Gulf Power

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April 10, 2020

VIA ELECTRONIC FILING

Mr. Adam Teitzman
Division of the Commission Clerk and Administrative Services
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Re: Docket No. 20200070-EI
Review of 2020-2029 Storm Protection Plan pursuant to Rule 25-6.030, F.A.C., Gulf Power Company

Dear Mr. Teitzman:

Enclosed for electronic filing in the above-referenced docket, please find Gulf Power Company's Petition for Approval of its 2020-2029 Storm Protection Plan pursuant to Rule 25-6.030, F.A.C., together with the Direct Testimony of Gulf Power witness Michael Spoor and Exhibit MS-1. Copies of this filing will be provided as indicated on the enclosed Certificate of Service.

If you or your staff have any question regarding this filing, please contact me at (850) 444-6550.

Respectfully submitted,

s/ *Russell A. Badders*
Russell A. Badders
Vice President & Associate General Counsel
Attorney for Gulf Power Company
Florida Bar No. 007455

Enclosure

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

Review of 2020-2029 Storm Protection Plan pursuant to Rule 25-6.030, FAC, Gulf Power Company	Docket No. 20200070-EI Filed: April 10, 2020

PETITION OF GULF POWER COMPANY
FOR APPROVAL OF THE 2020-2029 STORM PROTECTION PLAN

I. INTRODUCTION

Gulf Power Company ("Gulf" or the "Company") hereby files this petition (the "Petition") requesting that the Florida Public Service Commission ("Commission") approve the Transmission and Distribution ("T&D") Storm Protection Plan for the years 2020-2029 (hereinafter, the proposed "SPP") pursuant to Section 366.96, Florida Statutes ("F.S.") and Rule 25-6.030, Florida Administrative Code ("F.A.C."). Gulf's proposed SPP is, in large part, a continuation and expansion of its previously approved and successful storm hardening and storm preparedness programs. Gulf also proposes to implement a new distribution lateral undergrounding program similar to that of Florida Power & Light Company ("FPL") to protect certain overhead laterals during extreme weather events by converting them to underground laterals. Gulf submits that the storm hardening and storm preparedness programs included in its proposed SPP are appropriate and necessary to achieve the legislative objectives of Section 366.96, F.S., to protect and strengthen T&D infrastructure from extreme weather conditions, reduce outage times and restoration costs, and improve overall service reliability to customers.[1] In support of this Petition, Gulf states as follows:

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[1] The recovery of costs associated with the proposed SPP, as well as the actual and projected costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause, will be addressed in a subsequent and separate Storm Protection Plan Cost Recovery Clause docket pursuant to Rule 25-6.031, F.A.C. The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

1. The name and address of the Petitioner is:

Gulf Power Company
One Energy Place
Pensacola, FL 32520

2. Gulf is a corporation organized and existing under the laws of the State of Florida and is an electric utility as defined in Sections 366.02(2) and 366.96, F.S. Gulf provides generation, transmission, and distribution service to approximately 460,000 retail customer accounts.

3. Any pleading, motion, notice, order or other document required to be served upon the petitioner or filed by any party to this proceeding should be served upon the following individuals:

Kenneth A. Hoffman
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4. The Commission has jurisdiction pursuant to Section 366.96, F.S., and Rule 25-6.030, F.A.C.

5. This Petition is being filed consistent with Rule 28-106.201, F.A.C. The agency affected is the Commission, located at 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399. This case does not involve reversal or modification of an agency decision or an agency's proposed action. Therefore, subparagraph (c) and portions of subparagraphs (b), (e), (f) and (g) of subsection (2) of Rule 28-106.201, F.A.C., are not applicable to this Petition. In compliance with subparagraph (d) of Rule 28-106.201, F.A.C., Gulf states that it is not known which, if any, of the issues of material fact set forth in the body of this Petition may be disputed by any others who may plan to participate in this proceeding. The discussion below demonstrates how the petitioner's substantial interests will be affected by the agency determination.

II. BACKGROUND AND OVERVIEW

6. On June 27, 2019, the Governor of Florida signed CS/CS/CS/SB 796 addressing Storm Protection Plan Cost Recovery, which was codified in Section 366.96, F.S. Therein, the Florida Legislature found that it was in the State's interest to "strengthen electric utility infrastructure to withstand extreme weather conditions by promoting the overhead hardening of distribution and transmission facilities, undergrounding of certain distribution lines, and vegetation management," and for each electric utility to "mitigate restoration costs and outage times to utility customers when developing transmission and distribution storm protection plans." Section 366.96(1), F.S. The Florida Legislature directed the Commission to adopt rules to specify the elements that must be included in each utility's SPP. Section 366.96(1), F.S.

7. Rule 25-6.030, F.A.C., requires each utility to file an updated SPP at least every three years that covers the utility's immediate ten-year planning period. Rule 25-6.030, F.A.C., also specifies the information to be included in each utility's SPP. Consistent with these

requirements, Gulf is herein submitting its SPP for the ten-year period of 2020-2029, which is provided as Exhibit MS-1.

8. Gulf's proposed SPP is largely a continuation and expansion of its existing storm hardening and storm preparedness programs, which were most recently approved in Gulf's 2019-2021 Storm Hardening Plan.[2] These existing hardening and storm preparedness programs have already demonstrated that they have and will continue to increase T&D infrastructure resiliency, reduced restoration times, and reduce restoration costs when Gulf's system is impacted by extreme weather events. Gulf performed a forensic analysis of Hurricane Michael which indicated restoration time and costs for this storm would have been higher without Gulf's storm hardening programs.[3]

9. While Gulf's initiatives have made significant progress toward strengthening Gulf's infrastructure, Gulf must continue its T&D storm hardening and storm preparedness plans and initiatives. Storms remain a constant threat and Florida is the most hurricane-prone state in the nation. With the significant coast-line exposure of Gulf's system, and the fact that 50% of Gulf's customers live within one (1) mile of a coast or major body of water, a robust storm protection plan is critical to maintaining and improving grid resiliency and storm restoration as contemplated by the Legislature in Section 366.96, F.S.

10. As part of its SPP, Gulf proposes to continue the previously approved storm hardening and storm preparedness programs and to achieve the legislative objectives of the SPP by promoting the overhead hardening of T&D facilities, the undergrounding of certain distribution lines, and vegetation management to reduce restoration costs and outage times to customers and

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[2] *See In re: Review of 2019-2021 Storm Hardening Plan, Gulf Power Company*, Docket No. 20180147-EI, Order No. PSC-2019-0311-PAA-EI (Fla. PSC July 29, 2019).

[3] *See* Appendix B to Gulf's SPP Plan to Exhibit MS-1.

improve the overall service reliability for customers. In addition, Gulf proposes to implement a new distribution lateral undergrounding program. Gulf submits that the proposed SPP will continue to expand the benefits of hardening, including improved day-to-day reliability, to all customers throughout Gulf's system.

11. Submitted herewith and in support of Gulf's proposed SPP is the Direct Testimony of Michael Spoor and Exhibit MS-1, which includes Gulf's proposed SPP for the period of 2020-2029 and supporting schedules.

III. PROPOSED STORM PROTECTION PLAN

A. Description of the Proposed SPP Programs

12. Gulf's proposed SPP is largely a continuation and expansion of the following previously approved storm hardening and storm preparedness programs:

- Distribution Inspection Program
- Transmission Inspection Program
- Distribution Feeder Hardening Program
- Transmission Hardening Program
- Vegetation Management – Distribution Program
- Vegetation Management – Transmission Program

In addition, Gulf proposes to implement a new Distribution Hardening – Lateral Undergrounding Program to protect certain overhead laterals during extreme weather events by converting them to underground laterals. These proposed SPP programs are summarized below and a detailed description of each SPP program, consistent with Rule 25-6.030(1)(d), F.A.C., is provided in Section IV of Exhibit MS-1.

13. The Distribution Inspection Program will continue Gulf's existing Commission-

approved distribution inspection program, which includes the following programs that target specific facilities and infrastructure comprising Gulf's distribution system: (1) Feeder Patrols; (2) Infrared Patrols; and (3) Pole Inspections. The Feeder Patrol program ensures that all critical lines are inspected annually and issues are promptly corrected in accordance with the requirements of the National Electric Safety Code ("NESC") and any other applicable standards or guidelines. The annual Infrared Patrol program utilizes equipment that detects excess heat and can identify structural, mechanical, and electrical issues with Gulf's distribution facilities. The Pole Inspection program is an eight-year pole inspection cycle for all distribution poles that targets approximately 1/8 of the system annually (the actual number of poles inspected can vary somewhat from year to year). With approximately 208,000 distribution poles as of year-end 2019, Gulf expects to inspect approximately 26,000 poles annually. The estimated 2020-2029 annual average cost for the Distribution Inspection Program is approximately $3.7 million per year.[4] A detailed description of the Distribution Inspection Program is provided in Section IV(A) of Exhibit MS-1.

14. The Transmission Inspection Program will continue Gulf's current Commission-approved transmission inspection program which requires annual inspections of substations and its structures on two alternating twelve-year cycles, which results in a structure being inspected at least every six years. The estimated 2020-2029 annual average cost for the Transmission Inspection Program is approximately $3.5 million per year, which is consistent with historical

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[4] Note, the 2020-2029 program costs shown above are projected costs estimated as of the time of this filing. Subsequent projected and actual costs could vary by as much as 10% to 15%. The annual projected costs, actual/estimated costs, actuals costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause will all be addressed in a subsequent and separate Storm Protection Plan Cost Recovery Clause filing pursuant to Rule 25-6.031, F.A.C. The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

costs for the existing transmission inspection program.[5] A detailed description of the Transmission Inspection Program is provided in Section IV(B) of Exhibit MS-1.

15. The Distribution Feeder Hardening Program will continue Gulf's existing Commission-approved approach to harden existing feeders and certain critical distribution poles, as well as Gulf's initiative to design and construct new pole lines and major planned work to meet the extreme wind loading ("EWL") criteria set forth in the NESC. Gulf has approximately 269 feeders remaining to be hardened and expects to harden approximately 12 to 18 feeders annually, with approximately 50% of Gulf's feeders to be hardened or underground by year-end 2029. The estimated 2020-2029 average annual cost for the Distribution Feeder Hardening Program is approximately $31.5 million per year.[6] A detailed description of the Distribution Feeder Hardening Program is provided in Section IV(C) of Exhibit MS-1.

16. The Distribution Hardening – Lateral Undergrounding Program is a new storm hardening program that Gulf proposes to implement as part of its SPP. The Distribution Hardening – Lateral Undergrounding Program will implement measures similar to those already in effect by FPL through its Storm Secure Underground Program Pilot ("SSUP Pilot"). FPL's SSUP Pilot, which will provide the model for Gulf's related program, targets certain overhead laterals that were impacted by recent storms and have a history of vegetation-related outages and other reliability issues for conversion from overhead to underground. As part of its proposed SPP, Gulf proposes to incorporate, continue, and expand its Lateral Undergrounding Program during the ten-year SPP period to provide the benefits of underground lateral hardening throughout its system. The estimated 2020-2029 annual average cost for the Distribution Hardening – Lateral Undergrounding

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[5] *See* footnote 4.

[6] *See* footnote 4.

Program is approximately $4.7 million per year.[7] A detailed description of the Distribution Hardening – Lateral Undergrounding Program is provided in Section IV(D) of Exhibit MS-1.

17. The Transmission Hardening Program is a continuation of Gulf's existing transmission hardening program to replace all wood transmission structures with steel or concrete structures, implement flood monitoring on vulnerable substations and review switch house construction standards, and the initiation of a transmission and substation resiliency program. Gulf expects to replace its remaining wood transmission structures on its system by year-end 2029. Gulf plans to install flood monitors on substations prone to flooding and eliminate critical single points of failure through its transmission and substation resiliency program. The estimated 2020-2029 annual average cost for the Transmission Hardening Program is approximately $48.9 million.[8] A detailed description of the Transmission Hardening Program is provided in Section IV(E) of Exhibit MS-1.

18. The Vegetation Management – Distribution Program is a continuation of Gulf's existing, Commission-approved distribution vegetation management program. Gulf's currently approved distribution vegetation program, includes the following system-wide vegetation management activities: three-year cycle for mainline feeders; mid-year cycle targeted inspection and trimming for certain feeders; four-year cycle for laterals; and continued education of customers through its Right Tree, Right Place Program. On average, Gulf plans to inspect and trim annually: approximately 1/3 of its overhead feeder miles or 259 miles; approximately 1/4 of its overhead lateral miles or 1,257 miles; and mid-cycle inspection and trim approximately 518 miles for a total estimated inspected and trim average of approximately 2,000 miles per year, which is consistent

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[7] *See* footnote 4.

[8] *See* footnote 4.

with the historical miles inspected and trimmed annually. The estimated 2020-2029 average annual cost for the Vegetation Management – Distribution Program is approximately $4.7 million per year.[9] A detailed description of the Vegetation Management – Distribution Program is provided in Section IV(F) of Exhibit MS-1.

19. The Vegetation Management – Transmission Program is a continuation of Gulf's existing transmission vegetation management program, which includes visual and aerial inspections of all transmission line corridors, developing and executing annual work plans to address identified vegetation conditions, and identifying and addressing priority and hazard tree conditions prior to and during storm season. For transmission line corridors that fall under the jurisdiction of the North American Electric Reliability Corporation's ("NERC") vegetation management standards and requirements, Gulf plans to pilot and begin using LiDAR technology to perform inspections. Gulf plans to inspect and maintain, on average, approximately 1600 miles of transmission lines annually, which is consistent with the historic miles inspected and maintained annually. The estimated 2020-2029 average annual cost for the Vegetation Management – Transmission Program is approximately $2.8 million per year.[10] A detailed description of the Vegetation Management – Transmission Program is provided in Section IV(G) of Exhibit MS-1.

B. Additional Details for First Three Years of the Proposed SPP

20. The following additional project level information required by Rule 25-6.030(3)(e)(1), F.A.C., for the first year of the proposed SPP (2020) is provided in Appendix C to Exhibit MS-1: (a) the actual or estimated construction start and completion dates; (b) a description of the affected existing facilities, including number and type(s) of customers served, historic

[9] *See* footnote 4.

[10] *See* footnote 4.

service reliability performance during extreme weather conditions, and how this data was used to prioritize the proposed storm protection project; (c) a cost estimate including capital and operating expenses. A description of the criteria used to select and prioritize proposed storm protection projects is included in the description of each proposed SPP program provided in Section IV of Exhibit MS-1.

21. Pursuant to Rule 25-6.030(3)(e)(2), F.A.C., Gulf has also provided the estimated number and costs of projects under each specific program for the second and third years (2021-2022) of the proposed SPP. This information is provided in Appendix C to Exhibit MS-1.

22. The following additional information required by Rule 25-6.030(3)(f), F.A.C., for the first three years (2020-2022) of the vegetation management activities under the proposed SPP is provided in Exhibit MS-1: (a) the projected frequency (trim cycle); (b) the projected miles of affected transmission and distribution overhead facilities; and (c) the estimated annual labor and equipment costs for both utility and contractor personnel. Descriptions of how the vegetation management activities will reduce outage times and restoration costs due to extreme weather conditions are provided in Sections IV(F) and IV(G) of Exhibit MS-1.

C. Estimated Revenue Requirements and Rate Impacts

23. Pursuant to Rule 25-6.030(3)(f), F.A.C., the estimated annual jurisdictional revenue requirements of Gulf's proposed SPP for the ten-year period of 2020-2029 are provided in Section VI of Exhibit MS-1. While Gulf has provided estimated costs by program as of the time of this filing and associated total revenue requirements in its SPP, consistent with the requirements of Rule 25-6.030, F.A.C., subsequent projected and actual program costs submitted for cost recovery through the Storm Protection Plan Cost Recovery Clause (per Rule 25-6.031, F.A.C.,) could vary by as much as 10-15%, which would then also impact associated estimated revenue requirements

and rate impacts.

24. Gulf anticipates the programs included in the SPP will have zero bill impacts on customer bills during the first year of the SPP and only minimal bill increases for years two and three of the SPP. An estimate of hypothetical overall rate impacts for the first three years of the SPP (2020-2022) based on the total program costs reflected in this filing, without regard for the fact that pursuant to a Commission-approved settlement agreement, Gulf remains under a general base rate freeze until base rates are next established by the Commission, are provided in Section VII of Exhibit MS-1.

25. The annual jurisdictional revenue requirements and the estimated rate impacts are based on the total estimated costs, as of the time of this filing, for all programs included in the proposed SPP regardless of whether those costs will be recovered in Gulf's Storm Protection Plan Cost Recovery Clause or through base rates. In addition, as previously stated, under Gulf's Commission-approved rate case settlement agreement, any incremental base rate adjustment may not take effect until Gulf's base rates are established by the Commission in Gulf's next base rate proceeding. *See* Order No. PSC-17-0178-S-EI, issued May 16, 2017, in Docket No. 160186-EI.

26. Gulf is not seeking Commission approval, through this petition, to recover any of the estimated costs associated with the proposed SPP in this filing. The projected costs, actual/estimated costs, actuals costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause, including whether these costs are included in current base rates, will all be addressed in a subsequent and separate Storm Protection Plan Cost Recovery Clause filing pursuant to Rule 25-6.031, F.A.C. The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

D. Gulf's Proposed SPP is in the Public Interest and Should Be Approved

27. Sections 366.96(4)-(5), F.S., provide that the Commission shall review each utility's SPP and, within 180 days from filing, determine whether the SPP is in the public interest.[11]

28. As explained above, the programs included in the proposed SPP are largely a continuation and expansion of Gulf's already successful and ongoing storm hardening and storm preparedness programs previously approved by the Commission, as well as a new distribution lateral undergrounding program to protect certain overhead laterals during extreme weather events. These SPP programs will continue to provide increased T&D infrastructure resiliency, reduced restoration time, and reduced restoration costs when Gulf's system is impacted by extreme weather events.

29. In Docket No. 20170215-EU, the Commission reviewed the electric utilities' storm hardening and storm preparedness programs and found the following:

- Florida's aggressive storm hardening programs are working;
- The length of outages was reduced markedly from the 2004-2005 storm season;
- Hardened overhead distribution facilities performed better than non-

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[11] In reaching this determination, the Florida Legislature has directed the Commission to consider the following:

> (a) The extent to which the plan is expected to reduce restoration costs and outage times associated with extreme weather events and enhance reliability, including whether the plan prioritizes areas of lower reliability performance.
>
> (b) The extent to which storm protection of transmission and distribution infrastructure is feasible, reasonable, or practical in certain areas of the utility's service territory, including, but not limited to, flood zones and rural areas.
>
> (c) The estimated costs and benefits to the utility and its customers of making the improvements proposed in the plan.
>
> (d) The estimated annual rate impact resulting from implementation of the plan during the first 3 years addressed in the plan.

See Section 366.96(4), F.S.

hardened facilities;

- Underground facilities performed much better compared to overhead facilities; and
- The primary causes of power outages came from outside the utilities' right of way including falling trees, displaced vegetation, and other debris.

See Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018, Docket No. 20170215-EU (July 24, 2018).[12] Gulf expects that the storm hardening and storm preparedness programs included in its proposed SPP will result in a reduction in storm as well as non-storm (day-to-day) restoration costs.

30. A detailed summary of the benefits of Gulf's proposed SPP is provided in Section II of Exhibit MS-1, and the benefits and costs of each program is provided in Section IV of Exhibit MS-1.

31. Gulf's proposed SPP meets the objectives of Section 366.96, F.S., satisfies the requirements of Rule 25-6.030, F.A.C., is in the best interest of customers, and should be approved.

IV. CONCLUSION

32. As explained above and in further detail in Exhibit MS-1 and the supporting Direct Testimony of Gulf Witness Michael Spoor, Gulf's proposed SPP provides a systematic approach to achieve the legislative objectives of reducing restoration costs and outage times associated with extreme weather events and enhancing reliability. Gulf's proposed SPP appropriately and effectively maintains and builds on Gulf's commitment to provide safe and reliable electric service to customers.

[12] *Available at* http://www.psc.state.fl.us/library/filings/2018/04847-2018/04847-2018.pdf.

WHEREFORE, Gulf respectfully requests that the Commission find Gulf's proposed SPP, as provided as Exhibit MS-1, is in the public interest and approve the proposed SPP for the years 2020-2029.

Respectfully submitted this 10th day of April, 2020,

By: s/ *Russell A. Badders*
Russell A. Badders
Florida Bar No. 007455
Vice President & Associate General Counsel
Gulf Power Company
One Energy Place
Pensacola, FL 32520

Attorney for Gulf Power Company

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of Gulf Power Company's Petition for Approval of the 2020-2029 Storm Protection Plan in Docket No. 20200070-EI, along with the Direct Testimony of Michael Spoor and Exhibit MS-1, has been furnished by Electronic Mail to the following parties of record this 10th day of April, 2020:

Charles Murphy, Esquire
Rachael Dziechciarz, Esquire
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s/ *Russell A. Badders*

Russell A. Badders
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Attorney for Gulf Power Company

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

GULF POWER COMPANY

2020-2029 STORM PROTECTION PLAN

DOCKET NO. 20200070-EI

DIRECT TESTIMONY OF

MICHAEL SPOOR

APRIL 10, 2020

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I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Michael Spoor, and my business address is One Energy Place, Pensacola, Florida, 32520.

Q. By whom are you employed and what is your position?

A. I am employed by Gulf Power Company ("Gulf" or the "Company") as Vice President of Power Delivery.

Q. Please describe your duties and responsibilities in that position.

A. As Vice President of Power Delivery, I am responsible for the planning, engineering, construction, operation, maintenance and restoration of Gulf's transmission and distribution ("T&D") grid. This includes the systems, processes, analyses, and standards utilized to ensure Gulf's T&D facilities are safe, reliable, secure, effectively managed and in compliance with regulatory requirements.

Q. Please describe your educational background and professional experience.

A. I graduated from Auburn University with a Bachelor of Science degree in Industrial Engineering and from Nova Southeastern University with a Master of Business Administration. I am also a graduate of executive education programs at both Columbia University and Kellogg School of Management at Northwestern University. I am a registered professional engineer in the State of Florida. I joined Florida Power & Light Company ("FPL") in 1985 and have served in a variety of leadership positions including area operations manager, manager of reliability, director of distribution system performance, director of business services and director of distribution operations. I assumed my current position and responsibilities in January 2019, having previously served as Vice President of Transmission and Substation with FPL.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to present and support Gulf Power's 2020-2029 Storm Protection Plan ("SPP"), attached as Exhibit MS-1, and demonstrate that Gulf's proposed SPP is in compliance with Section 366.96. Florida Statutes ("F.S.") and Rule 25-6.030, Florida Administrative Code ("FAC"). Specifically, my testimony provides a description of each storm protection program included in Gulf's SPP and how it is expected to reduce restoration costs and outage times, estimated start/completion dates, estimated costs, and criteria used to select and prioritize SPP projects. I will also provide project detail for the first three years in Gulf's proposed SPP.

Q. Are you sponsoring any exhibits in this case?

A. Yes. I am sponsoring the following exhibit: Exhibit MS-1 – Gulf Power's 2020-2029 Storm Protection Plan.

II. <u>OVERVIEW OF GULF'S 2020-2029 SPP</u>

Q. What is the purpose of Gulf's SPP?

A. On June 27, 2019, the Governor of Florida signed into law SB 796 titled, "Storm Protection Plan Cost Recovery", which was codified in Section 366.96, F.S. Therein, the Florida Legislature found that it was in the State's interest to "strengthen electric utility infrastructure to withstand extreme weather conditions by promoting the overhead hardening of distribution and transmission facilities, undergrounding of certain distribution lines, and vegetation management," and for each electric utility to "mitigate restoration costs and outage times to utility customers when developing transmission and distribution storm protection plans." See § 366.96(1). Based on these findings, the Florida Legislature directed each electric utility to file a SPP with the Florida Public Service Commission ("FPSC") covering the immediate 10-year planning period. See § 366.96(3). Consistent with this legislative requirement, Gulf is submitting its SPP for the ten-year period of 2020-2029.

Gulf's proposed SPP is a systematic approach to achieve the legislative objectives of reducing restoration costs and outage times associated with extreme weather events and enhancing reliability. As required by Rule 25-6.030, F.A.C., Gulf's proposed SPP includes, among other things, a description of each proposed storm protection program, including: (a) how each program will enhance the existing system to reduce restoration costs and outage times; (b) applicable start and completion dates for each program; (c) a cost estimate for each program; (d) a comparison of the costs and benefits for each program; and (e) a description of how each program is prioritized. The proposed SPP also provides an estimate of the annual jurisdictional revenue requirement and additional details on each program for the first three years of the SPP (2020-2022), including estimated rate impacts.

Q. What programs are included in Gulf's proposed 2020-2029 SPP?

A. Gulf's proposed SPP is both a continuation and expansion of existing Commission-approved storm hardening and storm preparedness programs and includes one new program, Distribution Hardening - Lateral Undergrounding Program. The following programs comprise Gulf's SPP:

- Distribution Inspection Program
- Transmission Inspection Program
- Distribution Feeder Hardening Program
- Distribution Hardening – Lateral Undergrounding Program
- Transmission Hardening Program
- Vegetation Management – Distribution Program
- Vegetation Management – Transmission Program

With the exception of the new program to target and underground select distribution laterals, the majority of these programs have been in place since 2007. As demonstrated by recent storm events, these programs have been successful in reducing restoration costs and outage times following major storms, as well as improving day-to-day reliability. Gulf submits that continuing these existing Commission-approved storm hardening and storm preparedness programs in the SPP is appropriate and necessary to address the expectations of Gulf's customers and other stakeholders for increased storm resiliency and will result in fewer outages and prompt service restoration. The proposed SPP will continue to expand the benefits of hardening, including improved day-to-day reliability, to all customers throughout Gulf's system.

Q. What are the benefits of Gulf's 2020-2029 SPP Programs?

A. The major benefit of Gulf's proposed SPP is to provide resiliency and faster restoration to the electric infrastructure that our approximately 468,000 customers and Northwest Florida's economy rely on for their electricity needs. Safe and reliable electric service is essential to the life, health, and safety of the public, and has become a critical component of modern life. Florida remains the most hurricane-prone state in the nation and, with the significant coast-line exposure of Gulf's system and the fact that 50% of Gulf's customers live within 1 mile of a coast or major body of water, a robust SPP is critical to maintaining and improving grid resiliency and storm restoration as contemplated by the Legislature in Section 366.96.

Gulf's proposed SPP programs have already demonstrated that they have and will provide increased Transmission and Distribution ("T&D") infrastructure resiliency, reduced restoration time, and reduce restoration cost when Gulf is impacted by severe weather events. The eastern portion of Gulf's service area was recently impacted by

Hurricane Michael and demonstrated the damage incurred by non-storm hardened areas was significantly higher than those areas which were storm hardened.

A detailed summary of the benefits of Gulf's proposed SPP is provided in Section II of the proposed SPP, and the benefits of each program is provided in Section IV of the proposed SPP.

Q. Does Gulf's 2020-2029 SPP address recovery of the costs associated with the proposed SPP?

A. No. Gulf anticipates the programs included in the SPP will have zero bill impacts on customer bills during the first year of the SPP and only minimal bill increases for years two and three of the SPP. However, the recovery of the actual costs associated with the proposed SPP, as well as the costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause, will be addressed in a subsequent and separate Storm Protection Plan Cost Recovery Clause docket pursuant to Rule 25-6.031, F.A.C. The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

III. DESCRIPTION OF EACH PROPOSED SPP PROGRAM

Q. Has Gulf provided the information required by Rule 25-6.030(3)(d), F.A.C. for each program included in its proposed 2020-2029 SPP?

A. Yes. In accordance with Rule 25-6.030(3)(d), F.A.C., Gulf's proposed SPP provides, if applicable: (1) a description of how each program is designed to enhance Gulf's existing transmission and distribution facilities including an estimate of the resulting reduction in outage times and restoration costs due to extreme weather conditions; (2) identification of the actual or estimated start and completion dates of the program; (3) a cost estimate including capital and operating expenses; (4) a comparison of the costs and the benefits;

and (5) a description of the criteria used to select and prioritize proposed storm protection programs. Each of the above listed descriptions is provided in Section IV of Gulf's proposed SPP. Below, I will provide a brief overview of each program included in Gulf's proposed SPP.

Q. Please provide a summary of Gulf's Distribution Inspection Program under the SPP.

A. Gulf's Distribution Inspection Program is a continuation of Gulf's existing Commission-approved distribution inspections which consists of feeder patrols, infrared patrols, and wood pole inspections. These programs exist to ensure a more storm resilient distribution infrastructure which will result in reductions in wood pole failures, fewer storm-related outages, and reduction in storm restoration time and costs.

The total estimated costs of the Distribution Inspection Program are $37.5 million with an annual cost of approximately $3.7 million.[1] Annually, Gulf inspects approximately 770 miles of mainline feeders and 4,100 pieces of equipment. With approximately 208,000 distribution wood poles as of year-end 2019, Gulf expects to inspect approximately 26,000 wood poles annually during the 2020-2029 SPP period.

A detailed explanation of the Distribution Inspection Program, its costs and benefits, is contained in Gulf's SPP, Section IV(A), Distribution Inspection Program.

Q. Please provide a summary of Gulf's Transmission Inspection Program under the SPP.

A. Gulf's Transmission Inspection Program will continue its existing Commission-approved inspection program consisting of substations and structures. Gulf's annual inspections of

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[1] Note, the 2020-2029 program costs shown above are projected costs estimated as of the time of this filing. Subsequent projected and actual costs could vary by as much as 10% to 15%. The annual projected costs, actual/estimated costs, actuals costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause will all be addressed in a subsequent and separate Storm Protection Plan Cost Recovery Clause filing pursuant to Rule 25-6.031, F.A.C. The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

transmission substations follow a prescribed set of processes and procedures utilized by Company personnel, to inspect substation equipment annually. These inspections are performed on substation equipment such as: batteries and chargers, breakers, instrument transformers, power fuses, regulators, substation yard, switches, and transformers.

The proposed SPP includes continuing aerial patrols to inspect transmission lines and circuits. Gulf's transmission structure inspection program is based on two alternating twelve year cycles, which results in a structure being inspected at least every six years. As explained in the proposed SPP, the performance of Gulf's transmission facilities during recent storm events indicates Gulf's Transmission Inspection Program has contributed to the overall storm resiliency of the transmission system and provided storm restoration savings in both time and costs.

The total estimated costs for the Transmission Inspection Program for the ten-year period of 2020-2029 is $35 million with an annual average cost of approximately $3.5 million, which is consistent with historical costs for the existing Transmission Inspection Program.[2]

A detailed description of the Transmission Inspection Program is provided in Section IV(B) of Gulf's proposed SPP.

Q. Please provide a summary of Gulf's Distribution Feeder Hardening Program under the SPP.

A. In Gulf's 2019-2021 Storm Hardening Plan, submitted to the Commission on March 1, 2019, Gulf introduced a new program to storm harden its distribution feeders to higher National Electric Safety Code storm hardening construction or Extreme Wind Loading ("EWL") standards. During 2006-2018, Gulf reconstructed many existing feeders, most of them considered Critical Infrastructure Function feeders which serve hospitals, police

[2] *See* footnote 1.

and fire stations, water treatment facilities, and feeders that serve other key community needs. In 2019, Gulf began to apply EWL standards to the design and construction of all new pole lines and major planned work, including pole line extensions and relocations, and certain pole replacements. This new construction standard for Gulf improves its distribution storm resiliency and overall service reliability to its customers.

Gulf has approximately 269 feeders remaining to be hardened and expects to harden approximately 12 to 18 feeders annually, with approximately 50% of Gulf's feeders to be hardened or underground by year-end 2029. The total estimated costs for the Distribution Feeder Hardening Program for the period of 2020-2022 is approximately $87.1 million with an annual average cost of $29 million. The total estimated costs for the period of 2020-2029 is $315.3 million with an annual average cost of $31.5 million.[3]

A detailed explanation of the program, its costs and benefits, is contained in Gulf's SPP, Section IV(C), Distribution Feeder Hardening Program.

Q. Please provide a summary of Gulf's Distribution Hardening – Lateral Undergrounding Program under the SPP.

A. Gulf is proposing in its SPP to initiate a new lateral undergrounding program, similar to that conducted by FPL and Duke Energy Florida. The program would build upon the experiences of FPL and focus on targeting certain overhead laterals, i.e., overhead laterals impacted by recent storms and with a history of vegetation-related outages and other reliability issues, spread throughout Gulf's system. Key objectives of the initial program would include validating conversion costs and identifying cost savings opportunities, testing different design philosophies, better understanding customer impacts and sentiments, and identifying barriers (e.g., obtaining easements, locating transformers, and attaching entities' issues). The evaluation and engineering of Gulf's lateral identified to be

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[3] *See* footnote 1.

converted from overhead to underground will begin during the fourth quarter of 2020. Gulf will begin construction in 2021 of its lateral underground program and for the period of 2021-2022, costs are estimated at approximately $10.4 million with an annual average cost of approximately $5.2 million. The total estimated costs for the period of 2020-2029 is approximately $46.6 million with an annual average cost of approximately $4.7 million.[4]

A detailed explanation of the program, its costs and benefits, is contained in Gulf's SPP, Section IV(D), Distribution Hardening – Lateral Undergrounding Program.

Q. Please provide a summary of Gulf's Transmission Hardening Program under the SPP.

A. Based on Gulf's recent storm experience with Hurricane Michael, transmission hardening opportunities were identified in order to strengthen these critical facilities for the future. These are: substation flood monitoring and hardening, transmission and substation resiliency, and transmission structure replacement.

Beginning in 2019, Gulf began a substation hardening program by implementing flood monitoring on vulnerable substations and reviewing switch house construction standards for possible replacement and strengthening. Gulf is re-evaluating substation locations using the Coastal Substation Risk Assessments for all substations. As part of this process, a National Oceanic and Atmospheric Administration Sea, Lake and Overland Surges from Hurricanes ("SLOSH") model is being used to define the potential maximum flood levels. SLOSH is a computerized model run by the National Hurricane Center to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes. Gulf will implement flood monitoring on vulnerable substations and review switch house construction standards for possible replacement and strengthening.

[4] *See* footnote 1.

While Gulf's transmission and substation facilities have continued to perform satisfactorily in the past, it should be noted that Gulf's system and the reliability has been impacted by single point of failure events that have had, and will continue to have, the potential to greatly impact customers. Gulf has initiated a transmission and substation resiliency program and has begun to invest in the overall strengthening of the electric grid at the transmission and substation level to remove these critical single points of failure that have the potential to impact large numbers of customers for extended periods of time. By building redundancy in the system to make it more resilient, these improvements will eliminate outages, and shorten restoration times following major weather events.

In Gulf's 2019-2021 Storm Hardening Plan, submitted to the Commission on March 1, 2019, Gulf introduced a new program to storm harden its transmission wood structures by replacing them with steel or concrete structures. As of year-end 2019, 62% of Gulf's transmission structures, system-wide, were steel or concrete, with approximately 38% (approximately 4,600) wood structures remaining to be replaced. Gulf expects to replace the approximately 4,600 wood transmission structures remaining on its system by year-end 2029. The total estimated costs for the Transmission Hardening Program for the ten-year period of 2020-2029 are $488.8 million with an annual average cost of approximately $48.9 million.[5]

A detailed explanation of the program, its costs and benefits, is contained in Gulf's SPP, Section IV(E), Transmission Hardening Program.

Q. Please provide a summary of Gulf's Vegetation Management – Distribution Program under the SPP.

A. Gulf proposes to continue its existing Commission-approved Vegetation Management - Distribution Program which includes its system-wide: three-year cycle for feeders; mid-

[5] *See* footnote 1.

year cycle inspection and trimming for feeders; four-year cycle for laterals; and continued education of customers through its Right Tree Right Place Program. On average, Gulf plans to inspect and trim annually approximately one-third (1/3) of its overhead feeder miles, or 259 miles; approximately one-fourth (1/4) of its overhead lateral miles, or 1,257 miles; and mid-cycle inspection and trim of approximately 518 miles for a total estimated inspection and trim average of approximately 2,000 miles per year. The primary objective of Gulf's Vegetation Management – Distribution Program is to clear vegetation in areas where Gulf is permitted to trim for the vicinity of distribution facilities and equipment in order to provide safe, reliable and cost-effective electric service to its customers. Additionally, as explained in the proposed SPP, recent storm events demonstrate that Gulf's existing Vegetation Management – Distribution Program has contributed to the overall improvement in the resiliency of distribution system during storms, resulting in reductions in storm damage to poles, days to restore, and storm restoration costs. The total estimated costs for the Vegetation Management – Distribution Program for the ten-year period of 2020-2029 is $47.4 million with an annual average cost of $4.7 million, which is consistent with historical costs for the existing Vegetation Management – Distribution Program.[6]

A more detailed explanation of the program, its costs and benefits, is contained in Gulf's SPP, Section IV(F), Vegetation Management – Distribution Program.

Q. Please provide a summary of Gulf's Vegetation Management - Transmission Program under the SPP.

A. Gulf proposes to continue its existing Commission-approved Vegetation Management – Transmission Program. This program also complies with the North American Electric Reliability Corporation's ("NERC") vegetation management standards and requirements

[6] *See* footnote 1.

for Gulf's transmission system. The reliability objective of these standards and requirements is to prevent vegetation-related outages which could lead to cascading by utilizing effective vegetation maintenance. Approximately just over one third of Gulf's total transmission system, or approximately 600 miles, fall under the NERC vegetation management standards and requirements. The key elements of Gulf's Vegetation Management – Transmission Program are rights of way ground floor vegetation management, annual ground inspections of transmission rights of way, document vegetation inspection results and findings, and prescribe a work plan and execute the work plan. For those transmission lines which fall under NERC's vegetation management standards and requirements, Gulf plans to pilot and begin using a technology called LiDAR, Light Detection and Ranging. The collected LiDAR data will be used to develop preventative and reactive work plans. Gulf will continue to develop and execute annual work plans to address identified vegetation conditions. Under the proposed SPP, Gulf plans to continue its current program of identifying and correcting priority vegetation and hazard tree conditions. The total estimated costs for the Vegetation Management – Transmission Program for the ten-year period of 2020-2029 is $28.3 million with an annual average cost of approximately $2.8 million, which is consistent with historical costs for the existing Vegetation Management – Transmission Program.[7]

A more detailed explanation of the program, its costs and benefits, is contained in Gulf's SPP, Section IV(G), Vegetation Management – Transmission Program.

IV. ADDITIONAL DETAILS FOR FIRST THREE YEARS OF THE SPP

Q. Has Gulf provided additional details and information for the first year of the proposed 2020-2029 SPP?

[7] *See* footnote 1.

A. Yes. The following additional information required by Rule 25-6.030(3)(e)(1), F.A.C., for the first year of the SPP (2020) is provided in Appendix C to Gulf's SPP: (1) the actual or estimated construction start and completion dates; (2) a description of the affected existing facilities, including number and type(s) of customers served, historic service reliability performance during extreme weather conditions, and how this data was used to prioritize the storm protection project; (3) a cost estimate including capital and operating expenses. Additionally, a description of the criteria used to select and prioritize storm protection projects is included in the description of each proposed SPP program provided in Section IV of the SPP.

Q. Does Gulf's proposed 2020-2029 SPP provide project related information for the second and third years of the SPP in sufficient detail to develop preliminary estimates of rate impacts?

A. Yes. As required by Rule 25-6.030(3)(e)(2), F.A.C., for the second and third years (2021-2022) of the SPP, Gulf has provided the estimated number and costs of projects under each specific SPP program. This information is provided in Appendix C to Gulf's SPP.

Q. Did Gulf provide a description of its vegetation management activities under the proposed 2020-2029 SPP for the first three years of the SPP?

A. Yes. The following additional information required by Rule 25-6.030(3)(f), F.A.C., for the first three years (2020-2022) of the vegetation management activities under the SPP is provided in Appendix C to Gulf's SPP: the projected frequency (trim cycle); the projected miles of affected transmission and distribution overhead facilities; the estimated annual labor and equipment costs for both utility and contractor personnel. Additionally, descriptions of how the vegetation management activities will reduce outage times and restoration costs due to extreme weather conditions are provided in Sections IV(F) and IV(G) of Gulf's SPP.

Q. Has Gulf provided the annual jurisdictional revenue requirements for the 2020-2029 SPP?

A. Yes. Pursuant to Rule 25-6.030(3)(g), F.A.C., Gulf has provided the estimated annual jurisdictional revenue requirements in Section VI of the SPP. While Gulf has provided estimated costs by program as of the time of this filing and associated total revenue requirements in its SPP, consistent with the requirements of Rule 25-6.030, F.A.C., subsequent projected and actual program costs submitted for cost recovery through the Storm Protection Plan Cost Recovery Clause (per Rule 25-6.031, F.A.C.,) could vary by as much as 10-15%, which would then also impact associated estimated revenue requirements and rate impacts. The projected costs, estimated costs, actuals costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause will all be addressed in subsequent filings in separate Storm Protection Plan Cost Recovery Clause dockets pursuant to Rule 25-6.031, F.A.C.[8]

Q. Has Gulf estimated the rate impacts for each of the first three years of the proposed 2020-2029 SPP?

A. Gulf anticipates the programs included in the SPP will have zero bill impacts on customer bills during the first year of the SPP and only minimal bill increases for years two and three of the SPP. An estimate of hypothetical overall rate impacts for the first three years of the SPP (2020-2022) based on the total program costs reflected in this filing, without regard for the fact that pursuant to a Commission-approved settlement agreement, Gulf remains under a general base rate freeze until base rates are next established by the Commission, are provided in Section VII of the SPP. The projected costs, estimated costs, actuals costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery

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[8] The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

Clause will all be addressed in subsequent filings in separate storm protection plan cost recovery clause dockets pursuant to Rule 25-6.031, F.A.C.[9]

V. <u>CONCLUSION</u>

Q. Does Gulf believe that its proposed 2020-2029 SPP will achieve legislative objectives of Section 366.96, F.S., of reducing restoration costs and outage times associated with extreme weather events by promoting the overhead hardening of electrical transmission and distribution facilities, the undergrounding of certain electrical distribution lines, and vegetation management?

A. Yes, while no electrical system can be made completely resistant to the impacts of hurricanes and other extreme weather conditions, the programs included in Gulf's SPP have already demonstrated that they mitigate and will continue to mitigate the impacts of future storms. Gulf's SPP is a systematic approach to achieve the legislative objectives of reducing restoration costs and outage times associated with extreme weather events and enhancing reliability. As explained above and in further detail in the SPP, Gulf's SPP is largely a continuation and expansion of its existing Commission-approved storm hardening and storm preparedness programs. Continuing these previously approved and well-tested storm hardening and storm preparedness plans and initiatives under Gulf's SPP is critical to further mitigate restoration costs and outage times, continue to provide safe and reliable electric service to customers, and meet the needs and expectations of our customers, today and for many years to come.

Q. Does this conclude your direct testimony?

A. Yes.

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[9] *See* footnote 8.

Gulf Power®

Storm Protection Plan
2020-2029

(Rule 25-6.030, F.A.C.)

Docket No. 20200070-EI

April 10, 2020

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Appendices:

Gulf Power Company's
2020-2029 Storm Protection Plan

I. Executive Summary

Pursuant to Section 366.96, Florida Statutes ("F.S."), and Rule 25-6.030, Florida Administrative Code ("F.A.C."), Gulf Power Company ("Gulf") submits its Storm Protection Plan ("SPP") for the ten (10) year period 2020-2029 (hereinafter, the proposed "SPP"). As explained herein, the SPP is largely a continuation of Gulf's successful storm hardening and storm preparedness programs previously approved by the Florida Public Service Commission ("Commission") over the last thirteen years, as well as a new program to target and underground select distribution laterals. Gulf anticipates the programs included in the SPP will have zero bill impacts on customer bills during the first year of the SPP and only minimal bill increases for years two and three of the SPP.[1]

Since 2006, Gulf has been implementing Commission-approved programs to strengthen its transmission and distribution ("T&D") infrastructure. These programs include multiple storm hardening and storm preparedness programs such as feeder hardening, replacing transmission structures, vegetation management, and pole inspections. These efforts, along with Gulf's storm preparedness and hardening initiatives to date, have produced a more storm resilient T&D electrical grid that will better withstand the hurricanes and tropical storms that are becoming more frequent and severe in the State of Florida.

The success of Gulf's storm hardening and storm preparedness programs has been achieved through the development and implementation of Gulf's forward-looking storm hardening, grid modernization, and reliability initiatives and investments, combined with the use of cutting-edge technology and strong employee commitment. Under the SPP, Gulf remains committed to continue these successful programs to further strengthen its T&D infrastructure, mitigate restoration costs and outage times, continue to provide safe

[1] The recovery of the costs associated with the proposed SPP, as well as the costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause, will be addressed in a subsequent and separate Storm Protection Plan Cost Recovery Clause docket pursuant to Rule 25-6.031, F.A.C.

and reliable electric service to customers, and meet future increasing needs and expectations.

As stated previously, Gulf's SPP is, in large part, a continuation and expansion of its previously approved storm hardening plan and includes the following SPP programs:

- Distribution Inspection Program
- Transmission Inspection Program
- Distribution Feeder Hardening Program
- Distribution Hardening – Lateral Undergrounding Program
- Transmission Hardening Program
- Vegetation Management – Distribution Program
- Vegetation Management – Transmission Program

With the exception of the new Distribution Hardening – Lateral Undergrounding Program, the majority of these programs have been in place since 2007. As demonstrated by recent storm events, these programs have been successful in reducing restoration costs and outage times following major storms, as well as improving day-to-day reliability. Gulf submits that continuing these previously approved storm hardening and storm preparedness programs in the SPP, together with the new Distribution Hardening – Lateral Undergrounding Program, is appropriate and necessary to address the mandates set forth in Section 366.96, F.S., and Rule 25-6.030, F.A.C., as well as the expectations of Gulf's customers and other stakeholders for increased storm resiliency and will result in fewer outages, reduced restoration costs, and prompt service restoration. The SPP will continue to expand the benefits of hardening, including improved day-to-day reliability, to all customers throughout Gulf's system.

The following sections provide information and details on Gulf's SPP as required by and in compliance with Rule 25-6.030, F.A.C. For the reasons explained below, Gulf submits that implementing the SPP is necessary and appropriate to achieve the goals and requirements expressed by the Florida Legislature in Section 366.96, F.S., to reduce restoration costs and outage times associated with extreme weather events and improve overall service reliability to customers and the State of Florida by promoting the overhead hardening of electrical transmission and distribution facilities, the undergrounding of certain electrical distribution lines, and vegetation management.

II. The 2020-2029 SPP Will Strengthen Gulf's Infrastructure to Withstand Extreme Weather Conditions and Will Reduce Restoration Costs and Outage Times

Pursuant to Rule 25-6.030(3)(a), F.A.C., this section provides an overview of how the SPP will strengthen Gulf's electric utility infrastructure to withstand extreme weather conditions by promoting the overhead hardening of electrical transmission and distribution facilities, the undergrounding of certain electrical distribution lines, and vegetation management. Consistent with Rule 25-6.030(3)(b), F.A.C., this section also provides a summary of how the SPP is expected to further reduce restoration costs and outage times associated with extreme weather conditions and, therefore, improve overall service reliability.

As described in more detail below, Gulf expects to pursue a new Distribution Lateral Undergrounding program similar to that of Florida Power & Light Company ("FPL"), which FPL initiated and the Commission approved in 2018. This program would convert certain targeted overhead laterals, such as those that have been impacted by recent storms or have a history of vegetation-related outages or other reliability issues, to underground laterals. Gulf also plans to continue implementing its design criteria, which require applying Extreme Wind Loading ("EWL") criteria to the design and construction of new overhead pole lines and major planned work, including pole line extensions, relocations and certain pole replacements. Gulf is proposing to continue executing its system-wide T&D pole inspection and replacement, and vegetation management cycle programs. Gulf will strengthen its electric grid to eliminate outages, minimize restoration times, and reduce the risk of single points of failure occurrences following major weather events.

Although Gulf's storm preparedness and hardening programs to date have produced a more storm resilient and reliable T&D electrical grid, Gulf must continue its efforts to storm-harden its T&D electrical grid consistent with the findings, conclusions, and objectives of the Florida Legislature in Section 366.96, F.S. Indeed, Florida remains the most hurricane-prone state in the nation and, with the significant coast-line exposure of Gulf's system and the fact that the nearly 50% of Gulf's customers live within one (1) mile of a coast or major body of water, a robust SPP is critical to maintaining and improving grid resiliency and storm restoration as contemplated by the Legislature in Section 366.96.

III. Description of Service Area and T&D Facilities

Pursuant to Rule 25-6.030(3)(c), F.A.C., this section provides a description of Gulf Power's service area, including areas prioritized for enhancement, if any, and any areas where Gulf has determined that enhancement of its existing T&D facilities would not be feasible, reasonable, or practical at this time.

Today, Gulf's service area consists of approximately 7,550 square miles. To serve its more than 468,000 customers, Gulf has constructed a T&D electric grid that contains approximately 9,500 miles of electrical lines, including:

- Approximately 5,831 miles of overhead distribution lines;
- Approximately 2,023 miles of underground distribution lines;
- Approximately 1,672 miles of high-voltage transmission lines;
- Approximately 208,000 distribution poles; and
- Approximately 12,000 transmission structures.

Gulf's service area is divided into three distribution management areas. A map depicting Gulf's service area and distribution management areas (with the number of customers served within each management area) is provided in Appendix A.

At this time, Gulf has not identified any areas of its service area where its SPP programs and projects would not be feasible, reasonable, or practical. While all of Gulf's SPP programs are currently system-wide initiatives, annual activities are prioritized based on certain factors such as last inspection date, last trim date, reliability performance and efficient resource utilization.[2] At this time, there is no area specifically targeted or prioritized for enhanced performance based on its geographical location.

IV. Proposed 2020-2029 SPP Programs

Pursuant to Rule 25-6.030(3)(d), F.A.C., this section provides a description of each program included in Gulf's SPP. If applicable, each program description below includes: (1) a description of how each program is designed to enhance Gulf's existing transmission and distribution facilities including an estimate of the resulting reduction in outage times and restoration costs due to extreme weather conditions; (2) identification of the actual or estimated start and completion dates of the program; (3) a cost estimate including capital and operating expenses; (4) a comparison of the costs and the benefits; and (5) a description of the criteria used to select and prioritize proposed storm protection programs.

A. Distribution Inspection Program

1. Description of the Program and Benefits

Gulf's Distribution Inspection Program included in the SPP is a continuation of Gulf's existing Commission-approved Distribution Inspection Program and includes programs that target specific facilities and infrastructure comprising Gulf's distribution system. Below is an overview of Gulf's Distribution Inspection Program and its associated benefits.

a. Overview of the Distribution Inspection Program

i. Feeder Patrols

Feeder patrols are a vital component of Gulf's Distribution Inspection Program and provide Gulf with the ability to efficiently identify and respond proactively to possible faults and other issues with Gulf's feeder systems. The feeder patrol component of Gulf's Distribution Inspection Program in the SPP is a continuation of the program previously

[2] The criteria and factors used to select and prioritize projects within each SPP program are described below.

approved by the Commission in Gulf's 2019-2021 Storm Hardening Plan. The program requires that, annually, by June 1, all critical lines must be inspected up to the first protective device for loose down guys, slack primary, and leaning poles. To the extent the patrols identify any problems with Gulf's feeders, those problems are promptly corrected in accordance with the requirements of the National Electric Safety Code ("NESC") and any other applicable standards or guidelines.

ii. Infrared Patrols

Infrared patrols assist Gulf in maintaining the reliable operation of its distribution system by utilizing equipment that detects excess heat and can identify structural, mechanical, and electrical issues with Gulf's distribution facilities. Similar to Gulf's feeder patrols, the infrared patrols in the SPP are a continuation of the program previously approved by the Commission in Gulf's 2019-2021 Storm Hardening Plan. Gulf's infrared patrols follow the same inspection cycle as its feeder patrols: annually, by June 1, Gulf will perform infrared inspections of critical equipment on main line three phase feeders. The inspected equipment includes feeder switches, capacitors, regulators, and automatic over-current protective devices. To the extent the infrared patrols proactively identify any potential problems with this equipment, Gulf will promptly schedule repairs, which will be performed in accordance with the requirements of the NESC and any other applicable standards or guidelines.

iii. Pole Inspections

Gulf implemented a distribution wood pole inspection program in the early 1990's and has continued that process since that time. Prior to 2006, Gulf utilized a 10-year distribution wood pole inspection program. In response to the 2004-2005 storm seasons and, in particular, the "large number of poles throughout Florida that required replacement," the Commission required investor-owned utilities ("IOUs") to implement an (8) eight-year pole inspection cycle for all wood distribution poles.[3] Gulf's plan was initially approved in

[3] See Order No. PSC-06-0144-PAA-EI.

September 2006, pending certain compliance filings,[4] and received final approval in January 2007.[5]

Gulf's (8) eight-year pole inspection cycle for all wooden distribution poles targets approximately 1/8 of the system annually (the actual number of poles inspected can vary somewhat from year to year). Gulf's strength and loading calculations for its distribution poles and pole inspections are based on the NESC's construction standards.

Gulf utilizes an inspection matrix that ensures all poles (Creosote, Penta, and CCA) receive a visual inspection with sounding, boring and excavation as appropriate. Inspections include a visual inspection of all distribution poles from the ground-line to the top of the pole to identify visual defects (*e.g.*, woodpecker holes, split tops, decayed tops, cracks, etc.). If, due to the severity of the defects, the poles are not suitable for continued service, the poles are designated for replacement. This inspection matrix has been approved by the FPSC in all previous plans. Utilizing this philosophy, Gulf's wooden pole plant has continued to perform well, with most pole failures being limited to times of extreme weather, tree failures, or vehicle strikes.

Gulf's rate of rejection for distribution wood poles has fallen from approximately 15% during its first ten-year inspection cycle to less than 3% in current inspection cycles.

b. Benefits of the Distribution Inspection Program

The Commission has previously found that "efforts to maintain system components can reduce the impact of hurricanes and tropical storms upon utilities' transmission and distribution systems," and noted that an "obvious key component in electric infrastructure is the transmission and distribution poles."[6] The Commission has also previously identified multiple benefits of and reasons for justifying pole inspections cycles for electric utilities, including, but no limited to: the likelihood of increased hurricane activity in the future; the high probability for equipment damage if a pole fails during a storm; the

[4] See Order No. PSC-06-0778-PAA-EU.
[5] See Order No. PSC-07-0078-PAA-EU.
[6] See Order No. PSC-06-0144-PAA-EI.

likelihood that failure of one pole often causes other poles to fail; the fact that deteriorated poles are more prone to fail when exposed to high winds; the fact that Florida electric utilities replaced nearly 32,000 poles during the 2004 storm restoration efforts; and the fact that restoration times increase significantly when a large number of poles fail, which limits the electric utilities' ability to respond quickly to widespread outages.[7]

In addition to the benefits discussed above that underlie the creation of the Commission's mandated pole inspection requirements, Gulf's pole inspection program has resulted in the identification of poles to be remediated and the subsequent replacement of approximately 10,000 poles since the implementation of Gulf's pole inspection program. The poles replaced were also constructed utilizing a higher NESC Grade B construction standard. Information from previous storms shows that poles replaced since 2007 at the increased construction standard performed significantly better than poles with a pre-2007 construction date. An independent forensic analysis was conducted immediately after Hurricane Michael to assess damage to Gulf's distribution system. This analysis stated, "a substantial decrease in the damage rate in poles installed after 2007 was found (30-32% damage rate pre-2007; 11-14% damage rate 2007 and beyond)". The analysis further stated, "The survey data as well as the analysis does indicate however, that newer construction standards and stronger pole classes (Class 2) outperformed those poles installed to older standards or those that were of Class 3, 5, or 6. This suggests that investments in storm hardening could reduce the extent of outages as well as restoration times from future storm events". The analysis further states, "… investments in storm hardening may improve system performance during future storm events." The forensic analysis is attached as Appendix B. Gulf submits that its Commission-approved Distribution Inspection Program has directly improved and will continue to improve the overall health and storm resiliency of its distribution facilities.

2. Actual/Estimated Start and Completion Dates

The SPP will continue Gulf's ongoing Commission-approved Distribution Inspection Program described above. Annually, Gulf visually inspects approximately 770 miles of

[7] See id.

mainline feeders and performs infrared inspections of critical equipment. With approximately 208,000 distribution poles as of year-end 2019, Gulf expects to inspect approximately 26,000 poles annually during the 2020-2029 SPP period.

3. Cost Estimates

Estimated annual costs for Gulf's Distribution Inspection Program are a function of the number of inspections estimated to be completed and the number of poles estimated to be remediated or replaced as a result of the annual inspections. Although costs to inspect the poles are operating expenses, the vast majority of pole inspection program costs are capital costs resulting from remediation/replacement of poles that fail inspection.

The table below provides a comparison of the estimated 2020-2022 (first three years of the SPP) Distribution Inspection Program costs with the estimated Distribution Inspection Program costs for 2020-2029:

	Total Program Costs (millions)	**Annual Average Program Costs (millions)**
2020-2022	$11.0	$3.7
2020-2029	$37.5	$3.7

Further details of these costs, including estimated annual capital expenditures and operating expenses, are provided in Appendix C.[8]

4. Comparison of Costs and Benefits

As provided in Section (IV)(A)(3) above, during 2020-2029, total costs for Gulf's feeder and infrared patrols and distribution pole inspection programs will average approximately $3.7 million per year. Benefits associated with Gulf's Distribution Inspection Program are

[8] Note, the 2020-2029 program costs shown above are projected costs estimated as of the time of this filing. Subsequent projected and actual costs could vary by as much as 10% to 15%. The annual projected costs, actual/estimated costs, actuals costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause will all be addressed in a subsequent and separate Storm Protection Plan Cost Recovery Clause filing pursuant to Rule 25-6.031, F.A.C. The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

discussed in Sections II and IV(A)(1)(b), above and include a decrease in the damage rate of poles installed during the time Hurricane Michael impacted Gulf's service area from 30-32% for Class 3, 5, or 6 (pre-2007) poles to 11-14% for Class 2 (2007 and beyond) poles.

5. Criteria used to Select and Prioritize Programs

Poles to be inspected annually are selected and prioritized within Gulf's service area based on the last cycle's inspection dates to ensure that poles are in compliance with Gulf's established eight-year cycle. As such, approximately 1/8 of the distribution poles in Gulf's service area are inspected annually.

At this time, Gulf has not identified any areas where the Distribution Inspection Program would not be feasible, reasonable or practical.

B. Transmission Inspection Program

1. Description of the Program and Benefits

Gulf's SPP Transmission Inspection Program is a continuation of Gulf's existing Commission-approved 2019-2021 storm hardening plan. The SPP includes programs that target the specific facilities comprising Gulf's transmission system. Below is an overview of Gulf's Transmission Inspection Program and its associated benefits.

a. Overview of the Transmission Inspection Program

In 2006, as part of its Storm Preparedness Initiative No. 3, the Commission required electric utilities to develop and implement plans to fully inspect substations annually and all transmission structures and all hardware associated with these facilities on a six-year cycle. Consistent therewith, Gulf implemented a Commission-approved transmission inspection plan in 2006 and has continued that plan to date.

Under its Commission-approved transmission inspection plan, Gulf inspects its transmission substations annually and its structures on two alternating twelve year cycles, which results in a structure being inspected at least every six-years. In general, Gulf uses a combination of company employees and contractors to perform comprehensive walking and aerial inspections of its transmission structures. At year-end 2019, approximately 12,000 transmission structures (62% steel or concrete and 38% wood) are included in Gulf’s transmission system.

Inspections for wood structures include an overall assessment of the condition of the structures, as well as other pole/structure components including the foundation, all attachments, insulators, guys, cross-braces, cross-arms, and bolts. If a wood transmission structure does not pass visual inspection, it is designated for replacement with a concrete or steel transmission structure.

For steel and concrete structures, the visual inspection includes an overall assessment of the structure condition (*e.g.*, cracks, chips, exposed rebar, and rust) as well as other pole/structure components including the foundation, all attachments, insulators, guys, cross-braces, cross-arms, and bolts. If a concrete or steel pole/structure fails the inspection, it is designated for repair or replacement.

Gulf's annual inspections of its transmission substations include comprehensive inspections based on substation inspection manuals. These inspections are performed by Company personnel knowledgeable of the processes, procedures, and equipment of Gulf's substations. Inspections include batteries and chargers, breakers, instrument transformers, power fuses, regulators, substation yard, switches, and transformers. The inspection steps for each type equipment is documented as well as the inspection results. Any abnormal situations are documented, repaired and/or replaced.

The SPP will continue Gulf’s current Transmission Inspection Program which requires: transmission substations and all associated equipment to be inspected annually and transmission structures to be inspected based on two alternating twelve-year cycles, which results in a structure being inspected at least every six years.

b. Benefits of the Transmission Inspection Program

As noted in Section IV(A)(1)(b) above, the Commission has found numerous benefits and reasons justifying inspections of electrical utility facilities, including transmission facilities. Importantly, the transmission system is the backbone of the electric grid. While outages associated with distribution facilities (*e.g.*, a transformer, lateral or feeder) can result in an outage affecting anywhere from a few customers up to several thousands of customers, a transmission related outage can affect tens of thousands of customers. Additionally, an outage on a transmission facility could cause cascading (a loss of power at one transmission facility can trigger the loss of power on another interconnected transmission facility, which in turn can trigger the loss of power on another interconnected transmission facility, and so on) and result in the loss of service for hundreds of thousands of customers. As such, it is imperative that transmission facilities be properly inspected using appropriate cycles and standards to help ensure that they are prepared for storms.

As with its distribution inspection program, discussed in Sections IV(A)(1)(a) & (b), the performance of Gulf's transmission facilities during recent storm events indicates Gulf's transmission inspection program has contributed to the overall storm resiliency of the transmission system and provided savings in storm restoration duration and costs. As a result, the inspections enable Gulf to timely identify and replace deteriorated structures, thus increasing the performance of its transmission structures during extreme weather events.

2. Estimated Start and Completion Dates

The SPP will continue Gulf's ongoing Commission-approved Transmission Inspection Program described above. This requires Gulf to inspect transmission substations and all associated equipment annually and structures based on two alternating twelve-year cycles, resulting in a structure being inspected at least every six years.

3. Cost Estimates

Estimated annual Transmission Inspection Program costs are a function of the number of inspections estimated to be completed and the transmission facilities estimated to be/actually remediated/replaced as a result of those inspections. Although the inspection costs are operating expenses, the vast majority of Transmission Inspection Program costs are capital costs resulting from remediation/replacement of facilities that fail inspection.

The table below provides a comparison of the estimated 2020-2022 (first three years of the SPP) Transmission Inspection Program costs with the estimated Transmission Inspection Program costs for 2020-2029:

	Total Program Costs (millions)	**Annual Average Program Costs (millions)**
2020-2022	$10.5	$3.5
2020-2029	$35.0	$3.5

Further details regarding SPP estimated Transmission Inspection Program costs, including estimated annual capital expenditures and operating expenses, are provided in Appendix C.[9]

4. Comparison of Costs and Benefits

As provided in Section IV(B)(3) above, during 2020-2029, total costs for Gulf's Transmission Inspection Program are expected to average approximately $3.5 million per year. Benefits associated with this program discussed in Sections II and IV(B)(1)(b) above include helping avoid outages that can affect tens of thousands of customers and, in particular, cascading outages where the loss of service can affect hundreds of thousands of customers.

5. Criteria used to Select and Prioritize Programs

As explained above, Gulf visually inspects its substations on an annual basis. For the inspection of transmission lines and structures and all associated hardware, the facilities are selected/prioritized throughout Gulf's service area based on the last cycle's inspection dates, to ensure that facilities are inspected in compliance with the established inspection cycle. Gulf's transmission structure inspection program is based on two alternating twelve-year cycles, which results in a structure being inspected at least every six years.

[9] *See* footnote 8.

At this time, Gulf has not identified any areas where the Transmission Inspection Program would not be feasible, reasonable, or practical.

C. Distribution Feeder Hardening Program

1. Description of the Program and Benefits

The Distribution Feeder Hardening Program included in the SPP is a continuation of Gulf's existing Commission-approved approach (most recently approved in Docket No. 20180147-EI) to harden existing feeders and certain critical distribution poles, as well as Gulf's initiative to design and construct new pole lines and major planned work to meet the NESC's extreme wind loading ("EWL") criteria. Below is an overview of Gulf's existing distribution feeder hardening program and associated benefits.

a. Overview of the Distribution Feeder Hardening Program

The foundation of Gulf's Distribution Feeder Hardening Program has been Gulf's objective to strengthen and reconstruct critical infrastructure to higher NESC storm hardening construction standards. Feeders are the backbone of Gulf's distribution system and, therefore, a critical component of Gulf's overall distribution overhead system. Feeder reliability can also have a substantial impact on overall service reliability to Gulf's customers. Therefore, hardening feeders has been, and continues to remain, one of Gulf's highest storm hardening priorities.

To harden its feeders in 2020-2029, Gulf's proposes to continue with its previously approved approach to apply EWL standards to harden existing feeders and certain critical infrastructure utilizing Gulf's Distribution Hardening Design Guidelines (Appendix D) to construct new pole lines and major planned work. Gulf will also continue its distribution automation program which includes the installation of additional distribution automation devices, strategic installation of automated overhead faulted circuit indicators, and the distribution supervisory control and data acquisition (DSCADA) system. Appendix B also provides a map depicting Gulf's three districts that comprise Gulf's service areas which are subject to extreme winds ranging from 110-140 mph. Gulf's application of EWL criteria to its hardening efforts incorporates and reflects these varying wind speeds throughout Gulf's service areas.

The SPP will also continue to utilize Gulf's Distribution Hardening Design Guidelines and processes to apply EWL to the design and construction of new pole lines and major planned work, including pole line extensions and relocations and certain pole replacements. Depending on the scope of the work that is performed in a particular project, this could result in the EWL hardening of an entire circuit (in the case of large-scale projects) or in EWL hardening of one or more poles (in the case of small projects) so that the affected circuit will be in a position to be fully EWL hardened in the future. These design criteria are primarily associated with changes in pole class, pole type, and desired span lengths to be utilized. The design criteria standardize the design and construction of new pole lines and major planned work to ensure that these projects align with Gulf's hardening strategy.

Gulf's current pole sizing guidelines provide for a minimum installation of: Class 2 wood poles for all new feeder and three-phase lateral work; Class 3 wood pole for two-phase and single-phase lateral work; and Class 3 wood pole for service and secondary work. For critical poles, Gulf's current pole sizing guidelines provide for the installation of concrete poles at accessible locations. These guidelines significantly increase the wind ratings (up to nearly 50 percent) from the design criteria in place prior to 2007.

To determine how an existing overhead circuit or critical pole will be hardened, a field survey of the circuit facilities is first performed. By capturing detailed information at each pole location such as pole type, class, span distance, attachments, wire size and framing, a comprehensive wind-loading analysis can be performed to determine the current wind rating of each pole, and ultimately the circuit itself. This data is then used to identify the specific pole locations on the circuit that do not meet the desired wind rating. For all poles that do not meet the applicable EWL, Gulf develops recommendations to increase the allowable wind rating of the pole.

Gulf plans to continue to utilize its "design toolkit" that focuses on evaluating and using cost-effective hardening options for each location, including:

- Storm Guying – Installing a guy in each direction perpendicular to the line; a very cost-effective option that is dependent on proper field conditions;

- Equipment Relocation – Moving equipment on a pole to a near-by stronger pole;

- Intermediate Pole – Installing a single pole when long span lengths are present, which reduce span length and increases the wind rating of both adjacent poles;

- Upgrading Pole Class – Replacing the existing pole with a higher class pole to increase the pole's wind rating; and;

- Undergrounding Facilities – Evaluated on a case-by-case basis using site-specific conditions.

- Distribution Automation – Installation of additional distribution automation devices to further segment the feeders for outage restoration. These devices protect customers by limiting those affected by temporary faults and sustained outages. These devices will either be controlled by Distribution Supervisory Control and Data Acquisition (DSCADA) and/or function as a part of automated restoration schemes.

    - Strategic Installation of Automated Overhead Faulted Circuit Indicators (FCIs) are devices designed to indicate the passage of fault current. These devices will reduce customer outage time by helping to expedite locating outage causes, aiding in the isolation of the problem. This process will help restore service to some customers while the problem is being corrected. Gulf proposes to continue to install new FCIs at strategic locations.

    - In order to reduce customer outage times, Gulf has implemented a Distribution Supervisory Control and Data Acquisition (DSCADA) System to remotely control and monitor the distribution system by

Distribution Control Center personnel. The DSCADA system will continue to be expanded with the addition of line devices.

To further improve distribution reliability and resiliency, in 2016, Gulf initiated a program to expand its storm hardening philosophy by purchasing vegetation management easements from private property owners on select feeders to enhance Gulf's ability to adequately address vegetation management concerns. The feeders selected consisted of mainline feeders that serve key customers; feeders that experience reliability issues due to off right of way vegetation conflicts; and feeders that have heavy exposure to off right-of-way vegetation. Gulf has successfully purchased easements on 89 miles of line giving Gulf the right to clear and maintain a 15 foot wide corridor on private property adjacent to the public right of way and Gulf's distribution facilities. Gulf plans to continue this program to provide VM reliability improvements on its system.

These options are not mutually exclusive, and when used in combination with sound engineering practices, provide cost-effective methods to harden a circuit. Gulf's design recommendations also take into consideration issues such as hardening, mitigation (minimizing damage), and restoration (improving the efficiency of restoration in the event of failure). Since multiple factors can contribute to losing power after a storm, utilizing this multi-faceted approach to distribution pole line design helps to reduce the amount of work required to restore power to a damaged circuit.

b. Benefits of the Distribution Feeder Hardening Program

Distribution feeders are the backbone of the distribution system and are critical component to providing safe and reliable electric service to Gulf's customers. Improving the storm resiliency of distribution feeders provides immediate benefits for every customer served off a hardened feeder as soon as the hardening is completed. Therefore, hardening distribution feeders has been and continues to be one of Gulf’s highest storm hardening priorities.

During the period 2006-2018, utilizing existing hardening specifications, Gulf hardened Critical Infrastructure Function ("CIF") feeders that serve hospitals, 911 centers, police and fire stations, water treatment facilities, county emergency operation centers and Community Project feeders, feeders that serve other key community needs like gas stations, grocery stores and pharmacies throughout Gulf's service area. In 2019, Gulf began to apply EWL standards to the design and construction of all new pole lines and major planned work, including pole line extensions and relocations and certain pole replacements. Logically, these storm-hardened feeders have and will continue to provide more storm and extreme weather resiliency to Gulf's customers.

2. Estimated Start and Completion Dates

Gulf initiated its feeder hardening initiative in 2006. As of year-end 2019, there are approximately 269 feeders remaining to be hardened. Gulf expects to harden 12-18 feeders annually through the program, and anticipates approximately 50% of Gulf's feeders to be hardened to EWL standards by year-end 2029.

3. Cost Estimates

Estimated Distribution Feeder Hardening Program costs are determined utilizing the length of each feeder, the average historical feeder hardening cost per mile and updated cost assumptions (*e.g.*, labor and materials). The table below provides a comparison of the estimated 2020-2022 (first three years of the SPP) Distribution Feeder Hardening Program with the estimated Distribution Feeder Hardening Program costs for 2020-2029:

	Total Program Costs (millions)	**Annual Average Program Costs (millions)**
2020-2022	$87.1	$29.0
2020-2029	$315.3	$31.5

Further details regarding the estimated SPP Distribution Feeder Hardening Program costs including estimated annual expenditures, the vast majority of which are capitalized, are provided in Appendix C.[10]

4. Comparison of Costs and Benefits

As provided in Section IV(C)(3) above, during 2020-2029, total costs for Gulf's Distribution Feeder Hardening Program average approximately $31.5 million per year through 2029. Benefits associated with this program discussed in Sections II and IV(C)(1)(b) above, include improved storm resiliency as well as: (1) lowering outage rates; (2) lowering construction man hours to restore hardened feeders; and (3) fewer pole failures.

5. Criteria used to Select and Prioritize Programs

As explained above, there are approximately 269 feeders remaining to be hardened or placed underground. Gulf attempts to spread its annual projects throughout its service areas. In prioritizing the remaining existing feeders to be hardened each year, considerations include the feeder's historical reliability performance, restoration difficulties, on-going or upcoming internal/external projects (*e.g.*, Gulf maintenance or system expansion projects, municipal overhead/underground conversion projects or municipal road projects) and geographic location (i.e., Gulf attempts to spread its annual projects throughout its service area). Additionally, Critical Infrastructure Function ("CIF") feeders that serve hospitals, 911 centers, police and fire stations, water treatment facilities, county emergency operation centers, and Community Project feeders, feeders that serve other key community needs like gas stations, grocery stores and pharmacies are considered during Gulf's feeder hardening considerations. There are no areas for feeder hardening that Gulf has determined to be not feasible, reasonable or practical.

D. Distribution Hardening – Lateral Undergrounding Program

1. Description of the Program and Benefits

The Distribution Hardening – Lateral Undergrounding Program included in the SPP is a new program similar to that of FPL, which is intended to protect certain overhead laterals

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[10] *See* footnote 8.

during extreme weather events by converting them to underground laterals. Below is an overview of Gulf's proposed Distribution Hardening - Lateral Undergrounding Program and associated benefits.

a. Overview of the Distribution Hardening-Lateral Undergrounding Program

Gulf's SPP includes a Distribution Hardening - Lateral Undergrounding Program similar to that conducted by FPL and Duke Energy Florida. The Distribution Hardening - Lateral Undergrounding Program would build upon the experiences of FPL and focus on targeting certain overhead laterals, *i.e.*, overhead laterals impacted by recent storms and with a history of vegetation-related outages and other reliability issues, spread throughout Gulf's system. Key objectives of the program would initially include validating conversion costs and identifying cost savings opportunities, testing different design philosophies, better understanding customer impacts and sentiments, and identifying barriers (e.g., obtaining easements, locating transformers and attaching entities' issues).

As part of the conversion process, Gulf will install meter base adaptors, which provide a means to receive underground service to the customer by utilizing the existing meter and meter enclosure. The meter base adaptors will minimize the impact on customer-owned equipment and facilities. For example, in certain situations, overhead to underground conversions of electric service can trigger a local electrical code requirement that causes a customer to have to upgrade the home's electric service panel. This can cost the customer thousands of dollars. By utilizing a meter base adaptor, the need to convert the electrical service panel and the additional customer cost is avoided.

b. Benefits of the Distribution Hardening - Lateral Undergrounding Program

Laterals make up the majority of Gulf's distribution system. For example, system-wide, there are approximately 7000 laterals, in contrast to 305 feeders and there are almost 7 times as many miles of overhead laterals as there are overhead feeders (approximately 770 miles vs. 5063 miles, respectively). Additionally, while feeders are predominately located on main roads and rights-of-way, many laterals are located on smaller roads, neighborhoods, and other areas that can create access issues for line maintenance, vegetation clearing, and restoration work. This results in a greater amount of construction man-hours being devoted to laterals during storm restoration. Based on the overall performance of underground vs. overhead facilities and the extensive damage to Gulf's overhead facilities caused by vegetation (much of which was outside of where Gulf trims, *e.g.*, outside of public rights-of-way and Gulf easements) during Hurricane Michael, this program will further expand the benefits of hardening throughout Gulf's distribution system (*i.e.*, reduced outages and restoration time). Further, the day-to-day performance of the underground vs. overhead facilities are generally better, which also provides customer benefits. As previously stated, The Florida Legislature has determined that it is in the State's best interest to "strengthen electric utility infrastructure to withstand extreme weather conditions by promoting the overhead hardening of distribution and transmission facilities, undergrounding of certain distribution lines, and vegetation management". Section 366. (1), F.S. Gulf's basis for converting certain laterals from overhead to underground throughout its system to eliminate the extensive damage to overhead facilities during storms is consistent with this statute.

2. <u>Estimated Start and Completion Dates</u>

The evaluation and engineering of Gulf's laterals identified to be converted to underground will begin during the fourth quarter of 2020. Gulf will begin conversion construction in 2021 and continue through 2029 in order to derive the benefits of underground lateral hardening throughout its system.

3. <u>Cost Estimates</u>

Estimated Distribution Hardening - Lateral Undergrounding Program costs are determined utilizing the length of each lateral, the average historical lateral undergrounding cost per mile and updated cost assumptions (*e.g.*, labor and materials). Total estimated Distribution Hardening - Lateral Undergrounding Program costs for 2020-2029, the vast majority of which are capitalized, are provided below:

	Total Program Costs (millions)	**Annual Average Program Costs (millions)**
2021-2022	$10.4	$5.2
2020-2029	$46.6	$4.7

Further details of these costs (*e.g.*, annual capital expenditures and operating expenses), along with 2021-2022 program costs are provided in Appendix C.[11]

4. Comparison of Costs and Benefits

As provided in Section IV(D)(3) above, during 2020-2029, total costs for Gulf's Distribution Hardening – Lateral Undergrounding Program average approximately $4.7 million per year through 2029. Benefits associated with this program are discussed in Sections II and IV(C)(1)(b) above and include improved storm resiliency and the mitigation and elimination of extensive damage caused by vegetation and windborne debris to overhead facilities.

5. Criteria used to Select and Prioritze Programs

Gulf is proposing that it select and prioritize the entire first-stage laterals to be converted utilizing an overall feeder performance methodology, *i.e.*, rather than selecting laterals downstream of a first-stage fuse. Key factors in selecting and prioritizing laterals for undergrounding are based on several reliability indices involving, but not limited to, performance during past hurricanes and tropical storms, certain number of outages in the past 10 years, and high percentage of past outages caused by vegetation. Gulf proposes also prioritizing conversions by additional methods, such as customer density (*i.e.*, customers served per mile converted). Additional considerations are delaying or skipping laterals in high flood risk zones and extremely long rural laterals with low customer densities.

[11] *See* footnote 8.

E. Transmission Hardening Program

1. Description of the Program and Benefits

Gulf's SPP Transmission Hardening Program is largely a continuation of Gulf's existing Commission-approved 2019-2021 storm hardening plan. Below is an overview of Gulf's Transmission Hardening Program and its associated benefits.

a. Overview of the Transmission Hardening Program

Hardening efforts within this program consist of transmission wood structure replacement, substation flood monitoring and hardening, and transmission and substation resiliency.

As of year-end 2019, approximately 62% of Gulf's transmission structures, system-wide, are steel or concrete, with approximately 38% wood structures remaining to be replaced. The annual prioritization/selection criteria for the remaining wood structures to be replaced includes proximity to high wind areas, system importance, customer counts, and coordination with other storm initiatives (*e.g.*, distribution feeder hardening). Other economic efficiencies, such as opportunities to perform work on multiple transmission line sections within the same transmission corridor, are also considered. Gulf expects to replace the approximately 4,600 remaining wood structures in its system before year-end 2029, at which time, 100% of its transmission structures will be steel or concrete.

Beginning in 2019, Gulf began to re-evaluate substation locations using the Coastal Substation Risk Assessments for all substations. As part of this process, a National Oceanic and Atmospheric Administration (NOAA) SLOSH (Sea, Lake and Overland Surges from Hurricanes) model is being used to define the potential maximum flood levels. SLOSH is a computerized model run by the National Hurricane Center (NHC) to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes.

Gulf will implement flood monitoring on vulnerable substations and review switch house construction standards for possible replacement and strengthening.

Although Gulf's transmission and substation facilities have continued to perform satisfactorily in the past, it should be noted that Gulf's transmission system and transmission substation reliability has been impacted by single point of failure events that have had and will continue to have the potential to greatly impact customers. During Hurricane Michael, Gulf experienced a single point of failure event which required the installation of a mobile substation to provide backup substation facilities and service to those customers impacted. As a result, Gulf has initiated a transmission line and radial substation resiliency program and has begun to invest in the overall strengthening of the electric grid at the transmission and/or substation level to remove these critical single points of failure that have the potential to impact large numbers of customers for extended periods of time. By building redundancy in the system to make it more resilient, these improvements will eliminate outages, and shorten restoration times following major weather events.

Based on customer impact and prioritization, Gulf is engaged in the process of removing single points of failure scenarios from the transmission and/or substation system. This program will focus on adding additional transmission lines into radially feed substations and additional transformers in single bank transmission substations in order to improve storm resiliency.

b. Benefits of the Transmission Hardening Program

While Gulf's transmission facilities were affected by Hurricane Michael in 2018, the damage experienced was significantly less than the damage sustained by distribution facilities. A primary reason for this resulted from the fact that transmission structures were already constructed to meet EWL standards, consistent with Florida Statute 366.04 and the NESC, Rule 250 C. However, based on the forensic data collected following the storm, steel and concrete structures out-performed wooden structures. Therefore, Gulf will continue its program of replacing transmission wood structures with steel or concrete to ensure the resiliency of its transmission structures.

The benefits associated with identifying and installing flood monitoring of substations is the ability to proactively de-energize those substations susceptible to flooding to reduce damage to powered substation equipment. The prevention of outages at substations due to storm surge or flooding is essential to minimizing outages affecting thousands of customers.

The benefits associated with removing single points of failure is to provide redundancy in single transformer substations and to provide additional feeds and/or equipment to improve storm resiliency. Further, while an outage associated with distribution facilities (*e.g.*, a transformer, lateral or feeder) can impact up to several thousands of customers, a transmission and/or substation-related outage can result in an outage affecting tens of thousands of customers. As a result, the hardening of transmission poles and structures; the monitoring and prevention of flood waters into substations; and the strengthening of equipment to prevent transmission and/or substation-related outages is essential.

2. Estimated Start and Completion Dates

Gulf implemented its substation flood monitoring in 2019 and will conclude the program in 2023. Substation resiliency and hardening will begin in 2020 and continue through 2029. Gulf implemented its transmission structure hardening program in 2019 and expects to replace the approximately 4,600 remaining wood transmission structures in its system before year-end 2029, at which time, 100% of its transmission structures will be steel or concrete.

3. Cost Estimates

Estimated annual Transmission Hardening Program costs are a function of the number of substations to be storm hardened through flood monitoring, scope of resiliency programs, and the number of poles to be replaced, actual historical replacement costs and updated cost assumptions (e.g., labor and materials). Total estimated Transmission Hardening Program costs for 2020-2029, the vast majority of which are capitalized, are provided below:

	Total Program Costs (millions)	Annual Average Program Costs (millions)
2020-2022	$106.3	$35.4
2020-2029	$488.8	$48.9

Further details of these costs (e.g., annual capital expenditures and operating expenses) are provided in Appendix C.[12]

4. Comparison of Costs and Benefits

As provided in Section IV(E)(3) above, total costs for Gulf's Transmission Hardening Program (transmission wood structure replacement, substation flood monitoring, and transmission and substation resiliency) average approximately $48.9 million per year. Benefits associated with this program discussed in Sections II and IV(E)(1)(b) above, include improved storm resiliency.

5. Criteria Used to Select and Prioritize Programs

Gulf evaluated substation locations using the Coastal Substation Risk Assessments for all substations. Projects were prioritized based on stations in the flood zone using the SLOSH model, coastal stations with metal switch houses, and impact based on customer numbers. Transmission and substation resiliency projects are prioritized based on number of customers impacted and the estimated time of repair for a single event.

The annual prioritization/selection criteria for the remaining wood structures to be replaced includes proximity to high wind areas, system importance, customer counts, and coordination with other storm initiatives (*e.g.*, distribution feeder hardening). Other economic efficiencies, such as opportunities to perform work on multiple transmission line sections within the same transmission corridor, are also considered.

At this time, Gulf has not identified any areas where the Transmission Hardening Program would not be feasible, reasonable or practical.

[12] *See* footnote 8.

F. Vegetation Management – Distribution Program

1. Description of the Program and Benefits

The Vegetation Management – Distribution Program included in the SPP is a continuation of Gulf's existing Commission-approved Vegetation Management – Distribution Program. Below is an overview of Gulf's existing Vegetation Management – Distribution Program and the associated benefits.

a. *Overview of the Distribution Vegetation Management Program*

Prior to 2006, Gulf's Vegetation Management – Distribution Program consisted of trimming its feeders on a three-year average trim cycle and performing targeted trimming on certain feeders more frequently, targeting vegetation with faster growth rates, through its "mid-cycle" program. Lateral trimming was prioritized based on reliability performance. Another important component of this program was Gulf's "Right Tree Right Place" ("RTRP") initiative, which provided information to educate customers on Gulf's Vegetation Management – Distribution Program and practices, safety issues, and the importance of placing trees in the proper location.

After the 2004-2005 storm seasons, in Order No. PSC-06-0351-PAA-EI, the FPSC determined that "(t)he vegetation management practices of the investor-owned electric utilities do not provide adequate assurance that tree clearances for overhead distribution facilities are being maintained in a manner that is likely to reduce vegetation related storm damage. We believe that utilities should develop more stringent distribution vegetation management programs." As a result, Gulf proposed and the Commission ultimately approved (Order No. PSC-07-0468-FOF-EI) the continuation of Gulf's system-wide three-year average trim cycle for mainline feeders, mid-cycle trimming for mainline feeders and its RTRP initiative and the implementation of a six-year average trim cycle for laterals. Gulf's Commission-approved 2010 Storm Hardening Plan included a change in lateral trim cycles from six years to four years. These same initiatives, which have provided storm and day-to-day reliability benefits, remain in place today.

Tree limbs and branches are among the most common causes of power outages/momentary interruptions, day-to-day as well as during storm events. The primary objective of Gulf's Vegetation Management – Distribution Program is to clear vegetation in areas where Gulf is permitted to trim from the vicinity of distribution facilities and equipment in order to provide safe, reliable and cost-effective electric service to its customers. The program is comprised of multiple initiatives designed to reduce the average time customers are without electricity as a result of vegetation-related interruptions. This includes preventive maintenance initiatives (planned cycle and mid-cycle maintenance), corrective maintenance (trouble work and service restoration efforts), customer trim requests, and support of system improvement and expansion projects, which focus on long-term reliability by addressing vegetation that will impact new or upgraded overhead distribution facilities.

Gulf follows the NESC, the American National Standards Institute ("ANSI") A-300, and all other applicable standards while considering tree species, growth rates and the location of trees in proximity to our facilities when performing line clearing. Danger or hazard trees (leaning, structurally damaged, diseased, or dead) outside of right-of-way ("ROW"), which cannot be trimmed by Gulf contractors without approval from the property owner, are candidates for customer-approved removal.

For 2020-2029, Gulf proposes to continue implementing its currently-approved Vegetation Management – Distribution Program which includes its system-wide: three-year cycle for mainline feeders: mid-year cycle inspection and trimming for mainline feeders; four-year cycle for laterals; and continued education of customers through its RTRP initiative.

b. Benefits of the Distribution Vegetation Management Program

In Order No. PSC-2006-0947-PAA-EI, the Commission confirmed that Gulf should continue to implement 3-year average cycles for its mainline feeders and 6-year cycles for laterals because the cycles complied with the Commission's storm preparedness objectives to promote system reliability and reduce storm restoration costs. In Gulf's Commission approved 2010 Storm Hardening Plan, Gulf changed its lateral trim cycle from 6 years to 4 years. Gulf has realized improved reliability as a result of its distribution vegetation management initiatives as its day-to-day distribution tree SAIDI has improved as a result of Gulf implementing its approved distribution vegetation management program (from 18.0 prior to the 2009 storm season to 14.1 at year-end 2019). Finally, another indication that the current program is providing benefits is that, while forensic analysis indicated vegetation was the overwhelming primary cause for pole and wire failures and a significant cause of outages during Hurricane Michael, the vast majority of damage resulted from uprooted trees, broken trunks, and broken limbs that fell into distribution facilities from outside of right-of-way, *i.e.*, beyond where Gulf is currently allowed to trim without approval from the property owner.

2. Actual/Estimated Start and Completion Dates

Gulf began its current 3-year mainline feeder cycle in 2019 which continues through 2021. The current 4-year lateral trim cycle began in 2018 and continues through 2021. At the conclusion of the current cycles, new cycles will begin. On average, Gulf plans to inspect and trim annually: approximately 1/3 of its mainline overhead feeder miles or 259 miles; approximately 1/4 of its overhead lateral miles or 1,257 miles; and mid-cycle inspection and trimming approximately 518 miles for a total estimated inspection and trimming average of approximately 2,000 miles per year, which is consistent with the historical miles inspected and trimmed annually.

3. Cost Estimates

The vast majority of Vegetation Management – Distribution Program costs are associated with cycle and mid-cycle inspection and trimming, which is performed by several approved Gulf contractors throughout Gulf's system. Other Vegetation Management – Distribution Program costs include costs associated with day-to-day restoration activities (e.g., summer afternoon thunderstorms), removals, debris cleanup, and support (e.g., arborists, supervision, back office support). Total estimated Vegetation Management – Distribution Program costs for 2020-2029 are provided below:[13]

[13] The vegetation management costs shown in the table below exclude storm-related vegetation management costs.

	Total Program Costs (millions)	Annual Average Program Costs (millions)
2020-2022	$14.4	$4.8
2020-2029	$47.4	$4.7

Further details of these costs (*e.g.*, annual capital expenditures and operating expenses, labor, and equipment) and the number of miles inspected and maintained annually are provided in Appendix C.[14]

4. Comparison of Costs and Benefits

As provided in Section IV(F)(3) above, during 2020-2029, total costs for Gulf's Vegetation Management – Distribution Program average approximately $4.7 million per year. Benefits associated with this program discussed in Sections II and IV(F)(1)(b) above, include increased storm resiliency.

5. Criteria Used to Select and Prioritize Programs

The primary reason for maintaining mainline feeders on a 3-year average cycle vs. a 4-year average cycle for laterals is that a mainline feeder outage can affect, on average, approximately 1,500 customers, as compared to a lateral line that can affect significantly less customers. Gulf enhances its approved mainline feeder trimming plan through its mid-cycle inspection and trimming program, which encompasses patrolling and trimming feeders between planned maintenance cycles to address tree conditions that may cause an interruption prior to the next planned cycle trim.

Additionally, customers often contact Gulf with requests to trim trees around lines in their neighborhoods and near their homes. As a result of our discussions with these customers and/or a follow-up investigation, Gulf either performs the necessary trimming or determines that the requested trimming can be addressed more efficiently by completing it through the normal scheduled cycle trimming.

[14] *See* footnote 8.

At this time, Gulf has not identified any areas where the Vegetation Management – Distribution Program would not be feasible, reasonable or practical.

G. Vegetation Management – Transmission Program

1. Description of the Program and Benefits

The Vegetation Management – Transmission Program included in the SPP is a continuation of Gulf's existing Vegetation Management – Transmission Program. Below is an overview of Gulf's existing Vegetation Management – Transmission Program and the associated benefits.

a. Overview of the Transmission Vegetation Management Program

The North American Electric Reliability Corporation's (NERC) vegetation management standards/requirements serve as the basis for Gulf's Vegetation Management - Transmission Program. The reliability objective of these standards/requirements standards is to prevent vegetation-related outages which could lead to cascading by utilizing effective vegetation maintenance while recognizing that certain outages such as those due to vandalism, human errors and acts of nature are not preventable. Transmission lines that must conform with these standards/requirements include lines operated at or above 200 kV or any line that is either an element of an Interconnection Reliability Operating Limit (IROL) or a Major West Electricity Coordinating Council (WECC). For Gulf, approximately 600 miles of its transmission system (or just over one-third of all of Gulf's total transmission system) fall under the NERC's vegetation management standards and requirements. NERC's vegetation management standards and requirements include annual inspection requirements, executing 100% of a utility's annual vegetation work plan and to prevent any encroachment into established minimum vegetation clearance distances ("MVCD").

The key elements of Gulf's Vegetation Management – Transmission Program are to inspect the transmission rights of way, document vegetation inspection results and findings, prescribe a work plan, and execute the work plan.

Gulf conducts ground inspections of all transmission corridors annually for work planning purposes. During these inspections, Gulf identifies vegetation capable of approaching the defined Vegetation Action Threshold (VAT). VAT is a calculated distance from the transmission line that factors in MVCD, conductor sag/sway potential, and a buffer. The identified vegetation is given a work prescription and then prioritized and organized into batches of work, which collectively become the annual work plan.

For transmission lines that fall under NERC's vegetation management standards and requirements, Gulf plans to pilot and begin using a technology called "LiDAR", short for light detection and ranging. LiDAR is a remote sensing technology that uses light in the form of a pulsed laser to measure ranges (distances) to a target. For vegetation management purposes, LiDAR is used to measure distance between vegetation and transmission lines. LiDAR patrols of all NERC transmission corridors are conducted annually. The LiDAR collected data is then used to develop preventative and reactive work plans.

For 2020-2029, Gulf proposes to continue implementing its current Vegetation Management – Transmission Program, which includes ground and aerial inspections of all transmission line corridors, and pilot LiDAR inspections of NERC transmission line corridors, developing and executing annual work plans to address identified vegetation conditions and identifying and addressing priority and hazard tree conditions prior to and during storm season.

b. Benefits of the Transmission Vegetation Management Program

The benefits of a Vegetation Management – Transmission Program are self-evident and the consequences of not having a reasonable transmission vegetation management plan can be extreme. As discussed previously, the transmission system is the backbone of the electric grid. While outages associated with distribution facilities (e.g., a transformer, lateral or feeder) can result in an outage affecting anywhere from a few customers up to several thousands of customers, a transmission related outage can affect tens of thousands of customers. As such, it is imperative that vegetation impacting transmission facilities be properly maintained using reasonable and appropriate cycles and standards to help ensure they are prepared for storms. For these reasons, it is no surprise that NERC has developed prescriptive vegetation management requirements for transmission facilities to help prevent such damage from occurring.

2. Estimated Start and Completion Dates

Gulf's Vegetation Management – Transmission Program inspections and resulting trim cycles are on-going programs and are completed in accordance with Gulf's 2019-2021 Commission approved storm hardening plan and NERC FAC003-4 standards and requirements. Under the SPP, Gulf plans to continue to inspect and maintain, on average, approximately 1,600 miles annually, including approximately 600 miles for NERC transmission line corridors and approximately 1,000 miles for non-NERC transmission line corridors.

3. Cost Estimates

The vast majority of Vegetation Management – Transmission Program costs are associated with annual inspections and the execution of planned work to address identified conditions, which is performed by several approved Gulf contractors throughout Gulf's system. Other vegetation management costs include costs associated with day-to-day restoration activities (e.g., summer afternoon thunderstorms), removals, debris cleanup, and management of the program. Total estimated Vegetation Management – Transmission Program costs for 2020-2029, the vast majority of which are operating expenses, are provided below:

	Total Program Costs (millions)	**Annual Average Program Costs (millions)**
2020-2022	$8.2	$2.7
2020-2029	$28.3	$2.8

Further details regarding the SPP estimated Vegetation Management – Transmission Program costs, including estimated annual capital expenditures and operating expenses are provided in the Appendix C.[15]

4. Comparison of Costs and Benefits

As provided in Section IV(G)(3) above, during 2020-2029, total costs for Gulf's Vegetation Management – Transmission Program average approximately $2.8 million per year. Benefits are discussed in Sections II and IV(G)(1)(b) above.

5. Criteria used to Select and Prioritize Programs

Priority vegetation conditions and hazard tree conditions are identified prior to storm season and are used to prioritize activities. Additionally, prior to and during the storm season, Gulf conducts aerial inspections of transmission corridors to identify hazard trees and any priority vegetation locations. Priority vegetation conditions and hazard tree conditions identified through aerial inspections are prioritized and addressed as soon as possible.

V. Detailed Information on the First Three Years of the 2020-2029 SPP

A. Detailed Description for the First Year of the SPP (2020)

The following additional information required by Rule 25-6.030(3)(e)(1), F.A.C., for the first year of the SPP (2020) is provided in Appendix C: (1) the actual or estimated construction start and completion dates; (2) a description of the affected existing facilities, including number and type(s) of customers served, historic service reliability performance during extreme weather conditions, and how this data was used to prioritize the proposed storm protection project; and (3) a cost estimate including capital and operating expenses. A description of the criteria used to select and prioritize proposed storm protection projects is included in the description of each SPP program provided in Section IV.

[15] *See* footnote 8.

B. Detailed Description of the Second and Third Years of the SPP (2021-2022)

Additional details required by Rule 25-6.030(3)(e)(2), F.A.C., for the second and third years of the SPP (2021-2022), including the estimated number and costs of projects under every program, is provided in Appendix C.

VI. Estimate of Annual Jurisdictional Revenue Requirements for the 2020-2029 SPP

Pursuant to Rule 25-6.030(3)(f), F.A.C., the table below provides the estimated annual jurisdictional revenue requirements for each year of the SPP.

	Estimated Annual Revenue Requirements (millions)
2020	$11.7
2021	$20.5
2022	$31.5
2023	$42.1
2024	$52.4
2025	$62.3
2026	$71.9
2027	$81.3
2028	$90.4
2029	$99.3

While Gulf has provided estimated costs by program as of the time of this filing and associated total revenue requirements in its SPP, consistent with the requirements of Rule 25-6.030, F.A.C., subsequent projected and actual program costs submitted for cost recovery through the Storm Protection Plan Cost Recovery Clause (per Rule 25-6.031, F.A.C.,) could vary by as much as 10-15%, which would then also impact associated estimated revenue requirements and rate impacts. The projected costs, estimated costs, actual costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause will all be addressed in subsequent filings in separate storm protection plan cost recovery clause dockets pursuant to Rule 25-6.031, F.A.C.[16]

VII. Estimated Rate Impacts for First Three Years of the SPP (2020-2022)

Gulf anticipates the programs included in the SPP will have zero bill impacts on customer bills during the first year of the SPP and only minimal bill increases for years two and three of the SPP. An estimate of hypothetical overall rate impacts for the first three years of the SPP (2020-2022) as stated in footnote 17 below are based on the total program costs reflected in this filing, without regard for the fact that pursuant to a Commission-approved settlement agreement, Gulf remains under a general base rate freeze until base rates are next established by the Commission.[17] The projected costs, estimated costs, actual costs, and true-up of actual costs to be included in Gulf's Storm Protection Plan Cost Recovery Clause will all be addressed in subsequent filings in separate storm protection plan cost recovery clause dockets pursuant to Rule 25-6.031, F.A.C.[18]

Pursuant to Rule 25-6.031, F.A.C., Gulf has not identified any reasonable implementation alternatives that could mitigate the resulting rate impact for each of the first three years of the SPP. As explained above, Gulf's SPP is largely a continuation of existing Commission-approved storm hardening programs and initiatives, which have already

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[16] The Commission has opened Docket No. 20200092-EI to address Storm Protection Plan Cost Recovery Clause petitions to be filed the third quarter of 2020.

[17] Pursuant to Rule 25-6.030(3)(h), F.A.C., the hypothetical rate impacts for Gulf's typical residential, commercial, and industrial customers for the first three years of the SPP (2020-2022) without regard for the fact that pursuant to a Commission-approved settlement agreement, Gulf remains under a general base rate freeze until base rates are next established by the Commission, are as follows for 2020, 2021, and 2022, respectively: Residential (RS) \$0.00118/kWh, \$0.00206/kWh, and \$0.00317/kWh; Commercial (GSD) \$0.00102 /kWh, \$0.00177/kWh, and \$0.00270/kWh; and Industrial (PX) \$0.00087/kWh, \$0.00158/kWh and \$0.00240/kWh. These rate impacts are for all programs included in the SPP and are based on the total estimated costs as of the time of this filing, which could vary by as much as 10% to 15%, regardless of whether those costs will be recovered in Gulf's Storm Protection Plan Cost Recovery Clause or through base rates.

[18] See footnote 16.

demonstrated that they have and will continue to provide increased T&D infrastructure resiliency, reduced restoration time, and reduced restoration costs when Gulf's system is impacted by severe weather events. Further, the estimated costs for the programs included in Gulf's proposed SPP are consistent with the historical costs incurred for the existing storm hardening and storm preparedness programs, which were most recently approved in Gulf's 2019-2021 Storm Hardening Plan.

VIII. Conclusion

The Florida Legislature has determined that it is in the State's interest to "strengthen electric utility infrastructure to withstand extreme weather conditions by promoting the overhead hardening of distribution and transmission facilities, undergrounding of certain distribution lines, and vegetation management," and for each electric utility to "mitigate restoration costs and outage times to utility customers when developing transmission and distribution storm protection plans." Section 366.96(1), F.S. Based on these findings, the Florida Legislature concluded that it is in the State's interest for each electric utility to develop and file a SPP for the overhead hardening and increased resilience of electric T&D facilities, undergrounding of certain electric distribution facilities, and vegetation management. See Sections 366.96(1) - (3).

Gulf's SPP is a systematic approach to achieve the legislative objectives of reducing restoration costs and outage times associated with extreme weather events and enhancing reliability. As explained above, Gulf's SPP is largely a continuation and expansion of its existing storm hardening and storm preparedness programs previously approved by the Commission, as well as a new distribution lateral undergrounding program to target certain overhead laterals for conversion from overhead to underground. Based on the recent experiences of Hurricane Michael, these existing storm hardening programs have a demonstrated and proven track record of mitigating and reducing restoration construction man-hours, outage times, and storm restoration costs, as well as improving day-to-day reliability. Gulf's SPP will continue and expand these important benefits to customers and the State.

APPENDIX A

(Gulf's Management Areas)

Gulf Power

Management Area/Customers Served

Docket No. 20200070-EI
Gulf's 2020-2029 Storm Protection Plan
Exhibit MS-1, APPENDIX A (Page 2 of 2)

Gulf Power GIS Department

REVISED 4/6/2020

APPENDIX B

(Hurricane Michael Forensic Analysis)

POST-STORM DATA FORENSICS ANALYSIS

Forensics Analysis on Hurricane Michael Storm Damage Survey Data

Gulf Power Company

Document No.: 10129258-HOU-PSFAR-01-B
Date: May 24, 2019

Project name:	Post-Storm Data Forensics Analysis	DNV GL Energy Insights USA, Inc.
Report title:	Forensics Analysis on Hurricane Michael Storm Damage Survey Data	Energy Advisory
Customer:	Gulf Power Company	1400 Ravello Drive
Customer contact:	Catherine S. Flory	Katy, TX
Date of issue:	May 24, 2019	77449
Project No.:	10129258	Tel: (303) 808-9795
Organization unit:	Operational Excellence	
Report No.:	1 [Rev.2]	
Document No.:	10129258-HOU-PSFAR-01-B	

Applicable contract(s) governing the provision of this Report:

Objective:

Prepared by:	Verified by:	Approved by:
James Leahy, P.E. Senior Consultant	Clay Tutaj Emergency Planning Consultant	Milton Omoto Head of Section

DNV GL Distribution:

☐ Unrestricted distribution (internal and external)

☐ Unrestricted distribution within DNV GL Group

☐ Unrestricted distribution within DNV GL contracting party

☒ No distribution (confidential)

Rev. No.	Date	Reason for Issue	Prepared by	Verified by	Approved by
0	20190115	Initial draft for review	Jim Leahy, P.E.	Clay Tutaj	Milton Omoto
1	20190524	Final Report	Jim Leahy, P.E.	Clay Tutaj	Milton Omoto
2					
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Appendices

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1 EXECUTIVE SUMMARY

This storm data forensics analysis report provides Gulf Power Company (Gulf Power) an overall assessment of the damages caused by Hurricane Michael (October 2018) to energy delivery poles and other structures in the Eastern District of its service area. It is intended to summarize the impacts to Gulf Power's distribution system from the storm and characterize root causes of the damage.

DNV GL Energy Insights USA, Inc. (DNV GL) performed this independent analysis of the storm damage data received from Gulf Power. In producing this report, DNV GL strived to provide a balanced report that includes an overview of the surveyed damage, a root cause analysis of asset failures, and the correlation of available weather conditions during the storm to the damage across the service area.

1.1 Approach to Data Collection

The sources of information used by DNV GL for this forensics analysis were primarily provided by Gulf Power. Some supplementary data was gathered by DNV GL to assist in the analysis including data from the National Oceanic and Atmospheric Administration (NOAA). Following the storm, which made landfall on October 10th, 2018, Osmose Utilities Services, Inc., under contract to Gulf Power, conducted a storm damage survey. The survey was conducted between October 11th and 13th, 2018. The scope of the survey was determined by Gulf Power and Osmose. Information on pole structures, underground transformers and junctions was gathered. This data, as well as other information about the Gulf Power system, including photographs of the damage and a database of geo-locational features was provided to DNV GL on Dec. 15th, 2018. Gulf Power also provided weather data from weather stations within and around the service area. This information formed the basis of the forensics analysis.

1.2 Storm Data Forensics Analysis Methodology

DNV GL used asset and storm damage survey data to perform a statistical analysis of damage and correlate potential contributing factors with impacts across the territory. To accomplish this, DNV GL produced one square mile grid cells for the utility's service area, with each grid containing a variety of factors such as maximum wind speed, maximum wind gust, geography, class and material type of distribution poles and density of assets within the area.

Using regression analysis and logit models, the storm damage survey data was correlated with weather data and other conditions. Accounts of damage (including broken poles, broken cross arms, wires down) were used to determine a failure probability in relation to wind speeds. The failure probabilities were then extrapolated to a 1-mile by 1-mile map grid across the Eastern District of the Gulf Power service area to provide an overall expected failure rate for the service area.

1.3 Conclusions of the Root Cause Analysis

Contributing factors for damage included in this analysis were wind speed, tree hitting pole and/or conductor, debris hitting pole, cross arm and/or conductor. Based on root cause analysis of data, the following conclusions were drawn:

- Pole damage (broken) and downed conductors was predominately due to wind-caused damage to trees (nearly 68% of the damage overall)
- Nearly 28% of the damage documented in the survey was due to wind only
- Damage showed a higher correlation with wind-gusts than with sustained wind speeds

- Urban versus rural settings showed no statistically significant correlation to damage; however, a substantial decrease in the damage rate in poles installed after 2007 was found (30-32% damage rate pre-2007; 11-14% damage rate 2007 and beyond).
- Areas considered 100-year flood-zones, or which have the potential to be impacted by storm surge showed no correlation with the damage[1]
- Considering that the area was not known to have been considerably affected by storm surge, underground transformers and junction structures were found to have very low failure rates (0.01%) based on survey data
- Of the damaged wooden poles surveyed, Class 3, Class 5, and Class 6 poles had a failure rate of 28%-33%, whereas Class 2 poles showed a 9% failure rate
- A 23% failure rate for all poles due to wind alone, falling trees or limbs, or other debris, may be expected when wind gusts exceed 85 mph according to the survey data collected.

Based on these findings, the expected total infrastructure damage rate for all areas affected by the storm in the Eastern District of Gulf Power was estimated to be 30% for all distribution poles. This is based on the extrapolated survey data and may be used to gauge overall performance of the system based on actual failure rates. It should be noted that this extrapolation is likely statistically biased in that only heavily impacted areas were surveyed.

The survey data as well as the analysis does indicate however, that newer construction standards and stronger pole classes (Class 2) outperformed those poles installed to older standards or those that were of Class 3, 5 or 6. This suggests that investments in storm hardening could reduce the extent of outages as well as restoration times from future storm events.

1.4 Definitions

The following definitions were used by DNV GL in this analysis:

Impacted or Damaged Infrastructure – This term is used to classify all poles or structures, leaning or broken that may or may not have been affected from the storm.

Broken Pole – A pole that failed due to the storm.

Damaged Conductor – Downed wires.

Broken Cross Arm – A damaged cross arm that required repair or replacement.

1.5 Disclaimer

The forensics data analysis performed as part of this post-storm assessment is based on the information provided by Gulf Power Company and Osmose, and publicly available data. DNV GL did not conduct field measurements in Gulf Power's service areas and therefore cannot accept liability for the accuracy of the data supplied to it.

[1] Data indicating the actual areas of flooding or extent of storm surge from Hurricane Michael were not available at the time of this analysis. To assess possible correlations between flooding or storm surge and damage, DNV GL reviewed FEMA 100-year flood plain maps and maps indicating areas of potential storm surge published by the National Hurricane Center data in relation to storm damage survey data.

2 INTRODUCTION

2.1 Background of Event

Hurricane Michael was a powerful Category 5 hurricane that made landfall near Mexico Beach, Florida at 12:30 PM CDT on October 10, 2018. At that time, the storm had estimated maximum sustained winds of 140 knots (~161) mph[2]. The storm was the fourth-strongest storm to make landfall in the U.S. and the most intense storm experienced by the Florida Panhandle on record.

Following the hurricane, Gulf Power contacted DNV GL with a desire to activate a data forensics analysis contract. These contracts are used to analyze storm damage data and summarize the impacts of the storm to Gulf Power's system as well as assess the root causes of the damage. Upon issuance of the contract, DNV GL worked with Gulf Power to obtain the necessary data to conduct the analysis.

2.2 Scope of this Assessment

This report documents the approach, methodology, and results of the storm data forensics analysis performed by DNV GL. The work scope for this assessment includes performing a forensics analysis on a sample of utility pole and structure data collected by Osmose Utilities, Inc. (Osmose), under contract to Gulf Power. Data collected by Osmose included storm impacted and damaged poles and structures, conductors, and other equipment. In assessing the damage data, Gulf Power had an interest in assessing damage to pole structures and the performance of underground transformers as well as junction structures in the area. DNV GL used the survey data as well as weather data recorded during the storm to perform the analysis and determine the root cause of failures.

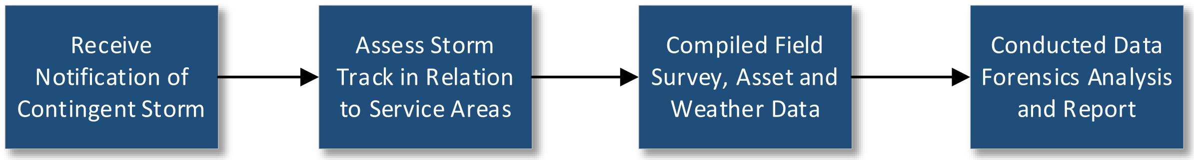
To accomplish this, DNV GL performed the following:

- Analyzed storm pattern to identify areas of probable impact and damage
- Defined a 1-mile by 1-mile grid map to assist in analyzing field survey data
- Analyzed data on storm damaged pole and impacted structures according to the field survey
- Correlated available weather data and geographical conditions to observed failures
- Performed a root cause analysis on damaged assets
- Extrapolated expected failure rates to the Eastern District of the Gulf Power service area
- Documented work and results of the data analysis in a report

[2] J. Beven, R. Berg and A. Hagan, National Hurricane Center, "Tropical Cyclone Report, Hurricane Michael", May 17, 2019

3 APPROACH AND METHODOLOGY

The storm data forensics analysis process is described as shown in the following flow diagram:



3.1 Initial Storm Track Assessment

A storm track assessment was performed to assess the direction and intensity of the storm as it passed over Florida and understand the areas of most probable damage. This involved using information available publicly to identify the path and intensity of Hurricane Michael as it relates to Gulf Power's service area. The National Oceanic and Atmospheric Administration – National Hurricane Center (NOAA-NHC) was the source of this information. NOAA-NHC provides data that shows the location of the storm at specific times along its course as well as the projected extent of high winds prior to the storm making landfall. Figure 3-1 shows the likely path of the hurricane as of 10:00 P.M. on Tuesday, October 9, 2018. Figure 3-2 presents the hurricane track and likely winds as of 10:00 A.M. on October 10, 2018. The storm made landfall at about 12:30 P.M. on October 10 with the center of the storm tracking just east of Panama City, FL.

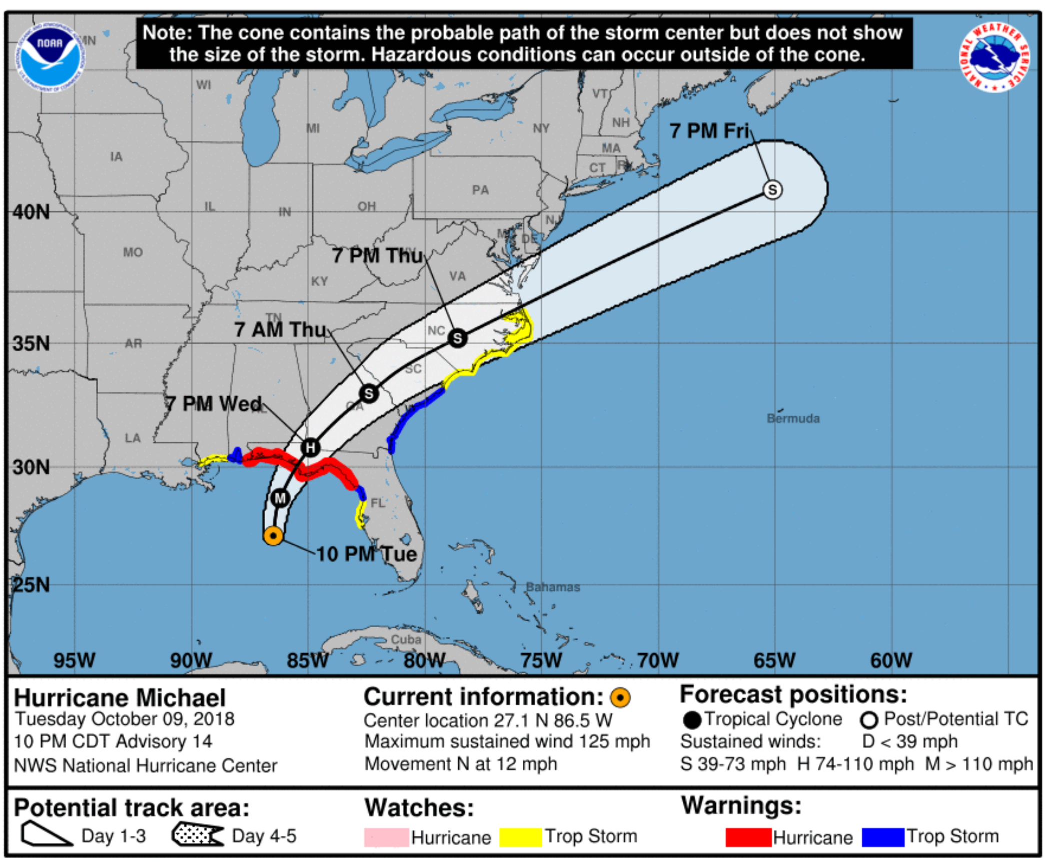


Figure 3-1 Hurricane Michael Predicted Path and Severity Map

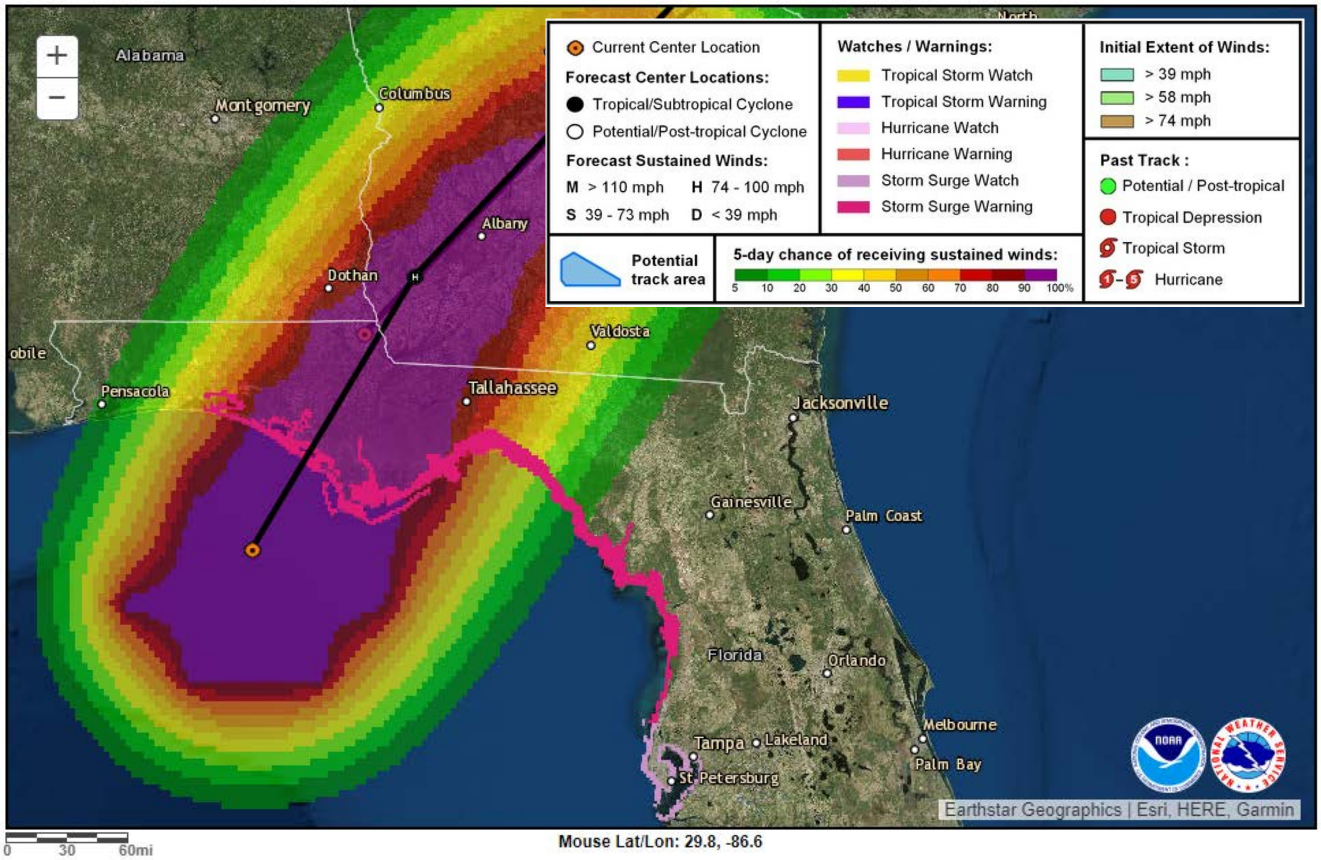


Figure 3-2 Hurricane Michael Storm Path and Likely Extent of Winds Above 57 mph (50 Knots)

3.2 Post-Storm Data Collection

Gulf Power provided DNV GL with pole and structure data for their entire service area. This data was combined with the storm track assessment to:

- Define 1-mile by 1-mile square grid cells to assess field survey data
- Assign grid cell identifiers to the Osmose field survey data
- Associate the survey data with the overall Gulf Power pole inventory

Survey areas for field data collected were determined by Gulf Power and Osmose. Much of the damage was concentrated in the Eastern District of the Gulf Power service area (Figure 3-3) near Panama City. This area experienced a category 5 severity storm with estimated sustained winds of up to 161 mph and was considered the priority area. When these conditions occur, catastrophic damage is expected. Hurricane Michael resulted in more than 45,000 structures being damaged in Bay County alone with an estimated $18.4 billion of losses total in Florida[3]. The survey had to be performed in a timely manner before significant

[3] J. Beven, R. Berg and A. Hagan, National Hurricane Center, “Tropical Cyclone Report, Hurricane Michael”, May 17, 2019

restoration activities began. The survey was conducted on above ground assets and underground transformers in order to determine the performance of both during this type of event.

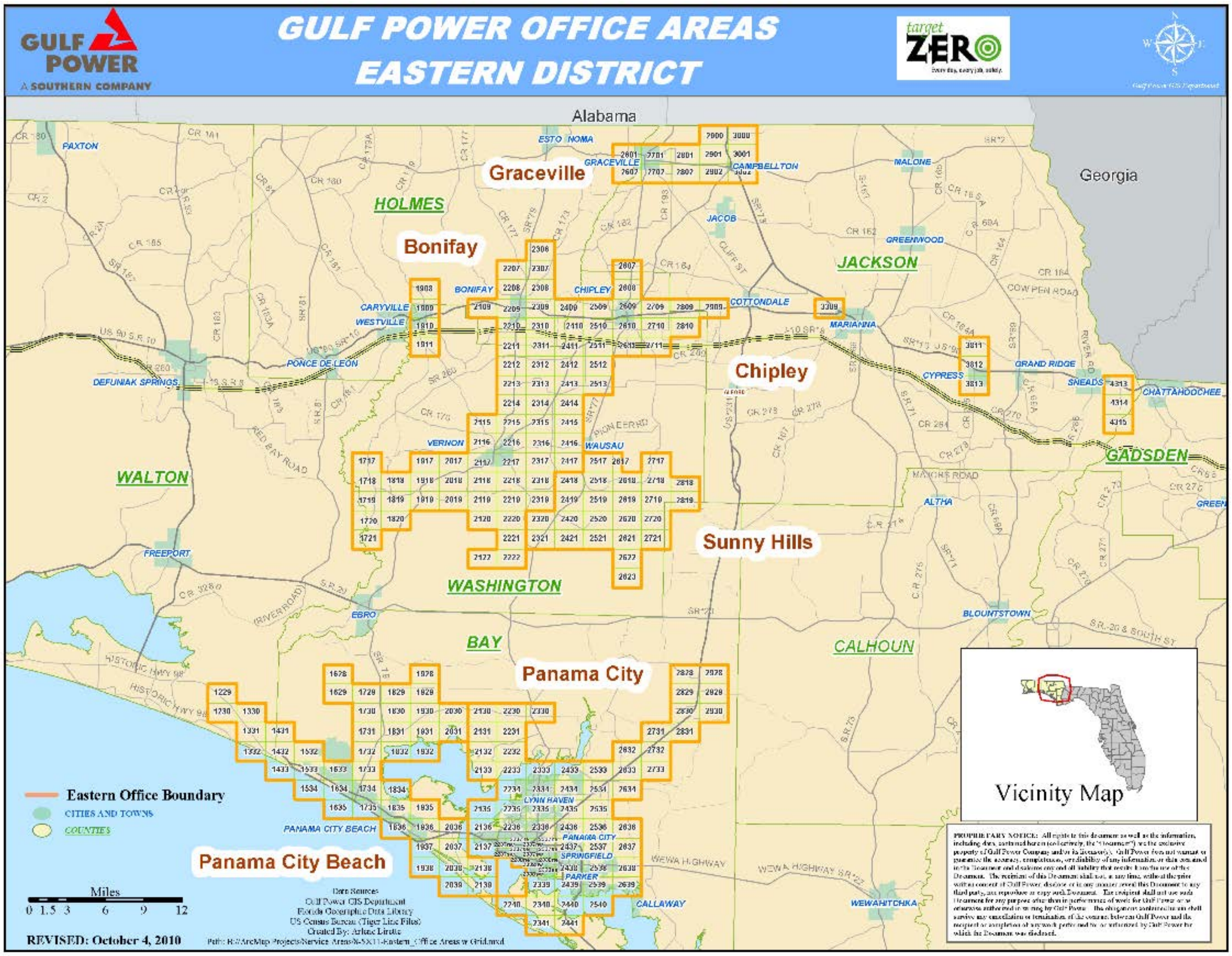


Figure 3-3 Gulf Power Eastern Office Service Area Map

Based on available weather station data, DNV GL interpolated wind speeds and wind gusts across the Gulf Power service area. The interpolated maximum sustained wind speeds, interpolated wind gusts are shown in Figures 3-4 and 3-5. Note that the weather station locations are labeled in each figure. Figure 3-6 shows the outage information as of October 16, 2018 for the service area, Figure 3-7 provides the pole density for the service area.

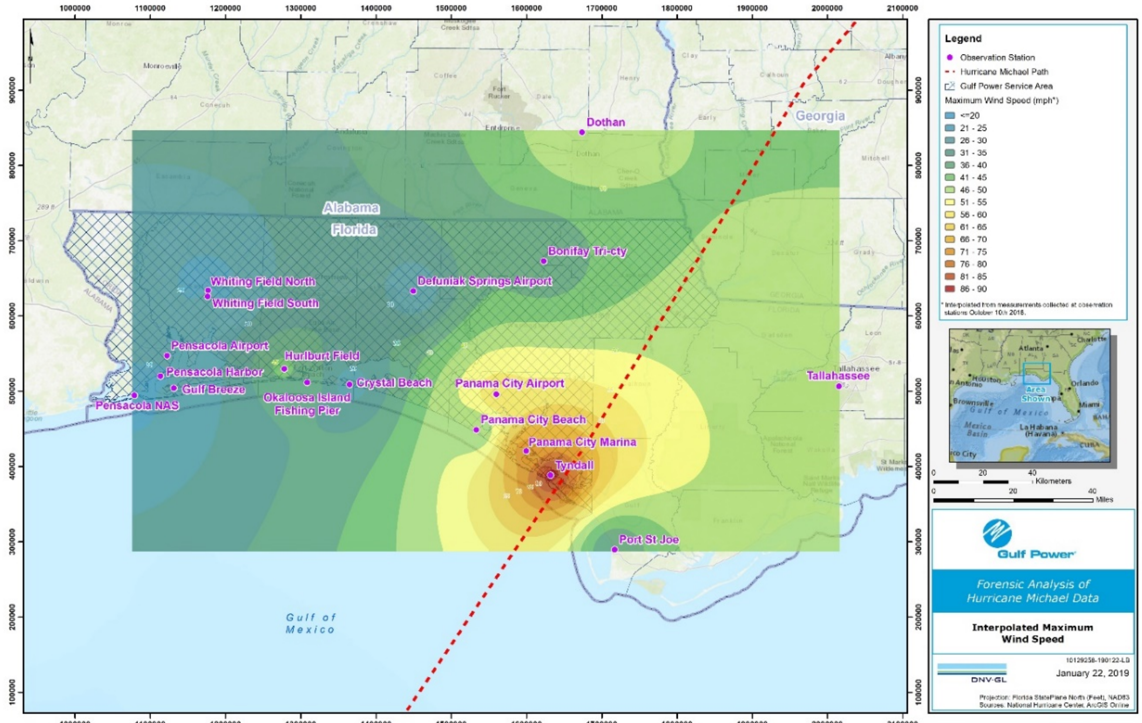


Figure 3-4 Interpolated Maximum Sustained Wind Speeds

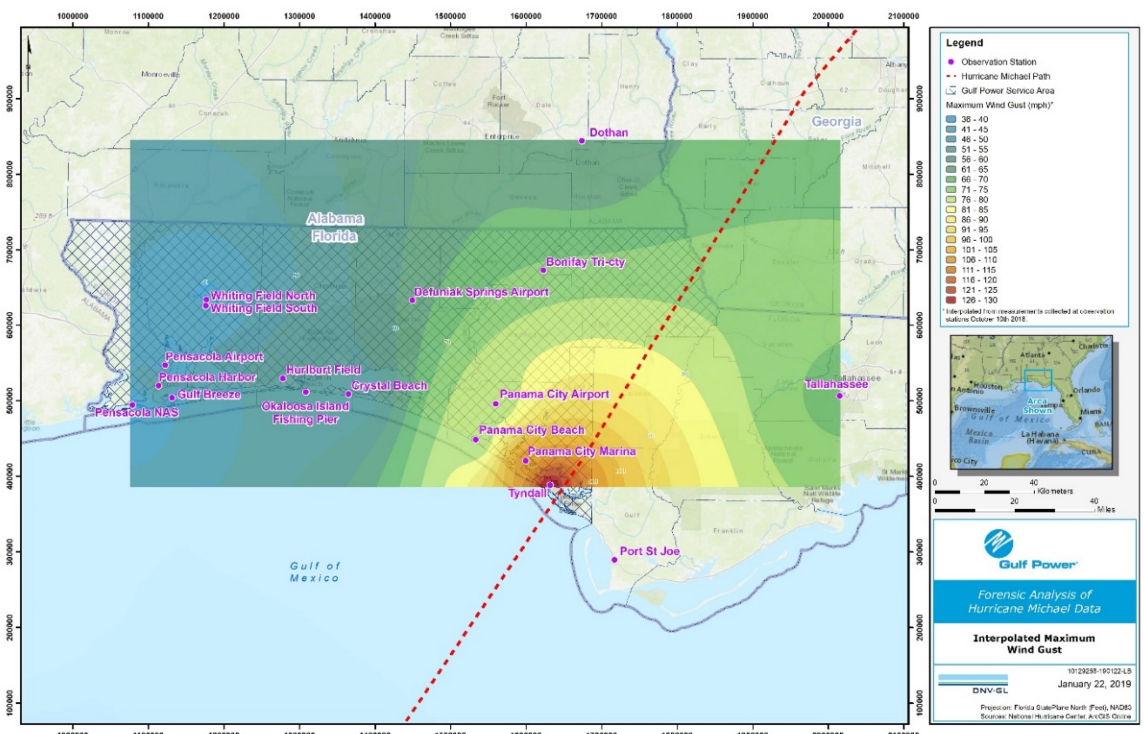
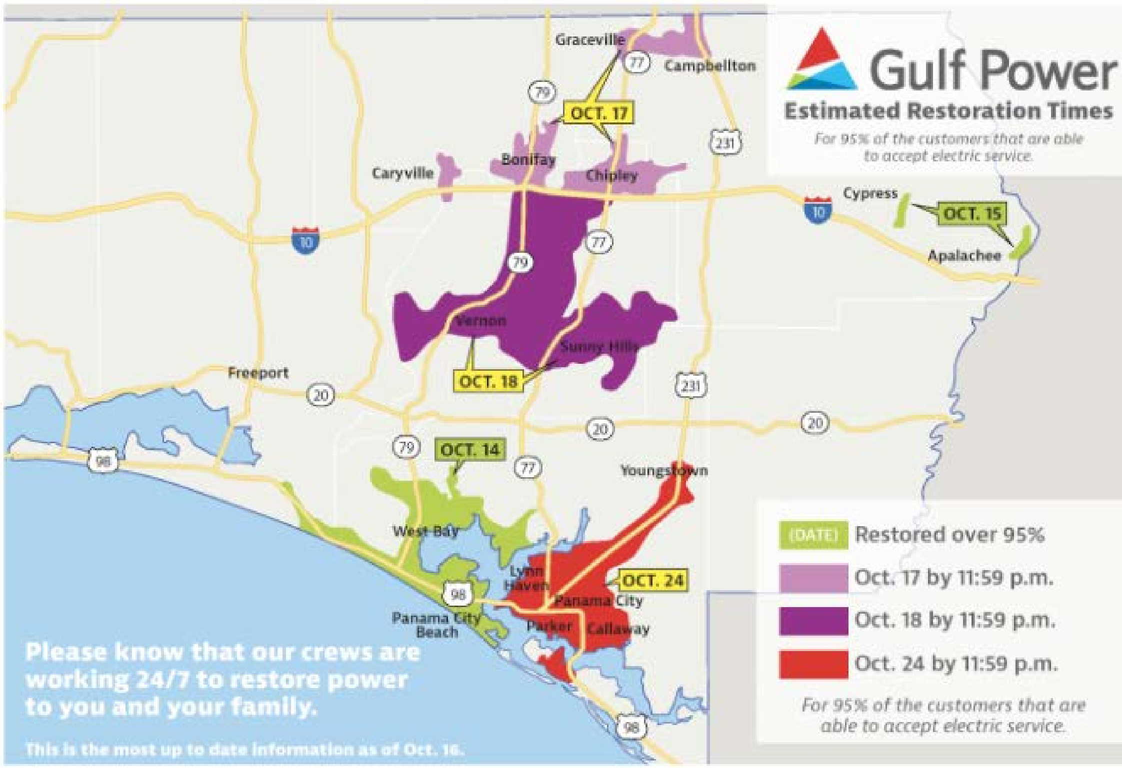


Figure 3-5 Interpolated Wind Gust[4]

[4] Maximum wind gusts were not recorded at Port St. Joe; therefore, wind gusts could not be interpolated south of Tyndall



Estimated Restoration Times as of 10/16/18 a.m.

Figure 3-6 Outage Map Example at 0930 Hour 09/11/2017

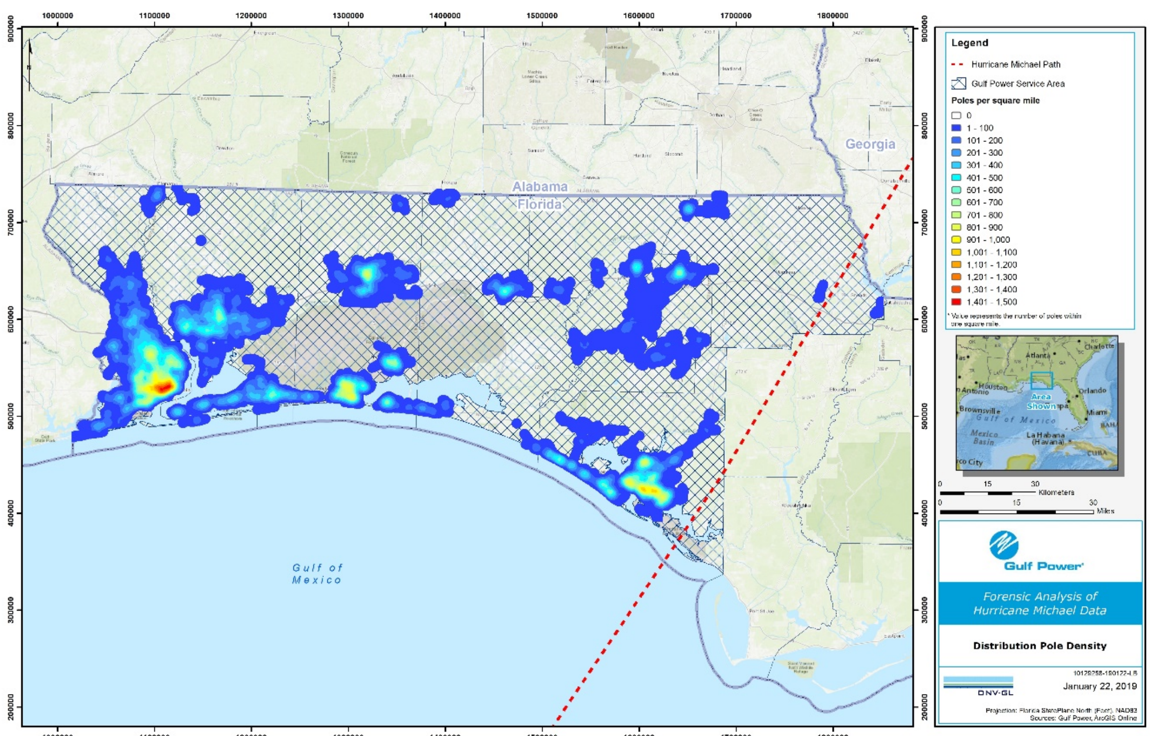


Figure 3-7 Distribution Pole Density

Osmose personnel performed the field survey in accordance with the plan developed with Gulf Power and collected impact and damage information to energy delivery poles, structures, conductors, and other equipment. This information was provided to DNV GL by Gulf Power for the analysis.

In all, 1,171 poles, 519 underground transformers, and 90 junctions were surveyed for a total of 1,780 structures. Of the 1,171 surveyed poles, 319 were damaged. The categories of reported impact, damage and quantities for poles were as shown in Table 3-1.

Table 3-1 Damage Categories from Survey

Damage description	Quantity
Conductor Down	168
Broken Pole	90
Leaning Pole	53
Cross Arm Broken	3
Other	4
Underground Dip Exposed	1
Total	**319**

The post storm data provided for underground transformers (n=519) and junctions (n=90) are limited in that only the status of the structure and the stated cause of damage were observed. For underground transformers, only four structures were damaged with two being damaged from debris on the transformer and two being damaged from being shifted. For junctions, only one structure was damaged due to the underground transformer being exposed. Given that systems were not energized at the time of the damage survey, it's possible that additional failures may have been experienced when systems were energized or upon further inspections.

3.3 Storm Data Forensics Analysis

DNV GL performed a forensics analysis on the storm damage survey data. The process includes:

- Compiling and cleaning the field survey data collected
- Summarizing impact and damage report data
- Developing a geo-locational based 1-mile by 1-mile grid for the Gulf Power service area
- Determining the pole failure rate by grid cells
- Analyzing contributing factors and associating the damage with a root cause

In conducting the storm damage survey, the survey team noted the likely contributing factors that caused the damage to the poles or structure. For this analysis, DNV GL merged the variations of contributing factors for each record into one root cause as shown in Table 3-2.

Table 3-2 Damage root cause

Root cause	Contributing factor 1	Contributing factor 2
Wind only	Wind	Wind
	Wind	Other
Wind & Tree	Wind	Tree
	Tree	Wind
	Tree	Tree
	Tree	[Blank]
Tree & Other	Tree	Other
	Other	Tree
Wind & Other	Wind	Other
	Other	Wind
Other	Other	Other
	[Blank]	Other
	Other	[Blank]

Section 4 of this report provides the results of this analysis including findings on the relationship between the impact and damage data and the root cause for pole, underground transformers and junction related damage.

3.4 Correlating Weather Data to Storm Damage

The analysis of contributing factors to the storm damage were based on weather data collected during the storm event at weather stations in the region. Weather information, including maximum sustained wind speed, wind direction and pressure, was obtained from 18 meteorological stations in the Gulf Power geographic area. The stations used are listed below in the following table. It should be noted that these observation sites were likely not located where maximum storm intensities could be sampled, which is typical of landfalling hurricanes. According to the NWS report on Hurricane Michael (May 2019), weather station observations were found to be below best track intensity estimates[5].

[5] J. Beven, R. Berg and A. Hagan, National Hurricane Center, “Tropical Cyclone Report, Hurricane Michael”, May 17, 2019

Table 3-3 List of the stations where sustained wind speeds and gusts were extracted

FID	Name	Max. Speed	Max. Gust	Unit
1	Bonifay Tri-city	35.7	N/A	mph
2	Crystal Beach	27.6	50.8	mph
3	Defuniak Springs Airport	26.5	N/A	mph
4	Dothan	49.5	61.1	mph
5	Gulf Breeze	29.1	43.9	mph
6	Hurlburt Field	41.4	54.1	mph
7	Okaloosa Island Fishing Pier	36.5	51.5	mph
8	Panama City Airport	57.5	76	mph
9	Panama City Beach	44.8	74.7	mph
10	Panama City Marina	72	107	mph
11	Pensacola Airport	29.9	41.4	mph
12	Pensacola Harbor	21	53	mph
13	Pensacola NAS	20.8	35.8	mph
14	Port St. Joe	36	N/A	mph
15	Tallahassee	47.2	69.1	mph
16	Tyndall	86.3	129.1	mph
17	Whiting Field North	18.3	35.8	mph
18	Whiting Field South	28.9	45	mph

This weather data allowed DNV GL to identify the timeframe and duration of the storm duration as it crossed over Florida. The duration was used for calculating average and maximum sustained wind speeds as well as maximum wind gusts. Several weather stations were excluded due to inconsistencies in readings which may be due to the geographic location of the station or damage incurred during the storm. For example, stations located over water showed a higher average wind-speed than those on land. We found that other stations zeroed-out after a certain time during the storm, indicating that these stations were disabled and may have suffered damage during the event. To correlate the weather data with damage survey data DNV GL:

- Interpolated wind speeds between weather stations
- Assigned wind speed values to each 1-mile by 1-mile grid cell
- Associated maximum wind gusts and wind speeds with the pole failure rates by grid cell

Figure 3-8 provides a mapping of the interpolated maximum sustained wind speeds across the area. Maximum wind gusts are illustrated in Figure 3-9. As can be seen, both figures show the maximum wind gusts and winds speeds occurring south of Panama City, near Tyndall.

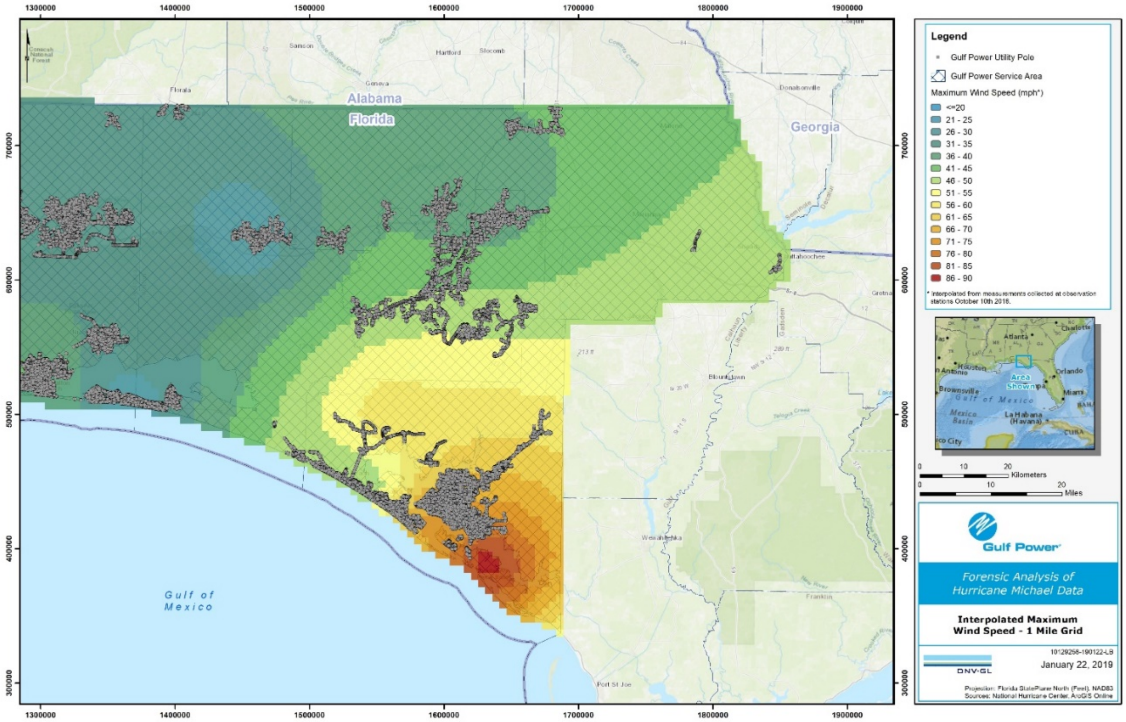


Figure 3-8 Interpolated Maximum Wind Speed

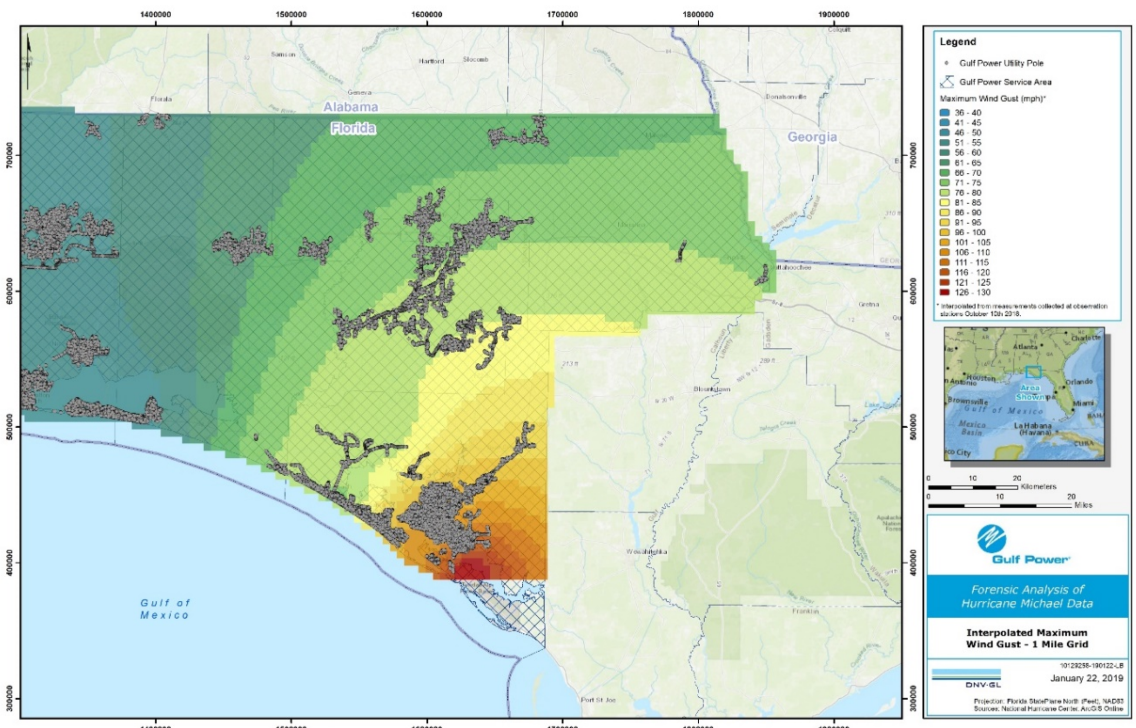


Figure 3-9 Interpolated Maximum Wind Gusts

3.5 Interpolation vs. Extrapolation

A key aspect to this forensics analysis is the difference between interpretation and extrapolation and how each was used. Interpolation was used when estimating between multiple known values. In the case of this analysis, the estimation of wind speeds and wind gusts between weather stations was interpolated based on recorded data at the stations. Extrapolation was used to make an estimate based on a sequence of information. In this case, the estimation of pole damage based on wind speeds to the service area was an extrapolation of information.

To produce the interpolated maps for this report (Figures 3-4, 3-5, 3-8 and 3-9), the maximum wind speed and maximum wind gust observed at 18 weather stations on October 10 was used. This data was provided by Gulf Power. The interpolation for each variable was conducted using inverse distance weighting (IDW) method to predict the values between multiple sets of points. In this technique, the measured values closest to the prediction location have more influence on the predicted value than those farther away. IDW assumes that each measured point has a local influence that diminished with distance. It gives greater weights to points closest to the prediction location, and the weights diminish as a function of distance. This technique does have limitations as it only considers distance to the measured location and does not consider local topography which can greatly influences wind speeds.

The estimated wind speed at each grid cell in the Gulf Power service area considered the distance of each cell from the weather stations as well as the wind contribution from all the stations. The equation for this is based on the weighted squared distance, where U is the interpolated wind speed, U_n is the known windspeed and r_n is the distance:

$$u = \frac{\left(\frac{u_1}{r_1^2} + \frac{u_2}{r_2^2} + \frac{u_3}{r_3^2} + \frac{u_5}{r_5^2}\right)}{\left(\frac{1}{r_1^2} + \frac{1}{r_2^2} + \frac{1}{r_3^2} + \frac{1}{r_4^2} + \frac{1}{r_5^2}\right)}$$

Extrapolation estimates were made by applying a known sequence of values to areas of unknowns with similar characteristics. For the storm data forensics analysis performed by DNV GL that follows, data extrapolation was applied to the grid cells in Eastern District of the utility service area where survey data was not collected to determine expected failure rates in those areas. The common characteristic used to extrapolate damage rate estimates was both the estimated maximum sustained wind speeds derived from the weather observation stations and maximum gusts.

4 STORM DATA FORENSICS ANALYSIS

DNV GL performed a thorough review and analysis of the available data to better understand impact and damage to the Gulf Power energy delivery infrastructure caused by Hurricane Michael. Findings with respect to the number of breakages, breakage rates, root causes, and explanations were documented in this report along with graphical maps to help visualize the information.

4.1 Available Data

Damage survey data collected by Osmose was used as the basis for the analysis. To assess the impact of the hurricane to Gulf Power's energy delivery system, DNV GL calculated a ratio of damaged poles/structures versus surveyed poles and structures and then evaluated the potential root causes. Significant effort was made to evaluate available information pertaining to pole or structure type, class, location, and other attributes.

4.2 Distribution Pole Population Data

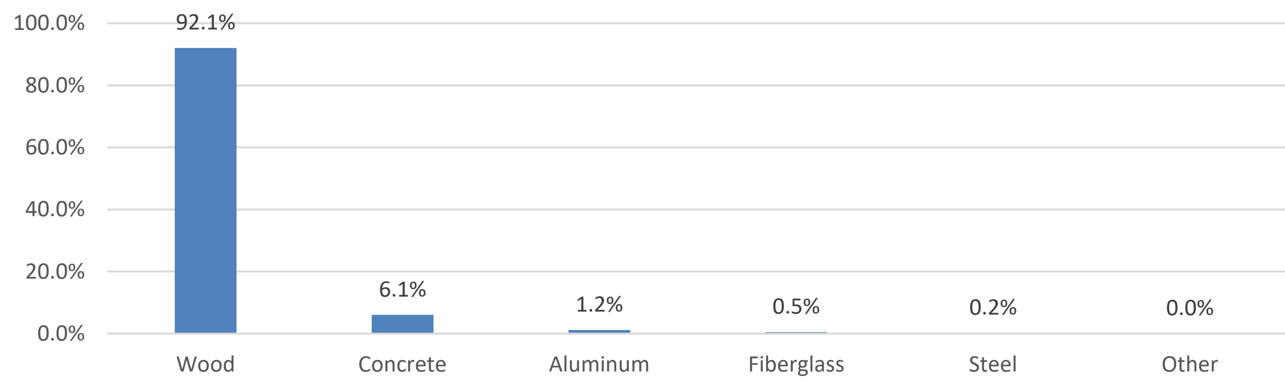
Geo-locational based pole record data provided by Gulf Power was processed and used for this analysis. This information served as the reference point for the resulting storm impacts and damages. This was the most accurate data source with respect to quantities, material and class of poles and other structures. Table 4-1 gives a summary of the pole population by material type for the Eastern District of the Gulf Power service area.

Table 4-1 Total Gulf Power pole population by material type in Eastern District

Type	Number of poles
Wood	54,068
Concrete	3,561
Aluminium	681
Fiberglass	312
Steel	101
Other	6
Unknown	962
Total	**59,691**

As shown in the table – and illustrated in Figure 4-1 – about 92% percent of the poles in the Eastern District of the Gulf Power service area are made from wood, with concrete poles being the second most common type at about 6% of the total population.

Figure 4-1 Graph of Pole Population by Material Type for Eastern District



Furthermore, the population of wooden poles by class, as shown in Table 4-2.

Table 4-2 Classification of Gulf Power wooden poles

	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	H-class	Unk
Wood poles	5	755	451	10,837	192	36,261	5,223	44	30	270
% of wood poles	0.0%	1.4%	0.8%	20.0%	0.4%	67.1%	9.7%	0.1%	0.1%	0.5%

These poles are located largely along the coast in the Panama City area, but the Eastern District of the Gulf Power service area includes communities further inland to the northern Florida state border with Alabama. Figure 4-2 shows the pole densities in the eastern portion of the Gulf Power service area. The scale indicates the number of poles present in a specific area.

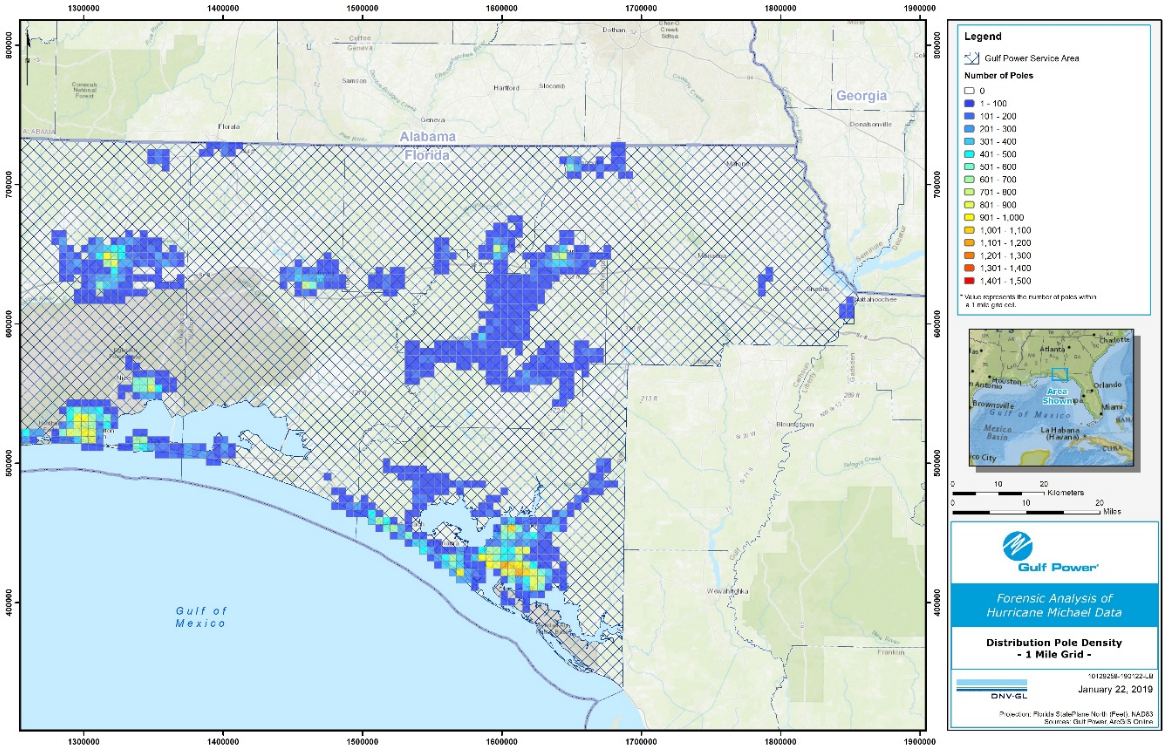


Figure 4-2 Total Gulf Power Distribution Pole Density Map

4.3 Damage Report Data

After the storm, Osmose, under contract to Gulf Power, surveyed impacts and damages to the Gulf Power energy delivery infrastructure in the Eastern District. In total, 319 reports of pole damage were collected from in the survey (about 1% of the Gulf Power pole assets). Details about the reported damage from collected data are provided in Table 4-3. Grid zones where less than 30 poles were surveyed are removed from this table as they provide misleading damage rates[6]. The impact and damage categories include poles (leaning or broken), conductor (wire down), cross arm damage, and "other." The other category includes miscellaneous impact or damage to service poles, lighting poles, and so on.

In the table below, poles are associated with a cell within the 1-mile by 1-mile grid (See section 3.4 and 5.1). Impacts and damages are related to distribution poles or structures because this was the reference source used (pole tag or ObjectID). Leaning poles were included in the analysis as impacted. It's understood that leaning poles reported to be 20º or even 30º from vertical may have existed prior to the storm and may or may not be the result of storm winds. However, there were several leaning poles reported that had greater angles of lean, and it was determined that these poles were to be included in the analysis.

[6] Several grid zones that were surveyed had a low sample size with all surveyed poles damaged – resulting in a failure rate of 100%. This is a statistically inaccurate representation of the damage. Thus, n=30 was used as the minimum requirement for an observation consistent with traditional sample sizes. For a full list of details for all grids include those with less than 30 observations per grid cell, please refer to Appendix A.

In summary, it was observed that the surveyed failure rates by grid cell where the surveyed number of poles was greater than 30, the damage rates vary widely from 0% to 61%. This wide range of failure rates further motivates the methodology used in this study to better understand failure rates through geospatial, statistical, and econometrical techniques. Note that this failure rate is only within the sampled survey areas, and these sampled areas most likely sustained more damage than other areas. The failure rates include all categories of damage including leaning poles. Actual pole damage (breakage) was low, even in the surveyed areas[7].

[7] As provided, this damage percentage range cannot be directly extrapolated to the entire Gulf Power service area because of the variation in sampling by grid cell. The method for using this information to extrapolate damage estimates to the larger service area is described in Section 5.

Table 4-3 Failure rates by distribution and streetlight pole per survey data in the Eastern District (n≥30)

Grid zone	Zone type	Total pole pop.	Poles surveyed	Surveyed poles damaged	Damage rate	Pole broken		Pole leaning		Conductor damage		Damaged cross arm		Underground dip exposed		Other	
						Number damaged	Rate	Number damaged	Rate	Number damaged	Rate	Number damaged	Rate	Number damaged	Rate	Number damaged	Rate
1118	Rural	129	46	28	61%	13	28%	6	13%	9	20%	0	0%	0	0%	0	0%
1160	Rural	40	31	12	39%	0	0%	2	6%	10	32%	0	0%	0	0%	0	0%
1191	Rural	126	35	12	34%	4	11%	1	3%	7	20%	0	0%	0	0%	0	0%
1234	Rural	87	60	21	35%	3	5%	0	0%	17	28%	0	0%	1	2%	0	0%
1307	Rural	129	75	6	8%	1	1%	1	1%	4	5%	0	0%	0	0%	0	0%
1379	Urban	219	74	7	9%	1	1%	1	1%	4	5%	0	0%	0	0%	1	1%
1772	Urban	785	72	38	53%	9	13%	5	7%	24	33%	0	0%	0	0%	0	0%
1901	Urban	693	112	63	56%	20	18%	11	10%	32	29%	0	0%	0	0%	0	0%
2411	Urban	925	41	3	7%	0	0%	0	0%	2	5%	1	2%	0	0%	0	0%
2810	Urban	489	141	2	1%	0	0%	0	0%	2	1%	0	0%	0	0%	0	0%
2811	Rural	41	30	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2865	Urban	366	119	2	2%	0	0%	0	0%	1	1%	0	0%	0	0%	1	1%

Table 4-4 shows the distribution of impacted and failure rates related to distribution wooden poles only, according to pole class in the grid areas surveyed. As shown, poles class 3, 5 and 6 show the highest related failure rate. These are also the most common wood pole classifications. Note again that these impacted rates include pole damage (broken), pole leaning, damaged conductor (line down), and damaged cross arm, whereas damaged rates do not include leaning poles.

Table 4-4 Failure and impacted rates of wooden poles by class from damage survey records

	Class 0	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Unk
Surveyed Wooden Poles	1	38	43	394	2	662	3	28
Damaged Wood Poles	0	0	4	121	0	190	1	3
% Damaged of Sample	0.0%	0.0%	9.3%	30.7%	0.0%	28.7%	33.3%	10.7%

Finally, Table 4-5 shows the damage and impacts to distribution poles by root cause (as given by the field survey reports). Damage and impacts are related to feeder, lateral, and material. As the table shows, 40% of the damage to feeder was caused by trees and wind and 55% was caused directly by wind.

Table 4-5 Damaged circuit and pole type by root cause

Type	Material	Wind Only	Wind & Tree[8]	Tree & Other	Wind & Other	Other	Total
Feeder		**26**	**19**	**0**	**0**	**2**	**47**
		55%	**40%**	**0%**	**0%**	**4%**	**99%**
	Wood	25	17	0	0	2	44
		57%	39%	0%	0%	5%	101%
	Concrete	1	2	0	0	0	3
		33%	67%	0%	0%	0%	100%
Lateral		**63**	**198**	**1**	**5**	**5**	**272**
		23%	**73%**	**0%**	**2%**	**2%**	**100%**
	Wood	63	197	1	5	5	271
		23%	73%	0%	2%	2%	100%
	Steel	0	1	0	0	0	1
		0%	100%	0%	0%	0%	100%

Table 4-6 shows the damage type by root cause including pole breakage, pole leaning, conductor damage (wire down) and broken cross arm. As can be seen, broken poles and downed conductors were primarily caused by trees. About 68% of the damage was associated with this cause. Nearly 28% of the damage was due to wind only. Downed conductors also made up 52.7% of the damage overall. Table 4-7 shows the percent of damaged poles by geographic area. These tables are relevant to distribution poles only.

[8] Occurrences of “tree only” are recoded as “wind & tree” due to the assumption that the wind is a contributing factor to a tree being the culprit of damage.

Table 4-6 Gulf Power damage type by root cause

Material	Wind Only	Wind & Tree	Tree & Other	Wind & Other	Other	Total
	89	**217**	**1**	**5**	**7**	**319**
Pole Broken	29	57	1	2	1	**90**
	9.1%	17.9%	0.3%	0.6%	0.3%	**28.2%**
Pole Leaning	26	27	0	0	0	**53**
	8.2%	8.5%	0.0%	0.0%	0.0%	**16.6%**
Conductor Down	31	129	0	2	6	**168**
	9.7%	40.4%	0.0%	0.6%	1.9%	**52.7%**
Cross Arm Broken	2	0	0	1	0	**3**
	0.6%	0.0%	0.0%	0.3%	0.0%	**0.9%**
Underground Dip	0	1	0	0	0	**1**
Exposed	0.0%	0.3%	0.0%	0.0%	0.0%	**0.3%**
Other	1	3	0	0	0	**4**
	0.3%	0.9%	0.0%	0.0%	0.0%	**1.3%**

Table 4-7 Number of damaged and impacted poles per grid zone type in the surveyed sample

Type of grid zone	#all poles	#damaged	Failure rate%
Rural	443	122	27.5%
Urban	728	197	27.1%

As previously mentioned, the post storm survey data provided information on underground transformers (n=519) and junctions (n=90). According to the survey data, only four underground transformer structures were identified as damaged with two being damaged from debris on the transformer and two being damaged from being shifted. Additionally, one was not in the field. For junctions, only one structure was damaged due to the underground transformer being exposed. Based on this information, the failure rate for these structures was 0.01%. It should be noted however, that the Gulf Power service area did not experience the same level of storm surge or flooding that was experience further east along the coast between Mexico Beach and Indian Pass.

4.4 Confidence level

Hurricane Michael post storm forensic analysis resulted in 319 survey records of damage in a survey of 1,171 poles (approximately 27.2% of surveyed poles damaged) versus a total amount of 298,411 poles within Gulf Power's service area. This amounts to a sample size of 0.11% of damaged poles against the total population. This sample size is generally sufficient for statistical analysis resulting in a 99% confidence level and a lower-upper range of approximately 23.9-30.6%. This indicates from statistical analysis that this sample yields damage results in a range of 27.2 ± 3.3% with 99% certainty.

4.5 Urban vs. rural and age analysis

DNV GL categorized grid cells as urban or rural to determine whether greater or less dense energy delivery infrastructure influenced the amount of impact from the storm. Figure 4-3 provides the graphic representation of urban versus rural geographic breakdown for the service area.

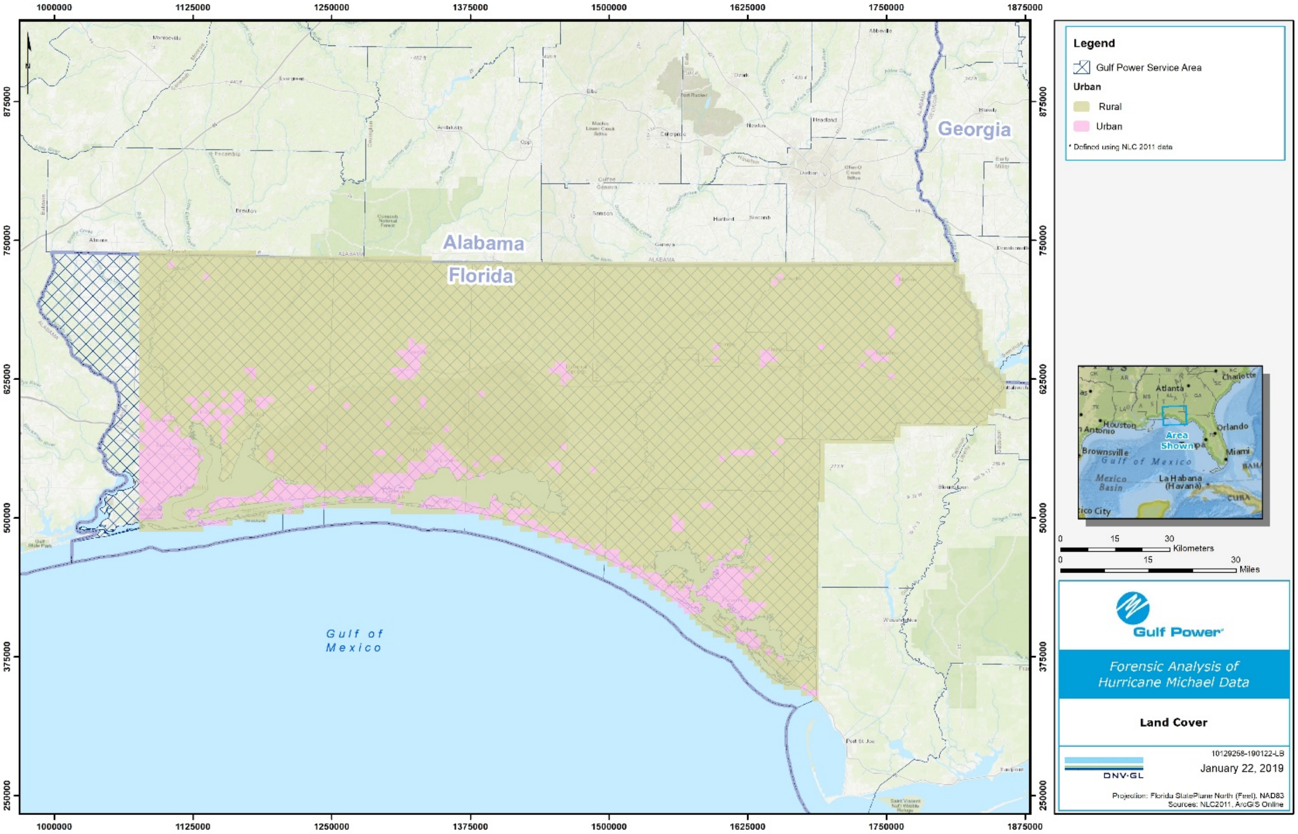


Figure 4-3 Land Cover Classification

Based on the analysis, no statistical correlation was found between reported damage and urban or rural classifications. As a robustness check, a basic logit model was employed regressing grid cell type with damage rates. No statistical evidence was found that a zone classified as rural or urban affected the damage of poles.

DNV GL created a pre/post 2007 pole installation variable to account for a change in construction standards in the year 2007. The results suggest that poles installed in 2007 or prior were more likely to be damaged than pole installed more recently. A statistically significant relationship exists between pre/post 2007 installation and whether the pole was damaged. A full display of rural vs. urban and pre/post 2007 installation by damage rates are shown below. Table 4-8 provides the breakdown of damage rates by of rural and urban areas and year of standard changes of poles.

Table 4-8 Damage rate by Rural vs. urban with age of poles surveyed

	Urban			Rural		
	Surveyed	**Damaged**	**Damage rate**	**Surveyed**	**Damaged**	**Damage rate**
Installed Pre-2007	548	178	32%	369	112	30%
Installed 2007 or after	180	19	11%	74	10	14%

4.6 Analysis of flood impacted areas

As part of the analysis, DNV GL reviewed the storm damage survey data versus available NOAA potential storm surge[9] and FEMA flood zone locations to understand if there may be any correlation with these conditions. From NWS measurements[10], the greatest amount of storm surge occurred southeast of Tyndall Air Force Base, where it was estimated to be 9-14 feet above ground level. Storm surge inundation heights dropped off significantly west of Mexico Beach, where the hurricane made landfall. Around Panama City and St. Andrew Bay the inundation height was estimated to be 4-6 above ground level.

We reviewed underground transformer, junction structure, and the pole damage data with respect to this information. Of the underground transformers that were surveyed, 42 were in a FEMA flood zone and only 1 of those was damaged (2.4%). Additionally, 1 underground transformer overlapped with a NOAA estuarine wetland/intertidal zones and 6 underground transformers overlapped NOAA areas of potential storm surge; no underground transformers were damaged in these areas. For junctions, 11 structures were within FEMA flood zones, none of which were damaged. No junctions overlapped with NOAA storm surge areas. Of the surveyed poles, 26 were within the NOAA storm surge areas, of which none were damaged. There were 112 surveyed poles that overlapped with the FEMA flood zone areas. Forty-two of these were damaged (37.5%).

Figures 4-4 and 4-5 provide examples in the Gulf Power Eastern District service area where damage survey information was collected, the locations of flood zones and areas of potential storm surge. As can be seen, very few of the structures found to be damaged lie within flood zone or areas of potential storm surge.

[9] Actual measurements of storm surge inundation from Hurricane Michael were not available at the time of this this analysis..
[10] J. Beven, R. Berg and A. Hagan, National Hurricane Center, “Tropical Cyclone Report, Hurricane Michael”, May 17, 2019

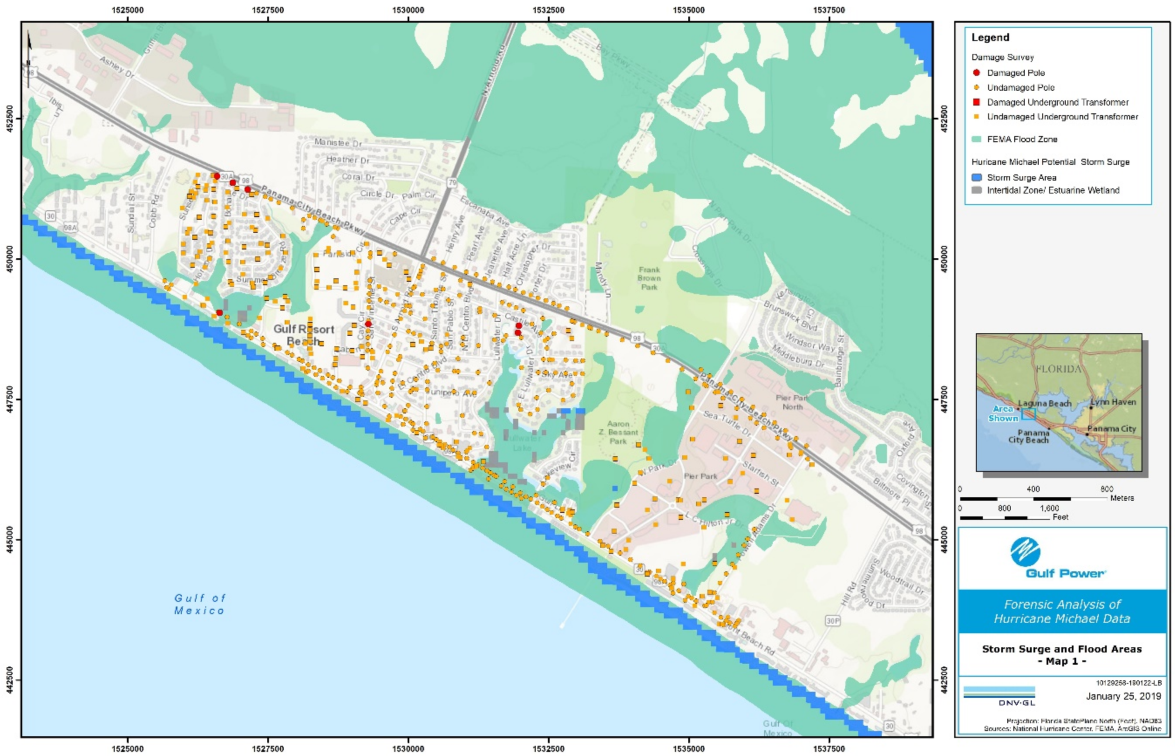


Figure 4-4 Coastal Storm Surge and Flood Area Map with Damage Survey Data

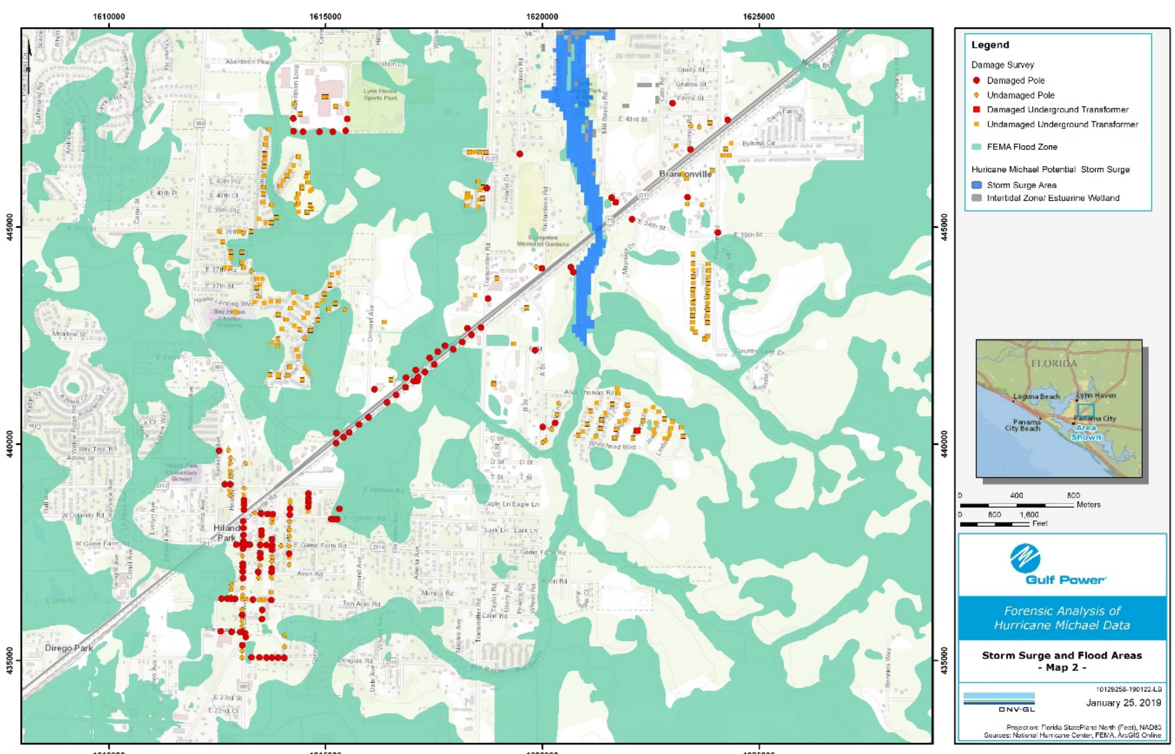


Figure 4-5 Inland Storm Surge and Flood Area Map with Damage Survey Data

5 DAMAGE EXTRAPOLATION ANALYSIS

The purpose of the extrapolation analysis was to determine expected failure rates by grid cell for the Eastern District of Gulf Power's service area in order to compare actual damage versus expected damage. This was done using the damage survey data and the calculated failure rates by wind speed.

5.1 Description of Map Grid Cells

DNV GL divided the Eastern District of the Gulf Power service area into 552 1-mile by 1-mile grid cells, each numerically identified and associated with maximum wind gust and wind speed characteristics, and urban versus rural. The pole/structure damage data was also associated with a grid cell based on the pole/structure location. This information was used to identified statistical relationships between the damaged assets and contributing factors.

The breakdown between urban and rural grid cells is shown in Table 5-1.

Table 5-1 Gulf Power grid cells by urban and rural areas in the Eastern District

Type	Number of grid zones	Percentage of total
Urban	125	23%
Rural	427	77%
Total	**552**	

Table 5-2 shows the distribution of poles in relation to urban or rural areas.

Table 5-2 Gulf Power distribution and transmission poles, street lights by grid zone type in the Eastern District

	Urban		Rural		Total
	Population	Percent of total	Population	Percent of total	
Poles	33,920	57%	19,278	32%	53,198
Street Light	5,385	9%	1,108	2%	6,493
					59,691

5.2 Key Assumptions for Extrapolation Analysis

To determine expected failure estimates based on the available data, DNV GL extrapolated the failure rates from the surveyed grid cells to Eastern District of the utility service area. In doing so, the following assumptions were used:

1. Each grid cell is of one type, i.e., either Rural or Urban;
2. Wind speed data: each grid cell contained an estimated maximum wind gust and wind speed value based on available weather data; actual conditions may have varied;
3. The Osmose field survey concentrated on high probability of damage areas;

4. The contributing factors for each record of damage to pole/structure were merged into one cause as noted in Table 3-1. Again, surveyed damage included pole damage (breakage), impacted pole (leaning), damaged conductor (wire down), and damaged cross arm.

5.3 Correlation of Weather Data to Storm Damage

The extrapolation of damaged distribution infrastructure for the Eastern District of the Gulf Power service area was performed using the average sustained wind speeds and maximum wind gusts associated with the surveyed grid cells. Failure rates by grid cell were estimated based on the ratio of number of damaged poles surveyed to total number of poles surveyed per grid cell. Grid cells with less than 30 poles surveyed (n=30) were removed to avoid skewing of results consistent with the previous notes about misleading data due to small sample sizes (see Section 4.3). This resulted in a total sample size of n=841 used for the failure rate estimates out of the original 1,171 poles and structures surveyed (71.8%).

Failure rates by grid cell were modelled using a simple linear regression twice for (1) average sustained wind speed (mph) and (2) maximum wind gust (mph). Understanding that failure rates are not a solely a function of wind speeds, DNV GL sought to determine a better estimate of failure rates by controlling for variation of several other pole attributes. These other attributes include the year the pole was manufactured, if the pole was in an urban location (urban = 1; rural = 0), if the pole is wooden (wood = 1; otherwise = 0), the height (ft) of the pole, if the pole was on a feeder line (feeder line = 1; otherwise = 0), and if the pole was installed before or after the new 2007 construction standard (installed in 2007 and beyond = 1; installed in 2006 or before = 0). Outputs from both models are shown below in Table 5-3 with coefficients and standard errors for the respective models[11]. Note that the R^2, a common measure of goodness-of-fit for econometric models[12], is higher for the maximum wind gust than for the average wind gust. This indicates that maximum wind gust captures more variation in the failure rates and is thus a better explanation for pole damage rates than sustained wind speed.

[11] Interpretation of the model will not be the focus of this section as the model is used to provide a per pole failure rate as opposed to a failure rate attributed to an area.

[12] R^2 is a common statistical measure for goodness-of-fit for econometric models – in this case an ordinary least square estimate of failure rate by controlling either average wind speed or maximum wind gust. High R^2 values suggest that the model better explains the variation and is evidence of a stronger predication.

Table 5-3: Linear regression of average wind speed and maximum wind gust (mph)

Dependent Variable: Observed grid cell pole failure rate

	Avg. Wind Speed (Std. Error)	**Max. Wind Gust (Std. Error)**
Intercept	-4.947*** (0.762)	-4.068*** (0.686)
Wind Speed (mph)	0.017*** (0.000)	0.015*** (0.000)
Year Manufactured	0.002*** (0.000)	0.002*** (0.000)
New Construction Standard	-0.044*** (0.012)	-0.046*** (0.011)
Urban	-0.183*** (0.009)	-0.158*** (0.008)
Wood	0.219*** (0.019)	0.219*** (0.017)
Height (ft)	-0.007** (0.001)	-0.005*** (0.001)
Feeder	0.004 (0.014)	0.007 (0.012)
R^2	0.807	0.843

Statistical significance levels of * p<0.1, **p<0.05, ***p<0.01

The output from these models provides the ability to estimate the failure rate for average wind speed and maximum wind gust by pole as opposed to by region. The linear form of these results are determines using the following equations[13]:

$$Failure\ Rate_{i,Avg\ Wind\ Speed} = Intercept + 0.017(Avg.\ Wind\ Speed) + 0.002(Year) + \cdots + 0.004(Feeder)$$

$$Failure\ Rate_{i,Max\ Wind\ Gust} = Intercept + 0.015(Max.\ Wind\ Gust) + 0.002(Year) + \cdots + 0.007(Feeder)$$

Once the failure rates by average sustained wind and maximum wind gust were imputed to each pole based on its characteristics, the overall failure rates were modelled to determine an estimated failure rate for the service area as a whole. Because these estimations are subject to error, DNV GL included an upper and lower confidence estimate to provide a confidence level of the failure rates. The output of these models is shown below in Table 5-4.

[13] For simplicity, only the first two and last variables are included in the equation to show the structure of the linear estimation.

Table 5-4: Dependent Variable: Imputed individual pole failure rate

	Avg. Wind Speed		
	Point (Std. Error)	**Upper Confidence (Std. Error)**	**Lower Confidence (Std. Error)**
Intercept	-0.451*** (0.017)	-0.260*** (0.018)	-0.421*** (0.010)
Wind Speed (mph)	0.013*** (0.000)	0.013*** (0.000)	0.010*** (0.000)
R^2	0.674	0.672	0.781
	Max. Wind Gust		
	Point (Std. Error)	**Upper Confidence (Std. Error)**	**Lower Confidence (Std. Error)**
Intercept	-0.868*** (0.022)	-0.692*** (0.022)	-0.740*** (0.013)
Wind Speed (mph)	0.013*** (0.000)	0.013*** (0.000)	0.010*** (0.000)
R^2	0.759	0.756	0.840

Statistical significance levels of * p<0.1, **p<0.05, ***p<0.01

To show these results graphically, the intercept and wind speed coefficients were graphed to show the linear relationship between estimated failure rates and sustained wind speed and maximum wind gust. These graphical representations of the estimations are shown below in Figure 5-1 where the dark blue line represents the average sustained wind speed failure rate with light blue lines showing the upper and lower confidence intervals. The maximum wind gust failure rate is shown as the dark green line with light green lines representing the upper and lower confidence interval.

From Figure 5-1, we see that there is a failure rate of 0% below 18 mph winds. Between 18 mph and 41 mph of sustained average winds, failure rates begin to rise. The point estimate shows that failure rates begin at 33 mph sustained average winds. These continue to increase at a linear rate with 25% failure at 53 mph, 50% failure at 72 mph, 75% failure at 90 mph, and 100% failure 110 mph sustained average winds. For maximum wind gusts, failure rate remains at 0% until between 52 mph and 74 mph maximum wind gust. The point estimate shows that failure rates begin at 67 mph maximum wind gust. These continue to increase at a linear rate with 25% failure at 88 mph, 50% failure at 105 mph, 75% failure at 125 mph, and 100% failure at 144 mph maximum wind gust.

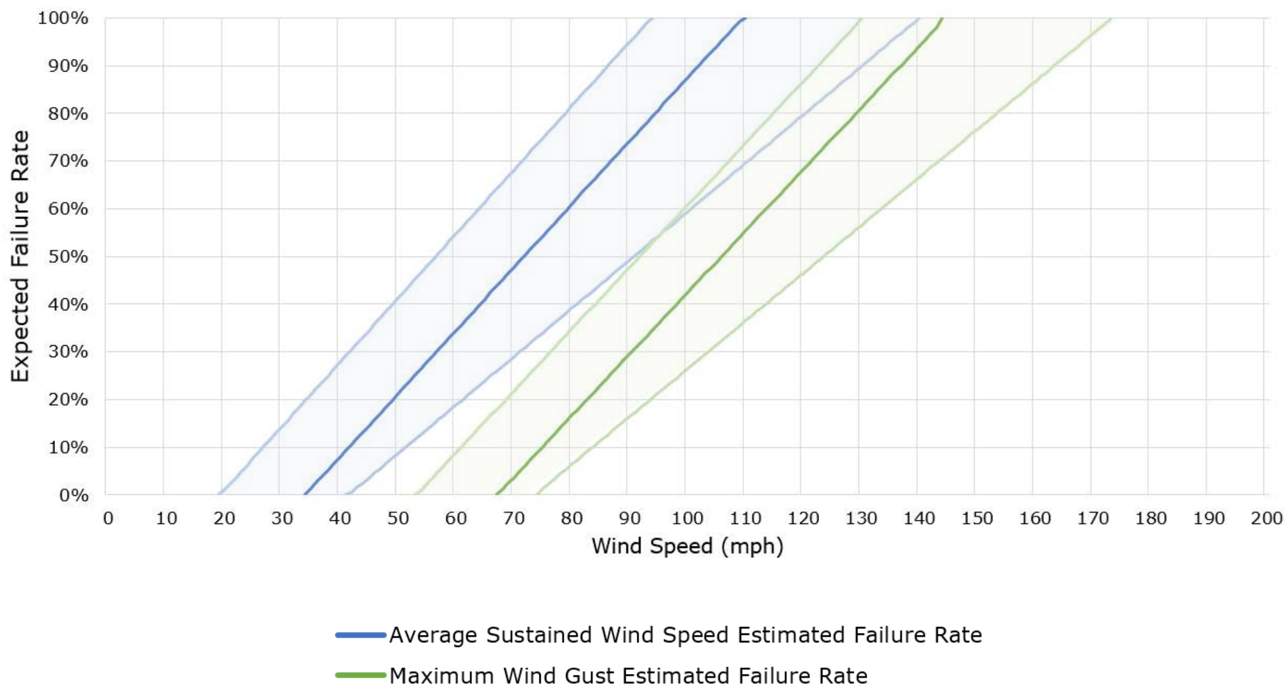


Figure 5-1 Failure rates of average wind speed and maximum wind gust (mph)

It should be noted that these failure rates are statistic rate estimates. As such, they are subject to error. Not all poles may or will follow these linear patterns. Additionally, this process for determining the failure rates comes with limitations that must be considered. The results used to obtain the failure rates are based on a non-statically random sample of poles in the Eastern District. The field survey was conducted in an area of high damage and thus the results may be subject to statistical bias.

5.4 Results of Extrapolation

The extrapolation of the failure rates to the Eastern District of the Gulf Power service area was performed using the maximum wind gusts associated with each grid cell. The amount of expected failures for each grid cell were determined based on wind gusts and the wind speed-failure rate curves presented in Figure 5-1. Poles that had a resulting expected failure rate below 0% were replaced with 0% and those with an expected failure rate above 100% were replaced with 100%.

Based on the speed-failure rate curve, and the extrapolated wind speed data for each map grid zone in the service area, the probability for impact and damage (combined) is shown for each grid zone in the service area in Figure 5-2. The scale is the percent damage to the pole/structure population in each grid.

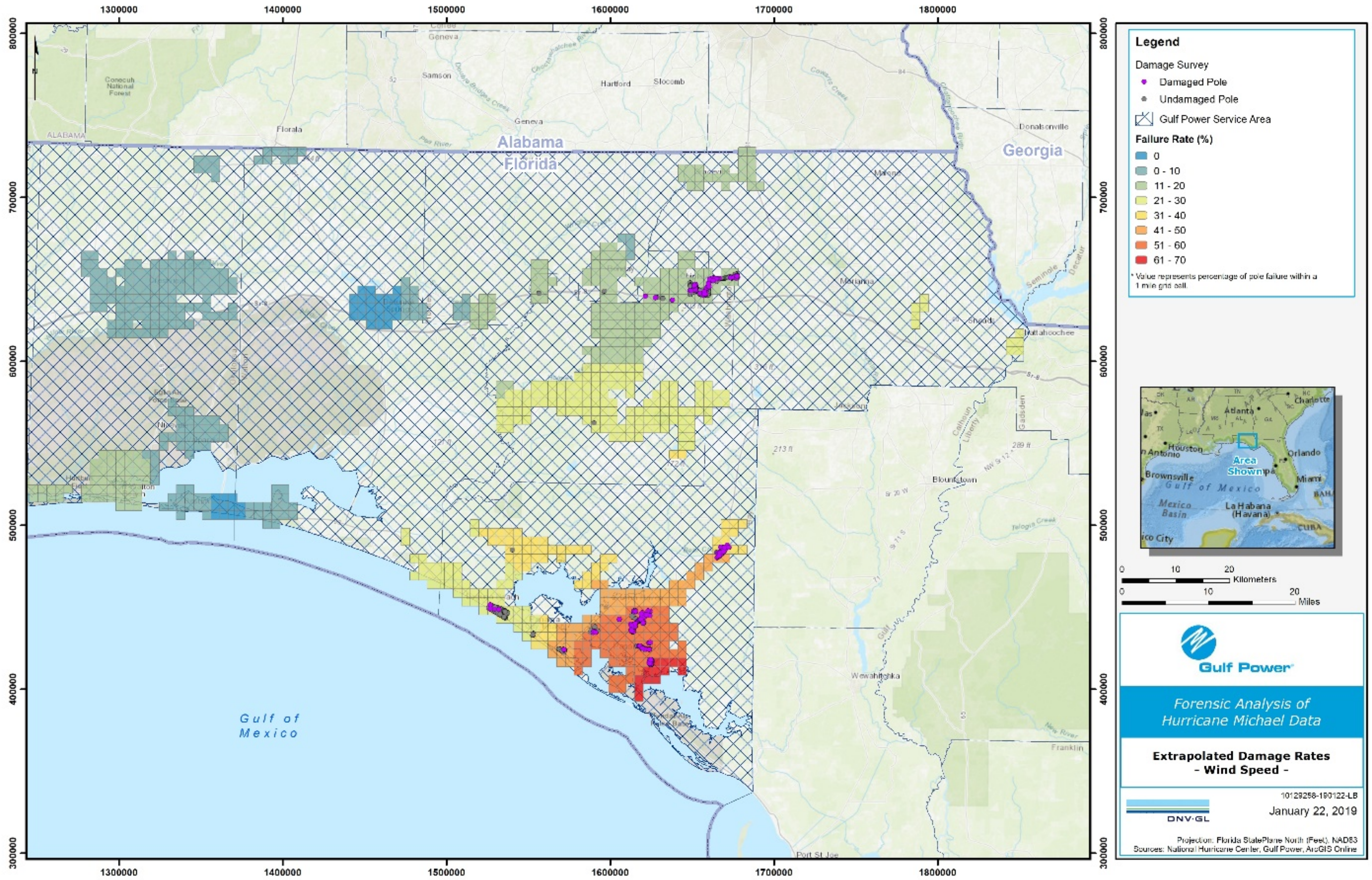


Figure 5-2 Extrapolated Gulf Power Damages to the Eastern District Service Area

The figure shows that the most severe damage probability occurred in the areas surveyed by Osmose in the Panama City area and north-easterly towards Youngstown. Based on this analysis between 30% (when considering maximum wind gust) and 30.4% (when considering maximum sustained wind) of the poles and structures in the Eastern District of the Gulf Power service area would have been damaged in conditions that were experienced during Hurricane Michael. The lower bound estimate for these models suggest a failure rate of 16.3% for maximum sustained wind) and 17.0% for maximum wind gust[14]. It is important to reiterate that the expected damage estimates derived from the survey data are likely higher than what was experienced due to the survey primarily being focused areas of high damage occurrence. To improve the accuracy of these estimates, future site surveys should seek to perform surveys using a random sample across the service area.

6 STORM DATA FORENSICS ANALYSIS CONCLUSION

During a major storm event, such as Hurricane Michael, high winds are the primary factor in damages to distribution poles and other structures. Sustained winds and wind gusts stress poles and cross arms and

[14] The upper bound damage estimates are between 48.3% 50.6%. These were not considered here given that they are taking the upper confidence of the estimates that were obtained from a sample area of high damage.

trees or other windborne debris hit poles, conductors and cross arms resulting in costly damage. Damage resulting from windborne debris and trees is generally outside of Gulf Power's control. Pole damage is often caused by trees and branches located outside Gulf Power's right-of-way.

Damage to conductors may be due to pole damage (broken) and conductors being hit directly by windborne debris. This is often also outside of Gulf Power's control. Insulator failures are mainly a result of debris or trees hitting conductors, leading to breakage of the post insulator.

DNV GL analyzed a variety of potential factors in the damage. This included wind speeds, urban versus rural settings, age, and the possibility of flooding or storm surge as a potential cause. The analyses showed no statistical correlation between reported damage and urban or rural classifications; however, the construction standards to which the poles were installed (Grade B vs. Grade C) appears to factor in to the damage rate. Survey data also indicates that Class 2 poles were less often damaged that Class 3, 5 and 6 poles.

Further, in reviewing flood zones and areas where storm surge may have been a factor, no correlation could be made with damage. This is likely because storm surge was not as extensive in the Gulf Power area as it was further east along the coast.

Based on field survey data analyzed, the Eastern District of the Gulf Power service area was estimated to have experienced damage to as much as 30% of their distribution grid assets. In actuality, Gulf Power is known to have experienced damage to approximately 12% of its distribution pole assets. Although, the extent of damaged poles was lower than what would have been expected, wide-spread, lengthy outages were still experienced across the territory. Given the findings that suggest newer pole construction standards reduce the likelihood of damage and that stronger pole classes (e.g. Class 2) were found to be less often damaged than Class 3, 5, and 6 poles, investments in storm hardening may improve system performance during future storm events

APPENDIX A FAILURE RATES BY DISTRIBUTION AND STREETLIGHT POLE PER SURVEY IN THE EASTERN DISTRICT

Grid zone	Zone type	Total pole pop.	Poles surveyed	Surveyed poles damaged	Damage rate	Pole broken		Pole leaning		Conductor damage		Damaged cross arm		Underground dip exposed		Other	
						Number damaged	Rate	Number damaged	Rate	Number damaged	Rate	Number damaged	Rate	Number damaged	Rate	Number damaged	Rate
1012	Rural	36	29	6	21%	0	0%	0	0%	6	21%	0	0%	0	0%	0	0%
1013	Rural	39	28	5	18%	0	0%	0	0%	5	18%	0	0%	0	0%	0	0%
1087	Rural	21	19	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
1117	Rural	62	1	1	100%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%
1118	Rural	129	46	28	61%	13	28%	6	13%	9	20%	0	0%	0	0%	0	0%
1119	Rural	10	1	1	100%	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%
1160	Rural	40	31	12	39%	0	0%	2	6%	10	32%	0	0%	0	0%	0	0%
1191	Rural	126	35	12	34%	4	11%	1	3%	7	20%	0	0%	0	0%	0	0%
1192	Rural	47	14	9	64%	4	29%	3	21%	2	14%	0	0%	0	0%	0	0%
1233	Rural	101	14	3	21%	0	0%	0	0%	3	21%	0	0%	0	0%	0	0%
1234	Rural	87	60	21	35%	3	5%	0	0%	17	28%	0	0%	1	2%	0	0%
1235	Rural	20	8	3	38%	0	0%	0	0%	2	25%	0	0%	0	0%	1	13%
1306	Rural	75	5	4	80%	0	0%	0	0%	4	80%	0	0%	0	0%	0	0%
1307	Rural	129	75	6	8%	1	1%	1	1%	4	5%	0	0%	0	0%	0	0%
1308	Rural	23	7	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
1378	Rural	99	18	2	11%	1	6%	0	0%	1	6%	0	0%	0	0%	0	0%
1379	Urban	219	74	7	9%	1	1%	1	1%	4	5%	0	0%	0	0%	1	1%
1380	Rural	4	1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
1523	Urban	207	2	1	50%	0	0%	0	0%	0	0%	0	0%	0	0%	1	50%
1593	Rural	71	2	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
1662	Rural	88	3	2	67%	2	67%	0	0%	0	0%	0	0%	0	0%	0	0%

1730	Rural	98	2	2	100%	0	0%	0	0%	2	100%	0	0%	0	0%	0	0%
1766	Urban	205	9	5	56%	1	11%	0	0%	3	33%	1	11%	0	0%	0	0%
1767	Rural	83	7	4	57%	0	0%	1	14%	2	29%	1	14%	0	0%	0	0%
1770	Urban	439	16	11	69%	4	25%	1	6%	6	38%	0	0%	0	0%	0	0%
1771	Urban	680	4	2	50%	0	0%	1	25%	1	25%	0	0%	0	0%	0	0%
1772	Urban	785	72	38	53%	9	13%	5	7%	24	33%	0	0%	0	0%	0	0%
1833	Urban	205	7	6	86%	3	43%	0	0%	3	43%	0	0%	0	0%	0	0%
1834	Urban	62	27	26	96%	12	44%	9	33%	5	19%	0	0%	0	0%	0	0%
1835	Urban	662	5	5	100%	0	0%	3	60%	2	40%	0	0%	0	0%	0	0%
1837	Urban	721	19	11	58%	4	21%	6	32%	1	5%	0	0%	0	0%	0	0%
1899	Urban	158	4	3	75%	2	50%	0	0%	1	25%	0	0%	0	0%	0	0%
1900	Urban	114	2	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
1901	Urban	693	112	63	56%	20	18%	11	10%	32	29%	0	0%	0	0%	0	0%
1965	Urban	146	2	2	100%	0	0%	1	50%	1	50%	0	0%	0	0%	0	0%
2056	Urban	88	2	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2159	Urban	69	6	1	17%	0	0%	0	0%	1	17%	0	0%	0	0%	0	0%
2160	Urban	524	5	5	100%	4	80%	1	20%	0	0%	0	0%	0	0%	0	0%
2222	Urban	36	1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2223	Urban	409	1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2410	Urban	351	6	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2411	Urban	925	41	3	7%	0	0%	0	0%	2	5%	1	2%	0	0%	0	0%
2546	Rural	63	2	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2586	Urban	387	10	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2754	Urban	97	16	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2755	Urban	393	9	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2810	Urban	489	141	2	1%	0	0%	0	0%	2	1%	0	0%	0	0%	0	0%
2811	Rural	41	30	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2864	Urban	243	10	3	30%	0	0%	0	0%	3	30%	0	0%	0	0%	0	0%

2865	Urban	366	119	2	2%	0	0%	0	0%	1	1%	0	0%	0	0%	1	1%

About DNV GL

APPENDIX C

(Gulf's 2020-2029 SPP Costs & 2020 Project Level Detail)

2020-2029 Storm Protection Plan 'SPP' Program Cost

($ in Millions)

SPP Programs (1)(2)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total SPP Cost	Annual Average Cost
Distribution Inspection Program												
Operating Expenses	$0.93	$0.98	$0.98	$0.98	$0.98	$0.98	$0.98	$0.98	$0.98	$0.98	$9.75	$0.98
Capital Expenditures	$2.50	$2.80	$2.80	$2.80	$2.80	$2.80	$2.80	$2.80	$2.80	$2.80	$27.70	$2.77
Total	$3.43	$3.78	$3.78	$3.78	$3.78	$3.78	$3.78	$3.78	$3.78	$3.78	$37.45	$3.75
Transmission Inspection Program												
Operating Expenses	$0.35	$0.35	$0.35	$0.35	$0.35	$0.35	$0.35	$0.35	$0.35	$0.35	$3.50	$0.35
Capital Expenditures	$3.15	$3.15	$3.15	$3.15	$3.15	$3.15	$3.15	$3.15	$3.15	$3.15	$31.50	$3.15
Total	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$3.50	$35.00	$3.50
Distribution Feeder Hardening Program												
Operating Expenses	$0.78	$2.51	$2.43	$2.29	$2.29	$2.29	$2.29	$2.29	$2.29	$2.29	$21.75	$2.18
Capital Expenditures	$11.50	$35.90	$34.00	$30.30	$30.30	$30.30	$30.30	$30.30	$30.30	$30.30	$293.50	$29.35
Total	$12.28	$38.41	$36.43	$32.59	$32.59	$32.59	$32.59	$32.59	$32.59	$32.59	$315.25	$31.53
Distribution Hardening - Lateral Undergrounding Program												
Operating Expenses	$0.00	$0.18	$0.18	$0.18	$0.18	$0.18	$0.18	$0.18	$0.18	$0.18	$1.62	$0.16
Capital Expenditures	$0.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$5.00	$45.00	$4.50
Total	$0.00	$5.18	$5.18	$5.18	$5.18	$5.18	$5.18	$5.18	$5.18	$5.18	$46.62	$4.66
Transmission Hardening Program												
Operating Expenses	$0.07	$0.40	$0.60	$0.60	$0.60	$0.60	$0.60	$0.60	$0.60	$0.60	$5.27	$0.53
Capital Expenditures	$5.22	$45.10	$54.90	$54.90	$53.90	$53.90	$53.90	$53.90	$53.90	$53.90	$483.52	$48.35
Total	$5.29	$45.50	$55.50	$55.50	$54.50	$54.50	$54.50	$54.50	$54.50	$54.50	$488.79	$48.88
Vegetation Management - Distribution Program												
Operating Expenses	$5.03	$4.68	$4.69	$4.70	$4.70	$4.71	$4.71	$4.71	$4.71	$4.71	$47.35	$4.74
Capital Expenditures	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$5.03	$4.68	$4.69	$4.70	$4.70	$4.71	$4.71	$4.71	$4.71	$4.71	$47.35	$4.74
Vegetation Management - Transmission Program												
Operating Expenses	$2.50	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$28.33	$2.83
Capital Expenditures	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Total	$2.50	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$2.87	$28.33	$2.83
Total SPP Cost												
Operating Expenses	$9.66	$11.97	$12.10	$11.97	$11.97	$11.98	$11.98	$11.98	$11.98	$11.98	$117.57	$11.76
Capital Expenditures	$22.37	$91.95	$99.85	$96.15	$95.15	$95.15	$95.15	$95.15	$95.15	$95.15	$881.22	$88.12
Total	$32.03	$103.92	$111.95	$108.12	$107.12	$107.13	$107.13	$107.13	$107.13	$107.13	$998.79	$99.88

(1) See also 2020 - 2022 project level details provided in Appendix

(2) Costs Include previous year(s) projects carried over to current year, current year's project costs and future year's preliminary project costs (e.g., engineering)

2020 - 2022 Storm Protection Plan 3 Year Summary By Program

Storm Protection Plan 'SPP' Programs	2020 Plan		2021 Plan		2022 Plan	
	Cap	O&M	Cap	O&M	Cap	O&M
Distribution Inspection Program	$2,500,000	$933,000	$2,800,000	$983,000	$2,800,000	$983,000
Transmission Inspection Program	$3,150,000	$350,000	$3,150,000	$350,000	$3,150,000	$350,000
Distribution Feeder Hardening Program	$11,500,000	$779,000	$35,895,000	$2,504,000	$33,995,000	$2,428,000
Distribution Hardening - Lateral Undergrounding Program	$0	$0	$5,000,000	$180,000	$5,000,000	$180,000
Transmission Hardening Program	$5,220,000	$70,000	$45,100,000	$400,000	$54,900,000	$600,000
Vegetation Management - Distribution Program	$0	$5,030,881	$0	$4,678,346	$0	$4,685,489
Vegetation Management - Transmission Program	$0	$2,502,932	$0	$2,872,936	$0	$2,872,936
Total SPP Cost	**$22,370,000**	**$9,665,814**	**$91,945,000**	**$11,968,282**	**$99,845,000**	**$12,099,425**
	Total Program Cost = $32M		Total Program Cost = $104M		Total Program Cost = $112M	
	Avg Annual Cost = $3M		Avg Annual Cost = $10M		Avg Annual Cost = $11M	

2020-2022 Project Level Detail

(by Program)

Distribution Inspection Program
(2020-2022)

2020 Plan		2021 Plan		2022 Plan	
Cap	**O&M**	**Cap**	**O&M**	**Cap**	**O&M**
$2,500,000	**$933,000**	**$2,800,000**	**$983,000**	**$2,800,000**	**$983,000**

Distribution Mainline Feeder Patrol	2020 Plan		2021 Plan		2022 Plan	
	Cap	**O&M**	**Cap**	**O&M**	**Cap**	**O&M**
Distribution Mainline Feeder Patrol Fort Walton: 71 Feeders; Panama City: 75 Feeders; Pensacola: 159 Feeders	$300,000	$163,000	$300,000	$163,000	$300,000	$163,000

Distribution - Pole Inspections (Cyclic)	2020 Plan		2021 Plan		2022 Plan	
	Cap	**O&M**	**Cap**	**O&M**	**Cap**	**O&M**
Pole Inspection (Cyclic) - Distribution	$2,200,000	$770,000	$2,500,000	$820,000	$2,500,000	$820,000

Transmission Inspection Program (2020-2022)

2020 Plan		2021 Plan		2022 Plan	
Cap	O&M	Cap	O&M	Cap	O&M
$3,150,000	**$350,000**	**$3,150,000**	**$350,000**	**$3,150,000**	**$350,000**

	2020 Plan		2021 Plan		2022 Plan	
Transmission Pole Inspections	Cap	O&M	Cap	O&M	Cap	O&M
Pole Inspection - Transmission	$3,000,000	$250,000	$3,000,000	$250,000	$3,000,000	$250,000

	2020 Plan		2021 Plan		2022 Plan	
Substation Equipment Inspections	Cap	O&M	Cap	O&M	Cap	O&M
Equipment Inspection - Substation	$150,000	$100,000	$150,000	$100,000	$150,000	$100,000

Distribution Feeder Hardening Program
(2020-2022)

2020 Plan		2021 Plan		2022 Plan	
Cap	O&M	Cap	O&M	Cap	O&M
$11,500,000	**$779,000**	**$35,895,000**	**$2,504,000**	**$33,995,000**	**$2,428,000**

Distribution Feeder Hardening

2020 Projects	District	Substation	Feeders	Scope	Estimated Cost Capital	Estimated Cost Expense	Estimated Start	Estimated Completion	Number of Customers Residential	Number of Customers Com/Industrial	Criteria
Brentwood 6678 & Oakfield 7922	Pensacola	Brentwood/Oakfield	6678/7922	Replace and hardening 37 poles	$1,087,000	$108,000	March 2020	December 2020	4,331	286	CIF
Avalon 5792	Pensacola	Avalon	5792	Replace and hardening 68 poles	$1,325,000	$121,000	March 2020	December 2020	2,974	250	CIF
Bayou Marcus 5572	Pensacola	Bayou Marcus	5572	Replace and hardening 60 poles	$925,000	$84,000	March 2020	December 2020	1,371	15	CIF
Turner 5662	Fort Walton	Turner	5662	Replace and hardening 123 poles	$867,000	$54,000	October 2020	December 2021	3,105	269	CIF
Hathaway 8642	Panama City	Hathaway	8642	Replace and hardening 150 poles	$1,790,000	$169,000	June 2020	December 2020	2,560	170	CIF
Redwood 8722	Panama City	Redwood	8722	Replace and hardening 34 poles	$506,000	$44,000	June 2020	December 2020	1,789	263	CIF
				Total =	$6,500,000	$580,000					

*CIF = Critical Infrastructure Facility

2021 Program Details	Estimated Projects	Feeder Impact	Scope	Estimated Cost
To Be Determined	6 to 18	6 to 18	Hardening range of 12 to 32 miles of feeder, and replacement of approximately 500 - 930 poles	**$26.4MM**

2022 Program Details	Estimated Projects	Feeder Impact	Scope	Estimated Cost
To Be Determined	6 to 18	6 to 18	Hardening range of 12 to 32 miles of feeder, and replacement of approximately 500 - 930 poles	**$26.4MM**

Distribution Automation	2020 Capital Plan	2021 Capital Plan	2022 Capital Plan
Distribution Automated Feeder Switch 'AFS' Capital; Feeder Recloser & Switched Installations. 2020: Fort Walton: 31 Sites; Panama City: 16 Sites; Pensacola 35 Sites	$3,200,000	$3,600,000	$1,700,000
Distribution Automation Other Capital: Communication & Control Equipment for Fault Current Indicators and other field equipment capable of providing SCADA information and controls	$1,800,000	$5,895,000	$5,895,000

Distribution Hardening - Lateral Undergrounding Program
(2021-2022)

2020 Plan *		2021 Plan		2022 Plan	
Cap	O&M	Cap	O&M	Cap	O&M
$0	$0	$5,000,000	$180,000	$5,000,000	$180,000

2021 Program Details	Estimated Projects	Lateral Impact	Scope	Estimated Cost
To Be Determined	8	8 miles	Replace overhead conductor with underground conductors based on predetermined criteria	$5M

2022 Program Details	Estimated Projects	Lateral Impact	Scope	Estimated Cost
To Be Determined	8	8 miles	Replace overhead conductor with underground conductors based on predetermined criteria	$5M

*** 2020 - Gulf Power will begin Evaluating and Engineering Undergrounding of Laterals and Plans to Begin Construction in 2021.**

Transmission Hardening Program (2020-2022)

2020 Plan		2021 Plan		2022 Plan	
Cap	O&M	Cap	O&M	Cap	O&M
$5,220,000	$70,000	$45,100,000	$400,000	$54,900,000	$600,000

Substation Hardening

2020 Projects	District	Substation Impact	Scope	Estimated Cost		Estimated Start	Estimated Completion	Number of Customers	
				Capital	Expense			Residential	Commercial/Industrial
Shalimar Substation Storm Hardening	Central	Shalimar	Storm Hardened Control House	$300,000	$0	January 2020	June 2020	4,827	378
Hurlburt Substation Storm Hardening	Central	Hurlburt	Storm Hardened Control House With Flood monitoring	$300,000	$0	June 2020	December 2020	6,054	348
Niceville Substation Storm Hardening	Central	Niceville	Storm Hardened Control House	$300,000	$0	June 2020	December 2020	5,122	462
Naval Air Station North Terminal Station Storm Hardening	Western	NAS North Terminal	Transmission Line Terminal Station Flood Monitoring	$20,000	$0	June 2020	December 2020	0	1
Naval Air Station South Terminal Station Storm Hardening	Western	NAS South Terminal	Transmission Line Terminal Station Flood Monitoring	$20,000	$0	June 2020	December 2020	0	2
Smith Construction Substation Storm Hardening	Eastern	Smith Construction	Substation Flood Monitoring	$20,000	$0	June 2020	December 2020	0	25
Blountstown Substation Storm Hardening	Eastern	Blountstown	Substation Flood Monitoring	$20,000	$0	June 2020	December 2020	0	2
Romana Substation Storm Hardening	Western	Romana	Substation Flood Monitoring	$20,000	$0	June 2020	December 2020	1,255	534
			Total =	$1,000,000	$0				

2021 Program Details	Estimated Projects	Impact	Scope	Estimated Cost Capital	Expense
To Be Determined	3	3	Storm Hardened Control House	$1,000,000	$0

2022 Program Details	Estimated Projects	Impact	Scope	Estimated Cost Capital	Expense
To Be Determined	3	3	Storm Hardened Control House	$1,000,000	$0

Substation Resiliency

2020 Projects	District	Substation/Line Impact	Scope	Estimated Cost		Estimated Start	Estimated Completion	Number of Customers	
				Capital	Expense			Residential	Commercial/Industrial
Valparaiso Substation Transformer Bank Addition	Fort Walton	Substation	Add 2nd Substation Transformer Bank. Design & Civil work in 2020 and Construct in 2021	$75,000	$0	January 2020	December 2021	5,245	863
South Crestview Substation Transformer Bank Addition	Fort Walton	Substation	Add 2nd Substation Transformer Bank. Design & Civil work in 2020 and Construct in 2021	$75,000	$0	January 2020	December 2021	5,923	1,191
Hurlburt Substation Transformer Bank Addition	Fort Walton	Substation	Add 2nd Substation Transformer Bank. Design & Civil work in 2020 and Construct in 2021	$570,000	$0	January 2020	December 2021	6,054	348
			Total =	$720,000	$0				

2021 Program Details	Estimated Projects	Impact	Scope	Estimated Cost Capital	Expense
To Be Determined	20	18	Transmission/Substation Resiliency Projects	$24,500,000	0

2022 Program Details	Estimated Projects	Impact	Scope	Estimated Cost Capital	Expense
To Be Determined	20	20	Transmission/Substation Resiliency Projects	$24,500,000	0

Wood Structure Replacement

2020 Projects	District	Number of structures to be replaced	Transmission Line	Estimated Cost		Estimated		Number of Customers	
				Capital	Expense	Start	Completion	Residential	Commercial/Industrial
Caryville Transmission Line Tap	Fort Walton	30	Glendale - Ponce De Leon 115 kV	$1,500,000	$30,000	May 2020	September 2020	Transmission System Loop	
Santa Rosa - Miramar #1 Transmission Line	Fort Walton	40	Santa Rosa - Miramar #1 115 kV	$2,000,000	$40,000	January 2020	December 2020	Transmission System Loop	
			Total =	$3,500,000	$70,000				

2021 Program Details	Estimated Projects	Number of structures to be replaced	Line Impact	Estimated Cost
To Be Determined	20	400	6	$20M

2021 Program Details	Estimated Projects	Number of structures to be replaced	Line Impact	Estimated Cost
To Be Determined	30	600	10	$30M

Vegetation Management Program (2020-2022)

Vegetation Management - Distribution Program	2020 Plan		2021 Plan		2022 Plan	
	Cap	O&M	Cap	O&M	Cap	O&M
Vegetation Management - Distribution Program	$0	$5,030,881	$0	$4,678,346	$0	$4,685,489

Vegetation Management - Transmission Program	2020 Plan		2021 Plan		2022 Plan	
	Cap	O&M	Cap	O&M	Cap	O&M
Vegetation Management - Transmission Program	$0	$2,502,932	$0	$2,872,936	$0	$2,872,936

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(Gulf's Distribution Hardening Design Guidelines)

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Distribution Hardening Design Guidelines

The following guidelines will be used to standardize the design of Gulf Power overhead distribution facilities when practical, feasible, and cost effective.

General

1. Gulf Power has made a change to adopt the Extreme Wind Loading Standards as the design criteria for (1) new pole line construction, (2) pole line extensions, (3) pole line relocations, (4) feeder pole replacements on multi-circuit pole lines, (5) feeder pole replacements on Top Critical Infrastructure Feeders, and (6) major equipment structures. Pole Foreman will be used for the guidelines to determine the necessary pole class and type for all work.

2. For maintenance, existing Non-Top Critical Infrastructure pole lines may be evaluated using National Electrical Safety Code combined ice and wind loading with Grade B construction. This represents the loading prior to the adoption of the Extreme Wind Loading Standards. If the pole must be replaced, refer to Pole Foreman calculations for the minimum class pole to be installed at Extreme Wind Loading Standards.

3. Every attempt should be made to place new or replacement poles in private easements or as close to the front edge of property (The Right-of-Way Line) as practical.

4. Overhead pole lines should be placed in front lot lines or accessible locations where feasible.

5. When replacing poles, the new pole should be set as close as possible to the existing pole to avoid the creation of a new pole location.

6. Poles are not to be placed in medians.

7. Concrete poles are not to be placed in inaccessible locations or locations that could potentially become inaccessible.

8. Every effort should be made not to install poles in sidewalks. If a pole must be placed in a sidewalk, a minimum unobstructed sidewalk width of 32 Inches must be maintained to comply with the American Disabilities Act requirements.

9. If concrete poles are required by the governing agency as a requirement of the permit, and if the work is being done solely for Gulf Power purposes (Feeder Tie, Et Cetera), then the concrete poles are installed with no differential charges. If the concrete poles are required as a condition of the permit, and the work is being done at the request of a customer to provide service to the customer or relocation by request of the customer, then the customer is charged a differential cost for the concrete poles.

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10. When installing new overhead secondary spans, multiplexed cable should be used instead of open wire secondary. When line reconductoring or relocating existing pole lines containing open wire secondary, replace the open wire with multiplexed cable whenever possible. The system neutral should not be removed when replacing open wire secondary with multiplexed cable if primary wire is present. It is necessary to maintain a separate system neutral for operational continuity of the system.

11. When designing overhead facilities where secondary and service crossings exist across major roadways; Engineers, Engineering Representatives and Engineering Contractors should take into consideration placing these secondary street crossings underground.

12. Whenever extending a feeder, line reconductoring of a feeder section, or attaching a device to a feeder; Engineers, Engineering Representatives and Engineering Contractors should reference the nearest existing disconnect switch number on the construction drawing and show the dimension to the switch.

13. When an overhead feeder crosses any obstacle to access (Id Est: Water bodies such as rivers, canals, swamps; limited access right-of-ways such as interstate highways, turnpikes, and expressways; Et Cetera) disconnect switches should be placed on both sides of the obstacle in order to isolate the crossing in the event of a wire down situation.

14. Projects that affect or extend feeder conductors should always be coordinated with Distribution Planning to ensure optimization of the distribution grid and to take into account future feeder plans such as, feeder boundary changes, sectionalizing devices, integration of automation and remotely controlled protection.

As always, good engineering judgment, safety, reliability, and cost effectiveness should be considered. In addition to these guidelines, all distribution facilities shall be engineered to meet the minimum requirements set forth in all applicable standards and codes including but not limited to the National Electrical Safety Code, Utility Accommodation Guide, and Gulf Power’s Distribution Construction Standards. Please contact the Technical Services Distribution Construction Engineering Standards team with any questions.

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New Construction

1. When installing a new feeder, lateral, or service pole, reference the Pole Sizing section for the guidelines to determine the necessary pole class and type to meet the Extreme Wind Loading Standard for the wind zone region (110, 120, 130 or 140 Miles Per Hour).

2. During the design of new pole lines in developed areas, field visits should be conducted to ensure the design would cause minimum impact to the existing property owners.

3. Overhead pole lines should not be built on both sides of a roadway unless agreed to by the customer nor should multi-circuit pole lines be created. When designing main feeder routes all viable options must be reviewed (Including alternative routes) and consideration should be given to constructing the line underground.

4. When there is an existing pole line in the rear easement, every effort should be made not to build a second pole line along the right of way.

5. When installing a pole line within a transmission line, accessible distribution poles should be concrete. Distribution concrete poles should not be installed in inaccessible locations.

6. If concrete distribution poles are installed in a concrete transmission line, there is no additional charge to the customer (The concrete poles are Gulf Power's choice and not requested by the customer). Coordination between the transmission and distribution design is critical and consideration should be given to a design with all transmission poles versus distribution intermediate poles. This approach will reduce the overall number of poles.

7. When transmission is overbuilding (Concrete structures), along an existing distribution corridor, if the distribution wood poles are in good condition, do not replace. If wood poles need to be changed out or relocated, replace with concrete poles to match the transmission pole type, coordination between the transmission and distribution design is critical and consideration should be given to a design with all transmission poles versus distribution intermediate poles. This approach will reduce the overall number of poles.

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Existing / Maintenance

1. When installing and/or replacing a feeder, lateral, or service pole on an existing pole line, Pole Foreman will be used for the guidelines to determine the necessary pole class and type to meet the Extreme Wind Loading Standards.

2. When installing or replacing a feeder pole on a feeder that serves a Top Critical Infrastructure Feeder customer, ensure the new pole will meet the Extreme Wind Loading Standards so that it will not have to be replaced when the feeder is hardened as a hardening project.

3. When extending pole lines, Pole Foreman will be used for the guidelines to determine the necessary pole class and type to meet the Extreme Wind Loading Standards. If concrete poles are requested by the customer or are required as a condition of the permit and fall outside the Pole Foreman recommendations, the customer will pay a differential charge for the concrete poles.

4. When replacing pole(s) and anchor(s) with larger self-supporting concrete poles, caution should be used, as the property owners in the vicinity of the pole will not necessarily perceive this concrete pole as a better choice.

5. When replacing poles on a multi-circuit feeder, the replacement pole should be designed for Extreme Wind Loading Standards using Pole Foreman to calculate the wind loading.

Relocations

1. When relocating a pole line, Pole Foreman will be used for the guidelines to determine the necessary pole class and type to meet the Extreme Wind Loading Standard for the wind zone region (110, 120, 130 or 140 Miles Per Hour).

2. When relocating either a concrete or wood pole line for a highway improvement project, the existing pole line type should be used as a guide for the pole type replacements. There is no additional charge for concrete poles if the existing poles being relocated are concrete (Like for like relocation). If the customer requests an upgrade to concrete poles, a differential is charged.

3. Reimbursable relocations will equal the cost to relocate the line built to the Extreme Wind Loading Standards (Plus removal of old line), including indirect cost.

4. Agency relocation projects should be coordinated with Distribution Planning to ensure optimization of the distribution grid and to take into account future feeder plans such as, feeder boundary changes, sectionalizing devices, integration of automation and remotely controlled protection.

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Crossing Multi-Lane Limited Access Highways

The following guidelines are to be used when an overhead feeder crosses any obstacle to access (Id Est: Limited access right-of-ways such as interstate highways, turnpikes, and expressways, Et Cetera). Similar consideration can be given to water bodies such as rivers, canals, swamps.

1. Underground installation is the preferred design for all new crossings (1, 2, and 3 phase circuits) that cross multi-lane limited access highways and hardening of existing crossings.

2. Underground crossing for 1 and 2 phases should be designed for potential three phase feeder size cable. Ensure riser poles meet or exceed the Extreme Wind Loading Standard design for the designated region. For further information, please contact the Centralized Engineering Services Distribution Hardening team.

3. For accessible overhead crossings, use concrete poles for the crossing poles and minimum Class 2 wood poles for the intermediate poles. For inaccessible overhead crossings, minimum Class 2 wood poles should be used for the crossing and intermediate poles. All poles installed should meet or exceed Extreme Wind Loading Standard for the designated region.

4. Every attempt should be made to install storm guys and back guys for the highway crossing poles. Storm guys are not required on the adjacent poles.

5. Consider installing disconnect switches on adjacent poles on both sides of the crossing (Or as required by field conditions) to isolate the feeder section for restoration. Switches are to be installed in accessible locations that can be reached with readily available aerial equipment.

6. Use Pole Foreman to check for uplift on all poles.

7. Ensure to maintain proper clearance above or under all highways as dictated by the owner of the right-of-way.

8. Any conductors crossing the highway that have splices should be replaced with a continuous conductor. One additional set of dead-end insulators at the highway crossing pole may be used if this eliminates the need for splices when installing a new pole.

9. Engineers, Engineering Representatives, and Engineering Contractors must conduct a pre-design meeting with the Production Lead to ensure the feasibility of the proposed design.

10. As always, use good engineering judgment to produce a quality, cost-effective design.

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Pole Sizing

1. Gulf Power has made a change to adopt Extreme Wind Loading Standards as the design criteria for (1) new pole line construction, (2) pole line extensions, (3) pole line relocations, (4) feeder pole replacements on multi-circuit pole lines, (5) feeder pole replacements on Top Critical Infrastructure Feeders, and (6) major equipment structures. Pole Foreman will be used for the guidelines to determine the necessary pole class and type for all work.

2. When installing or replacing a feeder pole on a feeder that serves a Top Critical Infrastructure Feeder customer, ensure the new pole will meet the Extreme Wind Loading Standards design so that it will not have to be replaced when the feeder is hardened as a hardening project.

3. For maintenance, existing Non-Top Critical Infrastructure pole lines may be evaluated using National Electrical Safety Code combined ice and wind loading with Grade B construction. This represents the loading prior to the adoption of the Extreme Wind Loading Standards. If the pole must be replaced, Pole Foreman will be used for guidance to determine the minimum class pole to be installed at Extreme Wind Loading Standards.

4. When performing work on an existing pole, and the pole requires change out (Exempli Gratia: clearance height, location, condition, or the ability to support the planned activity), use Pole Foreman. If the planned work can be done without changing out the pole and the pole meets minimum National Electrical Safety Code Grade B wind loading guidelines, use the existing pole(s).

5. Foreign pole owners are required to discuss design requirements with Gulf Power prior to construction. Gulf Power will assist with identifying the targeted poles.

6. Efforts should be made to ensure that span distances do not exceed 250 feet for wood poles and 350 feet for concrete poles even if longer spans would meet the Extreme Wind Loading Standards requirements.

7. Concrete poles are preferred in the cases where replacement costs would be extremely high (Id Est: Duct system riser pole, corner poles with multiple circuits, critical poles, Et Cetera). No differential is charged for poles in this case.

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Lateral Pole Policy

1. All existing poles must meet National Electrical Safety Code Grade B standards as an absolute minimum.
2. If a pole is modified in any way, it must meet National Electrical Safety Code Grade B standards at a minimum when completed.
3. All replacement lateral poles must meet National Electrical Safety Code Extreme Wind Loading Standards and be compliant with Gulf Power Distribution Construction Policies.

Practical Purposes and Means

1. Design and engineer all poles to the National Electrical Safety Code Extreme Wind Loading Standards and to meet Gulf Power Distribution Construction Policies.
2. Engineers, Engineering Representatives, and Engineering Contractors must run Pole Foreman on all designed Work Request and poles suspected of being substandard.
3. If you are completing substantial work on a pole, such as installing additional cables, upgrading a transformer, reconductoring or new framing; The pole must meet the Extreme Wind Loading Standards and the revised Pole Class standards.
4. Class 4 and Class 5 poles may only be installed for Services, Secondary, Street Lights, and Outdoor Lights. Once the available stock of Class 4 and Class 5 poles are used up, no more will be ordered and Gulf Power will install Class 3 poles for these applications.
5. In no case should Class 4 or Class 5 poles be installed in laterals.

Please contact the Technical Services Distribution Construction Engineering Standards team for situations that still are in question after careful consideration.

Gulf Power Service Territory (Extreme Wind Loading Standards Map)