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April 18, 2019

VIA: ELECTRONIC FILING

Mr. Adam J. Teitzman
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Review of 2019-2021 storm hardening plan, Tampa Electric Company; Docket No. 20180145-EI

Dear Mr. Teitzman:

Attached for filing in the above docket are Tampa Electric Company's responses to Staff's Third Data Request (Nos. 1-23) dated March 28, 2019. The answer to No. 23 is confidential and is being separately filed along with a Request for Confidential Classification and Motion for Temporary Protective Order.

Thank you for your assistance in connection with this matter.

Sincerely,

James D. Beasley

JDB/pp
Attachment

Please refer to TECO's storm hardening plan that was filed in Docket No. 20180145-EI.

National Electrical Safety Code (NESC) compliance

1. Please refer to page 18.

a. What NESC construction grade does TECO use for its distribution and transmission facilities?

b. Does TECO use the same NESC construction grade for new construction as it does for replacement?

c. Does TECO design all facilities, including transmission lines, distribution lines, supply lines, conductors and supporting structures in compliance with the 2017 NESC construction grade B or C and rule 250C?

A. a. Distribution facilities are designed to meet the National Electrical Safety Code ("NESC") Grade B – Light criteria. Grade B Light is appropriate due to Tampa Electric's service area is not typically impacted by snow and ice.

Transmission facilities are designed to meet NESC Grade B construction standards.

b. Yes, the company uses the same NESC Grade B Light for new distribution construction as it does for replacement. The company uses the same NESC Grade B for new transmission construction as it does for replacement.

c. Tampa Electric designs all distribution structures to NESC Grade B Light. Tampa Electric designs all transmission structures to NESC Grade B. Section 250 defines General Loading Requirements for structures (wind, temperature and ice) only. Rule 250C does not apply to distribution since all wood poles are less than 60 feet above ground.

Extreme Wind Loading (EWL) Standards

2. Please refer to page 18. As indicated on page 20 TECO's service territory is divided into two wind regions, the western half is in the 120-mph zone and the eastern half is in the 110-mph zone per Figure 250-2(d) of the 2017 NESC. Table 250-1 of the 2017 NESC indicates that for extreme wind loading (for use with Rule 250C) figure 250-2 should be used to find the extreme wind loading. For 110 and 120-mph the corresponding wind pressure is approximately 32 lb/ ft2 and 37 lb/ft2 respectively. Why is TECO using 9 lb/ft' which is the wind pressure to use to comply with Rule 205B instead of the recommended entry per Table 250-1 (column titled: "Extreme wind loading (for use with Rule 250C))?

A. NESC Rule 250B, the section of the referenced document titled “Extreme Wind Loading (“EWL”) Standards” addresses Grade B loading standards for Structures less than 60 feet above ground, as well as EWL standards for structures greater than 60 feet above. The wind force citations are correct for each case. Tampa Electric designs and builds distribution facilities to meet the NESC Grade B Light Criteria since all distribution wood poles are less than 60 feet above ground.

3. Please refer to page 19.

a. Why does TECO consider 116 mph as the effective wind speed for construction grade B? Please explain your answer as well as any calculations.

b. What is the size (height, diameter at ground line, length, and type of wood) of a wood pole designed to withstand the extreme wind load associated with the 110 mph and 120 mph as specified by Figure 250-2?

A. a. The effective wind speed value provides a means to quantitatively compare wind loading cases. The 116-mile per hour ("mph") is the effective wind speed for wood structures under NESC Grade B Light.

The effective wind speed of 116.28-mph for round poles meeting NESC Grade B Light requirements is calculated using the following equation:

$$Wse = \sqrt{\frac{Wnesc * Wocf}{SF * WCF}}$$

Where:

- Wse = Effective Wind Speed in mph for round wood structures.
- Wnesc= The NESC wind for desired load case = 9 pounds per square foot for light loading districts.
- Wocf = Overload Capacity factor for wind loads = 2.5 for grade B analysis
- SF = Strength Factor for wood structures = 0.65 for grade B analysis
- WCF = conversion factor used for converting between Wind Force and Speed. The accepted value is 0.00256.

b. Figure 250-2 defines extreme wind zones which applies to structures that are more than 60 feet above ground. Tampa Electric designs and builds distribution facilities to meet the NESC Grade B Light Criteria since all distribution wood poles are less than 60 feet above ground.

4. Please refer to page 20. Per Rule 241B the order of construction grades is B, C, and N, with grade B being the highest. What is NESC construction Grade B - Light?

A. The description NESC Grade B Light defines the design criteria applied to structures. The “Grade” value defines conditions such as load and strength factors. Light refers to NESC loading zones and defines air temperature, wind force and inches of radial ice utilized in calculations. The light district is defined by a temperature of 30 degrees Fahrenheit, a wind force of nine pounds per square foot and zero inches of radial ice.

5. Please refer to page 24.

a. Please explain why TECO considers the NESC construction Grade B to be 87 percent stronger than the NESC construction Grade C?
b. Is TECO installing poles designed to withstand an effective wind speed of 116 mph using construction grade B within the 120 mph zone?

A. a. Tampa Electric considers the NESC construction Grade B to be 87 percent stronger than the NESC construction Grade C by the difference in structure loading factors for each Grade of construction. Structural Loading Factor is calculated by dividing the wind load factor by the wood pole strength factor.

Grade	Wind Load Factor	Wood Pole Strength Factor
B	2.50	0.65
C	1.75	0.85

Calculating the Structure Loading Factors:

Structure Loading Factor Grade B = 2.50/0.65 = 3.84
Structure Loading Factor Grade C = 1.75/0.85 = 2.05

The Grade B structure loading factor is 1.79 higher or 87.32 percent greater than the Grade C structure loading factor.

b. The 116-mph effective wind speed is developed from Grade B construction criteria. The 120-mph zone is used for Extreme Wind Analysis for structures greater than 60 feet above ground. Grade B Light and Extreme Wind are two distinctly different structure loading criteria. Since all wood distribution poles are less than 60 feet above ground, the proper loading criteria is NESC Grade B Light.

6. Please provide the height of TECO's transmission and distribution wood poles?

A. Distribution poles vary from 34 to 52 feet above ground.

Transmission poles vary from 70 to 135 feet above ground.

7. What version of PoleForeman does TECO use to design its distribution and transmission facilities?

a. Does PoleForeman comply with the 2017 NESC?

b. Does the software's operator need to know the 2017 NESC code to enter the correct information into PoleForeman? Example: Input the correct Basic Wind Speed as specified by Figure 250-2 of the 2017 NESC into the software.

A. Tampa Electric utilizes PoleForeman to design distribution facilities, the current version is 7.08. Tampa Electric uses PLS-CADD by Power Line Systems, Inc. to design transmission facilities, the current version is 15.30x64.

a. Yes, PoleForman was updated for the 2017 NESC, PLS-CADD was verified to comply with the 2017 NESC.

b. For Distribution: The default values for Grade B Light analysis are pre-loaded in the PoleForeman software. If extreme wind loading is required, the user is prompted for the extreme wind speed from NESC Figure 250-2.

For Transmission: The software’s operator does not need to know the 2017 NESC code to enter the correct information into PLS-CADD to meet strength requirement. The software’s operator does need to know the 2017 NESC code to check for proper clearance requirements.

Mitigation of Flooding and Storm Surge Damage

8. Please refer to page 28.

a. Has TECO adopted and/or implemented any new procedure to build underground distribution to mitigate damage due to flooding and Storm Surges, like the installation of submersible equipment?

b. Has TECO conducted any testing to check the reliability of the underground system in the event of flooding in the area where the underground system has been installed? If yes, please explain the results and findings.

c. Has TECO learned any lessons from previous underground projects? If yes, please explain the lessons learned.

d. Does TECO consider the terrain's characteristics, soil consistency, historical data and FEMA flooding maps when selecting the Storm hardening underground project selection? Please explain.

A. **a**. To mitigate damage due to flooding and storm surges, Tampa Electric has adopted the use of submersible switchgear for critical customers in areas prone to flooding and located in areas predicted to be impacted by storm surge.

b. Tampa Electric has not conducted any testing to check the reliability of the underground system in the event of flooding.

c. Tampa Electric has not experienced any storms that have had a significant impact on the underground distribution system. Therefore, no lessons learned have been obtained from actual damage to the company's underground system.

d. The company has not engaged in any full scale underground hardening pilots or projects at this time. The use of submersible switchgear has been adopted for critical customers in flood prone areas as identified by the Federal Emergency Management Agency ("FEMA") flood maps.

Deployment Strategies

9. Please refer to pages 41 to 42.

a. Please explain why the average miles of new distribution overhead went from 67 miles in the 2016-2018 storm hardening plan to 106 miles in the 2019-2021 storm hardening plan.

b. Please explain why the average miles to construct, rerate or rebuild transmission overhead lines went from 90 miles in the 2016-2018 storm hardening plan to 41 miles in the 2019-2021 storm hardening plan.

A. **a**. For the development of the 2016-2018 storm hardening plan, the company utilized several information sources to project the average miles of new distribution overhead to be constructed. For the 2019-2021 storm hardening plan and moving forward, Tampa Electric utilized the company's Geographic Information System ("GIS") as the sole source for information to project the average miles of new distribution overhead to be constructed.

b. Tampa Electric evaluates its transmission expansion plan and ensures the transmission system is adequate and in compliance with the North American Electric Reliability Corporation ("NERC") Transmission Planning Standards. The transmission expansion plan's results are due to planning to serve refinements in load projections, maintaining service reliability, interconnecting new substations, integrating generation projects and providing transmission capacity for transmission service obligations. The need to construct, rerate or rebuild transmission for the transmission expansion plan can vary depending on those factors. During 2016 through 2018, the company integrated a 500 MW steam turbine and converted Polk Units 2-5 simple cycle combustion turbines to a 4x1 natural gas combined cycle unit with the addition of the steam turbine and approximately 51 miles of directly associated transmission lines. The 2019 through 2021 time frame mainly is planning for load growth and maintaining service reliability, even though the company is planning to integrate numerous solar plants, the associated transmission line mile lengths in comparison to 2016-2018 is much shorter.

10. Please refer to page 44. Please explain why TECO is planning to perform 1,750 transmission groundline inspection for 2019 through 2021, when the Utility planned 3,200 inspections for 2016 through 2018.

A. The planned transmission groundline inspections for 2016 through 2018 included a visual inspection for non-wood structures. It was determined that the visual inspection of non-wood structures for the groundline inspection was a duplication of efforts with the ground patrol that also includes a visual inspection of all structures, wood and non-wood, on the entire transmission system annually. Therefore, non-wood poles were removed from the planned transmission groundline inspections, reducing the planned ongoing inspection counts.

11. Please refer to page 46. Please explain why TECO is planning to perform 9,670 transmission above ground inspections for 2019 through 2021, when the Utility planned 3,200 inspections for 2016 through 2018.

A. The discrepancy in counts is due to inconsistency in timeframes in which the counts were reported, annual versus 3-year. For 2016 through 2018, approximately 3,200 above ground inspections were planned each year, for a total of approximately 9,600 over the 3-year time period. Also, for 2019 through 2021, approximately 3,200 above ground inspections are planned each year, for a total of approximately 9,600 over the 3-year time period.

12. Please refer to page 47.

a. Please explain why TECO is planning to harden 120 transmission structures in 2019 when the Utility planned 600 structures in 2016.

b. What type of hardening will be performed on the 120 transmission structures (pole or insulators replacements)?

A. a. The company's 2019 projection for 120 transmission structure is based on the anticipated number of poles identified for hardening. The company over the years has seen a steadily decreasing amount of transmission structures that need to be changed out to either concrete or steel due to failure.

b. The company is projecting that the majority of the 120 transmission structures will be changing the pole from wood to either concrete or steel.

13. Please refer to page 49.

a. How many Interstate Highway crossings have been converted from overhead to underground facilities?

b. How many Interstate Highway crossings are left to be converted?

A. a. There have been 16 interstate highway crossings converted from overhead to underground facilities through the end of 2018.

b. There are 22 interstate highway crossings to convert from overhead to underground. The company’s plan for undergrounding these remaining crossing will be in conjunction with other work required on those distribution line sections such as during a road widening or reconductoring project.

14. Please refer to page 50. How many "other hospitals" does TECO have current plans to install the switchgear?

A. Tampa Electric currently has no additional plans to install relay switchgear at other hospitals in the company's service area.

15. Please refer to page 51.

a. Is the ADMS operational?

b. How many AMI's have been installed?

c. How many AMI's per year is TECO planning to install in 2019, 2020, and 2021?

A. a. At this time, the Advanced Distribution Management System ("ADMS") is not operational.

b. As of the end of March 2019, Tampa Electric has installed approximately 130,000 Advanced Metering Infrastructure ("AMI") meters.

c. Tampa Electric is projecting to install the following AMI meters for 2019, 2020 and 2021:

Tampa Electric's Projected AMI Meter Installs	
2019	270,000
2020	340,000
2021	130,000

Note: The 270,000 AMI meters, projected for 2019, includes the 130,000 AMI meters the company has installed as of the end of March 2019, and the 140,000 AMI meters projected to be installed between April 1, 2019 and the end of 2019.

<u>Ten Initiatives</u>

16. Please refer to pages 10 and 11: Joint Use Pole Attachment Audit. Is TECO's joint use audit only in conjunction with its wooden pole inspection program?

A. No, Tampa Electric's Joint Use Pole Attachment Audit is separate from the company's wooden pole inspection programs. Page 10 explains the process in which an attacher wants to attach to the company's pole by permit. The bottom of page 10 and 11 explains the attachment audit which is necessary due to potential unpermitted attachments being made on Tampa Electric's poles and the potential loading and stress issues caused to poles without standard engineering to the poles.

17. Please refer to page 13: Geographic Information System. Please explain why there are no incremental costs for the Hardening of Existing Transmission Structures.

A. Tampa Electric utilizes the company's GIS as the foundational database for all of the company's distribution and transmission facilities and is embedded in the company's day to day business practice with new construction and/or maintenance activities. Because of this, there are no incremental O&M or capital costs associated with the Company's GIS for hardening the existing transmission system.

18. Please refer to page 12 of TECO's 2019-2021 storm hardening plan, and page 11 of TECO's 2016-2018 storm hardening plan. Please explain why the number of transmission poles and structures decreased from 25,400 for 2016-2018 to 24,600 for 2019-2021.

A. The decrease in the number of structures reported (approximately 700) was due to a data integrity issue in the company's GIS system that was discovered in between the response periods. The data has since been cleaned up and the actual number of structures is 25,300.

19. Please refer to page 14: Post-Storm Data Collection. How was the incremental cost of $113,000 per storm for Post-Storm Data Collection estimated?

A. Tampa Electric projected the cost of $113,000 based on the company's experience to perform post-storm data collection for Hurricane Irma in 2017. During Hurricane Irma, Tampa Electric paid a vendor $44,505 to collect the forensic data, paid a second vendor $40,000 to analyze the data and produce a report, and approximately $16,000 for internal employee support of this initiative. The company took these values and escalated them for the 2019 to 2021 period for a total of $113,000 in the year 2021.

20. Please refer to page 15: Outage Data - Overhead and Underground Systems. How was the incremental cost of $100,000 per storm for Outage Data - Overhead and Underground Systems estimated?

A. Tampa Electric has a contract with two vendors that would perform the detailed data collection and analysis that would provide the differentiation between the reliability performance of the company's overhead and underground systems. The contract cost for these two vendors is approximately $85,000 per storm with the remaining costs projected for internal employee costs to support the initiative.

21. Please refer to page 16 of TECO's 2019-2021 storm hardening plan, and page 15 of TECO's 2016-2018 storm hardening plan. Please explain why in 2018, TECO signed an extension of the memorandum of understanding with PURC for two years, rather than three years, as was done in 2015.

A. Tampa Electric, in conjunction with the other Research Collaboration Partners have had the Research Collaboration Memorandum of Understanding ("MOU") since its inception on January 1, 2010. In preparation for continuing the MOU through the next three-year storm hardening plan, the Research Collaboration Partners chose to add the provision of an evergreen clause that will effectively continuously renew the agreement automatically for successive two-year terms. Because the agreement will automatically renew at the end of the initial two-year term, and every two years thereafter, the Research Collaboration MOU is expected to be in effect throughout the three-year storm hardening plan.

22. Please refer to page 18 of TECO's 2019-2021 storm hardening plan, and page 18 of TECO's 2016-2018 storm hardening plan

d. Please explain in detail how the Damage Assessment tool will be utilized.

e. In TECO's 2016-2018 storm hardening plan, the TECO stated that a Damage Assessment tool would be implemented by June 2017. TECO's current estimate is a Damage Assessment tool will be implemented in 2021. Please explain why there was a delay in the implementation date.

A. a. The Damage Assessment tool is a mobile field data collection tool that approved internal and external resources will use to gather information on what damage has occurred due to the storm. The tool is connected to the company's Outage Management System ("OMS") whereby damage data can be paired up with outage data to more effectively manage restoration efforts. The tool will also help in estimating foreign crew and material needs.

b. The company that built the tool referred to in the 2016-2018 plan was bought out by another company and around the same time Tampa Electric was considering upgrading the company's OMS with the ADMS. The ADMS system the company is implementing has a damage assessment tool integral to the system. In 2017, the company made the decision to delay the initiation of the damage assessment tool because the incremental cost of the damage assessment tool (as part of ADMS) would be significantly less costly than a standalone tool.

23. Please complete the table attached.

A. The table is completed on the page below:

	Activity	Any change from current plan. (Y/N)	Actual Cost (Cost in $1,000's)									Estimated Cost (Costs in $1,000's)								
			2016			2017			2018			2019			2020			2021		
			O&M	Capital	Total	O&M	Capital	Total	O&M	Capital	Total	O&M	Capital	Total	O&M	Capital	Total	O&M	Capital	Total
	8-Year Wooden Pole inspection Program	N	$2,137	$0	$2,137	$0	$0	$0	$1,153	$0	$1,153	$1,042	$47	$1,089	$1,068	$48	$1,116	$1,094	$49	$1,144
10 Storm Hardening Initiatives																				
1	A Three-Year Vegetation Management Cycle for Distribution Circuits	N	$10,351	$0	$10,351	$6,442	$0	$6,442	$9,753	$0	$9,753	$12,645	$0	$12,645	$12,898	$0	$12,898	$13,156	$0	$13,156
2	An Audit of Joint-Use Attachment Agreements	N	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	A Six-Year Transmission Structure Inspection program	N	$573	$0	$573	$286	$0	$286	$405	$0	$405	$491	$0	$491	$504	$0	$504	$516	$0	$516
4	Hardening of Existing Transmission Structures	N	$722	$20,145	$20,687	$49	$13,046	$13,094	$34	$3,781	$3,824	$145	$4,279	$4,424	$149	$4,386	$4,535	$152	$4,496	$4,648
s	Transmission and Distribution GIS	N	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Post-Storm Data Collection and Forensic Analysis	N	$0	$0	$0	$100	$0	$100	$0	$0	$0	$107	$0	$107	$110	$0	$110	$113	$0	$113
7	Collection of Detailed Outage data Differentiating Between the Reliability Performance of Overhead and Underground Systems	N	$0	$0	$0	$0	$0	$0	$0	$0	$0	$100	$0	$100	$100	$0	$100	$100	$0	$100
8	Increased Utility Coordination with Local Governments	N, (Note 1)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Collaborative Research on Effects of Hurricane Winds and Storm Surge	N	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	A Natural Disaster Preparedness and Recovery Program ""	N, (Note 2)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		Totals	$13,782	$20,145	$33,927	$6,777	$13,046	$19,822	$11,355	$3,781	$15,136	$14,323	$4,326	$18,649	$14,619	$4,434	$19,053	$14,918	$4,546	$19,464
	Any Other Key Elements or Proposed Initiatives																			

*Please explain any changes from the current plan
•• Please provide a copy of the disaster plan (Note 3)

Note 1: Initiative 8 (Increased Utility Coordination with Local Governments), there are no incremental O&M or capital costs with this initiative due to the activities associated with this initiative are covered by the company's all-hazards planning process within Tampa Electric's Emergency Management and Business Continuity program.

Note 2: Initiative 10 (Disaster Preparedness and Recovery Plan), there are no incremental O&M or capital costs with this initiative due to the activities associated with this initiative are covered by the company's all-hazards planning process within Tampa Electric's Emergency Management and Business Continuity program.

Note 3: Tampa Electric is providing a confidential copy of the company's Emergency Management Plan within this response.

BATES STAMPED PAGES

26 THROUGH 130

ARE REDACTED