BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Review of 2022-2031 Storm Protection Plan, pursuant to Rule 25-6.030, F.A.C., Florida Public Utilities Company.	DOCKET NO.: 20220049-EI FILED: May 31, 2022

CONFIDENTIAL

DIRECT TESTIMONY

OF

KEVIN J. MARA, P.E.

ON BEHALF OF THE CITIZENS OF THE STATE OF FLORIDA

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DIRECT TESTIMONY

OF

KEVIN J. MARA

On Behalf of the Office of Public Counsel

Before the

Florida Public Service Commission

Docket No. 20220049-EI

I. INTRODUCTION

Q. WHAT IS YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS?

A. My name is Kevin J. Mara. My business address is 1850 Parkway Place, Suite 800, Marietta, Georgia 30067. I am the Executive Vice President of the firm GDS Associates, Inc. ("GDS") and Principal Engineer for a GDS company doing business as Hi-Line Engineering. I am a registered engineer in Florida and 22 additional states.

Q. PLEASE STATE YOUR PROFESSIONAL EXPERIENCE.

A. I received a Bachelor of Science degree in Electrical Engineering from Georgia Institute of Technology in 1982. Between 1983 and 1988, I worked at Savannah Electric and Power as a distribution engineer designing new services to residential, commercial, and industrial customers. From 1989-1998, I was employed by Southern Engineering Company as a planning engineer providing planning, design, and consulting services for electric cooperatives and publicly owned electric utilities. In 1998, I, along with a partner, formed a new firm, Hi-Line Associates,

which specialized in the design and planning of electric distribution systems. In 2000, Hi-Line Associates became a wholly owned subsidiary of GDS Associates, Inc. and the name of the firm was changed to Hi-Line Engineering, LLC. In 2001, we merged our operations with GDS Associates, Inc., and Hi-Line Engineering became a department within GDS. I serve as the Principal Engineer for Hi-Line Engineering and am Executive Vice President of GDS Associates. I have field experience in the operation, maintenance, and design of transmission and distribution systems. I have performed numerous planning studies for electric cooperatives and municipal systems. I have prepared short circuit models and overcurrent protection schemes for numerous electric utilities. I have also provided general consulting, underground distribution design, and territorial assistance.

Q. PLEASE DESCRIBE GDS ASSOCIATES, INC.

A. GDS is an engineering and consulting firm with offices in Marietta, Georgia; Austin, Texas; Auburn, Alabama; Orlando, Florida; Manchester, New Hampshire; Kirkland, Washington; Portland, Oregon; and Madison, Wisconsin. GDS has over 170 employees with backgrounds in engineering, accounting, management, economics, finance, and statistics. GDS provides rate and regulatory consulting services in the electric, natural gas, water, and telephone utility industries. GDS also provides a variety of other services in the electric utility industry including power supply planning, generation support services, financial analysis, load forecasting, and statistical services. Our clients are primarily publicly owned utilities, municipalities, customers of privately owned utilities, groups or

associations of customers, and government agencies.

Q. HAVE YOU TESTIFIED BEFORE ANY REGULATORY COMMISSIONS?

A. I have submitted testimony before the following regulatory bodies:

- Vermont Department of Public Service
- Florida Public Service Commission
- Federal Energy Regulatory Commission ("FERC")
- District of Columbia Public Service Commission
- Public Utility Commission of Texas
- Maryland Public Service Commission
- Corporation Commission of Oklahoma

I have also submitted expert opinion reports before United States District Courts in California, South Carolina, and Alabama.

Q. HAVE YOU PREPARED AN EXHIBIT DESCRIBING YOUR QUALIFICATIONS AND EXPERIENCE?

A. Yes. I have attached Exhibit KJM-1, which is a summary of my regulatory experience and qualifications.

Q. ON WHOSE BEHALF ARE YOU APPEARING?

A. GDS Associates, Inc., was retained by the Florida Office of Public Counsel ("OPC") to review Florida Public Utilities Company's ("FPUC" or "Company")

proposed 2022-2031 Storm Protection Plan ("SPP" or "Plan") on behalf of the OPC. Accordingly, I am appearing on behalf of the Citizens of the State of Florida.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I am presenting my recommendations on behalf of OPC regarding FPUC's proposed 2022-2031 Storm Protection Plan. My testimony serves to refute the testimony presented by Mr. P. Mark Cutshaw regarding the scope of the SPP projects, and whether the programs and projects could qualify to be included in the SPP.

Q. WHAT INFORMATION DID YOU REVIEW IN PREPARATION OF YOUR TESTIMONY?

A. I reviewed the Company's filing, including the direct testimony and exhibits. I also reviewed the Company's responses to OPC's and Staff's discovery and other materials pertaining to the SPP and its impacts on the Company. In addition, I reviewed Section 366.96, Florida Statutes, which requires the filing of the SPP and authorized the Commission to adopt the relevant rules, including Rule 25-6.030, Florida Administrative Code ("F.A.C."), which addresses the Commission's approval of a Transmission and Distribution SPP that covers a utility's immediate 10-year planning period, and Rule 25-6.031, F.A.C., which addresses the utilities recovery of costs related to their SPPs.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. I first discuss the purpose of storm hardening and a SPP as informed by Rule 25-6.030, F.A.C., and criteria needed for storm hardening projects. I then discuss principles to be applied when reviewing FPUC's proposed SPP. I also address the level of spending by FPUC. Finally, I discuss my analysis of the new programs proposed in the SPP, including principles that should be applied when reviewing FPUC's proposed SPP. In the discussion of the principles I applied, I include criteria that, in my expert opinion, the Commission must weigh to properly evaluate the sufficiency of the SPP and each SPP program under the statutes and rules governing the SPPs.

I. THE REVIEW OF PURPOSE OF STORM HARDENING

Q. PLEASE DISCUSS SECTION 366.96, FLORIDA STATUTES.

A. Section 366.96, Florida Statutes, addresses storm protection plan cost recovery for investor-owned electric utilities. The purpose of storm hardening is to "effectively reduce restoration costs and outage times to customers and improve overall service reliability for customers."[1]

The Florida Legislature has directed the Commission to consider "[t]he estimated costs and benefits to the utility and its customers of making the improvements proposed in the plan."[2] But there is no express ceiling or cap on the magnitude of the upgrades or improvements contained in the SPP or on the rate impact to the customers. Again, while the legislature left the ratemaking impact of both of these considerations to the Commission's discretion it appears that they

[1] Section 366.96 (1)(d), Florida Statutes.
[2] Section 366.96 (4)(c), Florida Statutes.

gave the Commission direction and the tools to limit the utilities' spending in the SPP and SPPCRC approvals. As part of my testimony, I will present some recommended limits to the construction programs.

All of the utilities' SPPs are based on the premise that by investing in storm hardening activities the electric utility infrastructure will be more resilient to the effects of extreme weather events. This resiliency means lower costs for restoration from the storms and reduced outage times experienced by the customers. Some programs have a greater impact on reducing outages times and lowering restoration costs than other programs. Clearly, the goal is to invest in storm hardening activities that benefit the customers of the electric utilities at a cost that is reasonable relative to those benefits.

Q. PURSUANT TO SECTION 366.96, FLORIDA STATUTES, THE COMMISSION ADOPTED RULE 25-6.030, F.A.C. PLEASE DISCUSS RULE 25-6.030, F.A.C., FROM YOUR PERSPECTIVE AS AN ELECTRIC UTILITY DISTRIBUTION ENGINEER.

A. Rule 25-6.030, F.A.C., mandates a storm protection program, which is a group of storm protection projects to enhance the utility's existing infrastructure for "the purpose of reducing restoration costs and reducing outages times associated with extreme weather conditions . . . "[3] Further, a storm protection *project* is defined as a specific activity designed for enhancement of the system" for the purpose of

[3] Rule 25-6.030 (2)(a), F.A.C.

reducing restoration costs and reducing outage times associated with extreme weather conditions . . . "[4]

Clearly, this two-prong test to reduce restoration costs and reduce outage times as defined in Rule 25-6.030, F.A.C., must be applied to storm protection programs and projects. A project must accomplish both benefits, reduction in restoration costs, and reduction in outage time to be included in the SPP.

Logically, strengthening the electric utility infrastructure is a storm plan requirement and simply replacing like-for-like equipment with the same strength and functionality does not meet the requirements of Rule 25-6.020, F.A.C. The point of the SPP is to enhance the strength of the grid to withstand extreme weather conditions that result in high winds.

Thus, there are two criteria that must be in each SPP project;

(1) Reduce restoration costs, and

(2) Reduce outage times.

Rule 25-6.030, F.A.C., requires utilities to provide budgets for programs and to provide the estimated reduction in restoration costs.[5] These amounts must be balanced against the benefits to the utilities' customers. Further, the two amounts will allow the Commission and stakeholders to understand the benefits of the capital investments for storm hardening relative to the "reasonableness" of the costs. Any program can claim to reduce outage costs and outage time; however, the program must be cost effective for customers to benefit. To summarize, the

[4] Rule 25-6.030 (2)(b), F.A.C.
[5] Rule 25-6.030 (3)(d)(1), F.A.C.

Rules require a two-prong test for consideration of a program: reduction in outage costs and reduction in outage time.

Q. CAN YOU PROVIDE AN ILLUSTRATIVE EXAMPLE OF HOW A STORM HARDENING PROJECT MEETS THE TWO CRITERIA OF RULE 25-6.030- F.A.C.?

A. Yes. Hardening means to design and build components of the system to a strength that would not normally be required. For instance, distribution poles per the National Electrical Safety Code ("NESC") need only be built based on loading requirement of Rule 250B (60 MPH wind) and Grade C strength. Hardening would specify poles to be built based on loading requirements of Rule 250C extreme wind (120-140 MPH) and Grade B strength factors.[6] By installing poles with greater strength needed to meet this new design criteria, these hardened poles will reduce restoration costs because there will be fewer pole failures and will reduce restoration time because there will be fewer failed poles to repair.

Simply replacing a pole using the same loading requirements and same strength factors will not harden the system. A like–for-like replacement will result in a stronger pole only because it is new but the performance of the like-for-like replacement will be the same over time. For instance, in transmission system hardening, many utilities are using non-wood poles (steel or concrete) to replace existing wood poles. The upgrade to non-wood poles is not required by the NESC, but these non-wood poles have proven to reduce outages and reduce outage times

[6] The loading of NESC Rule 250C and Grade B do not normally apply to distribution lines.

due the superior ability of the non-wood poles to survive during extreme windstorms.

Alternately, replacing aging infrastructure with new infrastructure of the same strength or purpose does not harden the system. This is because using the same strength components does not reduce outage times nor outage costs when compared to the original components.

Q. CAN YOU PROVIDE EXAMPLES OF ENHANCEMENTS TO AN ELECTRIC UTILITY SYSTEM WHICH DO NOT MEET THE CRITERIA SET FORTH IN RULE 25-6.030, F.A.C.?

A. Yes. Adding new sectionalizing equipment such as smart gird enhancements, SCADA systems and remotely operated air break switches (GOABs) do not reduce outages. The outage will still occur and will still need to be repaired. Thus, there is no change to the restoration costs. These devices only help to isolate a smaller portion of the system that is affected by the outage. Thus, the devices fail to meet the criteria in Rule 25-6.030, F.A.C. While the devices do reduce outage times, they fail to reduce outage costs. Further, adding sectionalizing equipment does not strengthen or harden the system.

While not proposed in FPUC's filing, the following is an example to illustrate how utilities could expand the SPP programs if the Commission does not adhere to the stringent the two-prong test for the program. For example, purchasing a new replacement line truck which is more fuel efficient does not reduce outages. It could be argued that it reduces outage costs by being more fuel efficient. Also,

since the truck is new one could argue that it is more reliable and therefore would reduce outage times. However, this type of program does not reduce outages; it does not strengthen or harden the system, and in my opinion would not meet the requirements of the Statute.

Q. WHAT OTHER TYPES OF PROGRAMS DO YOU BELIEVE SHOULD BE EXCLUDED FROM THE SPP PROGRAMS?

A. An electric utility has as a core responsibility to maintain a safe operating system. To that end, aging infrastructure and deteriorated equipment needs to be maintained in safe operating condition. Failure to meet this core responsibility puts the public at risk. However, simply replacing old equipment does not constitute storm hardening. The approved storm hardening programs started with replacement of old poles with stronger poles designed for extreme wind experienced during storms above what is necessary to meet the requirements of the National Electrical Safety Code. This hardening was characterized by stronger than required components and timed improvements such that as poles failed inspection, the system would be naturally strengthened over a period of time.

Q. CAN ALL COSTS THAT REDUCE OUTAGE COSTS, REDUCE OUTAGE TIMES AND STRENGTHEN THE ELECTRIC UTILITY INFRASTRUCTURE BE INCLUDED IN THE SPP AND SPPCRC?

A. Section 366.96, Florida Statutes, and Rule 25-6.030, F.A.C., provide no overt governance regarding limitations to the costs of SPP programs. It is imperative that

the Commission consider guidelines to limit the magnitude of each program's costs compared to its benefits. For this reason, and on behalf of the customers who must bear these costs against the level of projected benefits, elsewhere in my testimony, I propose my limits to projects for the Commission to consider in the public interest.

Q. DID FPUC PROVIDE ANY SPECIFIC COST REDUCTION FOR THE PROGRAMS PROPOSED IN THE 2022-2031 SPP?

A. No. FPUC did not include any estimate of the cost reduction of the programs. Mr. Cutshaw stated the FPUC's SPP included an estimate of the resulting reduction outage times and restoration costs due to extreme weather conditions.[7] This information is specifically required by Rule 25-6.030(3)(d)1, F.A.C. The Rule further requires a comparison of the costs of the programs and the benefits of the programs.[8] Without an estimate of the cost reduction for outages, it is impossible for any party to make a judgment on prudence. FPUC acknowledged that the Commission shall consider FPUC's SPP based on the estimated costs and benefits to the utility and its customers of making improvements proposed in the plan.[9] Mr. Cutshaw states that the programs meet the statutory objective of reducing restoration costs.[10] Yet nowhere in the 2022-2031 SPP does FPUC provide anything other than vague language about reducing restoration costs. In my opinion, anyone can claim reduction in outage restoration costs, but in a regulatory setting with the need to comply with specific statues, it is necessary and expected

[7] Direct Testimony of P. Mark Cutshaw, p. 8, lines 20-23.
[8] Rule 25-6.030 (3)(d)3 and Rule 25-6.030 (3)(d)4, F.A.C.
[9] FPUC's Petition for Approval of Storm Protection Plan, p. 4.
[10] Direct Testimony of P. Mark Cutshaw, p. 4, lines 11-12.

that monetized values of these reductions during extreme weather events be provided.

Q. DID FPUC PROVIDE ANY SPECIFIC REDUCTIONS IN OUTAGE TIMES FOR THE PROGRAMS PROPOSED IN THE 2022-2031 SPP?

A. No. FPUC did not include any estimate of the reduction in outage times. Even though Rule 25-6.030 (3)(d)1, F.A.C., mandates "including an estimate of the resulting reduction in outage times and restoration costs due to extreme weather conditions." I believe that the outage times should be monetized on a basis consistent with the other utilities to help determine the benefits compared to the costs of the proposed storm hardening programs. FPUC simply states in many of the programs that "FPUC believes the Overhead Feeder Hardening program will achieve the desired objectives outlined in Rule 25-6.030 of "reducing restoration costs and outage times associated with extreme weather events and enhancing reliability.'"[11] This is inadequate for the Commission to make a proper determination. There is no cost reduction estimate provided; only a statement of belief by FPUC. In fact, FPUC used exactly the same statement for the Overhead Feeder Hardening Program, Distribution Pole Inspection and Replacement Program, Transmission Wood Pole Replacement Program, and T&D Vegetation Management Program.

Q. WHAT IS YOUR RECOMMENDATION REGARDING THE LACK OF INFORMATION REGARDING THE REDUCTION IN OUTAGE COSTS AND REDUCTION IN OUTAGE TIME?

[11] *See* FPUC Storm Protection Plan, p. 26.

A. I recommend that FPUC be required to amend their filing and provide the necessary data for each program as required by Rule 25-6.030 F.A.C., with an opportunity for intervenors to provide review and testimony.

Q. DID YOU COMPARE THE 10-YEAR COSTS OF FPUC'S 2020-2029 SPP AND ITS 2022-2031 SPP?

A. No. FPUC's 2022-2031 SPP is the Company's first filing of an SPP so I was unable to make a comparison to the budgets of a prior plan.

Q. HAVE YOU COMPARED THE COSTS ON A PER RATEPAYER BASIS FOR THE INVESTOR-OWNED UTILITIES WHO HAVE FILED SPP PLANS?

A. Yes. I looked at the ratio of capital spending to the number of customers for FPUC's 2022-2031 SPP and the 10-year SPPs for the other electric utilities who filed plans. This information is in the following table:

Total 10-year Projected SPP Investment per Customer
Includes only Capital Investment

		2020 SPP		2023 SPP *	
	Customers Total	10-Year Capital $Millions	2020 SPP $/Customer	10-Year Capital $Millions	2023 SPP $/Customer
FPUC	32,993	N/A		$ 243	$ 7,369
Tampa Electric	824,322	$ 1,589	$ 1,928	$ 1,699	$ 2,061
Duke Energy Florida	1,879,073	$ 6,635	$ 3,531	$ 7,318	$ 3,894
Florida Power & Light	5,700,000	$ 11,244	$ 1,973	$ 13,908	$ 2,440

* FPUC's and TECO's plans dated 2022 for a 10-year period

FPUC's spending per customer is extremely high when compared to the other utilities in Florida. In fact, the spending on a per customer basis is more than 3.5

times higher than Tampa Electric, the next smallest utility. This higher cost per customer will result in an excessive increase in rates for all FPUC customers.

II. SUMMARY OF PROPOSED SPP REDUCTIONS

Q. CAN YOU SUMMARIZE YOUR PROPOSED REDUCTION IN FPUC'S PROGRAMS?

A. The table below summarizes my recommendations to reduce the 10-year SPP capital budget by $2.0 billion. These recommendations are detailed in the testimony.

Capital	Total 2022-2031 SPP $Millions	Reductions Proposed by Mara	Net 2022-2031 SPP $Millions	Reason for Reduction
Distribution - OH Feeder Hardening	$ 17.1	$ -	$ 17.1	
Distribution - OH Lateral Hardening	$ 24.7	$ (12.6)	$ 12.1	Limit impact to customers
Distribution - OH Lateral Underground	$ 63.3	$ (31.1)	$ 32.2	Limit impact to customers
Distribution - Pole Insp. & Replace	$ 12.6	$ -	$ 12.6	
T&D - Vegetation Management	$ -	$ -	$ -	
Future T&D Enhancements	$ 30.0	$ (30.0)	$ -	Does not comply with Rule 25-6.030
Transmission / Substation Resiliency	$ 86.1	$ (86.1)	$ -	Not prudent
Transmission - Inspection and Hardening	$ 7.1	$ -	$ 7.1	
SPP Program Management	$ 2.2	$ -	$ 2.2	
Total Capital	$ 243.1	$ (159.8)	$ 83.4	

The reductions I am proposing will result in reducing the capital cost per customer to $2,528 which is still higher than most of the larger utilities in Florida.

Q. IF LIMITS ARE PLACED ON THESE PROGRAMS, DOES THAT REDUCE BENEFITS OF THE SPP?

A. Yes, it does. However, the reduction in benefits must be balanced against the impact to the rate payers. In fact, the United States is experiencing its worst inflation in 40 years and consumers have seen steep increases in the price of gas and groceries, as well as escalating electric bills specifically in Florida. Unless the Commission acts to limit the expenditures, the unchecked spending on SPP programs will result in an excessive burden on the ratepayers.

Q. DO THE BENEFITS OF THESE PROGRAMS SEEM TO BE DEPENDENT ON THE RETURN PERIOD OF THE EXTREME WEATHER EVENTS?

A. Yes, the magnitude of benefits is based on the return period of storms meaning how frequently the electric utility's service area is impacted by a major storm. The goal is to reduce hurricane restoration costs that are imposed on customers. It is important to consider the recent history of weather events impacting Florida. After a catastrophic two-year period in 2004 and 2005, the Commission undertook to require storm hardening measures. As the companies began implementing these measures, Florida embarked on a 10-year period of relative quiet, with no major storms impacting the State until 2016.

In 2016, a five-year period of major storms began. Over this period the five investor-owned electric utilities have reported the following costs from named hurricanes and tropical storms:

Reported Costs from Named Tropical Storms for Each Florida Investor-Owned Utility
2016 Through 2020
$ Millions

	Storm	FPL	Duke	Gulf	TECO	FPUC	Total
2016	Matthew	310.3	40.0		1.0	0.6	351.9
2016	Hermine	21.2	28.6		5.7	0.0	55.5
2016	Colin - TS		3.6		2.5		6.1
2017	Irma	1,378.4	464.1		101.7	2.3	1,946.5
2017	Nate		5.3				5.3
2017	Cindy - TS					0.0	0.0
2018	Michael		316.5	427.7		67.3	811.5
2018	Alberto - TS		1.0				1.0
2019	Dorian	240.6 *	153.0 *			1.2 *	394.7
2019	Nestor - TS		0.6				0.6
2020	Sally			227.5			227.5
2020	Zeta			11.4			11.4
2020	Isaias	68.5	1.1				69.5
2020	Eta - TS	115.9	20.8				136.7
Total All Years		2,134.9	1,034.5	666.6	111.0	71.4	4,018.4

Note: The reported costs included above represent the actual total Company restoration costs included in each petition filed with the FPSC. They do not include reductions for costs capitalized or determined to be non-incremental (ICCA). They also do not include carrying charges or impacts from requested changes to storm reserve balances. Finally, they do not include changes due to later Company modifications, settlements, and/or any other FPSC action.

* Expenses are mostly all preparation costs because the storm did not make landfall in Florida.

Q. YOU NOTE THAT EXPENSES RELATED TO HURRICANE DORIAN ARE MOSTLY FOR PREPARATION AND STAGING. DOES FPUC CLAIM THAT THEIR SPP WILL RESULT IN LESS PRE-STORM STAGING THEREFORE REDUCING COSTS?

A. No. I am not aware that any of the Florida utilities have committed to reducing the number of contractors that the company pre-stages ahead of a storm due to implementing its SPP programs. The SPP's do not claim to reduce costs in this regard, but if the system is hardened, at some point a company should logically spend less on pre-staging and would be expected to limit the amount of staging they do ahead of a storm in conjunction with the SPP.

III. THE REVIEW OF SPP PROJECTS

Q. CAN YOU DESCRIBE FPUC'S OVERHEAD LATERAL HARDENING PROGRAM?

A. Yes. This program is intended to upgrade certain laterals to NESC 250C Extreme wind standards. The upgrades include replacement of deteriorated poles, relocation of facilities to accessible areas, upgrade the conductor to one of higher tensile strength, adequate BIL insulation, additional guying, environmental upgrades such as avian protection and animal mitigation, and upgrading fuses to reclosers.[12] The priority for laterals to be hardened is based on a Risk Resiliency Model.

Q. CAN YOU DESCRIBE WHAT IS MEANT BY THE TERM LATERAL?

[12] *See* FPUC Storm Protection Plan, p. 27.

A. Yes. The term lateral is critical to understanding the purpose of the Overhead Lateral Hardening and Overhead Lateral Undergrounding. A distribution circuit can be described as a combination of the mainline feeder with laterals stemming off the mainline. The Overhead Feeder Hardening Program increases the strength of the mainline feeder from the substation to some point along the circuit such as a three-phase tie point with another circuit. Some describe the feeder as the first zone of protection out of the substation, meaning the breaker in the substation will trip for any fault in this zone of protection. Thus, hardening the first zone of protection greatly reduces the chance of a structure failure during an extreme wind event. This is important since failure of the mainline feeder results in all customers on the feeder being without power. Laterals are taps off the mainline and FPUC has approximately 575 miles of overhead lateral lines of which are 433 miles are single phase lines.[13] For FPUC's system a typical lateral can have upwards of 200 to 300 customers.[14] These laterals can be single-phase taps or three-phase taps serving residential neighborhoods or businesses. The Overhead Lateral Hardening Program focuses on improving the condition of the laterals so they may withstand an extreme wind event.

Q. WHAT IS THE MAGNITUDE OF THE OVERHEAD LATERAL HARDENING PROGRAM?

[13] *See* FPUC Storm Protection Plan, p. 27 and p. 28.
[14] *See* FPUC Storm Protection Plan, p. 27.

A. The ten-year capital budget for the FPUC Overhead Lateral Hardening program is $24.75 million in the 2022-2031 SPP.[15]

Q. DID FPUC PROVIDE ANY SPECIFIC VALUE FOR THE BENEFITS OF THE OVERHEAD LATERAL HARDENING PROGRAM?

A. No. Even though this data was required in the filing by Rule 25-6.030, F.A.C., FPUC failed to provide any estimates of cost reduction or estimates of outage reduction times.[16] FPUC referenced a report prepared by the Florida PSC entitled *Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018,* dated July 2018. FPUC quoted the report as stating, "[h]ardened overhead distribution facilities performed better than non-hardened facilities."[17] However, there was no data presented in the Commission's report regarding lateral hardening.[18] The data demonstrating better performance was limited to feeder hardening and therefore not directly applicable to this program for hardening laterals.

Q. DO YOU HAVE A RECOMMENDATION FOR THE OVERHEAD LATERAL HARDENING PROGRAM?

A. Yes. I recommend reducing the budget for the Overhead Lateral Hardening program. I recommend a 10-year capital budget of roughly $12.1 million.

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[15] *See* FPUC Storm Protection Plan, Appendix A, p. 44.
[16] *See* FPUC Storm Protection Plan, p. 28.
[17] *See* FPUC Storm Protection Plan, p. 28.
[18] *See* Exhibit KJM-2, State of Florida Public Service Commission, *Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018,* July 2018, p.29.

Essentially my recommendation uses the same budgets proposed by FPUC for the first 3 years (2022 to 2024) and then caps the annual spending for this program to roughly $1.5 million per year for the years 2025 to 2031. This recommended budget is shown in the following table.

Overhead Lateral Hardening

Year	FPUC 2022 SPP $millions	Recommended 2022 SPP $millions
2022	0.06	0.06
2023	0.56	0.56
2024	0.98	0.98
2025	4.41	1.5
2026	1.80	1.5
2027	2.99	1.5
2028	3.17	1.5
2029	4.71	1.5
2030	3.46	1.5
2031	2.62	1.5
Total	**24.76**	**12.1**

The basis for the reduction is two-fold. First, FPUC has failed to demonstrate that the benefits to FPUC's customers outweighs the costs for hardening overhead laterals. It is apparent from experiences in Florida that hardened poles will reduce outage costs and outage times, but the extent that this is true for this Overhead Lateral Hardening program is unknown. Second, the FPUC overall 2022-2031 SPP has a very high cost per customer and will result in excessive higher rates for ratepayers who are also experiencing high inflation pressures. Accordingly, this FPUC proposal should be scaled back.

Q. CAN YOU DESCRIBE FPUC'S OVERHEAD LATERAL UNDERGROUNDING PROGRAM?

A. Yes. This program is intended to address undergrounding of single phase overhead electric facilities many of which are located in heavily vegetated areas, environmentally sensitive areas, or in areas where hardening the overhead facilities to NESC 250C Extreme wind standards is not practical.[19] The priority for laterals to be undergrounded is based on a Risk Resiliency Model, and specific priority will be assigned to laterals on risk ranked feeders.[20]

Q. WHAT IS THE MAGNITUDE OF THE OVERHEAD LATERAL UNDERGROUNDING PROGRAM?

A. The 10-year capital budget for the Overhead Lateral undergrounding program is $63.35 million in the 2022-2031 SPP.[21]

Q. DID FPUC PROVIDE ANY SPECIFIC VALUE FOR THE BENEFITS OF THE OVERHEAD LATERAL UNDERGROUNDING PROGRAM?

A. No. Even though this data was required in the filing by Rule 25-6.030, F.A.C., FPUC failed to provide any estimates of cost reduction or estimates of outage reduction times.[22] FPUC referenced a report prepared by the Florida PSC entitled *Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018,* dated July 2018. However, FPUC did not try to monetize the benefits

[19] *See* FPUC Storm Protection Plan, p. 28.
[20] *See* FPUC Storm Protection Plan, p. 41.
[21] *See* FPUC Storm Protection Plan, Appendix A, p. 44.
[22] *See* FPUC Storm Protection Plan, p. 29.

of undergrounding laterals, thus it is not possible to compare the benefits to the cost of the program.

Q. DO YOU HAVE A RECOMMENDATION FOR THE OVERHEAD LATERAL UNDERGROUNDING PROGRAM?

A. Yes. I recommend reducing the budget for the Overhead Lateral Undergrounding program. I recommend a 10-year capital budget of roughly $32.2 million. Essentially my recommendation uses the same budgets proposed by FPUC for the first 3 years (2022 to 2024) and then caps the annual spending for this program to roughly $4.2 million per year for the years 2025 to 2031. This recommended budget is shown in the following table.

Overhead Lateral Undergrounding

Year	FPUC 2022 SPP $millions	Recommended 2022 SPP $millions
2022	0.11	0.11
2023	1.09	1.09
2024	1.62	1.62
2025	6.23	4.2
2026	5.00	4.2
2027	8.52	4.2
2028	8.06	4.2
2029	6.44	4.2
2030	13.13	4.2
2031	13.13	4.2
Total	**63.35**	**32.22**

The basis for the reduction is two-fold. First, FPUC has failed to demonstrate the benefit to cost for overhead lateral undergrounding. It is apparent

from experiences in Florida that undergrounding laterals will reduce outage costs and outage times but the extent this is true for this Overhead Lateral Undergrounding program is unknown. Second, the FPUC overall 2022-2031 SPP has a very high cost per customer and will result in excessive higher rates for ratepayers who are also experiencing high inflation pressures.

Accordingly, this FPUC proposal should be scaled back.

Q. CAN YOU DESCRIBE THE TRANSMISSION AND SUBSTATION RESILIENCY PROGRAM?

A. Yes. This program is intended to improve the electrical redundancy and resiliency to Amelia Island through the construction of an additional 138 kV transmission line, the upgrade of one of the 69kV transmission lines, and the construction of one substation.[23] This work may include upgrades to existing substations.

Q. WHAT IS THE PURPOSE OF THE NEW 138 KV TRANSMISSION LINE CONTAINED IN THE TRANSMISSION AND SUBSTATION RESILIENCY PROGRAM?

A. Amelia Island is served by a 3.56-mile long FPUC owned double circuit 138 kV transmission line. Approximately 1.1 miles is along a transmission right-of-way and the remaining 2.46 miles is along a four-lane highway. FPUC is proposing a new 138kV transmission line to provide redundancy to the existing double circuit transmission line. The proposed new transmission line will be 8.72 miles of

[23] *See* FPUC Storm Protection Plan, p. 33.

overhead transmission line and 2.03 of 138kV submarine cable.[24] The majority of the proposed route is not accessible by existing roads.[25]

Q. IS THIS NEW TRANSMISSION LINE NECESSARY FOR STORM HARDENING?

A. No. This new line is not necessary or prudent. The existing double circuit transmission line is built on concrete poles with a few lattice steel towers at the river crossing. FPUC states that the location of this transmission system makes access to it very challenging.[26] However, the existing dual circuit transmission line is adjacent to a four-lane highway providing better access than to most transmission lines in Florida and the route has limited interference with trees along the majority of the right-of-way. In addition, research by the Florida PSC found that very few non-wood poles failed during hurricanes.[27] Thus by employing the good maintenance practices as described in the FPUC 2022-2031 SPP, the existing double circuit line will be hardened against extreme wind speeds of 120 mph with Grade B strength factors.

[redacted]

[24] *See* FPUC Storm Protection Plan, p. 34.
[25] *See* FPUC's Response to OPC's First Request for Production of Documents.
[26] Direct Testimony of P. Mark Cutshaw, p. 11, line 15.
[27] *See* Exhibit KJM-2, State of Florida Public Service Commission, *Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018,* July 2018, pp.29-30.

[redacted]

Further, the proposed new 10.8 miles of new 138 kV transmission line and cable route is a very poor right-of-way which is why a submarine cable is proposed. The poles would be in low lying areas with no access roads currently in place. This line will access an alternate power source that is presently available to FPUC through JEA's transmission system and therefore adds no value under the standards of the SPP Statute and Rule.

Q. WHAT IS YOUR RECOMMENDATION FOR THIS PROJECT OF A NEW 138 KV TRANSMISSION LINE TO AMELIA ISLAND?

A. I recommend this project be excluded from the SPP because it is not a prudent investment. This recommendation is based on my review of the existing system configuration, access to the existing line, the fact that the existing line is relatively short with limited exposure and is built with 100% concrete poles and lattice steel tower specifically designed for extreme wind.

Q. WHAT IS THE PURPOSE OF THE UPGRADE OF THE 69 KV TRANSMISSION LINE AND THE UPGRADE TO AN EXISTING 69 KV

SUBSTATION CONTAINED IN THE TRANSMISSION AND SUBSTATION RESILIENCY PROGRAM?

A. Specifically, FPUC proposes to upgrade 4.45 miles of 69 kV line including reconductoring the line for increased capacity and construction of a new substation interconnection to connect to a paper mill that has generation resources that could be leveraged by FPUC during normal and emergency conditions.[28] Presently the Eight Flags Energy CHP Plant, located at the Rayonier Advanced Materials plant at Amelia Island, generates approximately 20 MW of base load power, producing enough electricity to meet 50 percent of the island's demand. The plant operates on natural gas provided by FPUC. The Rayonier Advanced Materials plant purchases the steam and heated water from the CHP plant and FPUC purchases the electricity for distribution to its retail electric customers in the area.[29] There is another paper mill on the island with a CHP plant powered by coal,[30] although based on limited scope of FPUC's filing and lack of time for discovery, it is unclear if the proposed transmission line upgrade and new substation is for one or both of these industrial sites.

Q. ARE THE UPGRADED 69KV TRANSMISSION LINE AND NEW SUBSTATION NECESSARY FOR STORM HARDENING?

[28] *See* FPUC Storm Protection Plan p. 34.
[29] *See* Exhibit KJM-4, Fernandina Observer, *Eight Flags Energy combined heat and power plant (CHP) named best CHP project of 2016*, Suanne Thamm, December 22, 2016.
[30] *See* Exhibit KJM-5, U.S. Department of Energy Combined Heat and Power and Microgrid Installation Databases.

A. No. The 69 kV line already exists and is interconnected with an existing CHP plant. This project will increase the capacity of the line to gain access to more electricity from CHP generation. This type of power, which calls for increased investment to access an alternate power source, is not a storm hardening issue. It is a power supply hedging strategy which more appropriately belongs in a traditional rate case in which the issues of the investment in capacity compared to the access of the alternate power source can be vetted. I note that FPUC is not suggesting the paper mill will contribute aid for the increase in capacity or storm hardening of the substation. At no cost to it, the paper mill would enjoy access to a transmission grid with more capacity to sell more electricity, a more robust transmission line for the sale of electricity, and a new substation that meets FPUC storm hardening measures.

Further, there is no analysis that suggests that the CHP will be operational within 5-6 hours of a hurricane making landfall. For the CHP to aid in resiliency, it must be viable with full capacity when needed. This is outside the control of FPUC and outside the scope of the SPP Statute and Rule.

Q. WHAT IS YOUR RECOMMENDATION FOR THIS UPGRADE OF THE 69KV TRANSMISSION AND SUBSTATION AT THE PAPER MILL?

A. I recommend this project be excluded from the SPP. This project is not a storm hardening project; it is an energy delivery/energy access project. The cost of the transmission capacity increase and the new substation should have either contribution-in-aid from the CHP owner or a clear analysis showing that the

investment in the new plant will be offset by the alternate energy resource. Further, the cost of this plan as a storm hardening resource has not considered the fuel cost and power purchase cost at critical times such within hours of a hurricane making landfall.

Q. WHAT IS YOUR RECOMMENDATION FOR THE TRANSMISSION AND SUBSTATION RESILIENCY PROGRAM?

A. The 10-year capital cost of this program is $86.07 million, and I recommend that two projects within the program be excluded from the SPP. The proposed 138 kV transmission line through the low-lying area around Amelia Island is not a prudent option when the existing transmission system is already hardened for extreme weather. Also, the capacity increase for interconnection of a co-generation plant needs to be analyzed from a power supply cost perspective and not based on storm hardening, especially since there are no guarantees that the plant will be operational when most needed by the FPUC.

Q. CAN YOU DESCRIBE FPUC'S FUTURE TRANSMISSION AND DISTRIBUTION ENHANCEMENTS PROGRAM?

A. Yes, this program will, at some time in the future, include some kind of distribution automation or smart grid technology which can create a self-healing system. A Supervisory Control and Data Acquisition (SCADA) system will be part of these

future enhancements.[31] Because this is a future program, specific costs and details on the full deployment are not yet available.[32]

Q. DOES FPUC'S FUTURE TRANSMISSION AND DISTRIBUTION ENHANCEMENTS PROGRAM REDUCE RESTORATION COSTS?

A. No. This system does not reduce the number of outages. Instead, the system is designed to limit the outage to the smallest segment of the system. For example, if a fuse is added to a lateral and a tree falls on that lateral, the fuse opens and isolates the failed portion of the system. Only a few customers are affected by the outage, but the repair costs to remove the tree off the line and perhaps replace a pole are the same whether a fuse is on the lateral or not. The smart grid as described by FPUC is more complex but acts in a similar fashion except it uses automation to switch and isolate outages to the smallest portion of the system. Thus, there is no reduction in restoration costs for the smart grid system. In fact, FPUC failed to provide any details of the proposed system and does not include any monetized value for reduction in outage costs or reduction in outage times. Rather FPUC provides flowery language that "[t]hese systems have been proven across the nation at eliminating unnecessary outage impacts to unaffected customers ..."[33] However, FPUC has not determined what type of system they will install. If they install a SCADA system only on Amelia Island, that system will not function as a fault isolation system. Without any details about the type of system, or the actual

[31] Direct Testimony of P. Mark Cutshaw, p. 12, lines 10-14.
[32] *See* FPUC Storm Protection Plan, p. 35.
[33] *See* FPUC Storm Protection Plan, p. 36.

monetized benefits of the system, this program does not meet the requirements of the Rule 25-6.030, F.A.C.

Q. WHAT IS YOUR RECOMMENDATION REGARDING FPUC'S FUTURE TRANSMISSION AND DISTRIBUTION ENHANCEMENTS PROGRAM?

A. I recommend this program with a 10-year budget of $30 million be eliminated from FPUC's SPP because it fails to meet the two prong criteria established in Rule 25-6.030(2)(a), F.A.C. Specifically, this program, which is ill-defined but generally functions on a fault isolation system, does not reduce outage costs. The system only reduces outage times.

Q. DOES THIS COMPLETE YOUR PREFILED TESTIMONY?

A. Yes, it does.

CERTIFICATE OF SERVICE
Docket No. 20200049-EI

I HEREBY CERTIFY that a true and correct copy of the forgoing has been furnished by electronic mail on this 31st day of May 2022, to the following:

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Patricia Christensen
Associate Public Counsel

GDS Associates, Inc.
ENGINEERS & CONSULTANTS

KEVIN J. MARA, P.E.

Exec. Vice President & Principal Engineer

EDUCATION

BS Electrical Engineering, Georgia Institute of Technology, 1982

PROFESSIONAL MEMBERSHIPS

Institute of Electrical and Electronic Engineers Power Engineering Society – Senior Member

National Electric Safety Code Subcommittee 5 – Alternate Member

Past Member - Insulated Conductor Committee

PROFESSIONAL REGISTRATIONS

Registered Professional Engineer in Alabama, Arkansas, Georgia, Florida, Idaho, Indiana, Kansas, Kentucky, Louisiana, Michigan, Mississippi, Missouri, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, and Wisconsin.

AREAS OF EXPERTISE

Overhead and Underground Distribution Design, Distribution System Planning, Power System Modeling and Analysis, Training

DESIGN

Mr. Mara has over 30 years of experience as a distribution engineer. He worked six years at Savannah Electric as a Distribution Engineer and ten years with Southern Engineering Company as a Project Manager. At Savannah Electric, Mr. Mara gained invaluable field experience in the operation, maintenance, and design of transmission and distribution systems. While at Southern Engineering, Mr. Mara performed planning studies, general consulting, underground distribution design, territorial assistance, and training services. Presently, Mr. Mara is a Vice President at GDS Associates, Inc. and serves as the Principal Engineer for GDS Associates' engineering services company known as its trade name Hi-Line Engineering.

Overhead Distribution System Design

Mr. Mara is in responsible charge of the design of distribution lines for many different utilities located in a variety of different terrains and loading conditions. Mr. Mara is in responsible charge of the design of over 100 miles of distribution line conversions, upgrades, and line reinsulation each year. Many of these projects include acquisition of right-of-way, obtaining easements, and obtaining permits from various local, state and federal agencies. In addition, Mr. Mara performs inspections at various stages of completion of line construction projects to verify compliance of construction and materials with design specifications and applicable codes and standards.

Underground Distribution System Design

Mr. Mara has developed underground specifications for utilities and was an active participant on the Insulated Conductor Committee for IEEE. He has designed underground service to subdivisions, malls, commercial, and industrial areas in various terrains. These designs include concrete-encased ductlines, direct-burial, bridge attachments, long-bores, submarine, and tunneling projects. He has developed overcurrent and overvoltage protection schemes for underground systems for a variety of clients with different operating parameters.

PLANNING

Mr. Mara has prepared numerous planning studies for electric cooperatives and municipal systems in various parts of the country. The following is a representative list of specific projects:

- Little River Electric Cooperative, SC
  - Long Range Plan
  - Four Construction Work Plans
- Maxwell AFB, AL - Long Range Plan
- Fall River Electric, ID – Long Range Plan
- Chugach Electric, AK - Long Range Plan
- Newberry Electric Cooperative, SC - Construction Work Plan, Long Range Plan
- Lackland AFB, TX - Long Range Plan
- Rio Grande ECI, TX - Construction Work Plan, Long Range Plan
- Northern Virginia Electric Cooperative, VA - Construction Work Plan
- BARC Electric Cooperative - Construction Work Plan
- Dixie Electric Cooperative - Construction Work Plan
- Joe Wheeler Electric Cooperative - Construction Work Plan
- Cullman Electric Cooperative - Long Range Plan, Construction Work Plan

TRAINING SEMINARS

Mr. Mara has developed engineering training courses on the general subject of distribution power line design. These seminars have become extremely popular with more than 25 seminars being presented annually and with more than 4,000 people having attended seminars presented by Mr. Mara. A 3-week certification program is offered by Hi-Line Engineering in eleven states. The following is a list of the training material developed and/or presented:

- Application and Use of the National Electric Safety Code
- How to Design Service to Large Underground Subdivisions
- Cost-Effective Methods for Reducing Losses/Engineering Economics
- Underground System Design
- Joint-Use Contracts – Anatomy of Joint-Use Contract
- Overhead Structure Design
- Easement Acquisition
- Transformer Sizing and Voltage Drop

Construction Specifications for Electric Utilities

Mr. Mara has developed overhead construction specifications including overhead and underground systems for several different utilities. The design included overcurrent protection for padmounted and pole mounted transformers. The following is a representative list of past and present clients:

- Cullman EMC, Alabama
- Blue Ridge EMC, South Carolina
- Buckeye Rural Electric Cooperative, Ohio
- Three Notch EMC, Georgia
- Little River ECI, South Carolina
- Lackland Air Force Base
- Maxwell Air Force Base

System Privatization/Evaluation

- Central Electric Power Cooperative, Columbia, SC
  - 2017 Independent Certification of Transmission Asset Valuation, Silver Bluff to N. Augusts 115kV
  - 2015 Independent Certification of Transmission Asset Valuation, Wadmalaw 115kV
- Choctawhatchee Electric Cooperative, DeFuniak Springs, FL
  - Inventory and valuation of electrical system assets at Eglin AFB prior to 40-year lease to private-sector entity.

Publications

- Co-author of the NRECA "Simplified Overhead Distribution Staking Manual" including editions 2, 3 and 4.
- Author of "Field Staking Information for Overhead Distribution Lines"
- Author of four chapters of "TVPPA Transmission and Distribution Standards and Specifications"

Testimonies & Depositions

Mr. Mara has testified as an expert at trial or by deposition in the following actions.

- Deposition related to condemnation of property
  Newberry ECI v. Fretwell, 2005
  State of South Carolina

- Testimony in Arbitration regarding territory dispute
  Newberry ECI v. City of Newberry, 2003
  State of South Carolina
  Civil Action No. 2003-CP-36-0277

- Expert Report and Deposition, 2005
  United States of America v. Southern California Edison Company
  Case No CIV F-o1-5167 OWW DLB

- Expert Report and Deposition, 2005
  Contesting a transmission condemnation
  Moore v. South Carolina Electric and Gas Company
  United States District Court of South Carolina
  Case No. 1:05-1509-MBS

- Affidavit October 2007
  FERC Docket No. ER04-1421 and ER04-1422
  Intervene in Open Access Transmission Tariff filed by Dominion Virginia Power

- Affidavit February 26, 2008
  FERC Docket No. ER08-573-000 and ER08-574-000
  Service Agreement between Dominion Virginia Power and WM Renewable Energy, LLC

- Direct Filed Testimony date December 15, 2006
  Before the Public Utility Commission of Texas
  SOAH Docket No 473-06-2536
  PUC Docket No. 32766
- Expert Report and Direct Testimony April 2008
  United States Tax Court
  Docket 25132-06
  Entergy Corporation v. Commissioner Internal Revenue
- Direct Testimony September 17, 2009
  Public Service Commission of the District of Columbia
  Formal Case 1076
  Reliability Issues
- Filed Testimony regarding the prudency of hurricane restoration costs on behalf of the City of Houston, TX, 2009
  Cozen O'Connor P.C.
  TX PUC Docket No. 32093 – Hurricane Restoration Costs
- Technical Assistance and Filed Comments regarding line losses and distributive generation interconnection issues, 2011
  Office of the Ohio Consumer's Counsel
  OCC Contract 1107, OBM PO# 938 for Energy Efficiency T & D
- Technical Assistance, Filed Comments, and Recommendations evaluating Pepco's response to Commission Order 15941 concerning worst reliable feeders in the District of Columbia.
  2011, 2012 Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Assistance, Filed Comments, and Recommendations on proposed rulemaking by the District of Columbia PSC amending the Electric Quality of Service Standards (EQSS), 2011.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Yearly Technical Review, Filed Comments, and Recommendations evaluating Pepco's Annual Consolidated Report for 2011 through 2021.
  Office of the People's Counsel of the District of Columbia
  Formal Case Nos. 766; 766-ACR; PEPACR(YEAR)
- Technical Evaluation, Filed Comments, and Recommendations evaluating Pepco's response to a major service outage occurring May 31, 2011. (2011)
  Office of the People's Counsel of the District of Columbia
  Formal Case Nos. 766 and 1062
- Technical Assistance, Filed Comments, and Recommendations evaluating Pepco's response to Commission Order 164261 concerning worst reliable neighborhoods in the District of Columbia, 2011.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Review, Filed Comments, and Recommendations on Pepco's Incident Response Plan (IRP) and Crisis Management Plan (CMP), 2011.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766

- Technical Assistance, Filed Comments, and Recommendations assessing Pepco's Vegetation Management Program and trim cycle in response to Oder 16830, 2012.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Review, Filed Comments, and Recommendations on Pepco's Secondary Splice Pilot Program in response to Order 16426, 2012.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766 and 991
- Technical Review, Filed Comments, and Recommendations on Pepco's Major Storm Outage Plan (MSO), 2012 - active.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2011-2012.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1087 – Pepco 2011 Rate Case. Hearing transcript date: February 12, 2012.
- Evaluation of and Filed Comments on Pepco's Storm Response, 2012.
  Office of the People's Counsel of the District of Columbia
  Storm Dockets SO-02, 03, and 04-E-2012
- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2013 - 2014.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1103 – Pepco 2013 Rate Case. Hearing transcript date: November 6, 2013.
- Evaluation of and Filed Comments on Prudency of 2011 and 2012 Storm Costs, 2013 – 2014.
  State of New Jersey Division of Rate Counsel
  BPU Docket No. AX13030196 and EO13070611
- Technical Assistance and Direct Filed Testimony for DTE Acquisition of Detroit Public Lighting Department, 2013 – 2014.
  Office of the State of Michigan Attorney General
  Docket U-17437
- Evaluation of and Filed Comments on the Siemens Management Audit of Pepco System Reliability and the Liberty Management Audit, 2014.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1076
- Expert witness for personal injury case, District of Columbia
  Koontz, McKenney, Johnson, DePaolis & Lightfoot LLP
  Ghafoorian v Pepco 2013 - 2016
  Plaintive expert assistance regarding electric utility design. operation of distribution systems and overcurrent protection systems.
- Technical Assistance and Direct Filed Testimony in the Matter of the Application for approval of the Triennial Underground Infrastructure Improvement Projects Plan, 2014 – 2017.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1116
- Technical Assistance and Direct Filed Testimony in the Matter of the Merger of Exelon Corporation, Pepco Holdings, Inc., Potomac Electric Power Company, Exelon Energy Delivery Company, LLC and New Special Purpose Entity, LLC, 2014 – 2016.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1119. Hearing transcript date: April 21, 2015.

- Technical Assistance to Inform and advise the OPC in the matter of the investigation into modernizing the energy delivery system for increased sustainability. 2015 - active
  Office of the People's Counsel of the District of Columbia
  Formal Case No 1130.

- Technical Assistance and Direct Filed Testimony in the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc., 2014 – 2016.
  State of Maryland and the Maryland Energy Administration
  Case No. 9361.

- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2015 – 2016.
  State of Oklahoma Office of the Attorney General
  Cause No. PUD 201500273 - OG&E 2016 Rate Case. Hearing transcript date: May 17, 2016.

- Technical Assistance and Filed Comments on Notice of Inquiry, The Commission's Investigation into Electricity Quality of Service Standards and Reliability Performance, 2016 - 2018.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1076; RM36-2016-01-E.

- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2016 - 2017.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1139 – Pepco 2016 Rate Case. Hearing transcript date: March 21, 2017.

- Technical Assistance in the Matter of the Application for approval of the Biennial Underground Infrastructure Improvement Projects Plan, 2017.- active
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1145

- Technical Assistance to Inform and advise the OPC Regarding Pepco's Capital Grid Project, 2017 - active.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1144. Confidential Comments and Confidential Affidavit filed November 29, 2017.

- Expert witness for personal injury case Mecklenburg County, NC
  Tin, Fulton, Walker & Owen, PLLC
  Norton v Duke, Witness testimony December 1, 2017

- Technical assistance and pre-filed Direct Testimony on behalf of the Joint Municipal Intervenors in a rate case before the Indiana Utility Regulatory Commission.
  Cause No. 44967. Testimony filed November 7, 2017.

- Prefiled Direct Testimony and Prefiled Surrebuttal Testimony on behalf of the Vermont Department of Public Service in a case before the State of Vermont Public Utility Commission, Tariff Filing of Green Mountain Power Corp.
  Case No. 18-0974-TF. Direct Testimony Filed August 10, 2018. Surrebuttal Testimony Filed October 8, 2018.

- Technical assistance and pre-filed Direct Testimony on behalf of McCord Development, Inc. and Generation Park Management District against CenterPoint Energy Houston Electric, LLC in a case before the State Office of Administrative Hearings of Texas.
  TX PUC Docket No. 48583. Direct Testimony filed April 5, 2019.

- Technical Assistance, Direct Filed Testimony, Rebuttal Testimony, Surrebuttal Testimony, and Supplemental Testimony for fully litigated rate case, 2019 – active.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1156 – Pepco 2019 Rate Case. Direct Testimony Filed March 6, 2020. Rebuttal Testimony Filed April 8, 2020. Surrebuttal Testimony Filed June 1, 2020. Supplemental Testimony filed July 27, 2020.

- Technical assistance and pre-filed Direct Testimony on behalf of The State of Florida Public Counsel for Review of 2020-2029 Storm Protection Plan pursuant to Rule 25-6.030, F.A.C.
  Docket No. 20200071-EI.
  Gulf Power SPP. Direct Testimony filed May 26, 2020.
  Florida Power& Light Company SPP. Direct Testimony filed May 28, 2020.

- Prefiled Direct Testimony on behalf of the Vermont Department of Public Service in a case before the State of Vermont Public Utility Commission, Petition of Green Mountain Power for approval of its climate Plan pursuant to the Multi-Year Regulation Plan.
  Case No. 20-0276-PET. Direct Testimony Filed May 29, 2020.

- Technical assistance and Filed Comments on behalf of East Texas Electric Cooperative on a Proposal for Publication by the Public Utility Commission of Texas on Project 51841 Review of 16 TAC § 25.53 Relating to Electric Service Emergency Operations Plans.
  Project 51841. Comments filed January 4, 2022.

- Technical assistance, filed affidavit and direct testimony on behalf of Bloomfield, NM in an action concerning Bloomfield's exercise of its right to acquire from Farmington the electric utility system serving Bloomfield.
  Bloomfield v Farmington, NM. State of New Mexico, County of San Juan, Eleventh Judicial District Court Action No. D-1116-CV-1959-07581.

- Technical assistance and pre-filed Direct Testimony on behalf of Sawnee EMC in a territorial dispute with Electrify America.

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FPSC - COMMISSION CLERK

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

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

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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.

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[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

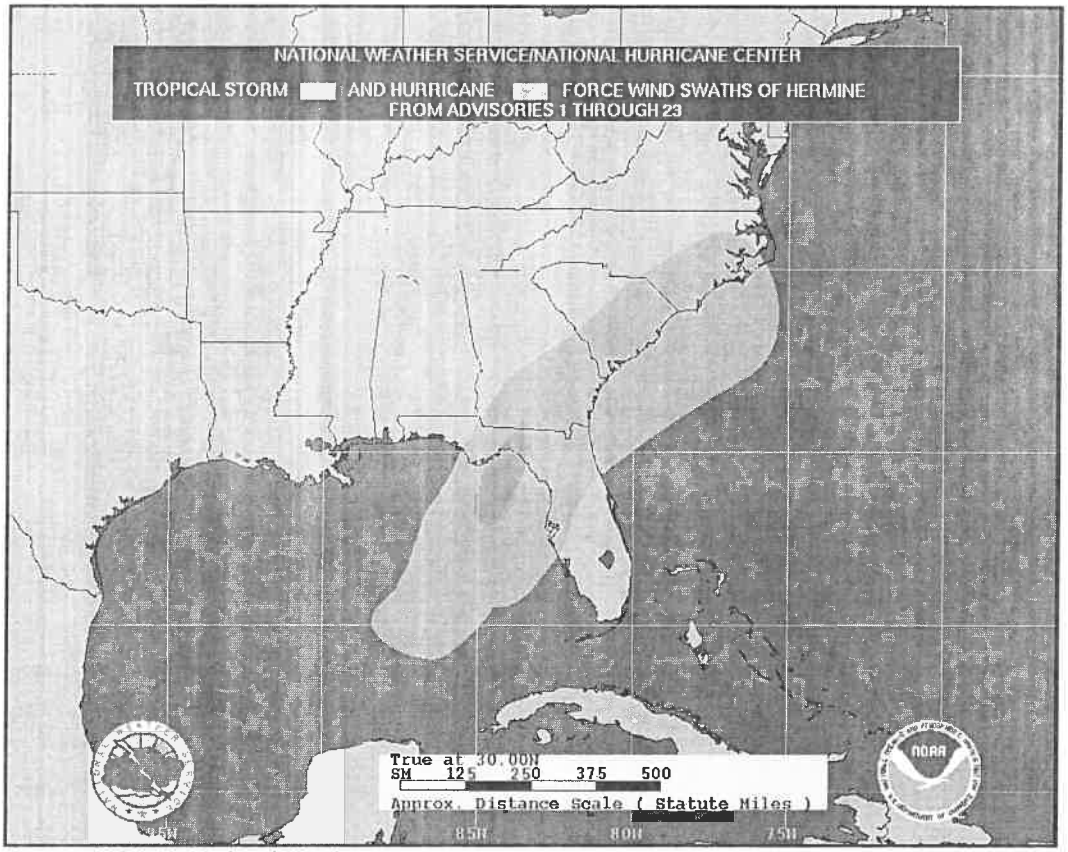
While an IOU's storm hardening plan must be approved by the Commission, this does not guarantee an IOU the recovery of all incurred costs for the implementation of the plan. Storm hardening costs are addressed during an IOU's general rate case proceeding, and those costs are covered in base rates since 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%

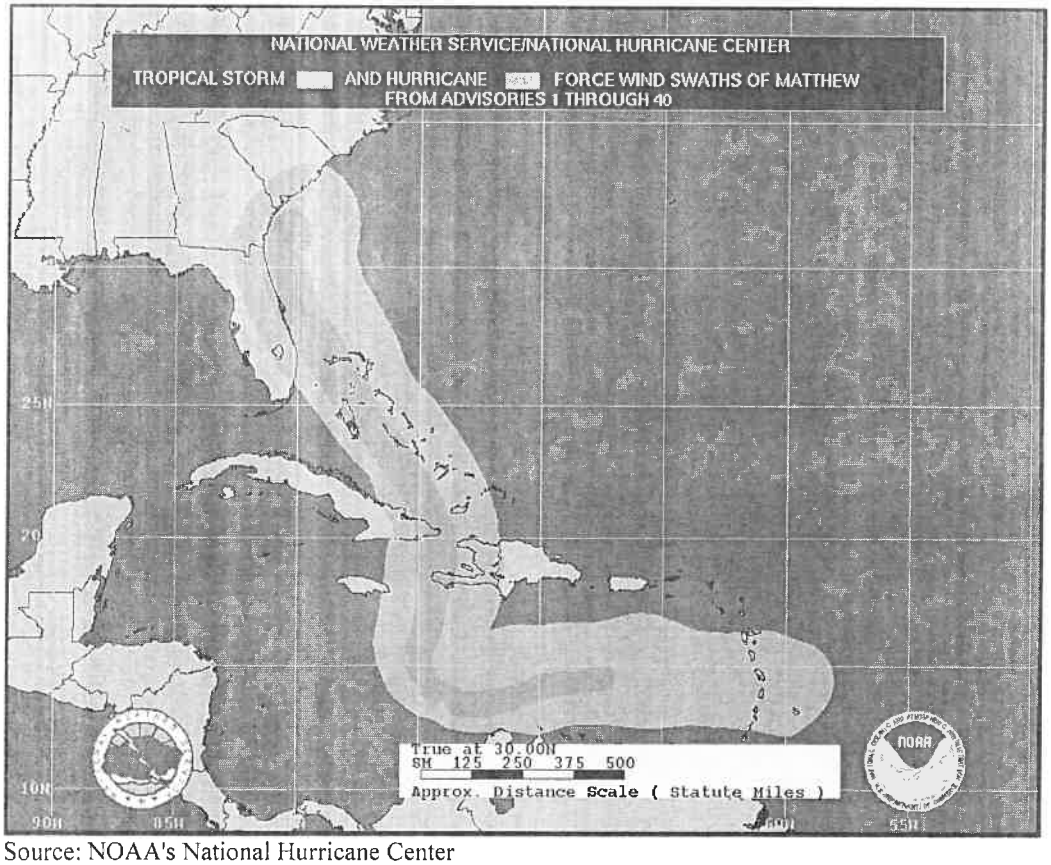
Source: State EOC power outage reports.

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%

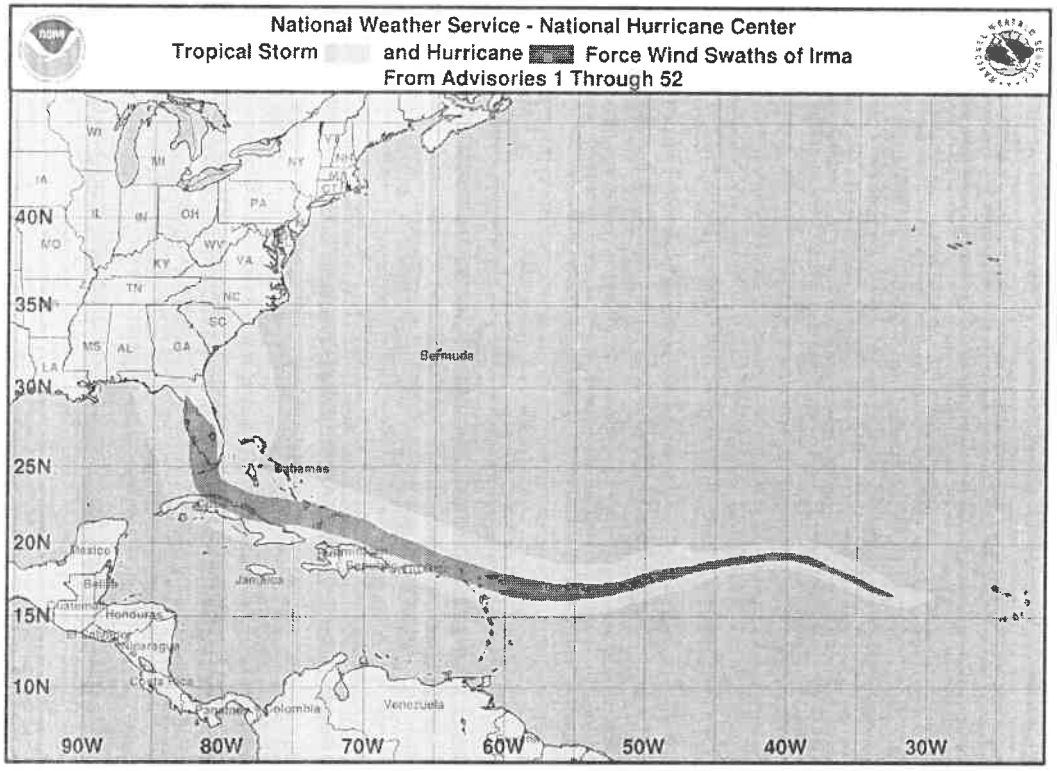
Source: State EOC power outage reports.

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%

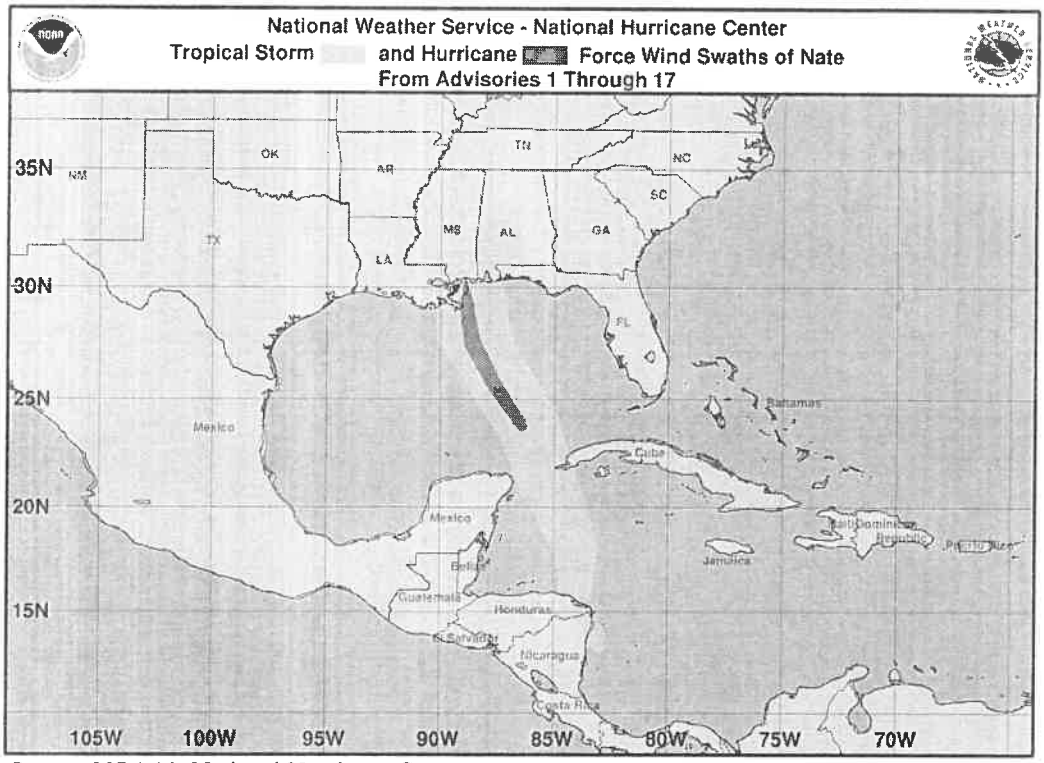
Source: State EOC power outage reports.

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.

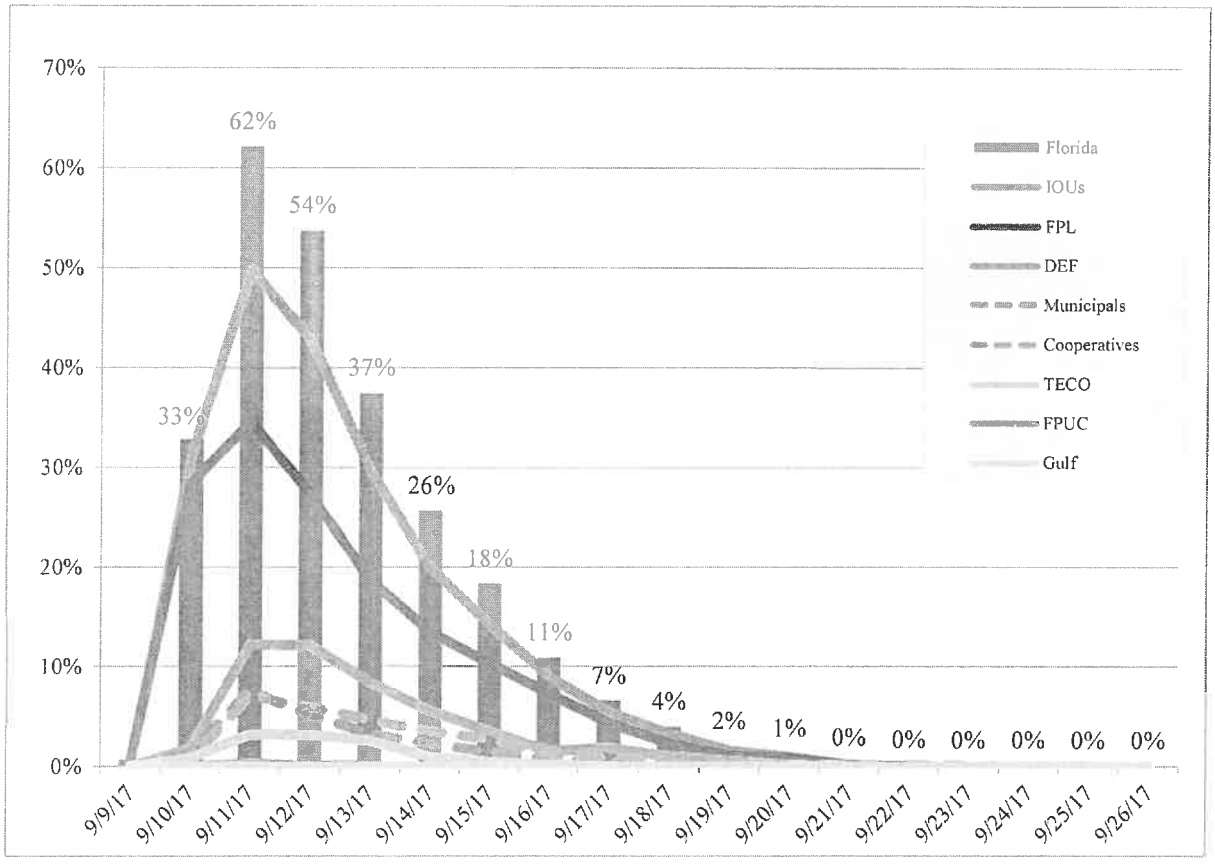
Based on a review of the utility presented data for each hurricane, the utilities performed consistently in restoring service. Hurricane Irma affected the entire state and was the first significant test of Florida's electric infrastructure since the 2004 and 2005 hurricane season. For simplification 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.

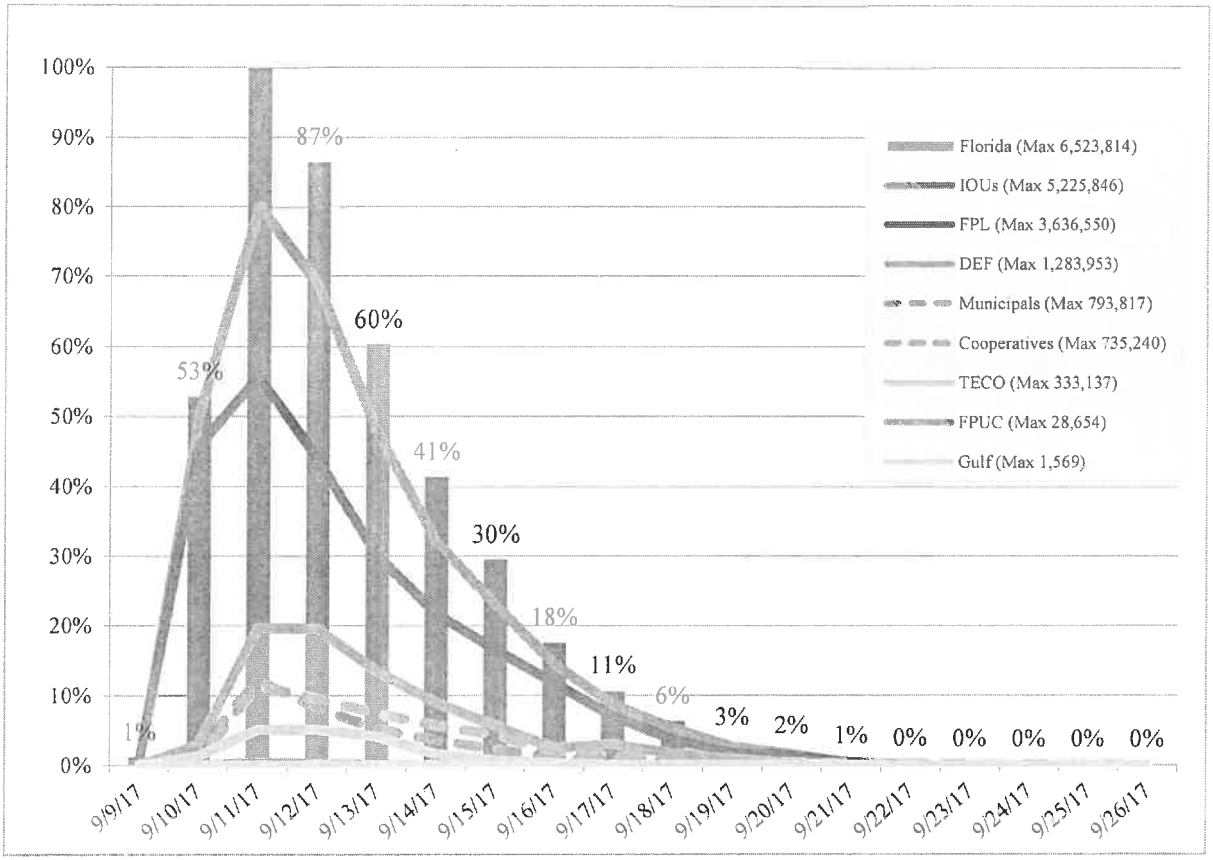
Figure 4-1
Hurricane Irma – Percent of Florida's Total Customers without Power



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.

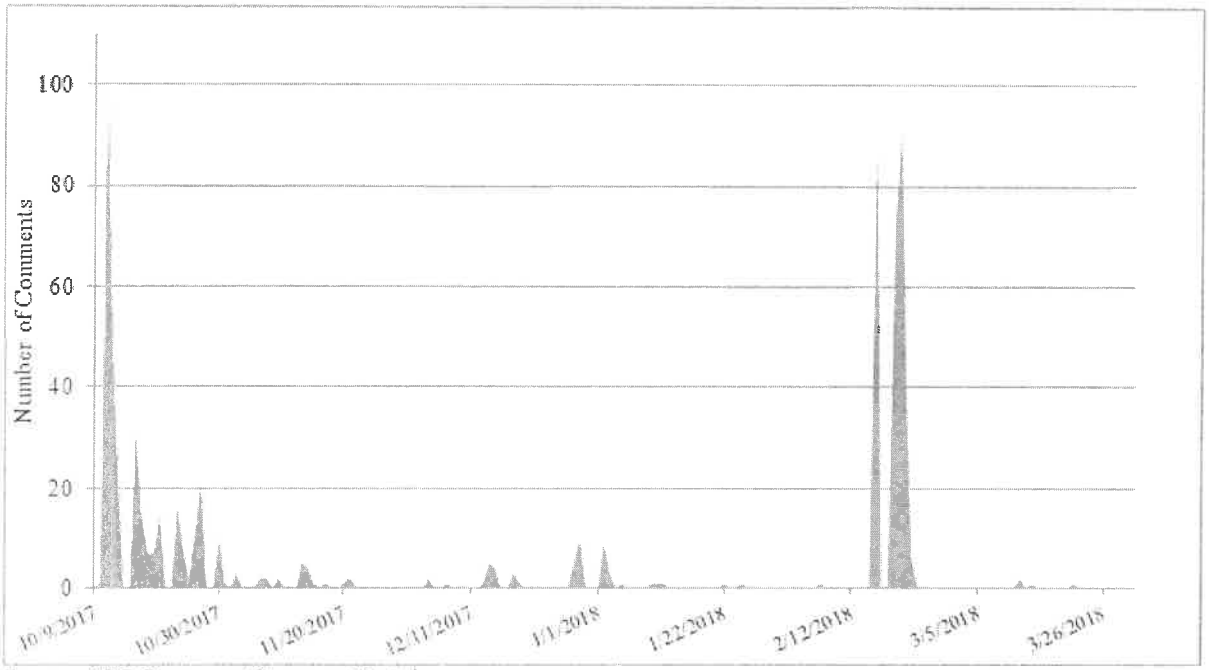
The portal provided consumers four categories to select from, as well as the option to submit written comments, where consumers could address any specific concerns. The four categories that consumers could select from were:

- 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	24.0%	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.

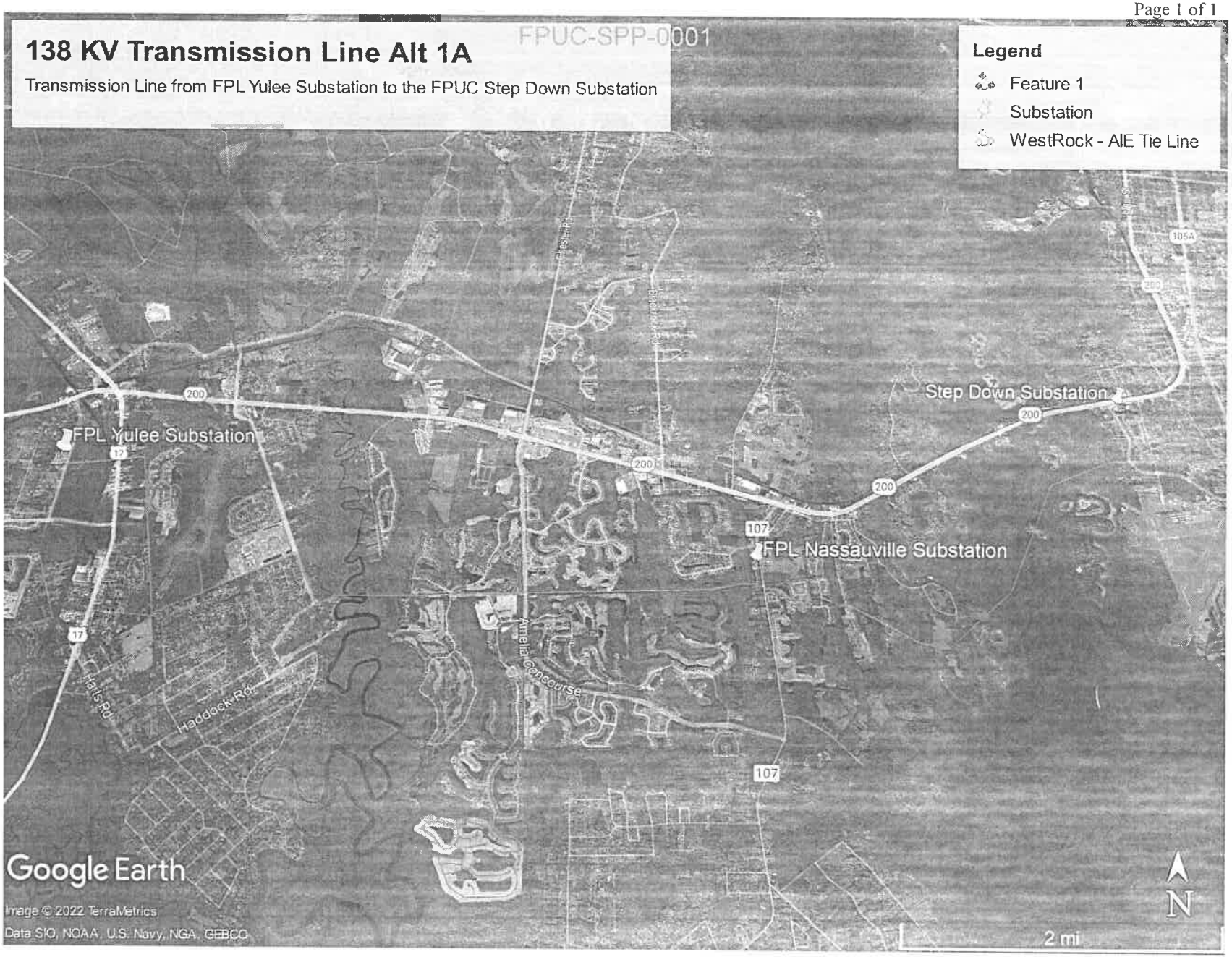
TECO
Overhead vs. Underground – Repairs per Mile for Hurricane Irma

	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.


138 KV Transmission Line Alt 1A
Transmission Line from FPL Yulee Substation to the FPUC Step Down Substation
FPUC-SPP-0001
Legend
Feature 1
Substation
WestRock - AIE Tie Line
FPL Yulee Substation
Step Down Substation
FPL Nassauville Substation
200
107
17
105A
Haddock Rd
Harts Rd
Amelia Concourse
Google Earth
Image © 2022 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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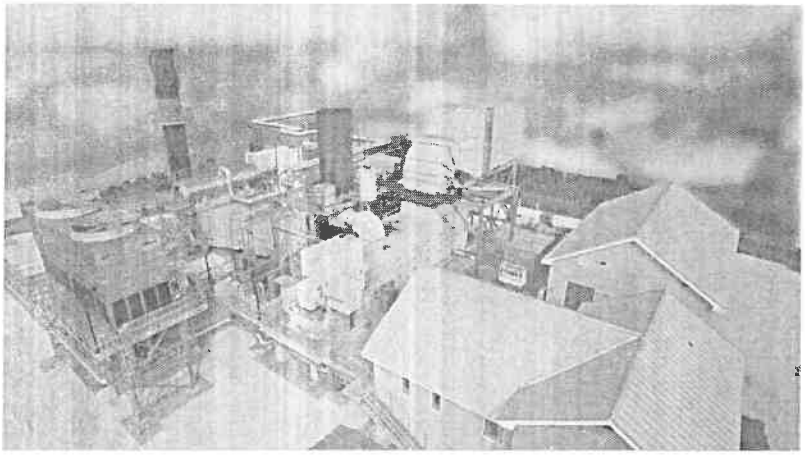
Fernandina Observer
A JOURNAL OF NEWS AND OPINION

GENERAL

Eight Flags Energy combined heat and power plant (CHP) named best CHP Project of 2016

POSTED ON DECEMBER 22, 2016 BY SUANNE THAMM

Media Release
December 22, 2016 10:17 a.m.



Power Engineering magazine has named the Chesapeake Utilities Corporation Eight Flags Energy Combined Heat and Power (CHP) Plant "Best CHP Project of the Year." The award was announced during the POWER-GEN International exposition in Orlando, Florida on December 13.

"This award is meant to recognize innovative and creative power projects that play a unique role in meeting local and regional demand for power," said Power Engineering Editor-in-Chief Russell Ray. "The Eight Flags Energy CHP Plant goes above and beyond in meeting these standards."

"The Eight Flags Energy CHP Plant is a strategic solution designed to meet the needs of our customers and communities while reducing emissions and providing savings," said Michael P. McMasters, President and Chief Executive Officer of Chesapeake Utilities Corporation. "This project, the first-of-its-kind for the Company, is an example of our employees' commitment to developing effective ways to grow while continuing to deliver value to our customers, investors and the communities we serve."

About Author

Suanne Thamm

Suanne Z. Thamm is a native of Chautauqua County, NY, who moved to Fernandina Beach from Alexandria,VA, in 1994. As a long time city resident and city watcher, she provides interesting insight into the many issues that impact our city. We are grateful for Suanne's many contributions to the Fernandina Observer.

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The Eight Flags Energy CHP plant is powered by natural gas, highly-regarded as one of the cleanest, safest and most efficient energy options. The plant operates on natural gas provided by Florida Public Utilities Company (FPU) and Peninsula Pipeline Company, two subsidiaries of Chesapeake Utilities Corporation, and produces three energy outputs: electricity, steam and heated water. Rayonier Advanced Materials purchases the steam and heated water for use in its cellulose specialties production facility. FPU purchases the electricity for distribution to its electric retail customers in the area which yields cost-savings and increased reliability. The Eight Flags Energy CHP Plant, located on the Rayonier Advanced Materials plant in Amelia Island, Nassau County, Florida, generates approximately 20 MW of base load power, producing enough electricity to meet 50 percent of the Island's demand.

"This plant is one of the most energy-efficient cogeneration power plants in the United States, with a target efficiency of 78 percent," added Jeffry M. Householder, President of Florida Public Utilities Company. "I'm proud of the team of employees and partners who worked diligently to bring this project to fruition. It's a resource that makes a meaningful impact, and I look forward to continuing to find ways to best serve our customers and the community."

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SUANNE THAMM

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U.S. Department of Energy Combined Heat and Power and Microgrid Installation Databases, https://doe.icfwebservices.com/microgrid

Organization Name	Facility Name	City	State	Application	SIC4	NAICS	Op Year	Latest Install Year	Capacity (kW)	Prime Mover	Fuel Class - Prim Fuel	Last Verified	Project Profile Link	Microgrid	Critical Infrastructure	EPA Award Winner
Rayonier, Inc.	Rayonier Fernandina Mill	Fernandina	FL	Pulp & Paper	2679	322299	1950	2012	42,000	Boiler/Steam Turbine	RENEWABLE - Wood	2015				
WestRock	Fernandina Beach Mill	Fernandina Beach	FL	Pulp & Paper	2621	322121	1987	1988	80,000	Boiler/Steam Turbine	COAL - Coal	2016				