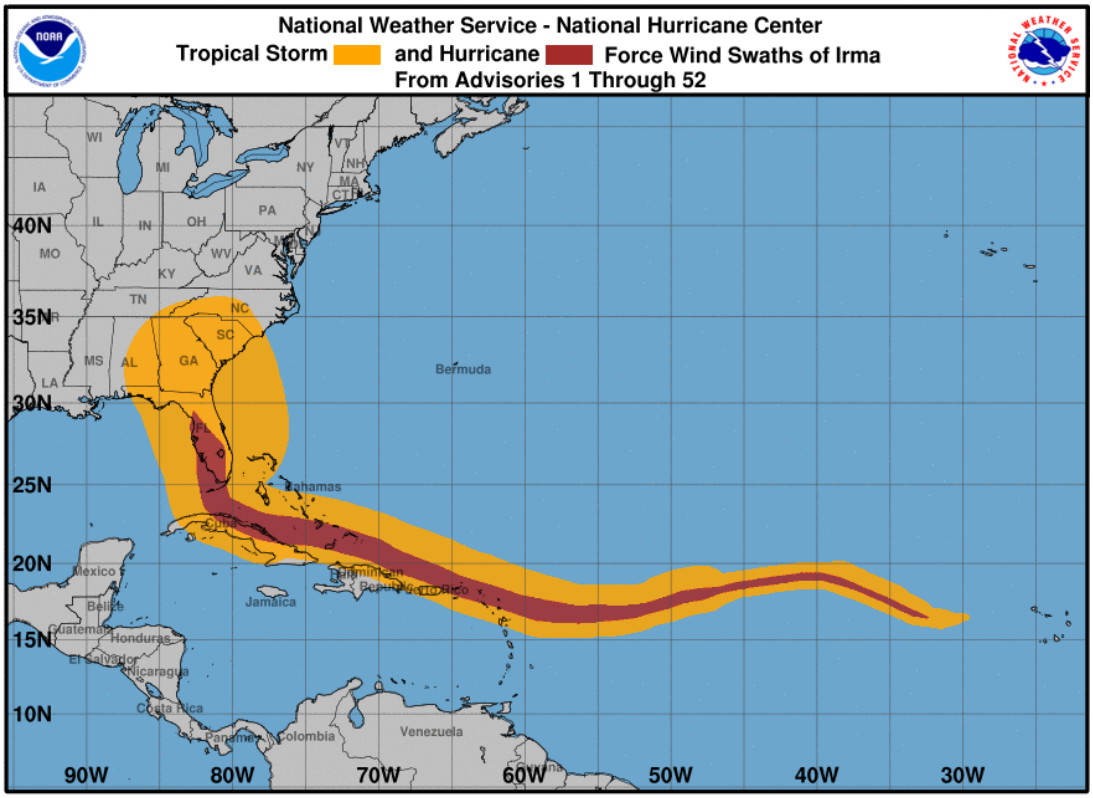
Source: State EOC power outage reports.

The outages for Flagler, Indian, St. Johns, and Volusia counties correlate to the reported weather data as they were among the counties that experienced the highest winds, rainfall, and storm surges. Rainfall data was not reported for Putnam County; however, it is located next to St. Johns County, which experienced severe weather conditions.

Hurricane Irma

Hurricane Irma was the first major hurricane to make landfall in Florida since the 2004 and 2005 hurricane seasons. On September 10, 2017, Hurricane Irma made landfall in the Florida Keys as a Category 4 hurricane and weakened to a Category 3 hurricane as it made a second landfall near Marco Island, Florida on the same day. The storm continued to weaken as it moved over Florida, affecting all 67 counties in the state and resulting in widespread power outages. Figure 3-3 illustrates the path of Hurricane Irma, and the areas that experienced tropical storm and hurricane force winds.

Figure 3-3
Hurricane Irma – Tropical Storm and Hurricane Force Winds



Source: NOAA's National Hurricane Center

Wind speed, rainfall, and storm surge data for Hurricane Irma is contained in Appendix E. The three counties that experienced the highest maximum sustained winds for Hurricane Irma were Collier, Monroe, and Polk. The largest amount of rainfall was reported for Bradford, Hillsborough, and St. Lucie counties. The three counties that had the largest maximum storm surge were Collier, Monroe, and Nassau. Due to the path of Hurricane Irma, many of the southernmost counties, such as Monroe and Collier, experienced high winds and storm surges, while parts of central Florida had large amounts of rain. Additionally, parts of northeast Florida, such as Nassau County, experienced high winds and storm surges due to the outer bands and the path of the storm.

Table 3-3 provides the five counties with the highest number of outages for Hurricane Irma. The total peak percentage of customer accounts in the state without power was 62 percent.

Table 3-3
Hurricane Irma – Five Counties with Highest Maximum Outages

	Max. Account Outages	Max. Percent of Account Outages
Hardee	11,976	97.4%
Hendry	18,750	100.0%
Highlands	62,010	99.3%
Nassau	43,740	97.6%
Okeechobee	21,990	96.5%

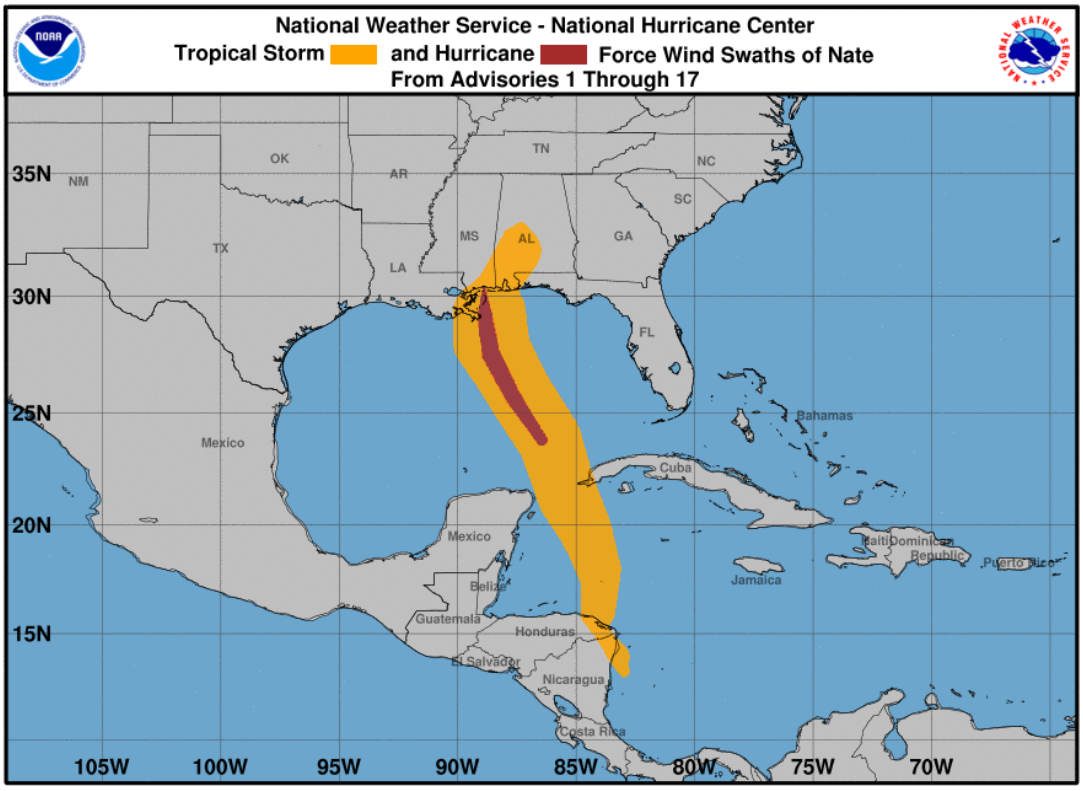
Source: State EOC power outage reports.

The outages for Nassau County correlate to the reported weather data as it was among the counties that experienced high storm surges. Okeechobee, Hardee, Henry, and Highlands counties are in close proximity to one another and are located in south Florida, near Hurricane Irma's landfall. All of these counties experienced wind gusts over 100 mph and all but Okeechobee recorded over 10 inches of rainfall.

Hurricane Nate

On October 7, 2017, Florida was impacted by a second storm, Hurricane Nate, which made its first landfall at the mouth of the Mississippi River as a Category 1 hurricane, followed by a second landfall near Biloxi, Mississippi on the same day. While Hurricane Nate did not make landfall in Florida, parts of the panhandle were impacted by the hurricane. Figure 3-4 illustrates the path of Hurricane Nate, and the areas that experienced tropical storm and hurricane force winds.

Figure 3-4
Hurricane Nate – Tropical Storm and Hurricane Force Winds



Source: NOAA's National Hurricane Center

Wind speed, rainfall, and storm surge data for Hurricane Nate is contained in Appendix F. The impact of Hurricane Nate was much smaller in scope compared to the previous three hurricanes. The three counties that experienced the highest sustained winds, wind gusts, and rainfall were Escambia, Okaloosa, and Santa Rosa. The three counties that had the highest storm surges were Escambia, Franklin, and Santa Rosa. All of these counties are located in Florida's panhandle, close to where Hurricane Nate made landfall. Table 3-4 provides the five counties with the highest number of outages for Hurricane Nate. The total peak percentage of accounts in the state without power was 0.1 percent.

Table 3-4
Hurricane Nate – Five Counties with Highest Maximum Outages

	Max. Account Outages	Max. Percent of Account Outages
Escambia	5,384	3.4%
Holmes	77	0.7%
Okaloosa	6,382	5.9%
Santa Rosa	1,712	2.2%
Walton	613	1.0%

Source: State EOC power outage reports.

The outages for Escambia, Okaloosa, and Santa Rosa counties correlate to the reported weather data as they were among the counties that experienced some of the highest winds, rainfall, and storm surges. While Walton County did not have the highest reported winds and rainfall, it experienced high winds comparable to Okaloosa County, as well as receiving several inches of rain. Wind data was not reported for Holmes County; however, it is located in the panhandle area near Okaloosa and Walton counties.

Section IV: Review of Outage Restoration Activities

Restoration Process

The restoration process is a year-round activity. Many utilities across the state engage in exercises that simulate storms in order to better prepare for an actual hurricane or other significant weather event.

In an actual hurricane, utilities may initiate pre-staging meetings and activities as early as 240 hours before landfall, which may include requests for mutual aid. IOUs communicate with county EOCs to identify critical facilities (i.e., hospitals, water and wastewater treatment plants, and fire stations) and coordinate on other restoration activities.

Before a storm makes landfall, an assessment of potential damage is completed by utilities based on the forecasted path of the storm. This information can be used to determine if mutual aid and additional material resources should be requested.

As the storm approaches, repair activities will continue until winds reach 35-40 miles per hour, at which time crews will be called back for a stand-down period. Once winds drop below 35-40 miles per hour and weather conditions are considered to be safe following a storm, utility crews are re-deployed to continue the restoration process.

Once the storm has passed, a post-storm damage assessment is completed, where utilities can establish what facilities have been damaged, refine restoration time estimates, manage workloads, and allocate resources to where they are needed. Restoration begins with repairs to generation plants and transmission facilities that sustained damage, followed by repairs to substations and feeders. Substations and feeders that power critical infrastructure are prioritized first in order to get those necessary facilities back in service.

Feeders that serve the largest number of customers are restored next, and finally laterals that serve neighborhoods with fewer customers are repaired and restored. Overall, utilities strive to restore as many customers as possible in the shortest amount of time.

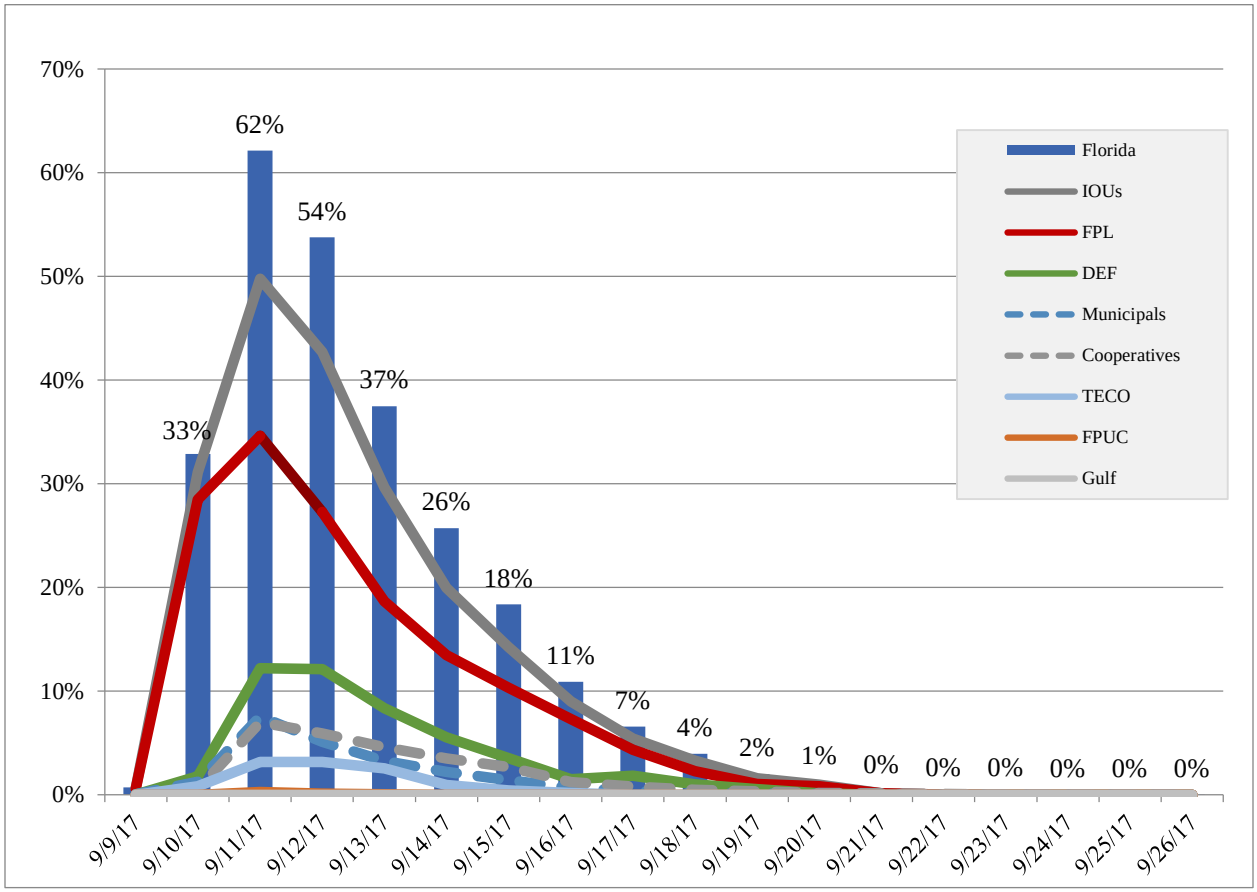
Based on a review of the utility presented data for each hurricane, the utilities performed consistently in restoring service. Hurricane Irma affected the entire state and was the first significant test of Florida's electric infrastructure since the 2004 and 2005 hurricane season. For simplification purposes, and due to the size and scope of the storm, the following subsections on restoration, outage causes, mutual aid, and impediments are specific to Hurricane Irma only. Data from other storms was used for comparison purposes to determine if there were any anomalies or unique circumstances.

Hurricane Irma Restoration

Florida's utilities managed more than 27,000 crews in the aftermath of Hurricane Irma. The rate of restoration was fairly rapid with comparable results for all utilities.

Using outage data reported to DEM, Figure 4-1 provides the number of customer accounts without power in proportion to the total number of customers in the state. The peak outages occurred on September 11, 2017, when more than 6.5 million customers (62 percent of the state's approximately 10.5 million customers) were without power. Five days following this peak, the number of outages dropped to approximately 11 percent. On September 20, 2017, ten days following the outage peak, the percent of customer accounts without power dropped below 1 percent.

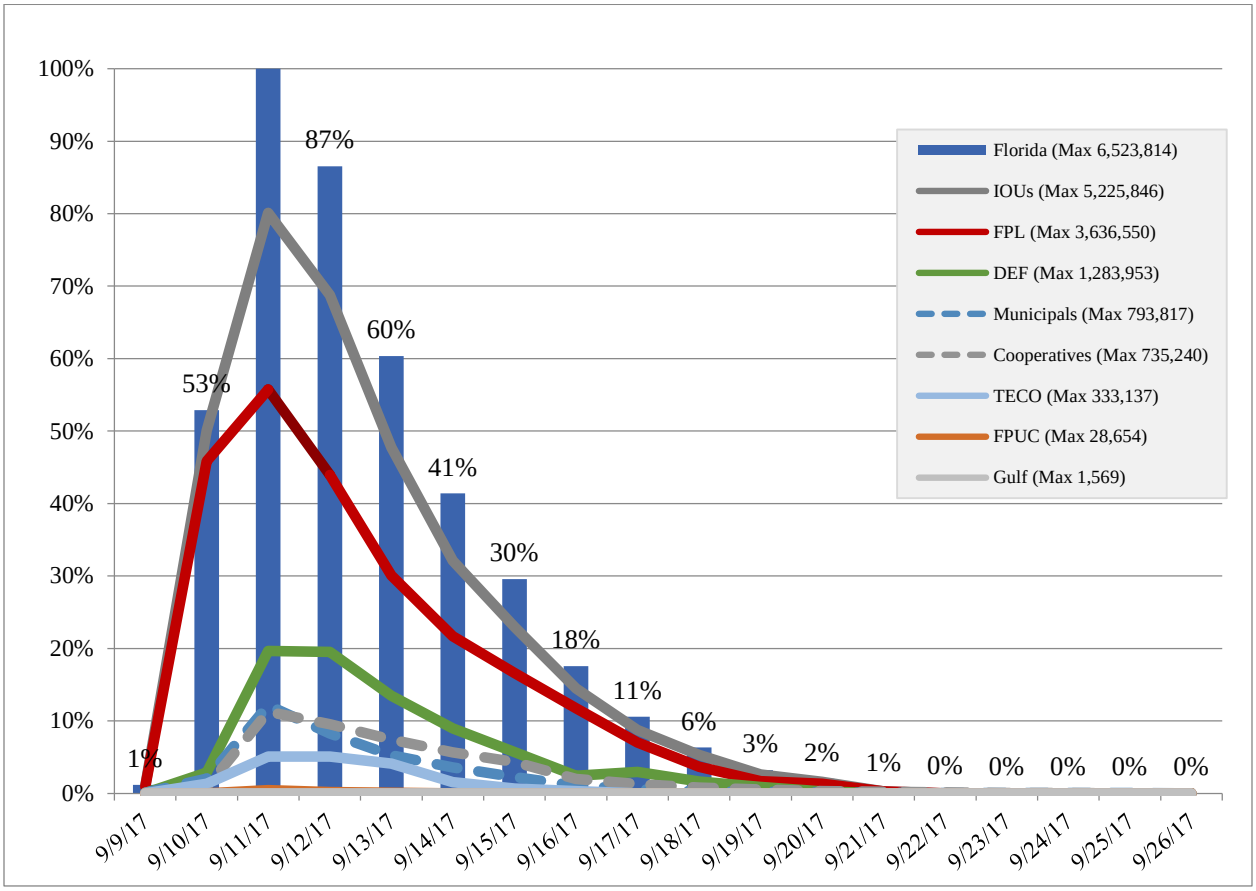
Figure 4-1
Hurricane Irma – Percent of Florida's Total Customers without Power



Source: State EOC power outage reports.
Note: Individual utility outage maximums occurred at different times and do not add to the total.

As previously stated, the peak number of outages occurred on September 11, 2017. Figure 4-2 provides the daily percentages of customers without power based on the peak outages. Following September 11, 2017, the proportion of affected customers that were still without power was below 50 percent three days later on September 14, 2017. Additionally, by September 20, 2017, the number of customers that were without power dropped to 2 percent. For several utilities, once the number of customers without power dropped to 2 percent or less, the utility stopped reporting outages to the DEM as these outages could be unrelated to the storm event.

Figure 4-2
Hurricane Irma – Percent of Affected Customers without Power



Source: State EOC power outage reports.
Note: Individual utility outage maximums occurred at different times and do not add to the total.

Overall, Figures 4-1 and 4-2 illustrate that the graphs for IOUs are similar in shape to the Municipals and Cooperatives, demonstrating comparable power restoration achievements for the different utility groups. No irregularities were observed in the data.

During the May 2018 workshop, FPL provided a comparison of outage data and restoration times for Hurricane Wilma (2005) and Hurricane Irma. As seen in Table 4-1, it took one day to

restore power to 50 percent of FPL's customers for Hurricane Irma, while FPL reported it took five days for Hurricane Wilma. Restoring all customers took 10 days after Hurricane Irma, and it took 18 days after Hurricane Wilma.

Table 4-1
FPL – Outage and Restoration Data for Hurricanes Wilma and Irma

	Wilma	Irma
Customer outages	3.2M	4.4M
Staging sites	20	29
% Restored / days	50% / 5	50% / 1
All restored (days)	18	10
Avg. days to restore	5.4	2.1

Source: FPL's presentation at the May 2, 2018, Commission Workshop.

Also at the May 2018 workshop, TECO provided a comparison of time to complete restoration after Hurricane Irma (7 days) and in 2004 Hurricane Jeanne (11 days). No other utility provided a similar comparison. While each storm is different and presents its own set of difficulties, the data show restoration times have decreased markedly compared to previous storms.

Outage Causes

Data collected from 39 utilities identified that the biggest source of outages was vegetation issues. Many utilities described that these issues were from fallen trees or branches that were outside of the utilities' rights of way where utilities typically do not have a legal access to perform vegetation management. Additional trimming by the utilities within their rights of way would not eliminate these vegetation related outages. It should also be noted that typical hardening projects are designed and constructed to withstand extreme wind loads, not fallen trees. The second most prevalent outage cause was from embedded severe weather events, such as tornadoes, microbursts, and flooding.

Proactive tree trimming has been a key initiative of the Commission, and the results of the review indicate that vegetation continues to be a primary cause of damage and outages. Entities with authority over tree trimming policies should carefully consider options that would enhance the ability of electric utilities to conduct vegetation management in order to further reduce outages and restoration costs. Enhanced statewide public education regarding tree trimming and problem tree placement and removal on private property could provide additional benefits.

Mutual Aid

Many mutual aid agreements among IOUs throughout the country are managed by seven Regional Mutual Assistance Groups (RMAGs). Florida's IOUs are members of the Southeastern Electric Exchange RMAG. RMAGs facilitate the process of identifying available restoration workers and help coordinate the logistics to help with restoration efforts.

IOUs that are in RMAGs follow guidelines established by the Edison Electric Institute (EEI), and also establish additional guidelines that aid in the communication process and rapid mobilization and response efforts. EEI also communicates regularly with the associations that

serve Municipals and Cooperatives during major outage incidents, providing a process for electric companies to request support from other electric companies that have not been affected by major outage events.[5]

The American Public Power Association (APPA), together with state and regional public power utilities and organizations, coordinate the mutual aid network for the nation's public power utilities. These utilities have local, state, and regional contracts and agreements for mutual aid, and there is a national mutual aid agreement with over 2,000 public power and rural electric cooperatives so they are able to assist one another when needed. Florida's electric cooperatives sign mutual aid agreements through the National Rural Electric Cooperatives Association (NRECA). These mutual aid agreements include more than 800 cooperatives in Florida, the Southeast, and across America.

Section 252.40, Florida Statutes, Mutual Aid Arrangements, authorizes the governing body of each political subdivision of the state, "to develop and enter into mutual aid agreements within the state for reciprocal emergency aid and assistance in case of emergencies too extensive to be dealt with unassisted." It also provides that, "[s]uch agreements shall be consistent with the state comprehensive emergency management plan and program, and in time of emergency it shall be the duty of each local emergency management agency to render assistance in accordance with the provisions of such mutual aid agreements to the fullest possible extent."

Mutual aid played a key role in restoring the power quickly after Hurricane Irma.[6] At the May 2018 workshop, all utilities stated that they received all assistance that was requested.

Prior to Hurricane Irma making landfall, many utilities made requests for mutual aid. Based on information from the state EOC, a total of 49 utilities received mutual aid. Information on the number of crew managers and crews managed, which includes both utility and mutual aid crews, was requested from utilities.

Table 4-2 illustrates the large number of crews that were managed by a limited number of experienced managers. From the 47 utilities that responded to staff's data request, the average experience level of the crew managers was 25 years. This demonstrates the level of expertise that is required to coordinate large recovery efforts, particularly in regard to mutual aid crews that are unfamiliar with local terrain, the transmission and distribution systems, and procedures specific to each utility.

Considering the large number of mutual aid crews that were brought in to assist with power restoration, the number of injuries was low and there were no fatalities. Of the total 103 injuries, 38 were reported for utility personnel and 65 were reported for mutual aid personnel.

[5] Edison Electric Institute, *Understanding the Electric Power Industry's Response and Restoration Process* (October 2016).
[6] APPA letter to U.S. House Energy & Commerce Committee, Subcommittee on Energy (November 1, 2017).

Table 4-2
Hurricane Irma – Utility Coordination, Injuries, and Fatalities

	Managers	Crews Managed	Meals	Injuries	Fatalities
IOU	48	22,398	1,409,352	76	0
Municipals	96	1,935	109,266	13	0
Cooperatives	104	3,295	171,803	14	0
Total	248	27,628	1,690,421	103	0

Impediments to Restoration

Data was collected from 39 utilities on the primary impediments that were identified for Hurricane Irma. Consistent with prior hurricanes, the biggest impediment to restoration was clearing vegetation, much of which was debris from fallen trees or branches that were outside of the utilities' rights of way.

Other impediments to restoration unique to Hurricane Irma were roadway congestion and lack of motor fuel availability due to the size and scale of evacuations. Therefore, utility crews that were tasked to aid in power restoration for various areas were delayed by some fuel shortages and traffic congestion on the roadways.

Storm Restoration Cost Recovery

Storm hardening costs (Section II), incurred to make the system less vulnerable, are covered by the base rates the utility is authorized to charge. Storm restoration costs, incurred in response to a specific storm, are addressed differently and are not covered by base rates.

Following Hurricane Andrew in 1992, which radically changed the availability and cost of commercial insurance, IOUs requested that the Commission allow for alternative risk mitigation for storm damage. The Commission considered various forms of storm cost risk mitigation for the IOUs and settled on a three part approach:

- A storm damage reserve.
- An annual storm accrual.
- A provision to seek recovery of costs that exceed the storm damage reserve balance.

Under the three-part system, cost recovery of storm related damage is typically addressed through a storm damage reserve, a surcharge, or a combination of the two.

A storm damage reserve can address the costs associated with less severe storm damage. The annual accrual spreads cost over a long period to build a reserve dedicated to storm expenses. Once the storm reserve reaches a target value, the accrual can be suspended. The reserve alleviates consumer rate shock, either by entirely absorbing the cost of lesser storm damage, or at

least diminishing the cost impact of major storms that may exceed the reserve balance. When the reserve is depleted, typically it is replenished through a small amount added to customer's monthly bills.

In order to define what type of costs can be recovered, the Commission adopted Rule 25-6.0143, F.A.C., which specifies that only incremental costs – those above the normal costs that are covered by rates – can be charged to the storm reserve or recovered in a storm cost recovery proceeding. The largest incremental storm cost categories typically include repair materials, added payroll/overtime, contracted crews, travel, housing, and food.

In the event that the storm reserve is depleted from a major storm or multiple storms, or if a utility does not have a storm reserve, an IOU can request an interim storm surcharge added to customer rates for a specific period based on an estimate, pending a thorough accounting. Upon determination by the IOU, the Commission dockets the matter for a formal process to determine actual eligible costs when they are available.

Revenues collected with the interim storm charge are compared to the total actual amount of storm restoration costs determined to be eligible. Expenses that exceed what the interim charge generated are recovered in rates, or excess interim charge revenues are flowed back to customers.

Section V: Storm Hardening Performance

Analyzing infrastructure performance is inherently problematic because conditions vary widely among storms, and among different times and locations within the same storm. However, Hurricane Irma's very large footprint, which spread extreme weather conditions across multiple IOUs' service territories throughout the Florida peninsula, provided a sample that tends to offset those variables. This section focuses on Hurricane Irma outcomes.

Although the sample was large, data collection was limited due to urgency and tumultuous conditions during storm restoration. With a decade having passed since the Commission's 2006 storm order, the IOUs report they were focused on restoring service as rapidly as possible and making it infeasible to collect data during restoration. In part, the performance data had to be reconstructed after the fact, not all the contemplated data is available, and much of it is based on differing methodologies, making comparisons among utilities difficult.

The 2016-2017 experience suggests the next step is more complete and standardized data collection in future storms, which will allow a deeper analysis of the circumstances under which hardening and undergrounding are most beneficial. However, the Hurricane Irma data provides a broad performance comparison of non-hardened overhead, hardened overhead, and underground facilities.

FPL, the state's largest utility, was able to report outage rates of Irma-impacted facilities broken out by non-hardened, hardened, and underground facilities.

Table 5-1
FPL Outage Rates for Facilities Impacted by Hurricane Irma

	Transmissions	Distribution feeders	Distribution Laterals
Overhead, Non-hardened	20%	82%	24%
Overhead, Hardened	16%	69%	N/A
Underground	---[7]	18%	4%

In addition to the reduction in number of outages shown in Table 5-1, hardening reduced the length of outages: the construction man hours to restore hardened feeders was 50 percent less than non-hardened feeders, primarily due to hardened feeders experiencing less damage than non-hardened feeders.[8]

[7] No underground section was damaged or failed causing an outage; however, the sections were out due to line termination equipment in substations.
[8] Document No. 04232-2018, FPL's Third Supplemental Amended Response to Staff's First Data Request No. 29

Supporting data for Table 5-1 is contained in Appendix G. The results showed, across FPL's system, that hardening overhead lines resulted in fewer outages and underground lines suffered minimal outages.

Hardening overhead facilities also resulted in lower rates of pole failure, and failure rates of underground facilities were even lower, across all three of Florida's largest IOUs. (Gulf Power Company's territory was not materially affected by Hurricane Irma, and FPUC's territory would provide a very small data sample.) Very few transmission structures failed as a majority of damaged facilities were related to the utilities' distribution systems. The data reflecting infrastructure performance is contained in Appendix H.

It should be noted that while underground facilities fared particularly well during Hurricane Irma, they also can be susceptible to damage caused by uprooted trees and flooding. Repairs to such facilities typically take longer to complete.

Forensic Analysis

As part of their storm hardening plans, as required by the 2006 order, IOUs conduct post-storm forensic analyses which review storm-related data and assess damaged facilities that did not perform as designed. Following a review of the storm damage data, which typically takes several months, a report is issued outlining the findings of the review.

For Hurricane Irma, FPL, DEF, and TECO completed a forensic analysis to evaluate the performance of their facilities during the storm.[9] GPC and FPUC indicated that forensic analyses were not completed due to a lack of significant damage or determined that all damage was caused by vegetation.

DEF provided five forensic analysis reports related to failures of wooden distribution poles, wooden transmission poles, and a transmission tower. In the forensic report on the steel transmission tower that fell during Hurricane Irma, the failure was identified as corrosion at the base of the tower. DEF's forensic reports also identified 27 wooden transmission pole failures due to high winds, with wood rot contributing to some of the failures. FPL provided a post-storm forensic review for Hurricane Irma, which identified five wooden transmission pole failures. TECO's forensic analysis identified three leaning structures following Hurricane Irma, and at the May 2018 workshop, TECO reported that it had ten transmission structure failures.

[9] Forensic analysis reports for FPL see Document No.03152-2018; for DEF see Document No. 00416-2018; for TECO see Document No. 01051-2018.

Section VI: Customer Communication

Public preparedness is critical during natural disasters. The utilities and the Commission provide information to consumers regarding storm preparedness, such as hurricane survival kits, portable generator safety, and ways to prepare a home before a storm.

Following a storm, customers are provided various methods to communicate with utilities. Customers can report a power outage to the utility through various means such as interactive voice response systems, customer call centers, the utility's website, mobile applications, and the PSC.

Communication issues were a notable source of customer dissatisfaction during Hurricane Irma. Customers particularly complained of inaccurate restoration projections and unavailability of overwhelmed utility websites and apps.

A total of 41 utilities provided data on the number of customer representatives that were utilized during Hurricanes Hermine, Matthew, Irma, and Nate. This information is summarized in Table 6-1, which includes third-party representatives.

Table 6-1
Total Number of Utility and Third-Party Customer Contact Representatives

	Hermine	Matthew	Irma	Nate
IOUs	948	1,825	2,418	106
Municipals	300	571	1,059	48
Cooperatives	163	84	297	6
Total	1,411	2,480	3,774	160

Source: Utilities' responses to staff's first data request, No. 14.

Table 6-2 provides the number of customer contacts for Hurricanes Hermine, Matthew, Irma, and Nate. Customer contacts may include various forms of communication, including phone, email, mobile application, utility website, and social media.

Table 6-2
Total Customer Contacts

	Hermine	Matthew	Irma	Nate
IOUs	395,358	3,605,174	11,424,246	30,545
Municipals	71,302	414,202	1,634,438	0
Cooperatives	53,804	12,053	207,488	343
Total	520,464	4,031,429	13,266,172	30,888

Source: Utilities' responses to staff's first data request, No. 15.

Table 6-3 provides the average number of customer contacts that were handled by each utility and third-party customer contact representatives. For Hurricane Irma, an average number of 2,513 customer contacts per representative, which demonstrates the large scale of communication that occurred between customers and the electric utilities.

Table 6-3
Average Number of Customer Contacts per Utility Representative[10]

	Hermine	Matthew	Irma	Nate
IOUs	628	1,776	2,513	332
Municipals	138	774	1,061	0
Cooperatives	439	84	796	57

Source: Utilities' responses to staff's first data request, Nos. 14 and 15.

Public Comments to the PSC

Following the establishment of Docket No. 20170215-EU, a customer portal was opened on the Commission's website on October 9, 2017, allowing customers to submit comments regarding their reaction to utility restoration/communication efforts.

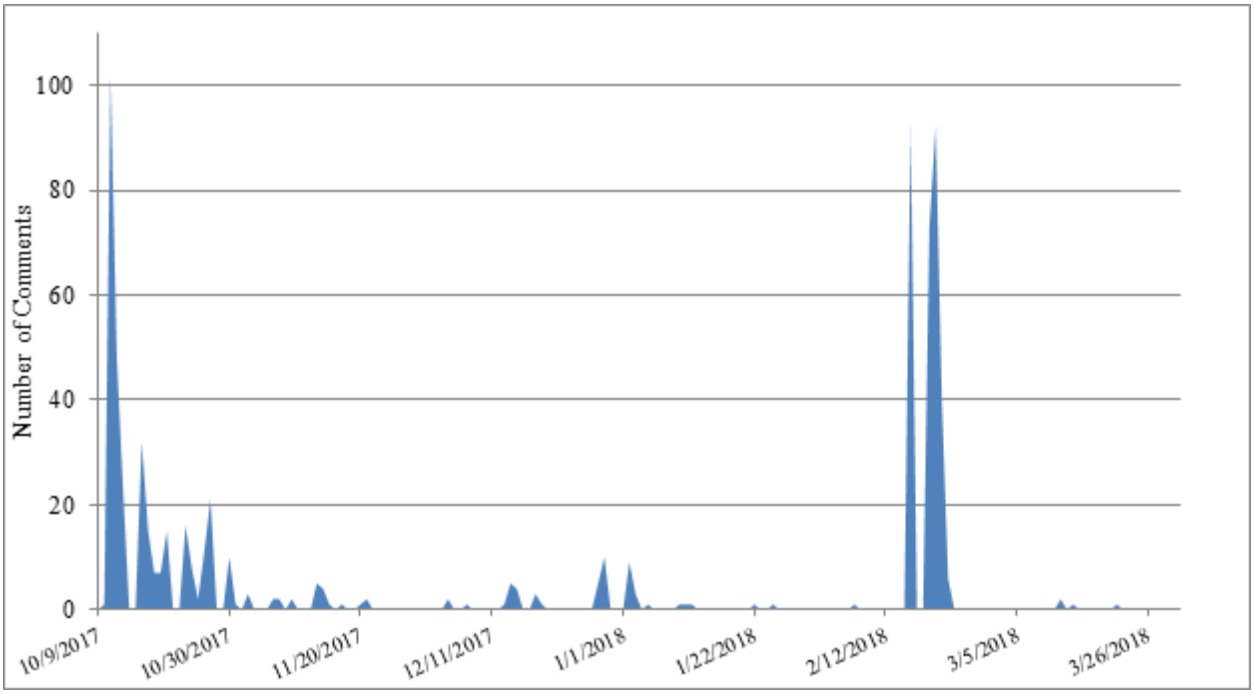
The portal provided consumers four categories to select from, as well as the option to submit written comments, where consumers could address any specific concerns. The four categories that consumers could select from were:

- Power restoration time.
- Information provided by electric utility provider prior to the storm.
- Information provided by electric utility provider after the storm.
- Other.

[10] It should be noted that this average includes only utilities that were affected by a storm.

Figure 6-1 provides a timeline of the number of comments received through the PSC Consumer Comment Portal.

Figure 6-1
PSC Portal – Timeline of Consumer Comments Received



Source: PSC Consumer Comment Portal

For the month of October the PSC received 319 comments, which mostly related to consumers' experiences and feedback during Hurricane Irma. Comments focused on frustration with timely communication, inaccurate estimated restoration times, and tree trimming.

Comments decreased after October 2017, but there was a small swell of comments from December 28, 2017, to January 12, 2018. Comments during this period expressed concerns about the potential addition of a surcharge to customer bills as a result of the hurricane.

From February 16 to February 22, 2018, a total of 303 comments were received, which were predominantly focused on supporting and encouraging the use of distributed solar generation. The portal was closed on May 1, 2018, with a total of 701 public comments received.

Staff collected and sorted the comments by category and divided them into subcategories based on whether the comment was negative, positive, or neutral. Table 6-4 provides a summary of the comments that were received.

Table 6-4
PSC Portal – Customer Comments

Category	Comments
Power Restoration Time	345
Information Provided Prior to the Storm	14
Information Provided After the Storm	69
Other	273
Total	701
Positive vs. Negative Comments	
Negative Comments on Electric Utility	346
Positive Comments on Electric Utility	74
Not Expressed	281
Total	701

Source: PSC Consumer Comments Portal

Table 6-5 provides the number of comments received for IOUs, Municipals and Cooperatives. Two of the customer comments did not provide the names of their electric utilities.

Table 6-5
PSC Portal – Customer Comments by Utility Type

Utility Type	Comments
Investor Owned Electric Utility	616
Municipal Electric Utility	48
Cooperative Electric Utility	35
Not Specified	2
Total	701

Source: PSC Consumer Comments Portal

The most prevalent topics were related to supporting and encouraging the use of roof-top or distributed solar generation, cost responsibility for restoration, frustration with communication, tree trimming, and effectiveness of storm hardening.

Table 6-6 provides the number of comments that were received for each of these topics.

Table 6-6
PSC Portal – Most Prevalent Topics Discussed in Customer Comments

Subcategory	Comments	Percent of Total
Support and encouragement of solar	258	37%
Cost responsibility for restoration	105	15%
Frustration with timely communications	84	12%
Tree trimming	73	10%
Effectiveness of hardening	60	9%

Stakeholder Comments to the PSC

In addition to comments from utilities and customers, staff also solicited comments from non-utility stakeholders, which included Associated Industries of Florida, the Florida Chamber of Commerce, Florida Association of Counties, and Florida League of Cities. Appendix A provides a summary of the stakeholder comments that the Commission received. A total of 14 stakeholders provided comments on the topics of vegetation management, undergrounding, and coordination and communications. Aside from the suggested areas of improvement mentioned below, the overall comments that stakeholders provided were positive.

Regarding vegetation management, the comments mainly focused on improving communication between stakeholders and utilities on where and when tree trimming occurs, as well as better educating the public on tree trimming. While the comments on undergrounding varied, many voiced a positive position on undergrounding, though stakeholders expressed differences in opinion on cost responsibility. Last, the comments on coordination and communication largely concentrated on more involvement from utilities at local EOCs, in addition to improving post-event information and power restoration time estimates.

Section VII: Commission Actions

Preparedness and Restoration

No amount of preparation can eliminate outages in extreme weather events. Throughout the year, utilities participate in hurricane exercises and drills in order to better prepare for a storm event. Prior to hurricane season, utilities ensure that they have the required internal materials on hand, as well as commitments for external resources which may be needed following a storm. Utilities also partake in hurricane preparedness exercises. Preparedness and restoration efforts appear consistent across the different utility entities. All utilities have similar staging, damage assessment, and workload management processes. Data collected after the storms show the causes of outages were consistent across utilities.

Utilities reported that they have regular meetings with local governments regarding vegetation management and identification of critical facilities (i.e., hospitals, water and wastewater treatment plants, and fire stations). However, the utilities, local government representatives, and the Office of Public Counsel agreed that communication among all affected parties could be improved. Counties should continue to take the lead in identifying critical facilities for priority restoration and utilities should work with the counties to provide information and expertise. Restoration priority lists should be based on community priorities balanced with the practical realities of restoration. During the May 2018 workshop, some local government representatives expressed a desire for additional utility staffing at local emergency operations centers.

Action: Commission staff should collect additional details regarding meetings with local governments regarding vegetation management, identification of critical facilities, and utility staffing practices at local EOCs as part of the Commission's review of utility storm hardening plans.

The Commission has been careful to balance the need to strengthen the state's electric infrastructure to minimize storm damage, reduce outages, and reduce restoration time while mitigating excessive cost increases to electric customers. Approval of an IOUs storm hardening plan does not equate to approval for cost recovery. During a general rate case, the costs for storm hardening are taken into consideration and the utility has the burden of proof to show that the costs are prudent for cost recovery. In order to enhance the review process related to storm hardening activities, a comparison of all viable alternatives considered by the IOUs before selecting proposed hardening projects would ensure that storm hardening is being pursued in a cost-efficient manner. For example, a utility should be able to explain why a proposed underground project is preferable to a hardened overhead project or additional smart grid investment, etc.

Action: Commission staff should collect information on all viable alternatives considered before selecting a particular storm hardening project as part of the Commission's review of utility storm hardening plans.

Distribution Infrastructure

While granular data appeared to be somewhat lacking due to a focus on restoration, Florida's aggressive hardening programs are working, as fewer poles were replaced and the length of

outages was reduced markedly compared to the 2004-2005 storm seasons. The IOUs affirmed that the hardened facilities, including poles, performed better than non-hardened facilities. The Commission's required eight-year wooden pole inspection program resulted in proactive replacement of poles before outages occurred. Based on the wooden pole replacement data provided by the IOUs, as well as the post-storm review, there were fewer broken poles due to non-vegetation causes than with prior storms.

Action: Commission staff should explore the collection of more uniform performance data for hardened vs. non-hardened and underground facilities, including sampling data where appropriate, as part of the Commission's review of utility storm hardening plans.

Some IOUs suggested legislation to require inspections and hardening of non-electric utility distribution poles, which includes poles owned and maintained by telecommunications providers. In 2006, the Commission required Florida's local exchange telecommunications companies to implement an eight-year inspection cycle of their wooden poles. The Commission's authority to impose that requirement was pursuant to Section 364.15, F.S., which was subsequently repealed in 2011. Thus, the Commission no longer has the authority to require inspections of poles owned by telecommunications companies.

Action: Commission staff should seek additional information on the impact of non-electric utility poles on storm recovery as part of the Commission's review of utility storm hardening plans.

Legislative Consideration: The Legislature may consider possible legislation to require inspection and hardening of non-electric utility poles.

Undergrounding

The data collected showed that underground lines suffered minimal outages during storms. It should be noted that while underground facilities fared particularly well during Hurricane Irma, they also are susceptible to damage, causing outages. The damage to underground lines may be caused by uprooted trees and flooding, and the repairs to such facilities typically take longer to complete. Under current pricing policies, approximately 40 percent of all distribution lines are underground and the majority of recent underground projects were for new construction, rather than the conversion of overhead to underground. In an effort to further the deployment of underground facilities, DEF and FPL have initiated targeted undergrounding programs over the next few years. Both programs are scheduled to begin in 2018, focus on historically poor performing lateral circuits to replace several hundred miles of overhead lines, and are being funded through current base rates including any previously approved step increases. The goal for each program is to test different construction techniques and identify different impediments to converting these targeted overhead facilities to underground.

Action: Commission staff should collect data and monitor the progress of targeted undergrounding programs as part of the annual distribution reliability review.

Transmission Infrastructure

The transmission infrastructure appears to have generally performed as designed. As part of their storm hardening plans, IOUs conduct post-storm forensic analyses which include a review of storm-related data and an assessment of damaged facilities that did not perform as designed.

Despite regular inspection requirements, post-storm forensic reports identified corrosion and/or wood rot as a contributing factor to the failure of some DEF transmission towers. Post-storm analyses provided by FPL reported five wooden transmission pole failures and TECO reported ten wooden transmission pole failures. A more thorough examination of the procedures and processes used by the IOUs for the inspection and maintenance of transmission structures may identify areas of improvement in the future.

Action: Commission staff should initiate a management audit to examine the procedures and processes used by the IOUs to inspect and maintain transmission structures.

Impediments to Restoration

In addition to the usual impediment of vegetation clearing, the majority of the utilities identified roadway congestion and procurement of fuel to be impediments to restoration during Hurricane Irma. Due to the large number of evacuations, major roadways experienced high amounts of traffic. This presented problems in allowing utility crews to reach areas where aid in power restoration was needed. Additionally, there was a shortage of fuel leading up to and following the storm which also presented an impediment to utilities' restoration efforts.

Action: Commission staff should collect information on how each IOU prepares for and responds to roadway congestion, fuel availability, and lodging accommodation issues as part of the Commission's review of utility storm hardening plans.

Legislative Consideration: The Legislature may consider implementation of emergency procedures regarding roadway congestion, motor fuel availability, and lodging accommodations for mutual aid personnel.

Vegetation Management Coordination

Proactive tree trimming has been a key initiative of the Commission. Each year, IOUs trim a certain percentage of their total lateral and feeder miles as part of their hardening plans. However, the trees trimmed only include those that are in the utilities' rights of way. Utilities identified that a major contributor to outages continues to be vegetation outside of the utilities' rights of way. Therefore, more frequent tree trimming by utilities within rights of way would not alleviate this outage cause. Tree trimming outside of a utility's rights of way requires coordination and cooperation with local government and customers.

As mentioned above, Commission staff should gather additional details regarding the utilities' coordination with local governments as part of the Commission's review of utility storm hardening plans. In addition, the Commission suggests the following for consideration by the Legislature.

Legislative Considerations: Revision of vegetation management policies to improve the ability of electric utilities to conduct vegetation management outside of rights of way to reduce outages and restoration costs.

Legislative Considerations: Enhance statewide public education regarding tree trimming and problem tree placement and removal on private property. This program could be similar to a Right Tree, Right Place initiative already used by several utilities.

Post-storm Communication

Despite substantial, well documented improvement to the utilities' infrastructure, some customers who provided comments were dissatisfied with the extent of outages and restoration times associated with Hurricane Irma. Post storm communication with customers was not an impediment to power restoration, yet many customers expressed dissatisfaction with the information provided by utilities following Hurricane Irma. In particular, customers voiced frustrations with inaccurate power restoration estimates and cost responsibility for restoration.

Action: Commission staff should initiate a management audit to examine the procedures and processes used by the IOUs to estimate and disseminate outage restoration times following a major storm.

Appendix A
Summary of Stakeholder Comments

Date	Stakeholder	Summary of Comments
01/26/2018	City of Homestead	Regarding coordination on vegetation management, the majority of FPL's power lines are underground, but it should focus on the local level. City ordinances require new construction be underground. Stated that communication with the utility is good, but would like to see more "granular, city-specific" information and outage status.
01/29/2018	City of St. Petersburg Fire Rescue	Suggested continuing aggressive tree trimming program. Continue to support annual pre-storm meetings at city level, and DEF should provide representative to city's EOC. As well as develop a system to report downed lines and assure downed power lines are safe for city crews to work on. Difficult to establish reliable line to communicate with DEF.
01/30/2018	City of Boca Raton	Very little communication from FPL. FPL should make contact with City 48 hours before storm, implement distribution and street light GPS program, have FPL liaison at City or trained staff, and interactive map that provides updates.
02/01/2018	City of South Daytona	Suggested that tree trimming is too infrequent. FPL has tried to inform public of tree trimming, but no way for city/customers to submit tree trimming requests. More information to public about planting vegetation near power lines. For undergrounding, suggested removing requirement to bury additional conduit for future growth. Yearly review of critical infrastructure should be required, and not enough accurate/fast information available during Irma. More representatives to communicate information.
02/06/2018	City of Naples Fire-Rescue Department	FPL is doing well with tree trimming, but more information should be provided to the public about property rights. Good communication with FPL, but improvement on the removal of problem trees should be made. New construction policy requires electrical line to be underground, and there should be communication with FPL on connection. Critical infrastructure was not previously identified to FPL, but this should be done in the future. Great communication at the EOC level.
02/07/2018	City of Dunedin	Utility should remove trees/palms listed on Florida Exotic Pest Plant Council list, and use proper trimming techniques. Utility should provide notice of when and where trimming will occur, and issue information on proper plants below power lines. Ordinance requires new construction to be underground, but it would be helpful to establish metrics for where conversion to underground should occur. There were challenges with extent of the outages, response times, and communication during restoration with DEF. Suggested that representatives are provided to local EOCs.
02/09/2018	Town of Belleair	Would like to see area risk assessments from DEF and consistent tree trimming. More proactive communication from DEF of when they will be in an area, what they are planning, and what work was completed. Suggested having an area administrator or a single point-of-contact. DEF should provide a more active role in undergrounding, and a set amount of area that is set up for undergrounding. More proactive communication on critical facilities and better information on restoration (DEF did not meet set restoration deadline).

Date	Stakeholder	Summary of Comments
02/12/2018	St. Johns County	Suggested enacting a program for local and state agencies to notify utilities of problem trees and vegetation areas. Currently have policy/practice in place for new construction, which is to require undergrounding. FPL is implementing county wide hardening projects, which is a much cheaper alternative than undergrounding. Communication between county and utility is critical for new projects to discuss subjects such as cost sharing. Currently good communication and coordination with both FPL and JEA at EOC.
02/15/2018	City of Wilton Manors	There should be an aggressive, proactive schedule for tree trimming and notification of when/where trimming is occurring. FPL should devise a plan to transition overhead to underground, and complete a cost benefits analysis. City should have a part in the process of updating and maintaining a list of critical facilities, and communication could be improved. Also, there was no way for the city to report outages to FPL, so there should be more technology resources for tracking restoration efforts.
02/19/2018	City of Monticello	Suggested no change to vegetation management as the city does not believe it was a contributing factor to outages. However, the staging of repair equipment prior to storm by DEF could be improved. Action by legislature and/or PSC for promoting undergrounding (ex. possible monetary incentives from the state). Suggested continued improvements with local DEF representative, and more accurate post storm information.
02/19/2018	Citrus County Public Works	Suggested providing notifications to utility if tree trimming or removal is needed, and facilitating undergrounding with County ordinances and state statues. More proactive interaction at EOC prior to, during, and after storm event.
02/20/2018	City of Rockledge	Suggested implementing a survey to list potential trimming or tree removal, and joint meetings on potential problem areas. For undergrounding, explore shared costs by grant funding. Communication of real time events was lacking; therefore, utility representative(s) should have contact with field representatives and management for plan of action. It would be beneficial to have a representative in each Brevard County EOC.
02/21/2018	City of Sarasota	Currently have close coordination with FPL on vegetation management, and should continue to have utility review and comment on ordinances and code changes. Suggested providing incentives for undergrounding. Potential problems may arise due to limited spots on priority list; therefore, criteria should be established to prioritize critical facilities. Suggested having designated FPL crew for the city to remove their power lines, so the city crews can make repairs to infrastructure.
02/22/2018	Marion County Utilities	Suggested that each electric utility should have a website with a critical infrastructure list, dedicated outage phone number for critical facilities (rather than consumer outage phone number), and better communication with all utilities to address issues.

Appendix B
Peak Number of Account Outages

	Hermine		Matthew		Irma		Nate	
	Peak Accounts Out	% of Accounts Out	Peak Accounts Out	% Accounts Out	Peak Accounts Out	% Accounts Out	Peak Accounts Out	% Accounts Out
Alachua	30,065	24.9%	5,796	4.8%	68,557	52.7%	2	0.0%
Baker	3,810	34.4%	4,527	40.8%	10,731	94.4%	0	0.0%
Bay	116	0.1%	18	0.0%	3,533	3.1%	388	0.3%
Bradford	2,285	23.3%	4,757	48.5%	12,010	94.9%	0	0.0%
Brevard	2,921	1.0%	196,729	64.6%	268,343	86.4%	0	0.0%
Broward	420	0.0%	12,340	1.3%	709,360	76.0%	0	0.0%
Calhoun	0	0.0%	0	0.0%	1,018	25.9%	0	0.0%
Charlotte	200	0.2%	220	0.2%	73,230	63.7%	0	0.0%
Citrus	15,375	16.0%	1,317	1.4%	69,269	79.0%	0	0.0%
Clay	6,000	4.2%	33,965	23.5%	74,424	78.5%	0	0.0%
Collier	110	0.0%	400	0.2%	236,141	96.0%	0	0.0%
Columbia	9,605	29.7%	2,953	9.1%	30,734	92.1%	0	0.0%
Desoto	10	0.1%	10	0.1%	15,627	88.9%	0	0.0%
Dixie	4,853	48.8%	290	2.9%	7,540	75.3%	0	0.0%
Duval	8,500	2.1%	253,725	61.5%	257,261	57.2%	0	0.0%
Escambia	27	0.0%	0	0.0%	1,421	0.9%	5,384	3.4%
Flagler	370	0.7%	57,016	100.0%	52,746	90.9%	0	0.0%
Franklin	2,264	22.5%	172	1.7%	5,869	57.5%	0	0.0%
Gadsden	9,747	44.0%	0	0.0%	14,998	67.2%	0	0.0%
Gilchrist	5,370	61.2%	590	6.7%	7,029	79.0%	0	0.0%
Glades	0	0.0%	10	0.1%	6,272	86.5%	0	0.0%
Gulf	540	5.0%	83	0.8%	4,198	38.5%	0	0.0%
Hamilton	5,864	87.9%	255	3.8%	5,249	78.2%	0	0.0%
Hardee	0	0.0%	26	0.2%	11,976	97.4%	0	0.0%
Hendry	10	0.1%	10	0.1%	18,750	100.0%	0	0.0%
Hernando	5,514	6.1%	117	0.1%	58,644	61.8%	0	0.0%
Highlands	128	0.2%	472	0.8%	62,010	99.3%	0	0.0%
Hillsborough	17,956	2.8%	262	0.0%	265,542	42.0%	0	0.0%
Holmes	0	0.0%	0	0.0%	1,254	12.0%	77	0.7%
Indian River	60	0.1%	59,244	67.2%	73,311	80.1%	0	0.0%
Jackson	0	0.0%	0	0.0%	11,092	42.4%	0	0.0%
Jefferson	5,762	71.5%	107	1.3%	6,092	75.1%	0	0.0%
Lafayette	2,965	71.5%	199	4.8%	3,676	90.9%	0	0.0%
Lake	1,699	1.0%	16,849	10.0%	123,954	69.7%	0	0.0%
Lee	50	0.0%	400	0.1%	361,999	82.5%	0	0.0%
Leon	94,088	65.6%	2	0.0%	59,821	42.2%	0	0.0%
Levy	10,007	41.2%	254	1.0%	17,932	72.6%	0	0.0%
Liberty	438	13.5%	0	0.0%	3,303	81.2%	0	0.0%
Madison	7,278	69.0%	69	0.7%	7,171	67.0%	0	0.0%
Manatee	2,290	1.1%	113	0.1%	132,455	63.1%	0	0.0%
Marion	11,525	6.3%	27,389	14.9%	143,485	75.9%	0	0.0%
Martin	40	0.0%	44,600	48.1%	76,120	81.5%	0	0.0%
Miami-Dade	400	0.0%	16,850	1.5%	919,340	80.9%	0	0.0%
Monroe	0	0.0%	0	0.0%	52,855	84.4%	0	0.0%
Nassau	3,052	11.1%	19,092	43.5%	43,740	97.6%	0	0.0%
Okaloosa	2	0.0%	45	0.0%	323	0.3%	6,382	5.9%
Okeechobee	100	0.5%	1,680	7.7%	21,990	96.5%	0	0.0%
Orange	685	0.1%	69,231	12.3%	362,088	62.4%	0	0.0%
Osceola	306	0.2%	7,321	5.7%	55,352	36.2%	0	0.0%
Palm Beach	30	0.0%	58,870	7.7%	566,250	73.8%	0	0.0%
Pasco	10,213	3.9%	472	0.2%	190,567	70.6%	0	0.0%
Pinellas	24,179	4.4%	1,111	0.2%	434,037	78.6%	0	0.0%
Polk	535	0.2%	1,306	0.4%	216,839	65.6%	0	0.0%
Putnam	1,011	2.5%	27,393	66.8%	36,634	88.8%	0	0.0%
Santa Rosa	0	0.0%	0	0.0%	259	0.3%	1,712	2.2%
Sarasota	3,570	1.4%	280	0.1%	174,672	66.2%	0	0.0%
Seminole	184	0.1%	68,597	33.1%	158,065	75.1%	0	0.0%
St. Johns	1,140	1.3%	78,610	89.6%	107,130	81.9%	0	0.0%
St. Lucie	150	0.1%	57,477	38.3%	113,280	73.6%	0	0.0%
Sumter	2,643	3.9%	1,307	1.9%	28,598	38.9%	0	0.0%
Suwannee	11,493	52.9%	1,300	6.0%	20,991	92.2%	0	0.0%
Taylor	8,742	67.9%	138	1.1%	9,665	74.8%	0	0.0%
Union	990	19.0%	920	17.7%	4,695	86.3%	0	0.0%
Volusia	635	0.2%	257,718	92.0%	222,328	77.6%	0	0.0%
Wakulla	14,009	93.0%	153	1.0%	11,513	74.5%	1	0.0%
Walton	3	0.0%	0	0.0%	139	0.2%	613	1.0%
Washington	0	0.0%	0	0.0%	605	4.6%	29	0.2%
Totals	323,505	3.2%	1.13M	11.0%	6.52M	62.1%	13,539	0.1%

Source: State EOC power outage reports.

Appendix C
Utility Reported Weather Data - Hurricane Hermine

County	Maximum Sustained Wind (MPH)	Maximum Gusts (MPH)	Maximum Rainfall (inches)	Maximum Storm Surge (Feet)
Alachua	34	52	4.85	-
Baker	32	50	-	-
Bay	35	69	2	-
Bradford	32	50	-	-
Brevard	26	39	-	-
Broward	19	29	-	-
Calhoun	30	64	-	-
Charlotte	30	45	4.47	-
Clay	39	60	2.02	0.73
Collier	25	38	-	-
Columbia	34	52	-	-
Desoto	24	36	-	-
Dixie	-	48	-	7.3
Duval	41	61	2.53	1.4
Flagler	34	51	-	-
Franklin	-	58	4.41	-
Gadsden	60	64	4	-
Glades	20	30	-	-
Gulf	-	79	-	-
Hamilton	-	-	3.15	-
Hardee	24	36	-	-
Hendry	21	31	-	-
Highlands	21	31	3.28	-
Hillsborough	36.8	57.5	7	4.2
Indian River	21	32	-	-
Jackson	30	64	-	-
Jefferson	75	90	7	6.1
Lafayette	-	-	6.1	-
Lee	29	43	1.49	-
Leon	60	70	6	-
Levy	-	-	-	6.2
Liberty	30	64	-	-
Madison	65	80	7	-
Manatee	38	57	10	-
Marion	33	45	6.18	-
Martin	21	32	-	-
Miami-Dade	21	32	-	-
Monroe	29	44	-	-
Nassau	37	64	-	-
Okeechobee	20	29	-	-
Orange	25	37	3.5	-
Osceola	22	34	3.25	-
Palm Beach	21	32	-	-
Polk	29.9	41.4	-	-
Putnam	36	55	-	-
Sarasota	35	53	10.71	-
Seminole	24	37	-	-
St. Johns	39	60	0.84	0.61
St. Lucie	21	32	-	-
Sumter	-	-	3.27	-
Suwannee	41	62	4.52	-
Taylor	75	90	7	8.6
Union	32	48	-	-
Volusia	32	49	-	-
Wakulla	65	75	5.81	6.3

Source: Utilities' responses to staff's first data request, No. 27.

Appendix D
Utility Reported Weather Data - Hurricane Matthew

County	Maximum Sustained Wind (MPH)	Maximum Gusts (MPH)	Maximum Rainfall (inches)	Maximum Storm Surge (Feet)
Alachua	35	60	1.49	-
Baker	30	46	-	-
Bradford	40	65	6	-
Brevard	80	121	17.01	4.09
Broward	39	60	1.61	-
Calhoun	39	87	7	-
Charlotte	26	39	-	-
Clay	44	68	10.3	3.77
Collier	26	40	-	-
Columbia	26	40	-	-
Desoto	20	30	-	-
Duval	61	88	9.63	4.69
Flagler	68	102	6	6
Glades	30	45	-	-
Hardee	23	34	-	-
Hendry	30	42	-	-
Highlands	29	43	-	-
Indian River	64	97	13.85	-
Jackson	39	87	7	-
Lake	31	48	5.22	-
Lee	26	40	-	-
Leon	23	30	-	-
Liberty	39	87	7	-
Manatee	30	45	-	-
Marion	23	39	3	-
Martin	61	92	4.18	-
Miami-Dade	31	48	-	-
Monroe	30	46	-	-
Nassau	45	87	7	7
Okeechobee	34	50	-	-
Orange	48	73	6.17	-
Osceola	49	69	0.03	-
Palm Beach	49	75	-	-
Pinellas	24.2	40.3	-	-
Polk	36	44	-	-
Putnam	48	74	-	-
Sarasota	29	43	-	-
Seminole	47	72	8.99	-
St. Johns	73	109	9.97	8.39
St. Lucie	71	100	13.85	-
Suwannee	24	37	-	-
Union	29	45	-	-
Volusia	72	109	7.75	-

Source: Utilities' responses to staff's first data request, No. 27.

Appendix E
Utility Reported Weather Data - Hurricane Irma

County	Maximum Sustained Wind (MPH)	Maximum Gusts (MPH)	Maximum Rainfall (inches)	Maximum Storm Surge (Feet)
Alachua	64	99	13.07	-
Baker	65	100	9.76	-
Bay	34	46	1.5	-
Bradford	62	96	15	-
Brevard	75	114	13.74	4.2
Broward	83	127	9.72	2.7
Calhoun	50	71	12	-
Charlotte	70	104	-	4
Citrus	-	64	10.65	-
Clay	73	112	11.32	5.97
Collier	115	144	14.98	6.5
Columbia	62	95	9.63	-
Desoto	77	100	-	-
Dixie	-	56	-	-
Duval	89	136	11.11	6.44
Escambia	30	42.6	0.25	-
Flagler	64	97	9.83	4.19
Franklin	-	50	-	-
Gadsden	50	55	2	-
Gilchrist	-	-	6.68	-
Glades	71	106	8.38	-
Gulf	-	45	1	-
Hamilton	-	-	-	-
Hardee	100	111	12	-
Hendry	80	102	10.31	-
Hernando	-	-	7.67	-
Highlands	70	103	10.95	-
Hillsborough	56	68	16.08	3.1
Holmes	23	37	2	-
Indian River	75	116	14.15	3
Jackson	50	71	12	-
Jefferson	-	60	3	-
Lake	43	69	11.59	-
Lee	72	110	9.02	6
Leon	43	55	2	-
Levy	-	55	8.07	-
Liberty	50	71	12	-
Madison	-	62	4	-
Manatee	80	122	-	-
Marion	-	51	13.24	-
Martin	79	119	10.53	-
Miami-Dade	85	127	8	6
Monroe	120	160	12.54	8
Nassau	89	135	12.7	7.8
Okaloosa	27.7	42.5	1	-
Okeechobee	72	107	-	-
Orange	71	110	12.36	-
Osceola	70	108	10.61	-
Palm Beach	85	127	10.35	2.7
Pasco	-	55	9.83	-
Pinellas	49.4	88	5.6	2.17
Polk	115	130	11.1	-
Putnam	59	91	-	3.6
Santa Rosa	28.9	40.3	0.75	-
Sarasota	72	108	8	-
Seminole	66	101	12.14	-
St. Johns	79	121	10.22	5.61
St. Lucie	84	127	21.66	-
Sumter	70	75	11.3	-
Suwannee	58	88	-	-
Taylor	-	48	4	1
Union	62	95	-	-
Volusia	78	116	12.55	-
Wakulla	35	56	2	0.7
Walton	25.3	33	1.5	-
Washington	10	27	2	-

Source: Utilities' responses to staff's first data request, No. 27.

Appendix F
Utility Reported Weather Data - Hurricane Nate

	Maximum Sustained Wind (MPH)	Maximum Gusts (MPH)	Maximum Rainfall (inches)	Maximum Storm Surge (Feet)
County	Max	Max	Max	Max
Bay	38	50	2	-
Escambia	50	85	5	5
Franklin	29	37	0.18	4
Gulf	25	34	0.2	3
Holmes	-	-	2	-
Jackson	25.3	33.4	0.75	-
Leon	25	31	0.52	-
Okaloosa	45	65	10	-
Santa Rosa	52	85	8	5
Walton	40	60	4	-
Washington	8	17	2	-

Source: Utilities' responses to staff's first data request, No. 27.

Appendix G
FPL Outage Data - Hurricane Irma

FPL's Feeder and Lateral Outage Performance for Hurricane Irma

Irma - 2017	Overhead Non-Hardened			Overhead Hardened			Underground			Total		
	Out	Pop	% Out	Out	Pop	% Out	Out	Pop	% Out	Out	Pop	% Out
Distribution Feeders	1,609	1,958	82%	592	859	69%	85	470	18%	2,286	3,287	70%
Distribution Laterals	20,341	84,574	24%	N.A.	N.A.	N.A.	3,767	103,384	4%	24,108	187,958	13%

Pop = Population; Lateral population includes laterals with multi-stage fusing
Source: FPL's second supplemental amended response to staff's first data request No. 29.

FPL's Substation Line Section Outage Performance for Hurricane Irma

Irma - 2017	Overhead Non-Hardened			Overhead Hardened			Underground			Total		
	Out	Pop	% Out	Out	Pop	% Out	Out	Pop	% Out	Out	Pop	% Out
Trans. Line Section	60	306	20%	142*	884	16%	13**	51	25%	215	1,241	17%

* 4 sections were out because substations were proactively de-energized due to flooding.
** No underground section was damaged or failed causing an outage; however, the sections were out due to line termination equipment in substations.
Source: FPL's second supplemental amended response to staff's first data request No. 29.

Appendix H
Utility Reported Repairs- Hurricane Irma

FPL
Overhead vs. Underground – Repairs per Pole Line Mile for Hurricane Irma

	Underground Total	Underground Replaced/Repaired	Overhead Total	Overhead Replaced/Repaired
Transmission	105	0	6,857	0.1
Distribution	25,818	12.5	42,301	443
Feeder	3,830	0.5	12,850	48
Lateral	17,921	1	22,788	148

Notes:
All figures above are provided in pole line miles instead of repairs per mile.

While FPL does not track or maintain its records in the manner requested, it has estimated the amount of pole line miles replaced/repaired using certain assumptions and preliminary information available at this time. Repaired/replaced information is preliminary, as Hurricane Irma follow-up work and final accounting are still ongoing.

Source: Document No. 03308-2018 filed 4/30/18.

FPL
Hardened vs. Non-hardened – Pole/Tower Repairs for Hurricane Irma

	Hardened Overhead Total	Hardened Overhead Replaced/Repaired	Non-hardened Overhead Total	Non-hardened Overhead Replaced/Repaired
Transmission	60,694	0	5,991	5[(2)]
Distribution	124,518[(1)]	26[(2)]	1,063,684[(3)]	2,834[(2)]

Note: Hardened pole for Transmission = concrete/steel pole; Hardened pole for Distribution = poles replaced as a result of FPL's approved hardening projects (Extreme wind loading thresholds – 105 mph in the north central region; 130 in north, east, and west coastal and central regions; and 145 mph in southern region).

(1) Includes only distribution feeder poles hardened as a result of FPL's approved hardening plan projects. Additional poles currently installed may meet FPL's EWL hardening criteria or are otherwise hardened relative to NESC minimum requirements but are not included as "hardened" in the above table. For example, the total for Hardened OH excludes other feeder/lateral poles installed since 2007 that meet FPL's current stronger construction standards (in place since 2007) for new construction (e.g., new feeders or laterals) and/or daily work activities (e.g., maintenance, pole line extensions and relocation projects).

(2) Poles that failed (i.e., had to be repaired/replaced during restoration in order to restore service).

(3) Includes all remaining distribution poles (i.e., all poles not counted in the 124,518 poles installed as a result of FPL's approved hardening plan projects). Distribution poles installed pre-2007 meet Grade B construction, while poles installed in 2007 or later meet FPL's new stronger construction standards and may also meet extreme wind loading thresholds.

Source: Document No. 03308-2018 filed 4/30/18.

DEF
Overhead vs. Underground – Repairs per Circuit Mile for Hurricane Irma

	Underground Total	Underground Replaced/Repaired	Overhead Total	Overhead Replaced/Repaired
Transmission	69.83*	0	5139.32*	0
Distribution	14,140	4.3	17,993	324
Feeder	N/A	N/A	N/A	N/A
Lateral	N/A	N/A	N/A	N/A

*Circuit miles.

**DEF does not track repaired conductors during a major event. The information above shows the amount of conductor that was replaced during Hurricane Irma. This information is based on the material charged out during the storm; differentiating between feeder and lateral is not possible because the size of the conductor does not necessarily determine the type of circuit.

Additional information comparing the overall outage performance of overhead versus underground facilities, at the feeder and lateral level, is available on Page 13 of the PowerPoint Slide Deck provided by DEF for the Docket No. 20170215 [-EU] Workshop.

Source: Document No. 03296-2018 filed 4/27/18.

DEF
Hardened vs. Non-hardened – Pole/Tower Repairs for Hurricane Irma

	Hardened Overhead Total	Hardened* Overhead Replaced/Repaired	Non-hardened Overhead Total	Non-hardened Overhead Replaced/Repaired
Transmission	29,499	0	21,285	139 wood poles**
Transmission Towers	1,095 (replaced/rebuilt)	0	2,340 (replaced/rebuilt)	3 towers
Distribution***	N/A	N/A	N/A	N/A

*DEF defines hardened transmission structures as new, repaired or replaced structures since the 2006/2007 Storm Hardening Plan began. Hardened structures consist of any new structures (steel or concrete) or any previously wood structures replaced with steel or concrete materials. DEF considered steel & lattice structures in place prior to the Hardening Plan to be "non-hardened"—they were not part of the original baseline for "hardened" as they were in place prior to 2006/2007.

**DEF originally stated that 148 transmission structures were replaced; 142 structures were actually replaced/repaired and it was later determined that 6 of these structures did not need replacement.

***DEF does not record damaged poles as "hardened" or "non-hardened" during restoration activity. A total of 2,130 poles were replaced during the restoration of damage from Hurricane Irma. To better understand the nature of the storm damage on DEF's system, a forensic report was conducted on 526 randomly selected replaced poles after Hurricane Irma. The report found that none of the selected poles were part of a storm hardening project. Therefore, 29 storm hardening project areas were selected for further analysis; no broken poles were discovered in any of the selected storm hardening projects.

Source: Document No. 03296-2018 filed 4/27/18.

TECO
Overhead vs. Underground – Repairs per Mile for Hurricane Irma

	Underground Total	Underground Replaced/Repaired	Overhead Total	Overhead Replaced/Repaired
Transmission	27	0	5,307	0
Distribution	7,915	0.1	19,104	24.8
Feeder	1,629	0.1	7,008	7.3
Lateral	6,286	0	12,096	17.5

TECO
Hardened vs. Non-hardened – Pole Repairs for Hurricane Irma

	Hardened Overhead Total	Hardened Overhead Replaced/Repaired	Non-hardened Overhead Total	Non-hardened Overhead Replaced/Repaired
Transmission	19,447	2	5,834	15
Distribution	63,120	20	199,880	145

Source: Document No. 03213-2018 filed 4/25/18.