BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

REVIEW OF STORM PROTECTION PLAN, PURSUANT TO RULE 25-6.030, F.A.C., DUKE ENERGY FLORIDA, LLC.

DOCKET NO. 20220050-EI

DIRECT TESTIMONY OF BRIAN M. LLOYD

ON BEHALF OF DUKE ENERGY FLORIDA, LLC

APRIL 11, 2022

I. INTRODUCTION AND QUALIFICATIONS.

Q. Please state your name and business address.

A. My name is Brian M. Lloyd. My current business address is 3250 Bonnet Creek Road, Lake Buena Vista, FL 32830.

Q. By whom are you employed and in what capacity?

A. I am employed by Duke Energy Florida, LLC ("DEF" or the "Company") as General Manager, Florida Major Projects.

Q. What are your responsibilities as General Manager, Florida Major Projects?

A. My duties and responsibilities include planning for grid upgrades, system planning, and overall Distribution asset management strategy across DEF and the Project Management for executing the work identified.

Q. Please summarize your educational background and work experience.

A. I have a Bachelor of Science degree in Mechanical Engineering from Clemson University and am a registered Professional Engineer in the state of Florida. Throughout my 15 years at DEF, I have held various positions within distribution ranging from Engineer to General Manager focusing on Asset Management, Asset Planning, Distribution Design and Project Management. My current position as General Manager of Region Major Projects began in January 2020.

II. PURPOSE AND SUMMARY OF TESTIMONY.

Q. What is the purpose of your direct testimony?

A. The purpose of my direct testimony is to provide and support the Company's Storm Protection Plan 2023-2032 ("SPP 2023"). The SPP 2023 is consistent with and complies with all the requirements of both Section 366.96, Florida Statutes ("SPP statute"), and Rule 25-6.030, F.A.C. ("SPP rule"). Both the SPP statute and rule require DEF to prepare and file a Storm Protection Plan at least every three years, but as agreed to in the settlement agreement reached in 2020,[1] DEF is filing its second SPP one year early. My testimony will show that DEF's SPP 2023 utilizes the same analysis methodology and includes the same Programs as previously approved in DEF's Storm Protection Plan 2020-2029 ("SPP 2020"). The results of this analysis are presented in DEF's SPP 2023 which is attached to my testimony.

Q. Do you have any exhibits to your testimony?

[1] Docket No. 20200069-EI.

A. Yes, I am sponsoring the following exhibits to my testimony:

- Exhibit No. __ (BML-1), DEF SPP Program Descriptions;
- Exhibit No. __ (BML-2), DEF SPP Support; and
- Exhibit No. __ (BML-3), DEF Service Area

These exhibits were prepared by the Company under my direction, and they are true and correct to the best of my information and belief. Mrs. Amy M. Howe is co-sponsoring Transmission Programs portion of Exhibit No. __ (BML-1) and Transmission Programs portion of Exhibit No. __ (BML-2). Mr. Christopher A. Menendez is co-sponsoring the Revenue Requirements and Rate Impacts component of Exhibit No. __ (BML-1).

Q. Please summarize your testimony.

A. My testimony presents DEF's Storm Protection Plan for the planning period of 2023 through 2032 and shows that DEF's SPP 2023 meets the requirements of both the SPP statute and rule. The SPP 2023 is designed to cost-effectively "strengthen [the Company's] infrastructure to withstand extreme weather conditions by promoting overhead hardening of electrical transmission and distribution facilities, the undergrounding of certain electrical distribution lines, and vegetation management." §366.96(1)(c), Fla. Stat. DEF's SPP 2023 is built upon the previously approved DEF SPP 2020, taking into consideration updated reliability, asset, storm and cost data.

III. OVERVIEW OF SPP 2023

Q. How did DEF approach the development of the SPP?

A. SPP 2023 was developed in a similar manner as the previously approved SPP 2020 by building a cross functional team of Company experts from various business functions, many that were directly involved in SPP 2020, and by utilizing the professional services of Guidehouse to provide modeling and analysis support. Much like the DEF team, many of the Guidehouse experts were key participants in the formation of SPP 2020. The Guidehouse experts' deep level of industry experience in the Distribution and Transmission systems, climate resilience, risk mitigation, benefits-cost analysis, and predictive analytical techniques provide the expert support necessary to build a comprehensive Storm Protection Plan that meets the requirements of the SPP statute and rule. Guidehouse's previous experience with SPP 2020 made for an efficient start-up process and provided continuity between the two iterations of the Plan.

Q. Please describe how the SPP is organized.

A. DEF's SPP 2023 is attached as three Exhibits. As required by Rule 25-6.030, Exhibit No. _(BML-1) includes a summary of each Program included in SPP 2023; estimated spend and units for the first three years of implementation (2023 to 2025); detailed information for the first-year projects (2023); vegetation management information; and the estimated benefits. Exhibit No._(BML-2) is a write-up of the prioritization methodology and estimated Program benefits. A map of DEF's service area with associated customer count is provided in Exhibit No._(BML-3).

Q. Has DEF determined that there are any areas of its service territory that Storm Protection Plan projects would not be feasible, reasonable or practical?

A. No, DEF has not determined there any areas of its service territory in which it would not be feasible, reasonable or practical to execute SPP projects.

IV. OVERVIEW OF PROGRAMS EVALUATED IN THE SPP

Q. Are the Programs in SPP 2023 the same as SPP 2020?

A. Yes, the DEF and Guidehouse teams selected the same portfolio of Programs for SPP 2023 as the previously approved SPP 2020. These ten Programs are tried, true and built from DEF's and Guidehouse's experience. The ten Programs are: Distribution Feeder Hardening; Distribution Lateral Hardening; Distribution Self-Optimizing Grid; Distribution Underground Flood Mitigation; Transmission Structure Hardening; Transmission Substation Flood Mitigation; Transmission Loop Radially Fed Substations; Transmission Substation Hardening; Distribution Vegetation Management; and Transmission Vegetation Management. Detailed descriptions of these Programs can be found in Exhibit No._(BML-1).

Q. How did DEF develop the list of Programs for the SPP?

A. As mentioned above, DEF utilized the same Programs for SPP 2023 as SPP 2020. These Programs are a combination of those that were previously included in DEF's Storm Hardening Plans (under the since repealed Storm Hardening rule) and those that were developed by internal subject matter experts to meet the requirements of the SPP rule and statute.

Q. Are there any new programs included in DEF's SPP 2023 when compared to DEF's SPP 2020?

A. No.

Q. Are there other potential programs that DEF may consider in the future for inclusion in the SPP?

A. Yes, DEF will continue to monitor emergent technologies that may warrant further review and consideration.

V. PROGRAM EVALUATION, PRIORITIZATION, AND SELECTION

Q. Are there differences in program evaluation and prioritization between SPP 2023 and SPP 2020?

A. Yes. Similar to the development of SPP 2020, DEF provided Guidehouse with asset, outage, project costs and storm damage cost data sets to support the Program evaluation and prioritization. These data sets were updated with information through 2021. As part of the refinement process from SPP 2020 to SPP 2023, DEF and Guidehouse updated values and model details such as conductor failures; calculations for the number of distribution laterals; Self-Optimizing Grid circuit requirements; Substation Flood Mitigation failure probabilities; GOAB unit complexity details; and others which resulted in an enhanced model.

Q. Are there differences in how programs were analyzed within the Guidehouse model?

A. No, the same analysis was performed by Guidehouse for SPP 2023 as SPP 2020. For each Program, Guidehouse estimated a reduction in storm damage and outage duration, using CMI as a proxy for duration, for each possible project location. The model enables DEF to prioritize the work over the life of the Program based on performing the highest benefit work first. As discussed in more detail in Exhibit No. __ (BML-2), the Guidehouse model prioritized work by looking at the probability of damage to particular assets (including consideration of information from various FEMA-produced models) and the consequences of that damage, including for example the number and/or type of customers served by particular assets. That information was then evaluated by DEF subject matter experts in the Distribution and Transmission functions for further analysis and prioritization.

Q. How did the DEF Distribution subject matter experts select the specific targets for implementation in 2023?

A. DEF's Distribution subject matter experts utilized the Guidehouse benefits-to-cost prioritized list of projects to select the highest ranked project. The DEF subject matter experts then evaluated other projects served from the same substation to determine if there were any opportunities with deployment years within the next three to four years. If a project or projects at the substation met this criteria, DEF selected that target to work alongside the initiating project which allows DEF engineering, project management, and construction resources to work more efficiently and reduce overall construction driven disturbance duration to the customers in the area. That is, by batching together qualifying projects from a particular substation, DEF aims to minimize any necessary work-related outages and reduce costs through the efficient use of resources. DEF notes that it is always working to identify efficiencies and other available means to lower costs related to all Programs. If efficiencies can be identified and costs lowered, those lower costs may allow for DEF to identify and complete additional Program scope within the Planning horizon.

Q. There is a difference between the Costs in BML-1 and the Distribution SPP Program Investment totals in BML-2 for the Feeder Hardening and Lateral Hardening Programs. Can you explain this variance?

A. Yes. As described above, DEF Distribution subject matter experts looked at all potential projects at a substation to determine how to efficiently deploy the Storm Protection Plan. This review resulted in selecting some projects that had more Feeder volume than Lateral volume, resulting in the variance between what was provided to Guidehouse as Program Investment targets and actual program costs. However, the total amount of investments between the two Programs was not altered; rather there was a shift of spending between the two Programs to efficiently perform the work described.

Q. Does DEF believe there are any implementation alternatives that could mitigate the resulting rate impact for each of the first three years of the proposed Storm Protection Plan?

A. No, DEF does not believe there are any implementation alternatives that could mitigate the rate impact without negatively impacting the benefits the SPP 2023 is designed to generate. In order to mitigate rate impact, the SPP 2023 would need to be reduced or delayed which would result in a reduction or delay of the benefits.

VI. BENEFITS THAT DEF'S SPP IS INTENDED TO BRING TO DEF'S CUSTOMERS

Q. What benefits does DEF believe its proposed SPP 2023 will provide its customers?

A. As mentioned above, DEF proposes to implement the activities included in Exhibit No. __ (BML-1). While DEF agrees with the Commission's recognition that "[n]o amount of preparation can eliminate outages in extreme weather events,"[2] DEF is confident that the activities included in this 10-Year plan will strengthen its infrastructure, reduce outage times associated with extreme weather events, reduce restoration costs, and improve overall service reliability.

Q. Does this conclude your testimony?

A. Yes, it does.

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[2] *See Review of Electric Utility Hurricane Preparedness and Restoration Actions,* Docket No. 20170215-EU, p. 6.

DUKE ENERGY

Storm Protection Plan

Florida

Program Descriptions

Contents

PROGRAM DESCRIPTIONS

The following sections of this document describe each of Duke Energy Florida's ("DEF") Storm Protection Plan ("SPP") Programs. This exhibit includes the Program vision, description, costs, and estimated benefits from completion of the Program.

Note: Shifts of scope may occur between years to optimize benefits delivery to customers and execution efficiencies.

At the Commission's direction and under its supervision, DEF has engaged in significant storm hardening activities since the 2006 adoption of the Storm Hardening Rule (Rule 25-6.0342, F.A.C., since repealed, due to the adoption of § 366.96, Fla. Stat., and subsequent adoption of Rule 25-6.030, F.A.C.). After the 2016/2017 storm seasons, the Commission initiated its "Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018"[1] to evaluate the efficacy of the approximately 12 years of hardening efforts. As a result of the analysis performed in that docket, the Commission determined that "Florida's aggressive storm hardening programs are working."[2] This conclusion was borne out by several observations: the length of outages from the 2016/2017 storm season was reduced markedly from the 2004-2005 storm season, hardened overhead distribution facilities performed better than non-hardened facilities, and underground facilities performed much better than overhead facilities.[3]

DEF agrees with the Commission's determination. In recognition of the efficacy of the storm hardening plans implemented since 2006, DEF's initial SPP ("SPP 2020") carried on the storm hardening work included in the Company's 2019-2021 Storm Hardening Plan ("SHP"); as such, the programs that were carried over from the SHP into the SPP are the very programs the Commission has previously acknowledged "are grounded in substantive strengthening and protection of the utility's electric facilities. Programs include tree trimming, pole inspections, hardening of feeders and laterals, and undergrounding."[4] DEF's current SPP ("SPP 2023") will continue these programs and build upon them, adding incremental investment over the life of the Plan. DEF will also continue researching and investigating additional technologies and programs.

That said, DEF also agrees with the Commission's recognition that "[n]o amount of preparation can eliminate outages in extreme weather events"[5] so while DEF's Plan is designed with an eye toward strengthening the system and reducing outages and outage duration, it must be understood that there is no panacea and individual storms will produce unique challenges.

[1] *Review of electric utility hurricane preparedness and restoration actions,* Docket No. 20170215-EU.
[2] *Id.* at p. 1.
[3] *See id.* at pp. 2-3.
[4] *See id.* at p. 9.
[5] *Id.* at p. 6.

Distribution Programs

Florida

Program Summaries

Feeder Hardening Program Description

Vision

Feeder Hardening is a long-term program that will systematically upgrade the feeder backbone to meet the National Electric Safety Code ("NESC") 250C extreme wind load standard. The existing backbone is approximately 6,300 miles on 1,411 feeders.

Description

The Feeder Hardening program will enable the feeder backbone to better withstand extreme weather events. This includes strengthening structures, updating basic insulation level ("BIL") to current standards, updating conductor to current standards, relocating difficult to access facilities, relocating or undergrounding facilities to address clearance encroachments, replacing oil filled equipment as appropriate, and incorporates the Company's pole inspection and replacement activities.

Structure Strengthening

Structure strengthening includes upgrading existing poles and other facilities as necessary to align with the NESC 250C extreme wind load standard. For example, a stronger pole class reduces the extent of damage incurred on feeder lines during extreme wind events. Other related hardware upgrades will occur simultaneously, such as insulators, crossarms, support brackets, and guys.

BIL

While upgrading feeders to the extreme wind load standard, the Company will also upgrade the BIL to further harden the system. Upgrading the BIL involves framing for more space between phases, more wood material between insulator mounting points, application of the larger standard insulator sizes, and moving arresters to the lowest level of the primary space.

Conductor Upgrades

As part of Feeder Hardening, DEF will replace any deteriorated or undersized conductor on the feeder backbone. This conductor is more susceptible to storm damage. It will be replaced with our current standard conductor.

Relocating Difficult to Access Facilities

Where practical, feeder sections that traverse hard to access areas, such as wetlands, will be relocated to truck-accessible routes. These line sections often suffer damage in extreme wind load events and, due to their location, are among the most expensive and longest to restore outages.

Relocating or Undergrounding Facilities to Address Clearance Encroachments

While upgrading feeders to the extreme wind load standards, the Company will review clearances with non-company owned structures and assets to determine if there will be adequate clearances with the proposed, hardened structures. If inadequate, the Company will relocate the facilities or install underground facilities where necessary.

Replacing Oil-Filled Equipment

While working to upgrade each feeder, hydraulic (oil-filled) reclosers will be upgraded to electronic reclosers (vacuum interrupters) with communications and remote Supervisory Control and Data Acquisition ("SCADA") control capability, as available. Electronic reclosers enable remote visibility and control. Real-time operational information is remotely available, such as current per phase, voltage per phase, var flow per phase, health condition of the device, on-board battery health, fault information, and interrupter status by phase. This real-time data will help target restoration efforts helping to reduce outage durations. Additionally, these oil-filled devices can cause negative environmental impacts. Electronic reclosers are vacuum interruption devices and have no internal oil.

Figure 1: SCADA enabled Electronic Recloser

Pole Inspection and Replacement

Per Commission Order No. 2006-0144-PAA-EI, pole inspection is performed on an 8-year cycle. These inspections determine the extent of pole decay and any associated loss of strength. The information gathered from these inspections is used to determine pole replacements and to effectuate the extension of pole life through treatment and reinforcement.

Cost

It is expected that the 10-year cost will be approximately $2.0B Capital and $49M O&M. This would cover approximately 2,100 miles of feeder hardening and costs of the pole inspection and replacement activities.

	DEF		
Feeder Hardening	**2023**	**2024**	**2025**
Totals	**$163,275,499**	**$147,020,015**	**$171,460,041**
Feeder Hardening	$145,418,235	$129,142,665	$153,550,611
Capital	$142,706,530	$126,786,600	$150,749,250
O&M	$ 2,711,705	$ 2,356,065	$ 2,801,361
Total Units	170	150	174
Pole Inspection/Replacement	$ 17,857,264	$ 17,877,350	$ 17,909,430
Capital	$ 16,486,848	$ 16,478,550	$ 16,481,570
O&M	$ 1,370,416	$ 1,398,800	$ 1,427,860
Total Units	1,692	1,650	1,610

Cost Benefit Comparison

The Feeder Hardening Program began in 2021 and is estimated to take 30 years to complete. Based on today's costs, the Program will cost an estimated $6B in Capital and $103M in Program O&M. At completion, approximately 6,300 feeder miles will be hardened.

When the Feeder Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Distribution system by approximately $15M to $18M annually based on today's costs.

When the Feeder Hardening Program is complete, DEF estimates it will reduce Distribution MED Customer Minutes Interrupted ("CMI") by approximately 111 million to 139 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

Work will be prioritized using the following process.

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and Sea, Lake, and Overland Surges from Hurricanes ("SLOSH") models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g., each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each feeder and the hardened configuration resulting from the particular program. The difference between the existing condition and the hardened configuration is the program impact.
3. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, resource availability and efficiency.

Year 1 Project List

2023 Planned Duke Energy Florida - Feeder Hardening Program

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
Bay Hill	K67	1.8	1912	$ 1,476,750	$ 27,320	1/1/2023	12/31/2023
Bay Hill	K68	4.9	1860	$ 4,026,000	$ 74,481	1/1/2023	12/31/2023
Bay Hill	K73	1.7	875	$ 1,410,750	$ 26,099	1/1/2023	12/31/2023
Bay Hill	K76	1.9	836	$ 1,526,250	$ 28,236	1/1/2023	12/31/2023
Boggy Marsh	K957	2.7	2937	$ 2,260,500	$ 41,819	1/1/2023	12/31/2023
Boggy Marsh	K959	8.0	1172	$ 6,591,750	$ 121,947	1/1/2023	12/31/2023
Central Park	K495	2.3	1123	$ 1,914,000	$ 35,409	1/1/2023	12/31/2023
Central Park	W0494	2.2	127	$ 1,782,000	$ 32,967	1/1/2023	12/31/2023
Central Park	W0497	2.9	62	$ 2,376,000	$ 43,956	1/1/2023	12/31/2023
Central Park	W0500	1.1	285	$ 932,250	$ 17,247	1/1/2023	12/31/2023
Clearwater	C10	2.9	1148	$ 2,359,500	$ 43,651	1/1/2023	12/31/2023
Clearwater	C11	2.7	1161	$ 2,252,250	$ 41,667	1/1/2023	12/31/2023
Clearwater	C12	2.3	1263	$ 1,856,250	$ 34,341	1/1/2023	12/31/2023
Clearwater	C18	2.6	2049	$ 2,178,000	$ 40,293	1/1/2023	12/31/2023
Crown Point	K278	1.5	1932	$ 1,204,500	$ 22,283	1/1/2023	12/31/2023
Curlew	C4973	4.2	1831	$ 3,432,000	$ 63,492	1/1/2023	12/31/2023
Curlew	C4976	4.5	2221	$ 3,696,000	$ 68,376	1/1/2023	12/31/2023
Curlew	C4985	2.0	1305	$ 1,683,000	$ 31,136	1/1/2023	12/31/2023
Curlew	C4987	3.0	902	$ 2,458,500	$ 45,482	1/1/2023	12/31/2023
Curlew	C4989	4.1	2096	$ 3,374,250	$ 62,424	1/1/2023	12/31/2023
Curlew	C4990	3.7	1689	$ 3,060,750	$ 56,624	1/1/2023	12/31/2023
Curlew	C4991	3.2	2982	$ 2,598,750	$ 48,077	1/1/2023	12/31/2023
Gateway	X111	1.2	316	$ 998,250	$ 18,468	1/1/2023	12/31/2023
Gateway	X113	2.9	2229	$ 2,417,250	$ 44,719	1/1/2023	12/31/2023
Gateway	X123	1.9	60	$ 1,584,000	$ 29,304	1/1/2023	12/31/2023
Gateway	X125	1.9	340	$ 1,534,500	$ 28,388	1/1/2023	12/31/2023
Lake Aloma	W0151	2.8	1720	$ 2,301,750	$ 42,582	1/1/2023	12/31/2023
Lake Aloma	W0153	2.7	642	$ 2,252,250	$ 41,667	1/1/2023	12/31/2023
Maitland	M80	3.5	1397	$ 2,879,250	$ 53,266	1/1/2023	12/31/2023
Maitland	M82	3.2	600	$ 2,615,250	$ 48,382	1/1/2023	12/31/2023
Maitland	W0079	3.3	1253	$ 2,730,750	$ 50,519	1/1/2023	12/31/2023
Maitland	W0086	1.2	386	$ 998,250	$ 18,468	1/1/2023	12/31/2023
Oakhurst	J224	4.0	2349	$ 3,316,500	$ 61,355	1/1/2023	12/31/2023
Oakhurst	J227	2.1	1951	$ 1,732,500	$ 32,051	1/1/2023	12/31/2023
Rio Pinar	W0368	3.1	3449	$ 2,582,250	$ 47,772	1/1/2023	12/31/2023
Rio Pinar	W0370	5.0	2966	$ 4,125,000	$ 76,313	1/1/2023	12/31/2023
Rio Pinar	W0375	4.3	2665	$ 3,572,250	$ 66,087	1/1/2023	12/31/2023
Seven Springs	C4501	5.6	2398	$ 4,620,000	$ 85,470	1/1/2023	12/31/2023
Seven Springs	C4508	4.2	2395	$ 3,481,500	$ 64,408	1/1/2023	12/31/2023
Sky Lake	W0363	4.8	2128	$ 3,927,000	$ 72,650	1/1/2023	12/31/2023
Sky Lake	W0365	3.1	2531	$ 2,516,250	$ 46,551	1/1/2023	12/31/2023
Sky Lake	W0366	2.7	960	$ 2,186,250	$ 40,446	1/1/2023	12/31/2023
Sky Lake	W0367	2.9	201	$ 2,367,750	$ 43,803	1/1/2023	12/31/2023
Sky Lake	W0368	5.4	1298	$ 4,422,000	$ 81,807	1/1/2023	12/31/2023
Vinoy	X70	3.1	2046	$ 2,532,750	$ 46,856	1/1/2023	12/31/2023
Vinoy	X71	2.5	1867	$ 2,037,750	$ 37,698	1/1/2023	12/31/2023
Vinoy	X72	4.8	3070	$ 3,968,250	$ 73,413	1/1/2023	12/31/2023
Vinoy	X78	1.9	2500	$ 1,600,500	$ 29,609	1/1/2023	12/31/2023
Cross Bayou	J141	3.8	1202	$ 3,102,000	$ 57,387	1/1/2023	12/31/2023
Cross Bayou	J143	1.9	1291	$ 1,592,250	$ 29,457	1/1/2023	12/31/2023
Cross Bayou	J148	3.7	826	$ 3,019,500	$ 55,861	1/1/2023	12/31/2023
Econ	W0320	4.7	2845	$ 3,910,500	$ 72,344	1/1/2023	12/31/2023
Econ	W0321	6.1	1413	$ 5,057,250	$ 93,559	1/1/2023	12/31/2023

Feeder Pole Inspections

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
WILLISTON	A124	939	1516		$ 37,560	1/1/2023	12/31/2023
WILLISTON	A125	2	0		$ 80	1/1/2023	12/31/2023
ALACHUA	A143	95	162		$ 3,800	1/1/2023	12/31/2023
ALACHUA	A144	38	30		$ 1,520	1/1/2023	12/31/2023
GE ALACHUA	A185	4	0		$ 160	1/1/2023	12/31/2023
GE ALACHUA	A186	369	556		$ 14,760	1/1/2023	12/31/2023
LURAVILLE	A192	369	699		$ 14,760	1/1/2023	12/31/2023
ARCHER	A195	182	458		$ 7,280	1/1/2023	12/31/2023
ARCHER	A196	283	494		$ 11,320	1/1/2023	12/31/2023
FORT WHITE	A20	357	609		$ 14,280	1/1/2023	12/31/2023
O' BRIEN	A379	391	758		$ 15,640	1/1/2023	12/31/2023
GEORGIA PACIFIC	A45	688	1360		$ 27,520	1/1/2023	12/31/2023
TRENTON	A90	504	1207		$ 20,160	1/1/2023	12/31/2023
TRENTON	A91	95	134		$ 3,800	1/1/2023	12/31/2023
NEWBERRY	A94	59	83		$ 2,360	1/1/2023	12/31/2023
CROSS BAYOU	J140	113	1583		$ 4,520	1/1/2023	12/31/2023
CROSS BAYOU	J141	104	1200		$ 4,160	1/1/2023	12/31/2023
CROSS BAYOU	J142	90	3322		$ 3,600	1/1/2023	12/31/2023
CROSS BAYOU	J143	85	1290		$ 3,400	1/1/2023	12/31/2023
CROSS BAYOU	J144	9	5		$ 360	1/1/2023	12/31/2023
CROSS BAYOU	J145	95	1219		$ 3,800	1/1/2023	12/31/2023
CROSS BAYOU	J146	70	732		$ 2,800	1/1/2023	12/31/2023
CROSS BAYOU	J147	218	3023		$ 8,720	1/1/2023	12/31/2023
CROSS BAYOU	J148	66	826		$ 2,640	1/1/2023	12/31/2023
CROSS BAYOU	J150	177	1928		$ 7,080	1/1/2023	12/31/2023
LAKE PLACID	K1066	296	1427		$ 11,840	1/1/2023	12/31/2023
MARLEY ROAD	K120	0	0		$ -	1/1/2023	12/31/2023
LAKE MARION	K1286	465	4105		$ 18,600	1/1/2023	12/31/2023
LAKE MARION	K1287	507	2396		$ 20,280	1/1/2023	12/31/2023
LAKE MARION	K1288	237	1603		$ 9,480	1/1/2023	12/31/2023
LAKE PLACID	K1320	557	2289		$ 22,280	1/1/2023	12/31/2023
ARBUCKLE CREEK	K1361	48	1192		$ 1,920	1/1/2023	12/31/2023
LEISURE LAKES	K1415	633	2068		$ 25,320	1/1/2023	12/31/2023
WEST DAVENPORT	K1521	151	2145		$ 6,040	1/1/2023	12/31/2023
WEST DAVENPORT	K1523	23	2191		$ 920	1/1/2023	12/31/2023
WEST DAVENPORT	K1524	101	1962		$ 4,040	1/1/2023	12/31/2023
WEST DAVENPORT	K1526	136	3486		$ 5,440	1/1/2023	12/31/2023
WEST DAVENPORT	K1529	75	2720		$ 3,000	1/1/2023	12/31/2023
FISHEATING CREE	K1560	765	2565		$ 30,600	1/1/2023	12/31/2023
HAINES CITY	K16	226	996		$ 9,040	1/1/2023	12/31/2023
HAINES CITY	K17	342	2130		$ 13,680	1/1/2023	12/31/2023
CHAMPIONS GATE	K1761	9	2187		$ 360	1/1/2023	12/31/2023
CHAMPIONS GATE	K1762	33	3445		$ 1,320	1/1/2023	12/31/2023
CHAMPIONS GATE	K1763	13	2225		$ 520	1/1/2023	12/31/2023
CHAMPIONS GATE	K1764	7	2029		$ 280	1/1/2023	12/31/2023
HAINES CITY	K18	248	3041		$ 9,920	1/1/2023	12/31/2023
NORTHRIDGE	K1825	61	225		$ 2,440	1/1/2023	12/31/2023
HAINES CITY	K19	136	533		$ 5,440	1/1/2023	12/31/2023
HAINES CITY	K20	160	1230		$ 6,400	1/1/2023	12/31/2023
HAINES CITY	K21	469	2614		$ 18,760	1/1/2023	12/31/2023
HAINES CITY	K22	213	2375		$ 8,520	1/1/2023	12/31/2023
LAKE PLACID NOR	K24	133	950		$ 5,320	1/1/2023	12/31/2023
LAKE PLACID NOR	K27	70	570		$ 2,800	1/1/2023	12/31/2023
LOUGHMAN	K5078	57	1119		$ 2,280	1/1/2023	12/31/2023
LOUGHMAN	K5079	153	2474		$ 6,120	1/1/2023	12/31/2023
LOUGHMAN	K5086	6	2330		$ 240	1/1/2023	12/31/2023
SEBRING EAST	K541	36	621		$ 1,440	1/1/2023	12/31/2023
SEBRING EAST	K542	73	109		$ 2,920	1/1/2023	12/31/2023
LAKE PLACID	K757	381	935		$ 15,240	1/1/2023	12/31/2023
LAKE PLACID	K758	253	1376		$ 10,120	1/1/2023	12/31/2023
INTERCESSION CIT	K966	202	622		$ 8,080	1/1/2023	12/31/2023
INTERCESSION CIT	K967	108	1443		$ 4,320	1/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
EUSTIS SOUTH	M1054	57	642		$ 2,280	1/1/2023	12/31/2023
EUSTIS SOUTH	M1055	162	1402		$ 6,480	1/1/2023	12/31/2023
EUSTIS SOUTH	M1056	173	1766		$ 6,920	1/1/2023	12/31/2023
EUSTIS SOUTH	M1057	68	1509		$ 2,720	1/1/2023	12/31/2023
EUSTIS SOUTH	M1058	243	1948		$ 9,720	1/1/2023	12/31/2023
EUSTIS SOUTH	M1059	140	1731		$ 5,600	1/1/2023	12/31/2023
LISBON	M1517	217	1663		$ 8,680	1/1/2023	12/31/2023
LISBON	M1518	122	1840		$ 4,880	1/1/2023	12/31/2023
LISBON	M1519	242	2045		$ 9,680	1/1/2023	12/31/2023
LISBON	M1520	283	1680		$ 11,320	1/1/2023	12/31/2023
LOCKHART	M400	86	306		$ 3,440	1/1/2023	12/31/2023
LOCKHART	M402	105	616		$ 4,200	1/1/2023	12/31/2023
LOCKHART	M406	89	1703		$ 3,560	1/1/2023	12/31/2023
LOCKHART	M412	165	1805		$ 6,600	1/1/2023	12/31/2023
LOCKHART	M415	27	47		$ 1,080	1/1/2023	12/31/2023
LOCKHART	M417	99	1127		$ 3,960	1/1/2023	12/31/2023
UMATILLA	M4405	164	757		$ 6,560	1/1/2023	12/31/2023
UMATILLA	M4407	327	2270		$ 13,080	1/1/2023	12/31/2023
UMATILLA	M4408	162	1399		$ 6,480	1/1/2023	12/31/2023
EUSTIS	M499	150	1448		$ 6,000	1/1/2023	12/31/2023
EUSTIS	M500	122	1754		$ 4,880	1/1/2023	12/31/2023
EUSTIS	M501	192	1144		$ 7,680	1/1/2023	12/31/2023
EUSTIS	M503	215	1441		$ 8,600	1/1/2023	12/31/2023
EUSTIS	M504	241	2013		$ 9,640	1/1/2023	12/31/2023
TAVARES EAST	M580	98	700		$ 3,920	1/1/2023	12/31/2023
TAVARES EAST	M581	166	1364		$ 6,640	1/1/2023	12/31/2023
KELLY PARK	M821	177	1987		$ 7,080	1/1/2023	12/31/2023
KELLY PARK	M822	164	402		$ 6,560	1/1/2023	12/31/2023
JASPER	N191	446	831		$ 17,840	1/1/2023	12/31/2023
JASPER	N191 OLD	1	0		$ 40	1/1/2023	12/31/2023
JASPER	N192	285	959		$ 11,400	1/1/2023	12/31/2023
JENNINGS	N195	278	481		$ 11,120	1/1/2023	12/31/2023
WHITE SPRINGS	N375	330	730		$ 13,200	1/1/2023	12/31/2023
TURNER PLANT	W0761	258	1953		$ 10,320	1/1/2023	12/31/2023
TURNER PLANT	W0762	190	1444		$ 7,600	1/1/2023	12/31/2023
TURNER PLANT	W0763	204	1712		$ 8,160	1/1/2023	12/31/2023
TURNER PLANT	W0764	111	1352		$ 4,440	1/1/2023	12/31/2023
BAYWAY	X100	45	798		$ 1,800	1/1/2023	12/31/2023
THIRTY SECOND S	X22	297	2379		$ 11,880	1/1/2023	12/31/2023
THIRTY SECOND S	X23	115	1135		$ 4,600	1/1/2023	12/31/2023
THIRTY SECOND S	X24	195	1283		$ 7,800	1/1/2023	12/31/2023
THIRTY SECOND S	X25	125	982		$ 5,000	1/1/2023	12/31/2023
THIRTY SECOND S	X26	206	1489		$ 8,240	1/1/2023	12/31/2023
THIRTY SECOND S	X27	196	2852		$ 7,840	1/1/2023	12/31/2023
THIRTY SECOND S	X28	190	2377		$ 7,600	1/1/2023	12/31/2023
THIRTY SECOND S	X29	192	2123		$ 7,680	1/1/2023	12/31/2023
THIRTY SECOND S	X30	395	2965		$ 15,800	1/1/2023	12/31/2023
SIXTEENTH STREE	X31	330	3714		$ 13,200	1/1/2023	12/31/2023
SIXTEENTH STREE	X32	1	22		$ 40	1/1/2023	12/31/2023
SIXTEENTH STREE	X33	44	926		$ 1,760	1/1/2023	12/31/2023
SIXTEENTH STREE	X34	333	2999		$ 13,320	1/1/2023	12/31/2023
SIXTEENTH STREE	X35	3	214		$ 120	1/1/2023	12/31/2023
SIXTEENTH STREE	X36	98	1016		$ 3,920	1/1/2023	12/31/2023
THIRTY SECOND S	X37	371	2460		$ 14,840	1/1/2023	12/31/2023
SIXTEENTH STREE	X43	169	1266		$ 6,760	1/1/2023	12/31/2023
SIXTEENTH STREE	X45	259	2104		$ 10,360	1/1/2023	12/31/2023
SIXTEENTH STREE	X46	298	2637		$ 11,920	1/1/2023	12/31/2023
VINOY	X70	171	2050		$ 6,840	1/1/2023	12/31/2023
VINOY	X71	107	1877		$ 4,280	1/1/2023	12/31/2023
VINOY	X72	295	3083		$ 11,800	1/1/2023	12/31/2023
VINOY	X75	0	1		$ -	1/1/2023	12/31/2023
VINOY	X76	2	146		$ 80	1/1/2023	12/31/2023
VINOY	X78	165	2510		$ 6,600	1/1/2023	12/31/2023
VINOY	X79	0	837		$ -	1/1/2023	12/31/2023
VINOY	X80	7	489		$ 280	1/1/2023	12/31/2023
BAYWAY	X96	86	2873		$ 3,440	1/1/2023	12/31/2023
BAYWAY	X97	68	1695		$ 2,720	1/1/2023	12/31/2023
BAYWAY	X99	112	3305		$ 4,480	1/1/2023	12/31/2023
Additional Inspectio	TBD	3781			$ 151,240	1/1/2023	12/31/2023

Feeder Pole Replacements

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
WILLISTON	A124	56	1516	$ 545,664	$ 8,288	1/1/2023	12/31/2023
ALACHUA	A143	6	162	$ 58,464	$ 888	1/1/2023	12/31/2023
GE ALACHUA	A186	22	556	$ 214,368	$ 3,256	1/1/2023	12/31/2023
LAKE MARION	K1286	28	4105	$ 272,832	$ 4,144	1/1/2023	12/31/2023
HAINES CITY	K18	15	3041	$ 146,160	$ 2,220	1/1/2023	12/31/2023
SEBRING EAST	K541	2	621	$ 19,488	$ 296	1/1/2023	12/31/2023
JASPER	N192	17	959	$ 165,648	$ 2,516	1/1/2023	12/31/2023
SIXTEENTH STREE	X33	3	926	$ 29,232	$ 444	1/1/2023	12/31/2023
SIXTEENTH STREE	X36	6	1016	$ 58,464	$ 888	1/1/2023	12/31/2023
VINOY	X78	10	2510	$ 97,440	$ 1,480	1/1/2023	12/31/2023
BAYWAY	X96	5	2873	$ 48,720	$ 740	1/1/2023	12/31/2023
ALACHUA	A144	2	30	$ 19,488	$ 296	1/1/2023	12/31/2023
LURAVILLE	A192	22	699	$ 214,368	$ 3,256	1/1/2023	12/31/2023
LAKE MARION	K1287	30	2396	$ 292,320	$ 4,440	1/1/2023	12/31/2023
NORTHRIDGE	K1825	4	225	$ 38,976	$ 592	1/1/2023	12/31/2023
SEBRING EAST	K542	4	109	$ 38,976	$ 592	1/1/2023	12/31/2023
JENNINGS	N195	17	481	$ 165,648	$ 2,516	1/1/2023	12/31/2023
SIXTEENTH STREE	X34	20	2999	$ 194,880	$ 2,960	1/1/2023	12/31/2023
THIRTY SECOND S	X37	22	2460	$ 214,368	$ 3,256	1/1/2023	12/31/2023
BAYWAY	X97	4	1695	$ 38,976	$ 592	1/1/2023	12/31/2023
ARCHER	A195	11	458	$ 107,184	$ 1,628	1/1/2023	12/31/2023
LAKE MARION	K1288	14	1603	$ 136,416	$ 2,072	1/1/2023	12/31/2023
HAINES CITY	K19	8	533	$ 77,952	$ 1,184	1/1/2023	12/31/2023
LAKE PLACID	K757	23	935	$ 224,112	$ 3,404	1/1/2023	12/31/2023
WHITE SPRINGS	N375	20	730	$ 194,880	$ 2,960	1/1/2023	12/31/2023
SIXTEENTH STREE	X43	10	1286	$ 97,440	$ 1,480	1/1/2023	12/31/2023
BAYWAY	X99	7	3305	$ 68,208	$ 1,036	1/1/2023	12/31/2023
ARCHER	A196	17	494	$ 165,648	$ 2,516	1/1/2023	12/31/2023
LAKE PLACID	K1320	33	2289	$ 321,552	$ 4,884	1/1/2023	12/31/2023
HAINES CITY	K20	10	1230	$ 97,440	$ 1,480	1/1/2023	12/31/2023
LAKE PLACID	K758	15	1376	$ 146,160	$ 2,220	1/1/2023	12/31/2023
TURNER PLANT	W0761	15	1953	$ 146,160	$ 2,220	1/1/2023	12/31/2023
SIXTEENTH STREE	X45	16	2104	$ 155,904	$ 2,368	1/1/2023	12/31/2023
FORT WHITE	A20	21	609	$ 204,624	$ 3,108	1/1/2023	12/31/2023
ARBUCKLE CREEK	K1361	3	1192	$ 29,232	$ 444	1/1/2023	12/31/2023
HAINES CITY	K21	28	2614	$ 272,832	$ 4,144	1/1/2023	12/31/2023
INTERCESSION CIT	K966	12	622	$ 116,928	$ 1,776	1/1/2023	12/31/2023
TURNER PLANT	W0762	11	1444	$ 107,184	$ 1,628	1/1/2023	12/31/2023
SIXTEENTH STREE	X46	18	2637	$ 175,392	$ 2,664	1/1/2023	12/31/2023
O' BRIEN	A379	23	758	$ 224,112	$ 3,404	1/1/2023	12/31/2023
LEISURE LAKES	K1415	38	2068	$ 370,272	$ 5,624	1/1/2023	12/31/2023
HAINES CITY	K22	13	2375	$ 126,672	$ 1,924	1/1/2023	12/31/2023
INTERCESSION CIT	K967	7	1443	$ 68,208	$ 1,036	1/1/2023	12/31/2023
TURNER PLANT	W0763	12	1712	$ 116,928	$ 1,776	1/1/2023	12/31/2023
VINOY	X70	10	2050	$ 97,440	$ 1,480	1/1/2023	12/31/2023
GEORGIA PACIFIC	A45	41	1360	$ 399,504	$ 6,068	1/1/2023	12/31/2023
WEST DAVENPOR	K1521	9	2145	$ 87,696	$ 1,332	1/1/2023	12/31/2023
LAKE PLACID NOR	K24	8	950	$ 77,952	$ 1,184	1/1/2023	12/31/2023
EUSTIS SOUTH	M1054	3	642	$ 29,232	$ 444	1/1/2023	12/31/2023
TURNER PLANT	W0764	7	1352	$ 68,208	$ 1,036	1/1/2023	12/31/2023
VINOY	X71	6	1877	$ 58,464	$ 888	1/1/2023	12/31/2023
TRENTON	A90	30	1207	$ 292,320	$ 4,440	1/1/2023	12/31/2023
WEST DAVENPOR	K1523	1	2191	$ 9,744	$ 148	1/1/2023	12/31/2023
LAKE PLACID NOR	K27	4	570	$ 38,976	$ 592	1/1/2023	12/31/2023
EUSTIS SOUTH	M1055	10	1402	$ 97,440	$ 1,480	1/1/2023	12/31/2023
BAYWAY	X100	3	798	$ 29,232	$ 444	1/1/2023	12/31/2023
VINOY	X72	18	3083	$ 175,392	$ 2,664	1/1/2023	12/31/2023
TRENTON	A91	6	134	$ 58,464	$ 888	1/1/2023	12/31/2023
WEST DAVENPOR	K1524	6	1962	$ 58,464	$ 888	1/1/2023	12/31/2023
LOUGHMAN	K5078	3	1119	$ 29,232	$ 444	1/1/2023	12/31/2023
EUSTIS SOUTH	M1056	10	1766	$ 97,440	$ 1,480	1/1/2023	12/31/2023
THIRTY SECOND S	X22	18	2379	$ 175,392	$ 2,664	1/1/2023	12/31/2023
NEWBERRY	A94	4	83	$ 38,976	$ 592	1/1/2023	12/31/2023
WEST DAVENPOR	K1526	8	3486	$ 77,952	$ 1,184	1/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
LOUGHMAN	K5079	9	2474	$ 87,696	$ 1,332	1/1/2023	12/31/2023
EUSTIS SOUTH	M1057	4	1509	$ 38,976	$ 592	1/1/2023	12/31/2023
THIRTY SECOND S	X23	7	1135	$ 68,208	$ 1,036	1/1/2023	12/31/2023
CROSS BAYOU	J140	7	1583	$ 68,208	$ 1,036	1/1/2023	12/31/2023
WEST DAVENPOR	K1529	4	2720	$ 38,976	$ 592	1/1/2023	12/31/2023
EUSTIS SOUTH	M1058	15	1948	$ 146,160	$ 2,220	1/1/2023	12/31/2023
THIRTY SECOND S	X24	12	1283	$ 116,928	$ 1,776	1/1/2023	12/31/2023
CROSS BAYOU	J141	6	1200	$ 58,464	$ 888	1/1/2023	12/31/2023
FISHEATING CREE	K1560	46	2565	$ 448,224	$ 6,808	1/1/2023	12/31/2023
EUSTIS SOUTH	M1059	8	1731	$ 77,952	$ 1,184	1/1/2023	12/31/2023
THIRTY SECOND S	X25	7	982	$ 68,208	$ 1,036	1/1/2023	12/31/2023
CROSS BAYOU	J142	5	3322	$ 48,720	$ 740	1/1/2023	12/31/2023
HAINES CITY	K16	14	996	$ 136,416	$ 2,072	1/1/2023	12/31/2023
LISBON	M1517	13	1663	$ 126,672	$ 1,924	1/1/2023	12/31/2023
THIRTY SECOND S	X26	12	1489	$ 116,928	$ 1,776	1/1/2023	12/31/2023
CROSS BAYOU	J143	5	1290	$ 48,720	$ 740	1/1/2023	12/31/2023
HAINES CITY	K17	21	2130	$ 204,624	$ 3,108	1/1/2023	12/31/2023
LISBON	M1518	7	1840	$ 68,208	$ 1,036	1/1/2023	12/31/2023
THIRTY SECOND S	X27	12	2852	$ 116,928	$ 1,776	1/1/2023	12/31/2023
CROSS BAYOU	J144	1	5	$ 9,744	$ 148	1/1/2023	12/31/2023
CHAMPIONS GATI	K1761	1	2187	$ 9,744	$ 148	1/1/2023	12/31/2023
LISBON	M1519	15	2045	$ 146,160	$ 2,220	1/1/2023	12/31/2023
THIRTY SECOND S	X28	11	2377	$ 107,184	$ 1,628	1/1/2023	12/31/2023
CROSS BAYOU	J145	6	1219	$ 58,464	$ 888	1/1/2023	12/31/2023
CHAMPIONS GATI	K1762	2	3445	$ 19,488	$ 296	1/1/2023	12/31/2023
LISBON	M1520	17	1680	$ 165,648	$ 2,516	1/1/2023	12/31/2023
THIRTY SECOND S	X29	11	2123	$ 107,184	$ 1,628	1/1/2023	12/31/2023
CROSS BAYOU	J146	4	732	$ 38,976	$ 592	1/1/2023	12/31/2023
CHAMPIONS GATI	K1763	1	2225	$ 9,744	$ 148	1/1/2023	12/31/2023
LOCKHART	M400	5	308	$ 48,720	$ 740	1/1/2023	12/31/2023
THIRTY SECOND S	X30	24	2985	$ 233,856	$ 3,552	1/1/2023	12/31/2023
CROSS BAYOU	J147	13	3023	$ 126,672	$ 1,924	1/1/2023	12/31/2023
LOCKHART	M402	6	618	$ 58,464	$ 888	1/1/2023	12/31/2023
SIXTEENTH STREE	X31	20	3714	$ 194,880	$ 2,960	1/1/2023	12/31/2023
CROSS BAYOU	J148	4	826	$ 38,976	$ 592	1/1/2023	12/31/2023
LOCKHART	M406	5	1703	$ 48,720	$ 740	1/1/2023	12/31/2023
CROSS BAYOU	J150	11	1928	$ 107,184	$ 1,628	1/1/2023	12/31/2023
LOCKHART	M412	10	1805	$ 97,440	$ 1,480	1/1/2023	12/31/2023
LAKE PLACID	K1066	18	1427	$ 175,392	$ 2,664	1/1/2023	12/31/2023
LOCKHART	M415	2	47	$ 19,488	$ 296	1/1/2023	12/31/2023
LOCKHART	M417	6	1127	$ 58,464	$ 888	1/1/2023	12/31/2023
UMATILLA	M4405	10	757	$ 97,440	$ 1,480	1/1/2023	12/31/2023
UMATILLA	M4407	20	2270	$ 194,880	$ 2,960	1/1/2023	12/31/2023
UMATILLA	M4408	10	1399	$ 97,440	$ 1,480	1/1/2023	12/31/2023
EUSTIS	M499	9	1448	$ 87,696	$ 1,332	1/1/2023	12/31/2023
EUSTIS	M500	7	1754	$ 68,208	$ 1,036	1/1/2023	12/31/2023
EUSTIS	M501	12	1144	$ 116,928	$ 1,776	1/1/2023	12/31/2023
EUSTIS	M503	13	1441	$ 126,672	$ 1,924	1/1/2023	12/31/2023
EUSTIS	M504	14	2013	$ 136,416	$ 2,072	1/1/2023	12/31/2023
TAVARES EAST	M580	6	700	$ 58,464	$ 888	1/1/2023	12/31/2023
TAVARES EAST	M581	10	1364	$ 97,440	$ 1,480	1/1/2023	12/31/2023
KELLY PARK	M821	11	1987	$ 107,184	$ 1,628	1/1/2023	12/31/2023
KELLY PARK	M822	10	402	$ 97,440	$ 1,480	1/1/2023	12/31/2023
JASPER	N191	27	831	$ 263,088	$ 3,996	1/1/2023	12/31/2023
Additional Replacen	TBD	241		$ 2,348,304	$ 35,668	1/1/2023	12/31/2023

Lateral Hardening

Vision

Lateral Hardening is a long-term Program that will systematically upgrade and harden branch line sections fed by the feeder backbone. There will be two main approaches, undergrounding and overhead hardening. The existing lateral system is approximately 11,800 miles on 1,411 feeders.

Description

The Lateral Hardening Program will enable branch lines to better withstand extreme weather events. This will include undergrounding of the laterals most prone to damage during extreme weather events and overhead hardening of those laterals less prone to damage.

Lateral Undergrounding

Lateral segments that are most prone to damage resulting in outages during extreme weather events will be placed underground. Doing so will greatly reduce both damage costs and outage duration for DEF customers. Lateral Undergrounding focuses on branch lines that historically experience the most outage events, contain assets of greater vintage, are susceptible to damage from vegetation, and/or often have facilities that are inaccessible to trucks. These branch lines will be replaced with a modern, updated, and standard underground design of today.

Figure 1: An example of residential customers that would be candidates for Undergrounding due to section of line and service in heavily vegetated areas.

Figure 2: Section of lines that runs through backlot and heavily vegetated areas will be underground.

Lateral Hardening Overhead

The overhead hardening strategy includes structure strengthening, deteriorated conductor replacement, removing open secondary wires, replacing fuses with automated line devices, pole replacement (when needed), line relocation, and/or hazard tree removal.

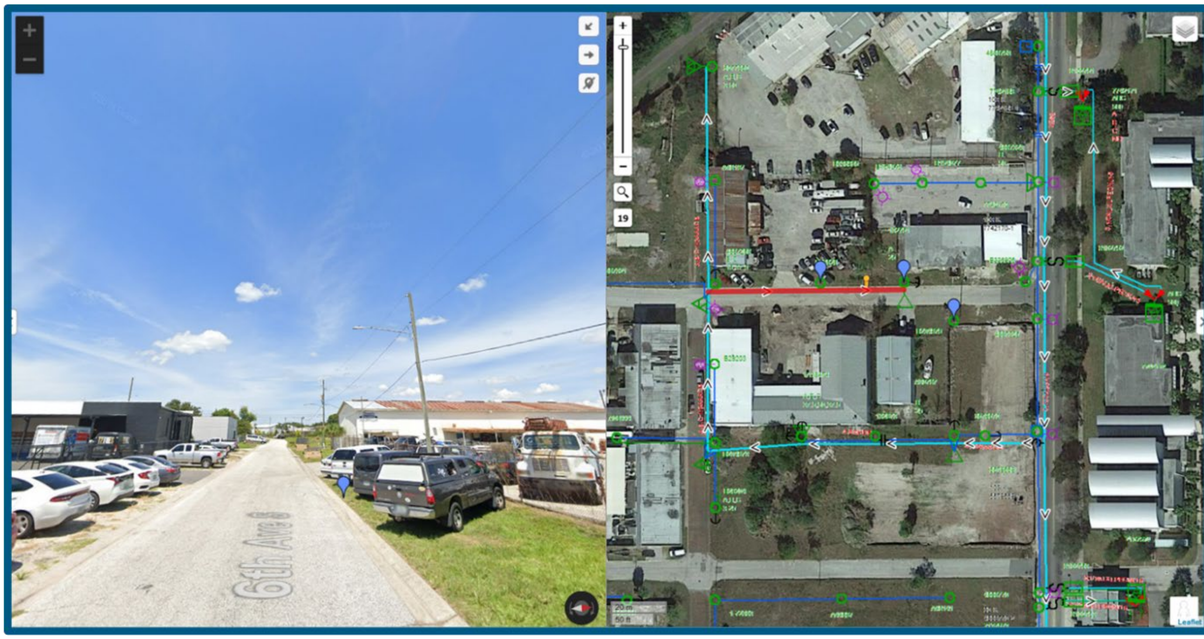


Figure 3: The teal tap line branches off the main road through an open lot to side streets where it splits again. It serves a few customers with minimal, to no vegetation. The street view is a view of the red line where there are no vegetation concerns.

Structure Strengthening

Structure Strengthening includes upgrading existing poles and other facilities as necessary to align with the NESC 250C extreme wind loading standard. For example, a stronger pole class reduces the extent of damage incurred on lateral lines during extreme wind events. Other related hardware upgrades will occur simultaneously, such as installation of insulators, crossarms, support brackets, and guys.

Conductor Upgrades

As part of Lateral Hardening Overhead, DEF will replace any deteriorated or undersized conductor on the lateral. This conductor is more susceptible to storm damage. It will be replaced with our current standard conductor.

Upgrade Open Wire Secondary

Removing the open secondary wire will mitigate outages during extreme weather conditions. This activity will eliminate an older design standard that is susceptible to wires contacting vegetation and debris. Modern triplex cable will be installed to replace the open wire secondary.

Figure 4: Three examples of open wire secondary that will be addressed

Fusing

DEF will replace current one-time use fuses with automated line devices ("ALD"), which are small vacuum reclosers, to improve lateral performance in extreme weather events. ALDs use current fuse holders and do not generally require pole reframing. The reclosing capability inherent in the ALD will reduce outage events for downstream customers. ALDs will also serve as the temporary fault clearing device, thus reducing momentary interruptions for customers upstream on the feeder.

Figure 5: Installed ALD

Line Relocation

Where practical, lateral line sections that traverse hard to access areas, such as wetlands, will be relocated to truck accessible routes. These line sections often suffer damage in extreme wind load events, and due to their location are among the most expensive to repair and take the longest to restore to service from an outage.

Hazard Tree

During the upgrade process DEF will identify hazard trees in the area surrounding the lateral requiring remediation. A hazard tree is a tree that is dead, structurally unsound, dying, diseased, leaning, or otherwise in a condition that is likely to result in striking electrical lines or other assets. Once identified, hazard trees are assigned to a contractor for remediation. When hazard trees are located in areas where DEF does not have the legal right to mitigate the danger, DEF or its contractor will work with the property owner to gain access and remediate.

Pole Inspection and Replacement

Per Commission Order No. PSC-2006-0144-PAA-EI, pole inspection is performed on an 8-year cycle. These inspections determine the extent of pole decay and any associated loss of strength. The information gathered from these inspections is used to determine pole replacements and to effectuate the extension of pole life through treatment and reinforcement.

Cost

It is expected that the 10-year cost will be approximately $2.9B Capital and $74M O&M. This would cover approximately 1,300 miles of Lateral Hardening Underground, approximately 1,700 miles of Lateral Hardening Overhead, and costs of the pole inspection and replacement activities.

	DEF		
Lateral Hardening	**2023**	**2024**	**2025**
Totals	$208,405,519	$243,029,355	$275,622,172
Lateral Hardening	$162,495,319	$197,047,439	$229,569,352
Capital	$160,310,990	$194,171,453	$226,204,650
O&M	$ 2,184,329	$ 2,875,986	$ 3,364,702
Total Units	179	249	286
Pole Inspection/Replacement	$ 45,910,200	$ 45,981,916	$ 46,052,820
Capital	$ 42,386,400	$ 42,384,828	$ 42,381,180
O&M	$ 3,523,800	$ 3,597,088	$ 3,671,640
Total Units	4,350	4,244	4,140

Cost Benefit Comparison

The Lateral Hardening Program began in 2022 and is estimated to take 40 years to complete. Based on today's costs, the Program will cost an estimated $11B in Capital and $154M in Project O&M. At completion, approximately 11,800 lateral miles will be hardened.

When the Lateral Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Distribution system by approximately $111M to $139M annually based on today's costs.

When the Lateral Hardening Program is complete, DEF estimates it will reduce Distribution MED CMI by approximately by 351 million to 439 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

The following steps are used to prioritize the work:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the

FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.

2. <u>Consequence of Damage</u>: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each feeder, and the hardened configuration resulting from the particular program. The difference between the existing condition and the hardened configuration is the program impact.
3. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, resource availability and efficiency.

Year 1 Project List

2023 Planned Duke Energy Florida - Lateral Hardening Program

Location		Unit Count	Customer Coun	Capital Cost	O&M Cost	Start Date	Finish Date
Lateral Hardening Underground							
Bay Hill	K67	0.29	1912	$ 359,287	$ 4,491	1/1/2023	12/31/2023
Bay Hill	K68	1.75	1860	$ 2,168,108	$ 27,101	1/1/2023	12/31/2023
Bay Hill	K73	0.44	875	$ 545,124	$ 6,814	1/1/2023	12/31/2023
Bay Hill	K76	1.70	836	$ 2,106,162	$ 26,327	1/1/2023	12/31/2023
Boggy Marsh	K957	0.42	2937	$ 520,346	$ 6,504	1/1/2023	12/31/2023
Boggy Marsh	K959	0.91	1172	$ 1,127,416	$ 14,093	1/1/2023	12/31/2023
Central Park	K495	4.05	1123	$ 5,017,622	$ 62,720	1/1/2023	12/31/2023
Central Park	W0494	0.41	127	$ 507,957	$ 6,349	1/1/2023	12/31/2023
Central Park	W0497	0.21	62	$ 260,173	$ 3,252	1/1/2023	12/31/2023
Central Park	W0500	1.79	285	$ 2,217,665	$ 27,721	1/1/2023	12/31/2023
Clearwater	C10	0.86	1148	$ 1,065,470	$ 13,318	1/1/2023	12/31/2023
Clearwater	C11	2.22	1161	$ 2,750,400	$ 34,380	1/1/2023	12/31/2023
Clearwater	C12	1.30	1263	$ 1,610,595	$ 20,132	1/1/2023	12/31/2023
Clearwater	C18	0.51	2049	$ 631,849	$ 7,898	1/1/2023	12/31/2023
Crown Point	K278	0.77	1932	$ 953,968	$ 11,925	1/1/2023	12/31/2023
Curlew	C4973	1.26	1831	$ 1,561,038	$ 19,513	1/1/2023	12/31/2023
Curlew	C4976	1.01	2221	$ 1,251,308	$ 15,641	1/1/2023	12/31/2023
Curlew	C4985	1.37	1305	$ 1,697,319	$ 21,216	1/1/2023	12/31/2023
Curlew	C4987	0.24	902	$ 297,341	$ 3,717	1/1/2023	12/31/2023
Curlew	C4989	1.41	2096	$ 1,746,876	$ 21,836	1/1/2023	12/31/2023
Curlew	C4990	1.03	1689	$ 1,276,087	$ 15,951	1/1/2023	12/31/2023
Curlew	C4991	0.60	2982	$ 743,351	$ 9,292	1/1/2023	12/31/2023
Gateway	X111	0.45	316	$ 557,514	$ 6,969	1/1/2023	12/31/2023
Gateway	X113	0.77	2229	$ 953,968	$ 11,925	1/1/2023	12/31/2023
Gateway	X123	1.01	60	$ 1,251,308	$ 15,641	1/1/2023	12/31/2023
Gateway	X125	0.37	340	$ 458,400	$ 5,730	1/1/2023	12/31/2023
Lake Aloma	W0151	1.18	1720	$ 1,461,924	$ 18,274	1/1/2023	12/31/2023
Lake Aloma	W0153	0.47	642	$ 582,292	$ 7,279	1/1/2023	12/31/2023
Maitland	M80	3.66	1397	$ 4,534,444	$ 56,681	1/1/2023	12/31/2023
Maitland	M82	1.49	600	$ 1,845,989	$ 23,075	1/1/2023	12/31/2023
Maitland	W0079	3.90	1253	$ 4,831,784	$ 60,397	1/1/2023	12/31/2023
Maitland	W0086	2.16	386	$ 2,676,065	$ 33,451	1/1/2023	12/31/2023
Oakhurst	J224	3.09	2349	$ 3,828,260	$ 47,853	1/1/2023	12/31/2023
Oakhurst	J227	2.78	1951	$ 3,444,195	$ 43,052	1/1/2023	12/31/2023
Rio Pinar	W0968	0.96	3449	$ 1,189,362	$ 14,867	1/1/2023	12/31/2023
Rio Pinar	W0970	0.77	2966	$ 953,968	$ 11,925	1/1/2023	12/31/2023
Rio Pinar	W0975	0.73	2665	$ 904,411	$ 11,305	1/1/2023	12/31/2023
Seven Springs	C4501	1.60	2398	$ 1,982,270	$ 24,778	1/1/2023	12/31/2023
Seven Springs	C4508	0.13	2395	$ 161,059	$ 2,013	1/1/2023	12/31/2023
Sky Lake	W0363	3.91	2128	$ 4,844,173	$ 60,552	1/1/2023	12/31/2023
Sky Lake	W0365	1.85	2531	$ 2,292,000	$ 28,650	1/1/2023	12/31/2023
Sky Lake	W0366	3.88	960	$ 4,807,006	$ 60,088	1/1/2023	12/31/2023
Sky Lake	W0367	0.16	201	$ 198,227	$ 2,478	1/1/2023	12/31/2023
Sky Lake	W0368	3.10	1298	$ 3,840,649	$ 48,008	1/1/2023	12/31/2023
Vinoy	X70	2.36	2046	$ 2,923,849	$ 36,548	1/1/2023	12/31/2023
Vinoy	X71	1.64	1867	$ 2,031,827	$ 25,398	1/1/2023	12/31/2023
Vinoy	X72	2.60	3070	$ 3,221,189	$ 40,265	1/1/2023	12/31/2023
Vinoy	X78	2.39	2500	$ 2,961,016	$ 37,013	1/1/2023	12/31/2023
Cross Bayou	J141	2.33	1202	$ 2,886,681	$ 36,084	1/1/2023	12/31/2023
Cross Bayou	J143	2.10	1291	$ 2,601,730	$ 32,522	1/1/2023	12/31/2023
Cross Bayou	J148	1.41	826	$ 1,746,876	$ 21,836	1/1/2023	12/31/2023
Econ	W0320	2.53	2845	$ 3,134,465	$ 39,181	1/1/2023	12/31/2023
Econ	W0321	3.77	1413	$ 4,670,725	$ 58,384	1/1/2023	12/31/2023
Fifty-first Street	X108	8.23	1726	$ 10,196,303	$ 127,454	1/1/2023	6/30/2023

Location		Unit Count	Customer Coun	Capital Cost	O&M Cost	Start Date	Finish Date
Lateral Hardening Overhead							
Bay Hill	K67	0.56	1,912	$ 263,659	$ 4,878	1/1/2023	12/31/2023
Bay Hill	K68	1.49	1,860	$ 701,522	$ 12,978	1/1/2023	12/31/2023
Bay Hill	K73	0.31	875	$ 145,954	$ 2,700	1/1/2023	12/31/2023
Bay Hill	K76	0.38	836	$ 178,912	$ 3,310	1/1/2023	12/31/2023
Baggy Marsh	K957	0.12	2,937	$ 56,498	$ 1,045	1/1/2023	12/31/2023
Baggy Marsh	K959	2.83	1,172	$ 1,332,421	$ 24,650	1/1/2023	12/31/2023
Central Park	K495	2.08	1,123	$ 979,306	$ 18,117	1/1/2023	12/31/2023
Central Park	W0494	0.30	127	$ 141,246	$ 2,613	1/1/2023	12/31/2023
Central Park	W0497	0.27	62	$ 127,121	$ 2,352	1/1/2023	12/31/2023
Central Park	W0500	0.94	285	$ 442,571	$ 8,188	1/1/2023	12/31/2023
Clearwater	C10	0.90	1,148	$ 423,738	$ 7,839	1/1/2023	12/31/2023
Clearwater	C11	1.80	1,161	$ 847,476	$ 15,678	1/1/2023	12/31/2023
Clearwater	C12	0.46	1,263	$ 216,577	$ 4,007	1/1/2023	12/31/2023
Clearwater	C18	0.49	2,049	$ 230,702	$ 4,268	1/1/2023	12/31/2023
Crown Point	K278	0.34	1,932	$ 160,079	$ 2,961	1/1/2023	12/31/2023
Curlew	C4973	0.73	1,831	$ 343,699	$ 6,358	1/1/2023	12/31/2023
Curlew	C4976	0.52	2,221	$ 244,826	$ 4,529	1/1/2023	12/31/2023
Curlew	C4985	0.53	1,305	$ 249,535	$ 4,616	1/1/2023	12/31/2023
Curlew	C4987	0.13	902	$ 61,207	$ 1,132	1/1/2023	12/31/2023
Curlew	C4989	1.22	2,096	$ 574,400	$ 10,626	1/1/2023	12/31/2023
Curlew	C4990	1.76	1,689	$ 828,643	$ 15,330	1/1/2023	12/31/2023
Curlew	C4991	1.74	2,982	$ 819,227	$ 15,156	1/1/2023	12/31/2023
Gateway	X111	0.29	316	$ 136,538	$ 2,526	1/1/2023	12/31/2023
Gateway	X113	0.71	2,229	$ 334,282	$ 6,184	1/1/2023	12/31/2023
Gateway	X123	0.26	60	$ 122,413	$ 2,265	1/1/2023	12/31/2023
Gateway	X125	0.15	340	$ 70,623	$ 1,307	1/1/2023	12/31/2023
Lake Alama	W0151	0.73	1,720	$ 343,699	$ 6,358	1/1/2023	12/31/2023
Lake Alama	W0153	1.19	642	$ 560,276	$ 10,365	1/1/2023	12/31/2023
Maitland	M80	1.07	1,397	$ 503,777	$ 9,320	1/1/2023	12/31/2023
Maitland	M82	0.77	600	$ 362,531	$ 6,707	1/1/2023	12/31/2023
Maitland	W0079	2.60	1,253	$ 1,224,132	$ 22,646	1/1/2023	12/31/2023
Maitland	W0086	1.76	386	$ 828,643	$ 15,330	1/1/2023	12/31/2023
Oakhurst	J224	2.67	2,349	$ 1,257,089	$ 23,256	1/1/2023	12/31/2023
Oakhurst	J227	3.81	1,951	$ 1,793,824	$ 33,186	1/1/2023	12/31/2023
Rio Pinar	W0968	0.31	3,449	$ 145,954	$ 2,700	1/1/2023	12/31/2023
Rio Pinar	W0970	1.02	2,966	$ 480,236	$ 8,884	1/1/2023	12/31/2023
Rio Pinar	W0975	1.89	2,665	$ 889,850	$ 16,462	1/1/2023	12/31/2023
Seven Springs	C4501	1.44	2,398	$ 677,981	$ 12,543	1/1/2023	12/31/2023
Seven Springs	C4508	1.72	2,395	$ 809,810	$ 14,981	1/1/2023	12/31/2023
Sky Lake	W0363	3.91	2,128	$ 1,840,906	$ 34,057	1/1/2023	12/31/2023
Sky Lake	W0365	1.52	2,531	$ 715,646	$ 13,239	1/1/2023	12/31/2023
Sky Lake	W0366	0.80	960	$ 376,656	$ 6,968	1/1/2023	12/31/2023
Sky Lake	W0367	0.36	201	$ 169,495	$ 3,136	1/1/2023	12/31/2023
Sky Lake	W0368	2.84	1,298	$ 1,337,129	$ 24,737	1/1/2023	12/31/2023
Vinoy	X70	2.06	2,046	$ 969,889	$ 17,943	1/1/2023	12/31/2023
Vinoy	X71	0.64	1,867	$ 301,325	$ 5,575	1/1/2023	12/31/2023
Vinoy	X72	3.81	3,070	$ 1,793,824	$ 33,186	1/1/2023	12/31/2023
Vinoy	X78	2.16	2,500	$ 1,016,971	$ 18,814	1/1/2023	12/31/2023
Cross Bayou	J141	0.84	1,202	$ 395,489	$ 7,317	1/1/2023	12/31/2023
Cross Bayou	J143	0.94	1,291	$ 442,571	$ 8,188	1/1/2023	12/31/2023
Cross Bayou	J148	1.44	826	$ 677,981	$ 12,543	1/1/2023	12/31/2023
Econ	W0320	0.64	2,845	$ 301,325	$ 5,575	1/1/2023	12/31/2023
Econ	W0321	2.45	1,413	$ 1,153,509	$ 21,340	1/1/2023	12/31/2023
SUN N LAKES	K1137	0.31	33	$ 148,185	$ 2,741	1/1/2023	12/31/2023
MIDWAY	K1475	0.11	2,896	$ 51,404	$ 951	1/1/2023	12/31/2023
ALTAMONTE	M575	0.27	323	$ 129,341	$ 2,393	1/1/2023	12/31/2023
PILSBURY	X252	0.97	1,030	$ 457,531	$ 8,464	1/1/2023	12/31/2023
SIXTEENTH STREET	X36	0.65	1,016	$ 305,166	$ 5,646	1/1/2023	12/31/2023
ULMERTON	J241	0.80	123	$ 376,710	$ 6,969	1/1/2023	12/31/2023
BAYBORO	X19	0.19	17	$ 87,928	$ 1,627	1/1/2023	12/31/2023
MEADOW WOODS EAS	K1060	0.17	2,262	$ 81,345	$ 1,505	1/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
BELLEVIEW	A3	1.21	521	$ 568,756	$ 10,522	1/1/2023	12/31/2023
CURRY FORD	W0596	0.46	1,607	$ 217,465	$ 4,023	1/1/2023	12/31/2023
SILVER SPRINGS SHO	A128	1.32	25	$ 623,179	$ 11,529	1/1/2023	12/31/2023
WELCH ROAD	M542	1.33	1,765	$ 624,874	$ 11,560	1/1/2023	12/31/2023
UCF	W1017	0.67	1,383	$ 316,668	$ 5,858	1/1/2023	12/31/2023
FOUR CORNERS	K1404	0.92	999	$ 432,579	$ 8,003	1/1/2023	12/31/2023
BAYVIEW	C655	0.48	757	$ 224,787	$ 4,159	1/1/2023	12/31/2023
POINCIANA NORTH	K629	0.45	1,427	$ 213,924	$ 3,958	1/1/2023	12/31/2023
NORTHEAST	X289	1.03	1,018	$ 487,078	$ 9,011	1/1/2023	12/31/2023
LAKE EMMA	M423	0.16	864	$ 75,152	$ 1,390	1/1/2023	12/31/2023
LARGO	J409	0.78	2,271	$ 365,126	$ 6,755	1/1/2023	12/31/2023
WESTRIDGE	K421	0.71	2,204	$ 335,723	$ 6,211	1/1/2023	12/31/2023
ALDERMAN	C5001	0.25	1,397	$ 116,339	$ 2,152	1/1/2023	12/31/2023
PIEDMONT	M477	0.28	1,574	$ 132,411	$ 2,450	1/1/2023	12/31/2023
SUNFLOWER	W0475	0.33	2,493	$ 155,160	$ 2,870	1/1/2023	12/31/2023
NEW PORT RICHEY	C441	0.30	2,068	$ 143,057	$ 2,647	1/1/2023	12/31/2023
ORANGE BLOSSOM	A310	0.19	1,575	$ 89,328	$ 1,653	1/1/2023	12/31/2023
WINTER PARK EAST	W0925	0.87	2,335	$ 411,741	$ 7,617	1/1/2023	12/31/2023
CHAMPIONS GATE	K1762	0.20	3,445	$ 92,416	$ 1,710	1/1/2023	12/31/2023
DELTONA	W4553	0.33	1,110	$ 155,288	$ 2,873	1/1/2023	12/31/2023
BAYWAY	X97	0.85	1,695	$ 398,475	$ 7,372	1/1/2023	12/31/2023
LAKE EMMA	M428	0.45	1,876	$ 211,389	$ 3,911	1/1/2023	12/31/2023
LAKE LUNTZ	K3287	0.38	1,200	$ 177,255	$ 3,279	1/1/2023	12/31/2023
THIRTY SECOND STRE	X24	1.86	1,283	$ 874,681	$ 16,182	1/1/2023	12/31/2023
PIEDMONT	M471	0.63	1,672	$ 297,693	$ 5,507	1/1/2023	12/31/2023
Lateral Pole Inspections							
WILLISTON	A124	2671	1516		$ 106,840	1/1/2023	12/31/2023
WILLISTON	A125	4	-		$ 160	1/1/2023	12/31/2023
ALACHUA	A143	269	162		$ 10,760	1/1/2023	12/31/2023
ALACHUA	A144	108	30		$ 4,320	1/1/2023	12/31/2023
GE ALACHUA	A185	10	-		$ 400	1/1/2023	12/31/2023
GE ALACHUA	A186	1049	556		$ 41,960	1/1/2023	12/31/2023
LURAVILLE	A192	1051	699		$ 42,040	1/1/2023	12/31/2023
ARCHER	A195	518	458		$ 20,720	1/1/2023	12/31/2023
ARCHER	A196	806	494		$ 32,240	1/1/2023	12/31/2023
FORT WHITE	A20	1016	609		$ 40,640	1/1/2023	12/31/2023
O'BRIEN	A379	1114	758		$ 44,560	1/1/2023	12/31/2023
GEORGIA PACIFIC	A45	1960	1360		$ 78,400	1/1/2023	12/31/2023
TRENTON	A90	1433	1207		$ 57,320	1/1/2023	12/31/2023
TRENTON	A91	269	134		$ 10,760	1/1/2023	12/31/2023
NEWBERRY	A94	168	83		$ 6,720	1/1/2023	12/31/2023
CROSS BAYOU	J140	320	1583		$ 12,800	1/1/2023	12/31/2023
CROSS BAYOU	J141	296	1200		$ 11,840	1/1/2023	12/31/2023
CROSS BAYOU	J142	257	3322		$ 10,280	1/1/2023	12/31/2023
CROSS BAYOU	J143	243	1290		$ 9,720	1/1/2023	12/31/2023
CROSS BAYOU	J144	24	5		$ 960	1/1/2023	12/31/2023
CROSS BAYOU	J145	270	1219		$ 10,800	1/1/2023	12/31/2023
CROSS BAYOU	J146	198	732		$ 7,920	1/1/2023	12/31/2023
CROSS BAYOU	J147	621	3023		$ 24,840	1/1/2023	12/31/2023
CROSS BAYOU	J148	186	826		$ 7,440	1/1/2023	12/31/2023
CROSS BAYOU	J150	503	1928		$ 20,120	1/1/2023	12/31/2023
LAKE PLACID	K1066	842	1427		$ 33,680	1/1/2023	12/31/2023
MARLEY ROAD	K120	1	-		$ 40	1/1/2023	12/31/2023
LAKE MARION	K1286	1322	4105		$ 52,880	1/1/2023	12/31/2023
LAKE MARION	K1287	1442	2396		$ 57,680	1/1/2023	12/31/2023
LAKE MARION	K1288	676	1603		$ 27,040	1/1/2023	12/31/2023
LAKE PLACID	K1320	1586	2289		$ 63,440	1/1/2023	12/31/2023
ARBUCKLE CREEK	K1361	138	1192		$ 5,520	1/1/2023	12/31/2023
LEISURE LAKES	K1415	1803	2068		$ 72,120	1/1/2023	12/31/2023
WEST DAVENPORT	K1521	430	2145		$ 17,200	1/1/2023	12/31/2023
WEST DAVENPORT	K1523	67	2191		$ 2,680	1/1/2023	12/31/2023
WEST DAVENPORT	K1524	289	1962		$ 11,560	1/1/2023	12/31/2023
WEST DAVENPORT	K1526	387	3486		$ 15,480	1/1/2023	12/31/2023
WEST DAVENPORT	K1529	213	2720		$ 8,520	1/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
FISHEATING CREEK	K1560	2177	2565		$ 87,080	1/1/2023	12/31/2023
HAINES CITY	K16	645	996		$ 25,800	1/1/2023	12/31/2023
HAINES CITY	K17	975	2130		$ 39,000	1/1/2023	12/31/2023
CHAMPIONS GATE	K1761	24	2187		$ 960	1/1/2023	12/31/2023
CHAMPIONS GATE	K1762	93	3445		$ 3,720	1/1/2023	12/31/2023
CHAMPIONS GATE	K1763	37	2225		$ 1,480	1/1/2023	12/31/2023
CHAMPIONS GATE	K1764	19	2029		$ 760	1/1/2023	12/31/2023
HAINES CITY	K18	707	3041		$ 28,280	1/1/2023	12/31/2023
NORTHRIDGE	K1825	172	225		$ 6,880	1/1/2023	12/31/2023
HAINES CITY	K19	387	533		$ 15,480	1/1/2023	12/31/2023
HAINES CITY	K20	457	1230		$ 18,280	1/1/2023	12/31/2023
HAINES CITY	K21	1334	2614		$ 53,360	1/1/2023	12/31/2023
HAINES CITY	K22	607	2375		$ 24,280	1/1/2023	12/31/2023
LAKE PLACID NORTH	K24	380	950		$ 15,200	1/1/2023	12/31/2023
LAKE PLACID NORTH	K27	200	570		$ 8,000	1/1/2023	12/31/2023
LOUGHMAN	K5078	162	1119		$ 6,480	1/1/2023	12/31/2023
LOUGHMAN	K5079	437	2474		$ 17,480	1/1/2023	12/31/2023
LOUGHMAN	K5086	18	2330		$ 720	1/1/2023	12/31/2023
SEBRING EAST	K541	102	621		$ 4,080	1/1/2023	12/31/2023
SEBRING EAST	K542	206	109		$ 8,240	1/1/2023	12/31/2023
LAKE PLACID	K757	1083	935		$ 43,320	1/1/2023	12/31/2023
LAKE PLACID	K758	720	1376		$ 28,800	1/1/2023	12/31/2023
INTERCESSION CITY	K966	574	622		$ 22,960	1/1/2023	12/31/2023
INTERCESSION CITY	K967	309	1443		$ 12,360	1/1/2023	12/31/2023
EUSTIS SOUTH	M1054	164	642		$ 6,560	1/1/2023	12/31/2023
EUSTIS SOUTH	M1055	461	1402		$ 18,440	1/1/2023	12/31/2023
EUSTIS SOUTH	M1056	493	1766		$ 19,720	1/1/2023	12/31/2023
EUSTIS SOUTH	M1057	194	1509		$ 7,760	1/1/2023	12/31/2023
EUSTIS SOUTH	M1058	690	1948		$ 27,600	1/1/2023	12/31/2023
EUSTIS SOUTH	M1059	398	1731		$ 15,920	1/1/2023	12/31/2023
LISBON	M1517	616	1663		$ 24,640	1/1/2023	12/31/2023
LISBON	M1518	346	1840		$ 13,840	1/1/2023	12/31/2023
LISBON	M1519	688	2045		$ 27,520	1/1/2023	12/31/2023
LISBON	M1520	807	1680		$ 32,280	1/1/2023	12/31/2023
LOCKHART	M400	244	308		$ 9,760	1/1/2023	12/31/2023
LOCKHART	M402	297	618		$ 11,880	1/1/2023	12/31/2023
LOCKHART	M406	255	1703		$ 10,200	1/1/2023	12/31/2023
LOCKHART	M412	471	1805		$ 18,840	1/1/2023	12/31/2023
LOCKHART	M415	77	47		$ 3,080	1/1/2023	12/31/2023
LOCKHART	M417	283	1127		$ 11,320	1/1/2023	12/31/2023
UMATILLA	M4405	466	757		$ 18,640	1/1/2023	12/31/2023
UMATILLA	M4407	931	2270		$ 37,240	1/1/2023	12/31/2023
UMATILLA	M4408	461	1399		$ 18,440	1/1/2023	12/31/2023
EUSTIS	M499	426	1448		$ 17,040	1/1/2023	12/31/2023
EUSTIS	M500	347	1754		$ 13,880	1/1/2023	12/31/2023
EUSTIS	M501	547	1144		$ 21,880	1/1/2023	12/31/2023
EUSTIS	M503	613	1441		$ 24,520	1/1/2023	12/31/2023
EUSTIS	M504	685	2013		$ 27,400	1/1/2023	12/31/2023
TAVARES EAST	M580	278	700		$ 11,120	1/1/2023	12/31/2023
TAVARES EAST	M581	474	1364		$ 18,960	1/1/2023	12/31/2023
KELLY PARK	M821	503	1987		$ 20,120	1/1/2023	12/31/2023
KELLY PARK	M822	467	402		$ 18,680	1/1/2023	12/31/2023
JASPER	N191	1268	831		$ 50,720	1/1/2023	12/31/2023
JASPER	N191 OLD	3	0		$ 120	1/1/2023	12/31/2023
JASPER	N192	812	959		$ 32,480	1/1/2023	12/31/2023
JENNINGS	N195	790	481		$ 31,600	1/1/2023	12/31/2023
WHITE SPRINGS	N375	940	730		$ 37,600	1/1/2023	12/31/2023
TURNER PLANT	W0761	734	1953		$ 29,360	1/1/2023	12/31/2023
TURNER PLANT	W0762	539	1444		$ 21,560	1/1/2023	12/31/2023
TURNER PLANT	W0763	581	1712		$ 23,240	1/1/2023	12/31/2023
TURNER PLANT	W0764	315	1352		$ 12,600	1/1/2023	12/31/2023
BAYWAY	X100	128	798		$ 5,120	1/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
THIRTY SECOND STRE	X22	847	2379		$ 33,880	1/1/2023	12/31/2023
THIRTY SECOND STRE	X23	327	1135		$ 13,080	1/1/2023	12/31/2023
THIRTY SECOND STRE	X24	556	1283		$ 22,240	1/1/2023	12/31/2023
THIRTY SECOND STRE	X25	354	982		$ 14,160	1/1/2023	12/31/2023
THIRTY SECOND STRE	X26	585	1489		$ 23,400	1/1/2023	12/31/2023
THIRTY SECOND STRE	X27	556	2852		$ 22,240	1/1/2023	12/31/2023
THIRTY SECOND STRE	X28	540	2377		$ 21,600	1/1/2023	12/31/2023
THIRTY SECOND ST	X29	545	2123		$ 21,800	1/1/2023	12/31/2023
THIRTY SECOND ST	X30	1123	2985		$ 44,920	1/1/2023	12/31/2023
SIXTEENTH STREET	X31	941	3714		$ 37,640	1/1/2023	12/31/2023
SIXTEENTH STREET	X32	1	22		$ 40	1/1/2023	12/31/2023
SIXTEENTH STREET	X33	125	926		$ 5,000	1/1/2023	12/31/2023
SIXTEENTH STREET	X34	949	2999		$ 37,960	1/1/2023	12/31/2023
SIXTEENTH STREET	X35	9	214		$ 360	1/1/2023	12/31/2023
SIXTEENTH STREET	X36	279	1016		$ 11,160	1/1/2023	12/31/2023
THIRTY SECOND ST	X37	1055	2460		$ 42,200	1/1/2023	12/31/2023
SIXTEENTH STREET	X43	480	1286		$ 19,200	1/1/2023	12/31/2023
SIXTEENTH STREET	X45	736	2104		$ 29,440	1/1/2023	12/31/2023
SIXTEENTH STREET	X46	847	2637		$ 33,880	1/1/2023	12/31/2023
VINOY	X70	487	2050		$ 19,480	1/1/2023	12/31/2023
VINOY	X71	306	1877		$ 12,240	1/1/2023	12/31/2023
VINOY	X72	839	3083		$ 33,560	1/1/2023	12/31/2023
VINOY	X75	1	1		$ 40	1/1/2023	12/31/2023
VINOY	X76	6	146		$ 240	1/1/2023	12/31/2023
VINOY	X78	469	2510		$ 18,760	1/1/2023	12/31/2023
VINOY	X79	1	837		$ 40	1/1/2023	12/31/2023
VINOY	X80	20	489		$ 800	1/1/2023	12/31/2023
BAYWAY	X96	244	2873		$ 9,760	1/1/2023	12/31/2023
BAYWAY	X97	193	1695		$ 7,720	1/1/2023	12/31/2023
BAYWAY	X99	320	3305		$ 12,800	1/1/2023	12/31/2023
Additional Inspections	TBD	3082			$ 123,280	1/1/2023	12/31/2023
Lateral Pole Replacements							
WILLISTON	A124	160	1516	$ 1,559,040	$ 23,680	1/1/2023	12/31/2023
ALACHUA	A143	16	162	$ 155,904	$ 2,368	1/1/2023	12/31/2023
LAKE MARION	K1286	79	4105	$ 769,776	$ 11,692	1/1/2023	12/31/2023
JASPER	N192	49	959	$ 477,456	$ 7,252	1/1/2023	12/31/2023
SIXTEENTH STREET	X33	8	926	$ 77,952	$ 1,184	1/1/2023	12/31/2023
VINOY	X78	28	2510	$ 272,832	$ 4,144	1/1/2023	12/31/2023
VINOY	X80	1	489	$ 9,744	$ 148	1/1/2023	12/31/2023
ALACHUA	A144	6	30	$ 58,464	$ 888	1/1/2023	12/31/2023
LAKE MARION	K1287	87	2396	$ 847,728	$ 12,876	1/1/2023	12/31/2023
JENNINGS	N195	47	481	$ 457,968	$ 6,956	1/1/2023	12/31/2023
SIXTEENTH STREET	X34	57	2999	$ 555,408	$ 8,436	1/1/2023	12/31/2023
BAYWAY	X96	15	2873	$ 146,160	$ 2,220	1/1/2023	12/31/2023
GE ALACHUA	A185	1	-	$ 9,744	$ 148	1/1/2023	12/31/2023
LAKE MARION	K1288	41	1603	$ 399,504	$ 6,068	1/1/2023	12/31/2023
WHITE SPRINGS	N375	56	730	$ 545,664	$ 8,288	1/1/2023	12/31/2023
SIXTEENTH STREET	X35	1	214	$ 9,744	$ 148	1/1/2023	12/31/2023
BAYWAY	X97	12	1695	$ 116,928	$ 1,776	1/1/2023	12/31/2023
GE ALACHUA	A186	63	556	$ 613,872	$ 9,324	1/1/2023	12/31/2023
LAKE PLACID	K1320	95	2289	$ 925,680	$ 14,060	1/1/2023	12/31/2023
TURNER PLANT	W0761	44	1953	$ 428,736	$ 6,512	1/1/2023	12/31/2023
SIXTEENTH STREET	X36	17	1016	$ 165,648	$ 2,516	1/1/2023	12/31/2023
BAYWAY	X99	19	3305	$ 185,136	$ 2,812	1/1/2023	12/31/2023
LURAVILLE	A192	63	699	$ 613,872	$ 9,324	1/1/2023	12/31/2023
ARBUCKLE CREEK	K1361	8	1192	$ 77,952	$ 1,184	1/1/2023	12/31/2023
TURNER PLANT	W0762	32	1444	$ 311,808	$ 4,736	1/1/2023	12/31/2023
THIRTY SECOND ST	X37	63	2460	$ 613,872	$ 9,324	1/1/2023	12/31/2023
ARCHER	A195	31	458	$ 302,064	$ 4,588	1/1/2023	12/31/2023
LEISURE LAKES	K1415	108	2068	$ 1,052,352	$ 15,984	1/1/2023	12/31/2023
TURNER PLANT	W0763	35	1712	$ 341,040	$ 5,180	1/1/2023	12/31/2023
SIXTEENTH STREET	X43	29	1286	$ 282,576	$ 4,292	1/1/2023	12/31/2023
ARCHER	A196	48	494	$ 467,712	$ 7,104	1/1/2023	12/31/2023
WEST DAVENPORT	K1521	26	2145	$ 253,344	$ 3,848	1/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
TURNER PLANT	W0764	19	1352	$ 185,136	$ 2,812	1/1/2023	12/31/2023
SIXTEENTH STREET	X45	44	2104	$ 428,736	$ 6,512	1/1/2023	12/31/2023
FORT WHITE	A20	61	609	$ 594,384	$ 9,028	1/1/2023	12/31/2023
WEST DAVENPORT	K1523	4	2191	$ 38,976	$ 592	1/1/2023	12/31/2023
BAYWAY	X100	8	798	$ 77,952	$ 1,184	1/1/2023	12/31/2023
SIXTEENTH STREET	X46	51	2637	$ 496,944	$ 7,548	1/1/2023	12/31/2023
O' BRIEN	A379	67	758	$ 652,848	$ 9,916	1/1/2023	12/31/2023
WEST DAVENPORT	K1524	17	1962	$ 165,648	$ 2,516	1/1/2023	12/31/2023
THIRTY SECOND STRE	X22	51	2379	$ 496,944	$ 7,548	1/1/2023	12/31/2023
VINOY	X70	29	2050	$ 282,576	$ 4,292	1/1/2023	12/31/2023
GEORGIA PACIFIC	A45	118	1360	$ 1,149,792	$ 17,464	1/1/2023	12/31/2023
WEST DAVENPORT	K1526	23	3486	$ 224,112	$ 3,404	1/1/2023	12/31/2023
THIRTY SECOND STRE	X23	20	1135	$ 194,880	$ 2,960	1/1/2023	12/31/2023
VINOY	X71	18	1877	$ 175,392	$ 2,664	1/1/2023	12/31/2023
TRENTON	A90	86	1207	$ 837,984	$ 12,728	1/1/2023	12/31/2023
WEST DAVENPORT	K1529	13	2720	$ 126,672	$ 1,924	1/1/2023	12/31/2023
THIRTY SECOND STRE	X24	33	1283	$ 321,552	$ 4,884	1/1/2023	12/31/2023
VINOY	X72	50	3083	$ 487,200	$ 7,400	1/1/2023	12/31/2023
TRENTON	A91	16	134	$ 155,904	$ 2,368	1/1/2023	12/31/2023
FISHEATING CREEK	K1560	131	2565	$ 1,276,464	$ 19,388	1/1/2023	12/31/2023
THIRTY SECOND STRE	X25	21	982	$ 204,624	$ 3,108	1/1/2023	12/31/2023
NEWBERRY	A94	10	83	$ 97,440	$ 1,480	1/1/2023	12/31/2023
HAINES CITY	K16	39	996	$ 380,016	$ 5,772	1/1/2023	12/31/2023
THIRTY SECOND STRE	X26	35	1489	$ 341,040	$ 5,180	1/1/2023	12/31/2023
CROSS BAYOU	J140	19	1583	$ 185,136	$ 2,812	1/1/2023	12/31/2023
HAINES CITY	K17	58	2130	$ 565,152	$ 8,584	1/1/2023	12/31/2023
THIRTY SECOND STRE	X27	33	2852	$ 321,552	$ 4,884	1/1/2023	12/31/2023
CROSS BAYOU	J141	18	1200	$ 175,392	$ 2,664	1/1/2023	12/31/2023
CHAMPIONS GATE	K1761	1	2187	$ 9,744	$ 148	1/1/2023	12/31/2023
THIRTY SECOND STRE	X28	32	2377	$ 311,808	$ 4,736	1/1/2023	12/31/2023
CROSS BAYOU	J142	15	3322	$ 146,160	$ 2,220	1/1/2023	12/31/2023
CHAMPIONS GATE	K1762	6	3445	$ 58,464	$ 888	1/1/2023	12/31/2023
THIRTY SECOND ST	X29	33	2123	$ 321,552	$ 4,884	1/1/2023	12/31/2023
CROSS BAYOU	J143	15	1290	$ 146,160	$ 2,220	1/1/2023	12/31/2023
CHAMPIONS GATE	K1763	2	2225	$ 19,488	$ 296	1/1/2023	12/31/2023
THIRTY SECOND ST	X30	67	2985	$ 652,848	$ 9,916	1/1/2023	12/31/2023
CROSS BAYOU	J144	1	5	$ 9,744	$ 148	1/1/2023	12/31/2023
CHAMPIONS GATE	K1764	1	2029	$ 9,744	$ 148	1/1/2023	12/31/2023
SIXTEENTH STREET	X31	56	3714	$ 545,664	$ 8,288	1/1/2023	12/31/2023
CROSS BAYOU	J145	16	1219	$ 155,904	$ 2,368	1/1/2023	12/31/2023
HAINES CITY	K18	42	3041	$ 409,248	$ 6,216	1/1/2023	12/31/2023
CROSS BAYOU	J146	12	732	$ 116,928	$ 1,776	1/1/2023	12/31/2023
NORTHRIDGE	K1825	10	225	$ 97,440	$ 1,480	1/1/2023	12/31/2023
CROSS BAYOU	J147	37	3023	$ 360,528	$ 5,476	1/1/2023	12/31/2023
HAINES CITY	K19	23	533	$ 224,112	$ 3,404	1/1/2023	12/31/2023
CROSS BAYOU	J148	11	826	$ 107,184	$ 1,628	1/1/2023	12/31/2023
HAINES CITY	K20	27	1230	$ 263,088	$ 3,996	1/1/2023	12/31/2023
CROSS BAYOU	J150	30	1928	$ 292,320	$ 4,440	1/1/2023	12/31/2023
HAINES CITY	K21	80	2614	$ 779,520	$ 11,840	1/1/2023	12/31/2023
LAKE PLACID	K1066	51	1427	$ 496,944	$ 7,548	1/1/2023	12/31/2023
HAINES CITY	K22	36	2375	$ 350,784	$ 5,328	1/1/2023	12/31/2023
LAKE PLACID NORTH	K24	23	950	$ 224,112	$ 3,404	1/1/2023	12/31/2023
LAKE PLACID NORTH	K27	12	570	$ 116,928	$ 1,776	1/1/2023	12/31/2023
LOUGHMAN	K5078	10	1119	$ 97,440	$ 1,480	1/1/2023	12/31/2023
LOUGHMAN	K5079	26	2474	$ 253,344	$ 3,848	1/1/2023	12/31/2023
LOUGHMAN	K5086	1	2330	$ 9,744	$ 148	1/1/2023	12/31/2023
SEBRING EAST	K541	6	621	$ 58,464	$ 888	1/1/2023	12/31/2023
SEBRING EAST	K542	12	109	$ 116,928	$ 1,776	1/1/2023	12/31/2023
LAKE PLACID	K757	65	935	$ 633,360	$ 9,620	1/1/2023	12/31/2023
LAKE PLACID	K758	43	1376	$ 418,992	$ 6,364	1/1/2023	12/31/2023
INTERCESSION CITY	K966	34	622	$ 331,296	$ 5,032	1/1/2023	12/31/2023
INTERCESSION CITY	K967	19	1443	$ 185,136	$ 2,812	1/1/2023	12/31/2023
EUSTIS SOUTH	M1054	10	642	$ 97,440	$ 1,480	1/1/2023	12/31/2023
EUSTIS SOUTH	M1055	28	1402	$ 272,832	$ 4,144	1/1/2023	12/31/2023
EUSTIS SOUTH	M1056	30	1766	$ 292,320	$ 4,440	1/1/2023	12/31/2023
EUSTIS SOUTH	M1057	12	1509	$ 116,928	$ 1,776	1/1/2023	12/31/2023
EUSTIS SOUTH	M1058	41	1948	$ 399,504	$ 6,068	1/1/2023	12/31/2023
EUSTIS SOUTH	M1059	24	1731	$ 233,856	$ 3,552	1/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
LISBON	M1517	37	1663	$ 360,528	$ 5,476	1/1/2023	12/31/2023
LISBON	M1518	21	1840	$ 204,624	$ 3,108	1/1/2023	12/31/2023
LISBON	M1519	41	2045	$ 399,504	$ 6,068	1/1/2023	12/31/2023
LISBON	M1520	48	1680	$ 467,712	$ 7,104	1/1/2023	12/31/2023
LOCKHART	M400	15	308	$ 146,160	$ 2,220	1/1/2023	12/31/2023
LOCKHART	M402	18	618	$ 175,392	$ 2,664	1/1/2023	12/31/2023
LOCKHART	M406	15	1703	$ 146,160	$ 2,220	1/1/2023	12/31/2023
LOCKHART	M412	28	1805	$ 272,832	$ 4,144	1/1/2023	12/31/2023
LOCKHART	M415	5	47	$ 48,720	$ 740	1/1/2023	12/31/2023
LOCKHART	M417	17	1127	$ 165,648	$ 2,516	1/1/2023	12/31/2023
UMATILLA	M4405	28	757	$ 272,832	$ 4,144	1/1/2023	12/31/2023
UMATILLA	M4407	56	2270	$ 545,664	$ 8,288	1/1/2023	12/31/2023
UMATILLA	M4408	28	1399	$ 272,832	$ 4,144	1/1/2023	12/31/2023
EUSTIS	M499	26	1448	$ 253,344	$ 3,848	1/1/2023	12/31/2023
EUSTIS	M500	21	1754	$ 204,624	$ 3,108	1/1/2023	12/31/2023
EUSTIS	M501	33	1144	$ 321,552	$ 4,884	1/1/2023	12/31/2023
EUSTIS	M503	37	1441	$ 360,528	$ 5,476	1/1/2023	12/31/2023
EUSTIS	M504	41	2013	$ 399,504	$ 6,068	1/1/2023	12/31/2023
TAVARES EAST	M580	17	700	$ 165,648	$ 2,516	1/1/2023	12/31/2023
TAVARES EAST	M581	28	1364	$ 272,832	$ 4,144	1/1/2023	12/31/2023
KELLY PARK	M821	30	1987	$ 292,320	$ 4,440	1/1/2023	12/31/2023
KELLY PARK	M822	28	402	$ 272,832	$ 4,144	1/1/2023	12/31/2023
JASPER	N191	76	831	$ 740,544	$ 11,248	1/1/2023	12/31/2023
Additional Replaceme	TBD	219		$ 2,133,936	$ 32,412	1/1/2023	12/31/2023

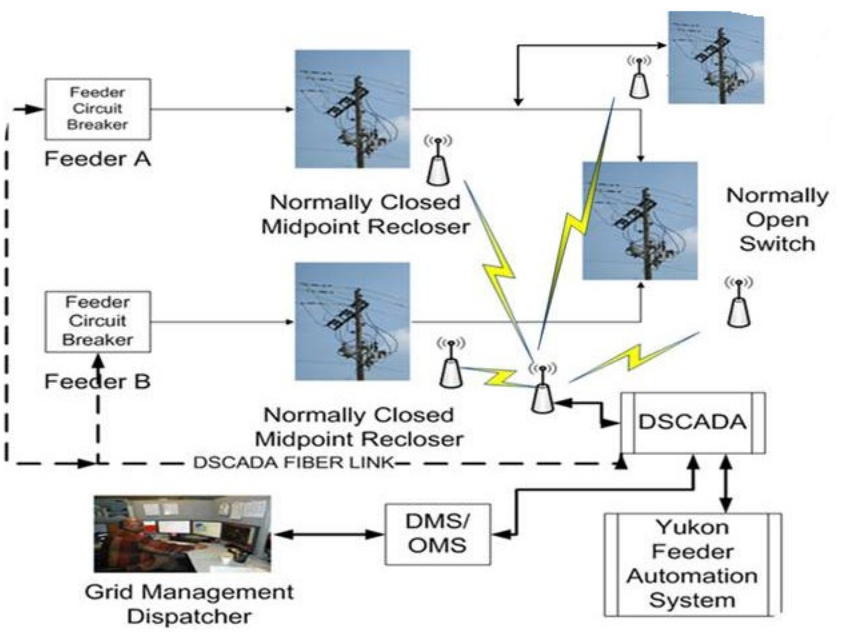
Self-Optimizing Grid – SOG

Vision

The SOG Program started as part of DEF's Grid Investment Plan which was partially funded through the 2017 Revised and Restated Settlement Agreement and was later continued through SPP 2020. DEF plans to continue this Program through SPP 2023 and at completion in 2025, approximately 80% of the distribution feeders on the DEF system will have the ability to automatically reroute power around damaged line sections. 100% of the distribution feeders will have automated switching capability.

Description

The current grid has limited ability to reroute and rapidly restore power. The SOG Program is established to address both issues.



The SOG Program consists of three (3) major components: capacity, connectivity, and automation and intelligence. The SOG Program redesigns key portions of the distribution system and transforms it into a dynamic smart-thinking, self-healing network. The grid will have the ability to automatically reroute power around trouble areas, like a tree on a power line, to quickly restore power to the maximum number of customers and rapidly dispatch line crews directly to the source of the outage. Self-healing technologies can reduce outage impacts by as much as 75 percent on affected feeders.

The **SOG Capacity projects** focus on expanding substation and distribution line capacity to allow for two-way power flow. **SOG Connectivity projects** create tie points between circuits. **SOG Automation projects** provide intelligence and control for the SOG operations; Automation projects enable the grid to dynamically reconfigure around trouble and restore customers not impacted by an outage.

Cost

The SOG Program is planned to be completed in 2025. Below are the projected units and costs for 2023-2025:

	DEF		
Self-Optimizing Grid (SOG)	2023	2024	2025
Totals	$ 77,339,715	$136,715,154	$136,715,488
Automation	$ 58,844,463	$ 87,035,148	$ 87,035,500
Capital	$ 57,130,194	$ 84,500,000	$ 84,500,000
O&M	$ 1,714,269	$ 2,535,148	$ 2,535,500
Total Units	783	1,138	1,111
Connectivity & Capacity	$ 18,495,252	$ 49,680,006	$ 49,679,988
Capital	$ 17,869,806	$ 48,000,000	$ 48,000,000
O&M	$ 625,446	$ 1,680,006	$ 1,679,988

Cost Benefit Comparison

Costs from 2023 through 2025 are approximately $340M Capital and $11M O&M.

At completion, with more customers automatically restored through automated switching, cost reductions can be achieved through better targeting of restoration efforts and personnel. SOG enables the grid to rapidly reroute power around damaged line sections. Accordingly, the benefit from the completion of this program is a reduction in customers affected by long duration outages as a result of extreme weather events, increased ability to target restoration efforts, and enhancement of overall reliability via anticipated decrease in CMI.

When the SOG Program is complete, DEF estimates it will reduce Distribution MED CMI by approximately by 179 million to 224 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

The following steps are used to prioritize the work:

1. Probability of Damage: SOG does not directly reduce damage but rather is intended to reduce the duration of outages, thus SOG impacts are conservatively assessed after other hardening projects. Since other hardening projects reduce equipment failures and outages, the simulated SOG impacts are evaluated against this new hardened baseline. To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers

served by a given asset (e.g., each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. For SOG, this step is performed based on the hardened configuration of the feeder after completion of the Feeder Hardening program (see above for a description of the Feeder Hardening program).

3. Consequence of Automation: Because the program benefits are tied to reduction in outage length and customers affected during outages, these values were calculated as a part of the simulation described in steps 1 and 2, with the addition of SOG automation. The outage time reduction varied feeder by feeder, based on number of customers served, historic observed outage durations by asset class on each feeder, the reduction impact of feeder hardening on the feeder, and current level of automation.
4. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, resource availability and efficiency.

Year 1 Project List

2023 Planned Duke Energy Florida - SOG (Self Optimizing Grid)

Location		Unit Count	Customer Coun	Capital Cost	O&M Cost	Start Date	Finish Date
Self Optimizing Grid - Automation							
LAKE BRYAN	K232	3	1110	$ 165,000	$ 5,047	7/1/2023	9/30/2023
INTERNATIONAL D	K4817	1	1562	$ 70,000	$ 2,141	7/1/2023	9/30/2023
ORANGEWOOD	K228	1	103	$ 55,000	$ 1,682	10/1/2023	12/31/2023
INTERNATIONAL D	K4815	4	1979	$ 240,000	$ 7,341	7/1/2023	9/30/2023
HUNTERS CREEK	K40	1	2165	$ 55,000	$ 1,682	1/1/2023	3/31/2023
HUNTERS CREEK	K43	1	1623	$ 55,000	$ 1,682	1/1/2023	3/31/2023
HUNTERS CREEK	K48	3	1808	$ 165,000	$ 5,047	1/1/2023	3/31/2023
CIRCLE SQUARE	A251	4	2333	$ 250,000	$ 7,647	4/1/2023	6/30/2023
CIRCLE SQUARE	A253	1	1441	$ 55,000	$ 1,682	4/1/2023	6/30/2023
BITHLO	W0951	2	1709	$ 140,000	$ 4,282	1/1/2023	3/31/2023
BITHLO	W0952	2	812	$ 140,000	$ 4,282	1/1/2023	3/31/2023
BITHLO	W0955	2	1318	$ 140,000	$ 4,282	1/1/2023	3/31/2023
BITHLO	W0956	2	2212	$ 140,000	$ 4,282	1/1/2023	3/31/2023
CLEARWATER	C12	2	1262	$ 110,000	$ 3,365	1/1/2023	12/31/2023
LARGO	J404	1	3167	$ 70,000	$ 2,141	4/1/2023	6/30/2023
ULMERTON WEST	J682	4	2513	$ 280,000	$ 8,565	4/1/2023	6/30/2023
DUNEDIN	C106	2	814	$ 140,000	$ 4,282	4/1/2023	6/30/2023
DUNEDIN	C107	2	2273	$ 140,000	$ 4,282	4/1/2023	6/30/2023
HIGHLANDS	C2806	1	3102	$ 70,000	$ 2,141	4/1/2023	6/30/2023
CLEARWATER	C7	2	1232	$ 140,000	$ 4,282	1/1/2023	12/31/2023
NARCOOSSEE	W0212	2	1973	$ 140,000	$ 4,282	1/1/2023	3/31/2023
NARCOOSSEE	W0219	4	2154	$ 280,000	$ 8,565	1/1/2023	3/31/2023
PINECASTLE	W0391	2	1335	$ 140,000	$ 4,282	7/1/2023	9/30/2023
WEKIVA	M101	4	998	$ 235,000	$ 7,188	7/1/2023	9/30/2023
WEKIVA	M107	2	1904	$ 125,000	$ 3,823	7/1/2023	9/30/2023
WEKIVA	M115	1	758	$ 70,000	$ 2,141	7/1/2023	9/30/2023
DOUGLAS AVENUE	M1704	2	972	$ 140,000	$ 4,282	10/1/2023	12/31/2023
DINNER LAKE	K1687	2	689	$ 140,000	$ 4,282	7/1/2023	9/30/2023
DINNER LAKE	K1688	2	923	$ 140,000	$ 4,282	7/1/2023	9/30/2023
DINNER LAKE	K1689	1	1273	$ 70,000	$ 2,141	7/1/2023	9/30/2023
COUNTRY OAKS	K1443	3	1128	$ 210,000	$ 6,423	10/1/2023	12/31/2023
LAKE OF THE HILLS	K1885	3	1177	$ 210,000	$ 6,423	10/1/2023	12/31/2023
DUNDEE	K3246	2	443	$ 140,000	$ 4,282	10/1/2023	12/31/2023
CYPRESSWOOD	K561	2	1139	$ 140,000	$ 4,282	10/1/2023	12/31/2023
OAKHURST	J221	1	1959	$ 70,000	$ 2,141	1/1/2023	12/31/2023
OAKHURST	J224	5	2424	$ 350,000	$ 10,706	1/1/2023	12/31/2023
OAKHURST	J228	2	2784	$ 140,000	$ 4,282	1/1/2023	12/31/2023
SEMINOLE	J890	3	2704	$ 210,000	$ 6,423	1/1/2023	3/31/2023
SEMINOLE	J893	1	1665	$ 70,000	$ 2,141	1/1/2023	3/31/2023
OAKHURST	J223	4	1804	$ 280,000	$ 8,565	1/1/2023	12/31/2023
OAKHURST	J225	4	1988	$ 280,000	$ 8,565	1/1/2023	12/31/2023
OAKHURST	J226	2	2999	$ 140,000	$ 4,282	1/1/2023	12/31/2023
OAKHURST	J227	9	2041	$ 630,000	$ 19,270	1/1/2023	12/31/2023
OAKHURST	J229	4	2941	$ 235,000	$ 7,188	1/1/2023	12/31/2023
OAKHURST	J230	6	2701	$ 420,000	$ 12,847	1/1/2023	12/31/2023
WALSINGHAM	J552	2	2561	$ 140,000	$ 4,282	4/1/2023	6/30/2023
WALSINGHAM	J557	4	3096	$ 250,000	$ 7,647	4/1/2023	6/30/2023
WINTER GARDEN	K201	4	2506	$ 280,000	$ 8,565	4/1/2023	6/30/2023
WINTER GARDEN	K203	3	738	$ 210,000	$ 6,423	4/1/2023	6/30/2023
WINTER GARDEN	K204	3	2347	$ 210,000	$ 6,423	4/1/2023	6/30/2023
CROWN POINT	K279	3	1499	$ 210,000	$ 6,423	1/1/2023	12/31/2023
MONTVERDE	K4831	1	1864	$ 70,000	$ 2,141	7/1/2023	9/30/2023
MONTVERDE	K4834	2	1647	$ 140,000	$ 4,282	7/1/2023	9/30/2023
WINTER GARDEN	K202	1	723	$ 70,000	$ 2,141	4/1/2023	6/30/2023
OCOEE	M1096	1	1944	$ 70,000	$ 2,141	7/1/2023	9/30/2023
WESTRIDGE	K426	3	2660	$ 165,000	$ 5,047	10/1/2023	12/31/2023
BOGGY MARSH	K957	2	3021	$ 110,000	$ 3,365	1/1/2023	12/31/2023
MAXIMIO	X151	2	2353	$ 210,000	$ 6,423	10/1/2023	12/31/2023
MONTVERDE	K4841	6	8701	$ 382,000	$ 11,685	7/1/2023	9/30/2023
LAKE EMMA	M428	17	12489	$ 1,158,000	$ 35,421	10/1/2023	12/31/2023
UCF	W1012	14	12741	$ 869,000	$ 26,581	10/1/2023	12/31/2023

Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
APALACHICOLA	N58	6	5363	$ 450,000	$ 13,765	10/1/2023	12/31/2023
WALSINGHAM	J556	16	7199	$ 1,200,000	$ 36,705	4/1/2023	6/30/2023
APOPKA SOUTH	M722	3	2293	$ 225,000	$ 6,882	10/1/2023	12/31/2023
MAITLAND	M85	21	11395	$ 1,575,000	$ 48,176	1/1/2023	12/31/2023
MAITLAND	M84	8	4105	$ 540,000	$ 16,517	1/1/2023	12/31/2023
MAITLAND	M82	42	8880	$ 2,490,000	$ 76,164	1/1/2023	12/31/2023
BAY HILL	K77	10	2978	$ 750,000	$ 22,941	1/1/2023	12/31/2023
LAKE ALOMA	W0151	10	2378	$ 750,000	$ 22,941	1/1/2023	12/31/2023
RIO PINAR	W0968	25	9731	$ 1,875,000	$ 57,352	1/1/2023	12/31/2023
CURLEW	C4976	30	11486	$ 2,250,000	$ 68,823	1/1/2023	12/31/2023
CLEARWATER	C17	30	6620	$ 1,800,000	$ 55,058	1/1/2023	12/31/2023
CROSS BAYOU	J147	33	12481	$ 2,445,000	$ 74,787	1/1/2023	12/31/2023
CURLEW	C4989	25	14124	$ 1,875,000	$ 57,352	1/1/2023	12/31/2023
CURLEW	C4990	30	11321	$ 2,250,000	$ 68,823	1/1/2023	12/31/2023
VINOY	X72	35	15735	$ 2,625,000	$ 80,293	1/1/2023	12/31/2023
CLEARWATER	C5	35	17931	$ 2,625,000	$ 80,293	1/1/2023	12/31/2023
VINOY	X71	10	4382	$ 750,000	$ 22,941	1/1/2023	12/31/2023
CLEARWATER	C18	15	8253	$ 1,125,000	$ 34,411	1/1/2023	12/31/2023
GATEWAY	X113	7	2360	$ 525,000	$ 16,059	1/1/2023	12/31/2023
CROSS BAYOU	J142	25	12575	$ 1,875,000	$ 57,352	1/1/2023	12/31/2023
GATEWAY	X112	16	6232	$ 1,200,000	$ 36,705	1/1/2023	12/31/2023
CURLEW	C4991	18	9557	$ 1,350,000	$ 41,294	1/1/2023	12/31/2023
CROSS BAYOU	J140	16	9593	$ 1,200,000	$ 36,705	1/1/2023	12/31/2023
CLEARWATER	C16	17	9775	$ 1,275,000	$ 39,000	1/1/2023	12/31/2023
CURLEW	C4985	7	3009	$ 525,000	$ 16,059	1/1/2023	12/31/2023
SEVEN SPRINGS	C4502	7	3413	$ 525,000	$ 16,059	1/1/2023	12/31/2023
SEVEN SPRINGS	C4507	8	5510	$ 600,000	$ 18,353	1/1/2023	12/31/2023
CROSS BAYOU	J150	12	6674	$ 900,000	$ 27,529	1/1/2023	12/31/2023
BAY HILL	K67	25	10448	$ 1,875,000	$ 57,352	1/1/2023	12/31/2023
MAITLAND	W0087	17	12082	$ 1,275,000	$ 39,000	1/1/2023	12/31/2023
CENTRAL PARK	K495	9	1430	$ 675,000	$ 20,647	1/1/2023	12/31/2023
CENTRAL PARK	W0500	22	1908	$ 1,650,000	$ 50,470	1/1/2023	12/31/2023
CENTRAL PARK	W0493	11	405	$ 825,000	$ 25,235	1/1/2023	12/31/2023
Self Optimizing Grid – Capacity and Conductor							
FERN PARK	M907	2700	1400	$ 445,500	$ 15,593	1/1/2023	3/31/2023
CIRCLE SQUARE	A250	430	2315	$ 70,950	$ 2,483	4/1/2023	6/30/2023
CITRUS HILLS	A265	10850	927	$ 1,790,250	$ 62,659	1/1/2023	3/31/2023
ULMERTON WEST	J682	1362	2513	$ 224,730	$ 7,866	4/1/2023	6/30/2023
DUNEDIN	C106	1817	814	$ 299,805	$ 10,493	4/1/2023	6/30/2023
DUNEDIN	C107	1003	2273	$ 165,495	$ 5,792	4/1/2023	6/30/2023
HIGHLANDS	C2806	1901	3102	$ 313,665	$ 10,978	4/1/2023	6/30/2023
DINNER LAKE	K1687	2200	689	$ 363,000	$ 12,705	7/1/2023	9/30/2023
LAKEWOOD	K1694	500	1429	$ 82,500	$ 2,888	1/1/2023	3/31/2023
DUNDEE	K3246	3200	443	$ 528,000	$ 18,480	10/1/2023	12/31/2023
FIFTY-FIRST STREE	X102	4400	3816	$ 726,000	$ 25,410	1/1/2023	3/31/2023
KENNETH CITY	X51	2850	1127	$ 470,250	$ 16,459	7/1/2023	9/30/2023
FORTIETH STREET	X84	5550	2245	$ 915,750	$ 32,051	7/1/2023	9/30/2023
MAXIMIO	X151	1025	2353	$ 190,632	$ 6,672	10/1/2023	12/31/2023
MONTVERDE	K4841	672	8701	$ 125,000	$ 4,375	7/1/2023	9/30/2023
LAKE EMMA	M428	1118	12469	$ 208,000	$ 7,280	10/1/2023	12/31/2023
UCF	W1012	877	12741	$ 163,100	$ 5,709	10/1/2023	12/31/2023
APALACHICOLA	N58	5739	5363	$ 1,067,478	$ 37,362	10/1/2023	12/31/2023
WALSINGHAM	J556	1464	7199	$ 272,261	$ 9,529	4/1/2023	6/30/2023
MAITLAND	M85	2640	11395	$ 491,040	$ 17,186	1/1/2023	12/31/2023
LAKE ALOMA	W0151	4005	2378	$ 744,930	$ 26,073	1/1/2023	12/31/2023
RIO PINAR	W0968	5100	9731	$ 948,600	$ 33,201	1/1/2023	12/31/2023
CROSS BAYOU	J147	6750	12481	$ 1,255,500	$ 43,943	1/1/2023	12/31/2023
CLEARWATER	C18	2160	8253	$ 401,760	$ 14,062	1/1/2023	12/31/2023
GATEWAY	X113	516	2360	$ 96,000	$ 3,360	1/1/2023	12/31/2023
CROSS BAYOU	J142	3200	12575	$ 595,200	$ 20,832	1/1/2023	12/31/2023
CURLEW	C4991	2690	9557	$ 500,340	$ 17,512	1/1/2023	12/31/2023
CROSS BAYOU	J140	7280	9593	$ 893,760	$ 31,282	1/1/2023	12/31/2023
CLEARWATER	C16	8760	9775	$ 1,969,400	$ 68,929	1/1/2023	12/31/2023
CURLEW	C4985	2050	3009	$ 209,100	$ 7,319	1/1/2023	12/31/2023
BAY HILL	K67	2000	10448	$ 204,000	$ 7,140	1/1/2023	12/31/2023
MAITLAND	W0087	2800	12082	$ 520,800	$ 18,228	1/1/2023	12/31/2023

Underground Flood Mitigation

Vision

The Underground Flood Mitigation program is a targeted Program to harden existing underground distribution facilities in locations that are prone to storm surge during extreme weather events. This Program will address the areas identified as being at high risk for significant flooding by installing submersible equipment within 20 years.

Description

Underground Flood Mitigation will harden existing underground line and equipment to withstand storm surge through the use of DEF's current storm surge standards. This involves the installation of specialized stainless-steel equipment, submersible connections and concrete pads with increased mass. The primary purpose of this hardening activity is to minimize the equipment damage caused by storm surge and thus reduce customer outages and/or expedite restoration after the storm surge has receded.

For selected locations, DEF would utilize a concrete pad with increased weight and stainless steel tiedowns and change all the connections to waterproof (submersible) connections. Conventional switchgear would be replaced with submersible switchgears that are able to withstand the storm surge.

Cost

It is expected that the 10-year cost will be approximately $15M.

	DEF		
UG Flood Mitigation	2023	2024	2025
Totals	$ 1,000,000	$ 1,500,000	$ 1,500,000
Capital	$ 1,000,000	$ 1,500,000	$ 1,500,000
O&M	$ -	$ -	$ -
Total Units	98	143	140

Cost Benefit Comparison

The Underground Flood Mitigation Program is scheduled to start in 2022 and estimated to take 20 years to complete. Based on today's costs, the Program will cost an estimated $26M in Capital.

When the Underground Flood Mitigation Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Distribution system by approximately $1M to $1.3M annually based on today's costs.

When the Underground Flood Mitigation Program is complete, DEF estimates it will reduce Distribution MED CMI by approximately 1M to 1.3M minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

Work will be prioritized using the following process.

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g., each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each feeder, and the hardened configuration resulting from completion of the program. The difference between the existing condition and the hardened configuration is the program impact.
3. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, resource availability and efficiency.

Year 1 Project List

2023 Planned Duke Energy Florida - Underground Flood Mitigation							
Location		Unit Count	Customer Count	Capital Cost	O&M Cost	Start Date	Finish Date
Underground Flood Mitigation							
Floramar	C4002	98	1000	$ 1,000,000		4/1/2023	10/31/2023

Distribution Vegetation Management

Vision

DEF will continue to utilize a fully Integrated Vegetation Management (IVM) to minimize the impact of vegetation on the distribution assets.

Description

DEF Distribution will continue a fully IVM program focused on trimming feeders and laterals on an average 3 and 5-year cycles respectively. This corresponds to trimming approximately 1,930 miles of feeder backbone and 2,455 miles of laterals annually. The IVM program consists of the following: routine maintenance "trimming", hazard tree removal, herbicide applications, vine removal, customer requested work, and right-of-way brush "mowing" where applicable. The IVM program incorporates a combination of condition, time since last trim and reliability-driven prioritization of work to reduce event possibilities during extreme weather events and enhance overall reliability.

Additionally, a hazard tree patrol is conducted every year on all three-phase circuits. Hazard trees are defined as trees that are dead, dying, structurally unsound, diseased, leaning or otherwise defective. The trees that are located within the right of way are removed prior to hurricane season each year, hazard trees that are located outside the right of way require landowner permission prior to removal. The contact with the landowner is initiated, permission for removal and the removal is also targeted for completion prior to hurricane season. If a feeder circuit is relocated or circuit height changes, an additional hazard tree assessment will be conducted in the line segments that will be impacted.

DEF will optimize the IVM program costs against reliability and storm performance objectives to harden the system for extreme weather events. There are four key objectives for optimization:

- Customer and employee safety;
- Tree-caused outage minimization, with the objective to reduce the number of tree-caused outages, particularly in the "preventable" category;
- Effective cost management; and
- Customer satisfaction.

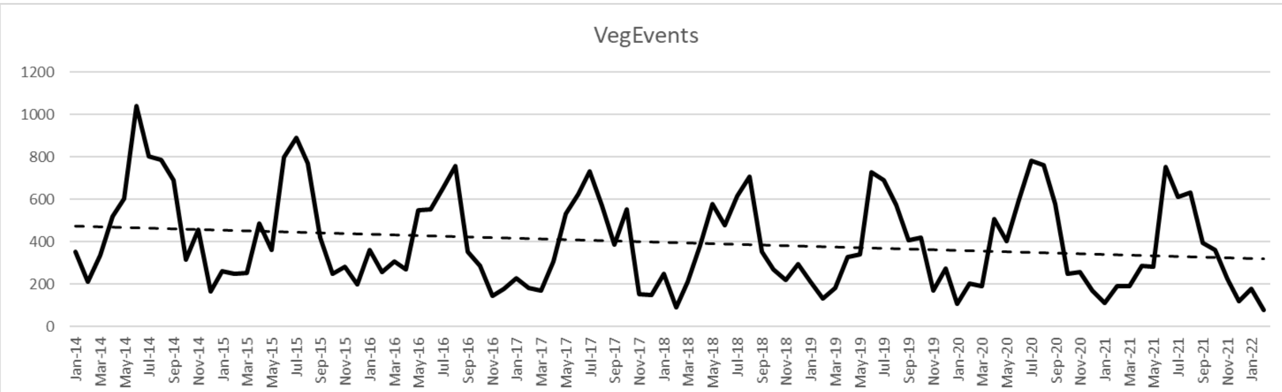
Cost

It is expected that the 10-year cost will be approximately $23M Capital and $517M O&M. This would cover the inspection and vegetation remediation activities. The circuit maintenance work performed is predominantly billed under a unit-based contract structure and not differentiated between labor and equipment. The estimated contractor ratio is 95% and the estimated utility personnel ratio is 5%.

2023-2025 Labor / Equipment Breakout		
	Labor	Equipment
Utility Personnel Totals	$ 6,633,579	$ 205,163
Capital	$ 590,225	$ 18,255
O&M	$ 6,043,354	$ 186,908
Contract Personnel Totals	$ 104,314,057	$ 34,358,323
Capital	$ 4,136,373	$ 1,378,791
O&M	$ 100,177,684	$ 32,979,532

	DEF		
VM - Distribution	2023	2024	2025
Totals	$ 47,111,034	$ 48,492,628	$ 49,907,460
Capital	$ 1,981,185	$ 2,040,620	$ 2,101,839
O&M	$ 45,129,849	$ 46,452,008	$ 47,805,621
Approximate Miles	4,383	4,398	4,398

Cost Benefit Comparison



DEF's Distribution IVM program is focused on ensuring the safe and reliable operation of the distribution system by minimizing vegetation-related interruptions and ensuring adequate conductor-to-vegetation clearances, while maintaining compliance with regulatory, environmental and safety requirements/standards. The chart above shows a reduction in vegetation related outage events over the past 5 years and demonstrates the effectiveness of the IVM program. Activities focus on the removal and/or control of incompatible vegetation within and along the right of way to minimize the risk of vegetation-related outages.

Prioritization Methodology

As part of the IVM program, DEF uses a comprehensive circuit prioritization model to minimize tree-caused outages by focusing on the feeders and or laterals that rate high in the model. Prioritization ranking factors are based on past feeder or lateral performance and probable future performance. Examples of the criteria used in prioritization include tree-caused outages in prior years, outages per vegetated mile, and total tree customer minutes of interruption. As systems and technologies continue to evolve and mature, DEF intends to leverage emerging technologies/systems and analytics to evaluate numerous variables coupled with local knowledge to optimize the annual planning and scheduling of work. DEF follows the ANSI 300 standard for pruning and the guide “Pruning Trees Near Electric Utility Lines” by Dr. Alex L. Shigo.

Transmission Programs

Florida

Program Summaries

Structure Hardening

Vision

The Structure Hardening program focuses on DEF's transmission structures throughout the state. As part of the program, all wood poles on the Florida transmission system will be replaced with non-wood structures within 15 years. In addition, Structure Hardening will upgrade lattice tower structure types that have failed during extreme weather and/or fail inspection.

Description

The Transmission Structure Hardening program addresses existing vulnerabilities on the system. This will enable the transmission system to better withstand extreme weather events. This program includes wood to non-wood upgrades, tower upgrades, adding cathodic protection, automating gang operated air break switches, Overhead Groundwire upgrades, and structure inspections.

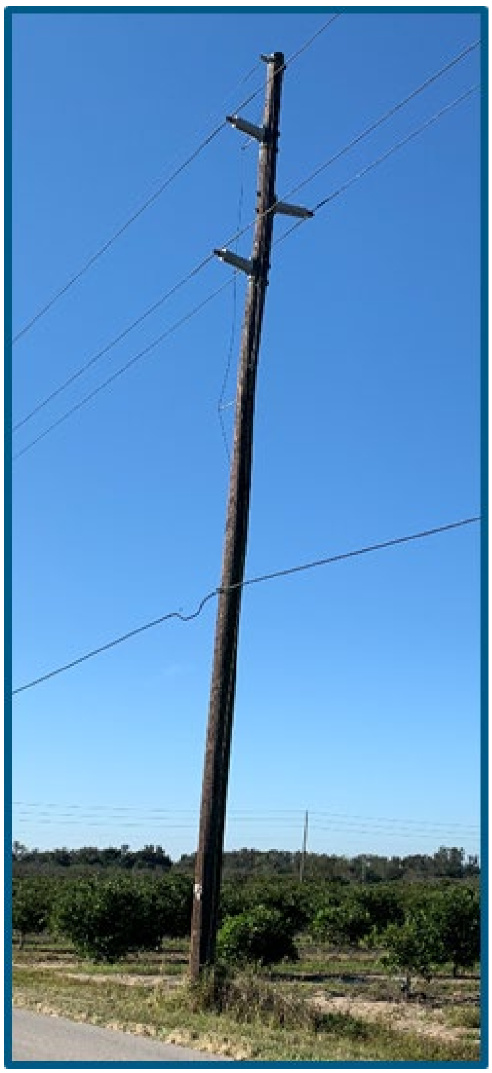


Figure 1: Wood Pole to Non-Wood Upgrade candidate

Wood to Non-Wood Upgrade

This activity upgrades wood poles to non-wood material such as steel or concrete. Wood pole failure has been the predominate structure damage to the transmission system during extreme weather. This strengthens structures by eliminating damage from woodpeckers and wood rot. The new structures will be more resistant to damage from extreme weather events. Other related hardware upgrades will occur simultaneously, such as insulators, crossarms, switches, and guys. This will upgrade an identified 20,520 wood poles.

Tower Upgrade

Tower Upgrade will prioritize towers based on inspection data and enhanced weather modeling. The upgrade activities will replace tower types that have previously failed during extreme weather events. Over 700 towers have been identified as having this design type.

In addition, the tower upgrade activities will upgrade lattice towers identified by visual ground inspections, aerial drone inspections and data gathered during cathodic protection installations (discussed below). This will improve the ability of the transmission grid to sustain operations during extreme weather events by reducing outages and improving restoration times. Other related hardware upgrades will occur simultaneously such as insulators, cathodic protection, and guys.

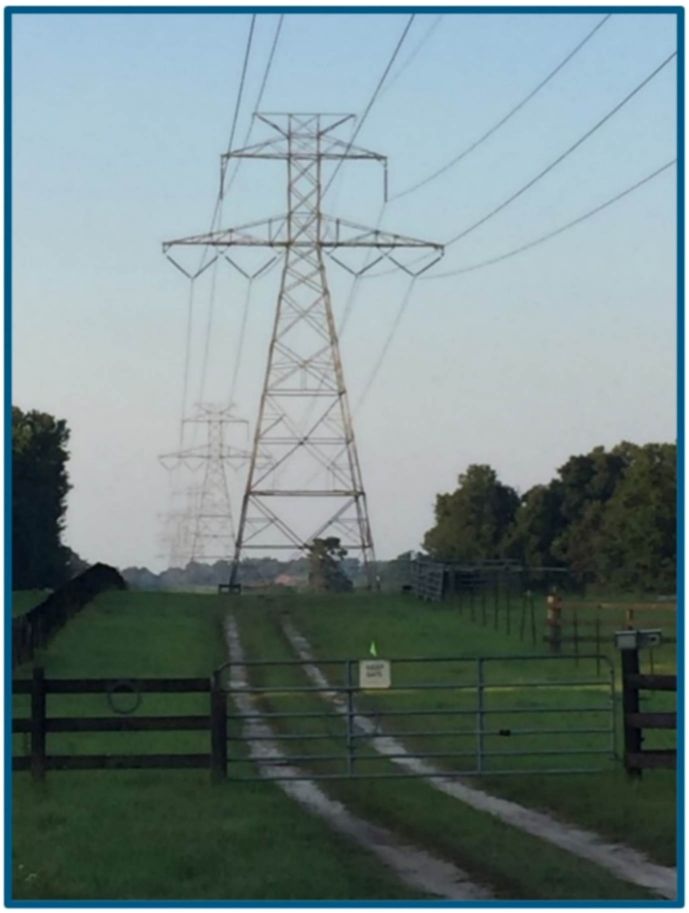


Figure 2: Double Circuit Tower

Cathodic Protection

The purpose of the Cathodic Protection (CP) activities is to mitigate active groundline corrosion on the lattice tower system. This will be done by installing passive CP systems comprised of anodes on each leg of lattice towers. The anodes serve as sacrificial assets that corrode in place of structural steel, preventing loss of structure strength to corrosion. Each CP project will address all towers on a line from beginning point to end point.

The following tangible benefits will be gained related to hardening the lattice system:

- Site Classification - Subsurface investigation and cathodic protection installation on all lattice structures, prioritizing lines based on system criticality, age, and potential storm impact. Galvanization and member thickness measurements will be taken on all legs and diagonals, and structural steel will be classified by corrosion severity. Concrete piers will be classified on concrete health, cracking, and rebar corrosion. This system evaluation will identify any potential weak spots resulting from ground line corrosion on DEF's lattice system.

- Corrosion Mitigation – Each lattice-structure tower leg will have cathodic protection installed on it in order to arrest the corrosion process.

- Corrosion Database – Soil conditions recorded at each tower site will include resistivity, soil pH, redox, and half-cell potentials. These values will be saved into a database which will be used to help classify areas of DEF's system prone to corrosion. This information will be used to aid in condition-based maintenance of system infrastructure.

Gang Operated Air Break (GOAB)

The GOAB line switch automation project is a 20-year initiative that will upgrade 160 switch locations with modern switches enabled with SCADA communication and remote-control capabilities. Automation will add resiliency to the transmission system. Later years will include adding new switch locations to add further resiliency to the transmission system. Transmission line switches are currently manually operated and cannot be remotely monitored or controlled. Switching, a grid operation often used to section off portions of the transmission system in order to perform equipment maintenance or isolate trouble spots to minimize impacts to customers, has historically required a technician to go to the site and manually operate one or more-line switches. The GOAB upgrade increases the number of remote-controlled switches to support faster isolation of trouble spots on the transmission system and more rapid restoration following line faults.

Figure 3: DEF Manually Operated Switch

Overhead Ground Wire (OHGW)

Florida is known for a high concentration of lightning events, which continually stress the existing grid protection. Deteriorated overhead ground wire reduces the protection of the conductor and exposes the line to repeated lightning damage and risk of failure impacting the system. This initiative will also reduce the safety risk due to the required removal of OHGW prior to any restoration work on the system. By targeting deteriorated OHGW on lines with high lightning events, the benefit of this activity will be maximized. An added benefit is upgrading to fiber optic OHGW, facilitating high-speed relaying and enhanced communication and control between stations and centralized control centers.

Structure Inspections and Drone Inspections

The transmission system's inspection activities include all types of structures, line hardware, guying, and anchoring systems. Inspections include:

- Aerial helicopter Transmission Line Inspections
- Wood Pole Line Patrols
- Wood Pole Sound and Bore Line Patrol – 8-year cycle
- Non-wood Structure Line Patrols – 6-year cycle

DEF will continue to conduct drone inspections on targeted lattice tower lines. The intent of these continued inspections is to identify otherwise difficult to see structure, hardware, or insulation vulnerabilities through high resolution imagery. DEF has incorporated drone patrols into the inspections because drones have the unique ability to provide a close vantage point with multiple angles on structures that is unattainable through aerial or ground patrols with binoculars.

Cost

DEF estimates the 10-year cost will be approximately $1.6B Capital and $34M O&M, and will entail approximately:

- 18,000 wood to non-wood poles;
- 700 tower replacements;
- Cathodic protection for all towers;
- 70 GOABs;
- 700 miles of OHGW; and
- system inspection cycles, ground and aerial.

	DEF		
Structure Hardening	2023	2024	2025
Totals	$142,483,532	$153,550,338	$167,661,144
Capital	$139,177,289	$150,194,566	$164,210,798
O&M	$ 3,306,243	$ 3,355,772	$ 3,450,346
Total Units	2,235	2,221	2,214

Cost Benefit Comparison

The Structure Hardening Program began in 2021 and is estimated to take 30 years to complete. Based on today's cost, the program is estimated to cost $2.6B in Capital and $71M in Project O&M. At completion, approximately:

- 20,520 wood to non-wood poles;
- 720 tower replacements;
- Cathodic protection for all towers;
- 160 GOABs;
- 1,500 miles of OHGW; and
- System inspections.

When the Structure Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Transmission system by approximately $14M to $18M annually based on today's costs.

When the Structure Hardening Program is complete, DEF estimates it will reduce Transmission MED CMI by approximately 13 million to 17 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and does not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a line), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each asset, and the hardened configuration resulting from completion of the Program. The difference between the existing condition and the hardened configuration is the program impact.
3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Year 1 Project List

2023 Planned Duke Energy Florida - Pole Replacement

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
ALAFAYA - OVIEDO 69KV	2	10294	$ 106,492.00	$ 2,630.00	3/30/2023	6/30/2023
ALTAMONTE - MAITLAND 69KV	20	5780	$ 1,064,920.00	$ 26,300.00	3/30/2023	6/30/2023
ALTAMONTE - NORTH LONGWOOD CKT1 69KV	11	6311	$ 585,706.00	$ 14,465.00	3/30/2023	6/30/2023
ALTAMONTE - SANFORD (FP&L) 230KV	21	1**	$ 1,118,166.00	$ 27,615.00	3/30/2023	6/30/2023
ALTAMONTE - SPRING LAKE 230KV	17	0*	$ 905,182.00	$ 22,355.00	3/30/2023	6/30/2023
AVALON - CLERMONT EAST 69KV	17	0*	$ 905,182.00	$ 22,355.00	3/30/2023	6/30/2023
BARNUM CITY - WESTRIDGE 69KV	17	6814	$ 905,182.00	$ 22,355.00	3/30/2023	6/30/2023
BROOKRIDGE - BROOKSVILLE WEST (BBW CKT) 115K	32	0*	$ 1,703,872.00	$ 42,080.00	3/30/2023	6/30/2023
BROOKRIDGE - BROOKSVILLE WEST (BWX CKT) 115K	6	0*	$ 319,476.00	$ 7,890.00	3/30/2023	6/30/2023
CLARCONA - OCOEE 69KV	24	4991	$ 1,277,904.00	$ 31,560.00	3/30/2023	6/30/2023
CLEARWATER - EAST CLEARWATER 69KV	35	0*	$ 1,863,610.00	$ 46,025.00	3/30/2023	6/30/2023
CLEARWATER - HIGHLANDS 69KV	16	0*	$ 851,936.00	$ 21,040.00	3/30/2023	6/30/2023
CYPRESSWOOD - HAINES CITY 69KV	37	4005	$ 1,970,102.00	$ 48,655.00	3/30/2023	6/30/2023
DAVENPORT - HAINES CITY 69KV	57	7976	$ 3,035,022.00	$ 74,955.00	3/30/2023	6/30/2023
DAVENPORT-WEST DAVENPORT	25	9255	$ 1,331,150.00	$ 32,875.00	3/30/2023	6/30/2023
DEBARY PL - LAKE EMMA 230KV	12	2731	$ 638,952.00	$ 15,780.00	3/30/2023	6/30/2023
DELAND - DELTONA 69KV	8	0*	$ 425,968.00	$ 10,520.00	3/30/2023	6/30/2023
DESOTO CITY - LAKE PLACID NORTH 69KV	23	3400	$ 1,224,658.00	$ 30,245.00	3/30/2023	6/30/2023
DISSTON - KENNETH 115KV	1	6489	$ 53,246.00	$ 1,315.00	3/30/2023	6/30/2023
DISSTON - STARKEY ROAD 69KV	21	4916	$ 1,118,166.00	$ 27,615.00	3/30/2023	6/30/2023
DUNDEE - LAKE WALES 69KV	41	2069	$ 2,183,086.00	$ 53,915.00	3/30/2023	6/30/2023
DUNNELLON TOWN - RAINBOW LK EST SEC 69KV RA	46	6188	$ 2,449,316.00	$ 60,490.00	3/30/2023	6/30/2023
EATONVILLE - SPRING LAKE 69KV	10	0*	$ 532,460.00	$ 13,150.00	3/30/2023	6/30/2023
EUSTIS SOUTH - SORRENTO 69KV	95	4912	$ 5,058,370.00	$ 124,925.00	3/30/2023	6/30/2023
FISHEATING CREEK - LAKE PLACID 69KV	5	3772	$ 266,230.00	$ 6,575.00	3/30/2023	6/30/2023
FISHEATING CREEK - SUN N LAKES 69KV	149	12451	$ 7,933,654.00	$ 195,935.00	6/30/2023	9/30/2023
FT WHITE - HIGH SPRINGS 69KV	58	5327	$ 3,088,268.00	$ 76,270.00	6/30/2023	9/30/2023

HIGGINS PL - CURLEW CKT2 115KV	5	0*	$ 266,230.00	$ 6,575.00	6/30/2023	9/30/2023
LAKE WALES - WEST LAKE WALES CKT#1 69KV	51	0*	$ 2,715,546.00	$ 67,065.00	6/30/2023	9/30/2023
LAKE WALES - WEST LAKE WALES CKT#2 69KV	49	0*	$ 2,609,054.00	$ 64,435.00	6/30/2023	9/30/2023
LOCKHART - SPRING LAKE 230KV	18	0*	$ 958,428.00	$ 23,670.00	6/30/2023	9/30/2023
LOCKHART - WOODSMERE 230KV	2	0*	$ 106,492.00	$ 2,630.00	6/30/2023	9/30/2023
MAXIMO - 51ST ST 115KV	103	6876	$ 5,484,338.00	$ 135,445.00	6/30/2023	9/30/2023
MEADOW WOODS SOUTH - HUNTER CREEK 69KV	16	5581	$ 851,936.00	$ 21,040.00	6/30/2023	9/30/2023
MEADWDS SOUTH - TAFT 69KV	40	0*	$ 2,129,840.00	$ 52,600.00	6/30/2023	9/30/2023
MONTVERDE - WINTER GARDEN 69KV	52	7229	$ 2,768,792.00	$ 68,380.00	6/30/2023	9/30/2023
OAKHURST - WALSINGHAM 69KV	36	5048	$ 1,916,856.00	$ 47,340.00	6/30/2023	9/30/2023
PALM HARBOR - TARPON SPRINGS 69KV	38	0*	$ 2,023,348.00	$ 49,970.00	6/30/2023	9/30/2023
RIO PINAR PL - EAST ORANGE 69KV	28	6741	$ 1,490,888.00	$ 36,820.00	6/30/2023	9/30/2023
SKY LAKE - SOUTHWOOD (OUC) 230KV	20	1***	$ 1,064,920.00	$ 26,300.00	6/30/2023	9/30/2023
UMERTON WEST - WALSINGHAM 69KV	18	5958	$ 958,428.00	$ 23,670.00	6/30/2023	9/30/2023
AVON PARK PL - DESOTO CITY 69KV	72	0*	$ 3,833,712.00	$ 94,680.00	6/30/2023	9/30/2023
DUNNELLON TOWN - HOLDER 69KV	51	0*	$ 2,715,546.00	$ 67,065.00	6/30/2023	9/30/2023
HOLDER - INVERNESS 69KV	41	6216	$ 2,183,086.00	$ 53,915.00	6/30/2023	9/30/2023
BAY RIDGE - SORRENTO 69KV	36	2645	$ 1,916,856.00	$ 47,340.00	6/30/2023	9/30/2023
LEESBURG - OKAHUMPKA 69KV	11	2436	$ 585,706.00	$ 14,465.00	6/30/2023	9/30/2023
TROPIC TERRACE 115KV TAPLINE	55	3483	$ 2,928,530.00	$ 72,325.00	6/30/2023	9/30/2023
PIEDMONT - PLYMOUTH 69KV	9	0*	$ 479,214.00	$ 11,835.00	6/30/2023	9/30/2023
VANDOLAH - MYAKKA PREC 69KV RADIAL	33	2699	$ 1,757,118.00	$ 43,395.00	6/30/2023	9/30/2023
BARBERVILLE - DELAND WEST 69KV	41	4185	$ 2,183,086.00	$ 53,915.00	9/30/2023	11/30/2023
OVIEDO - WINTER SPRINGS 69KV	20	0*	$ 1,064,920.00	$ 26,300.00	9/30/2023	11/30/2023
ALAFAYA - UCF 69KV	29	5045	$ 1,544,134.00	$ 38,135.00	9/30/2023	11/30/2023
CAMP LAKE - CLERMONT 69KV	53	5296	$ 2,822,038.00	$ 69,695.00	9/30/2023	11/30/2023
BAY RIDGE - KELLY PK 69KV	29	2637	$ 1,544,134.00	$ 38,135.00	9/30/2023	11/30/2023
MAITLAND - WINTER PARK 69KV	27	0*	$ 1,437,642.00	$ 35,505.00	9/30/2023	11/30/2023
TBD	120		$ 19,275,493.00	$ 213,209.00	9/30/2023	11/30/2023
Engineering/Materials for 2024 Project	0		$ 4,644,702.00		1/30/2023	11/30/2023

Notes: ** Customer count is zero due to GRID Redundancy*
*** Interconnection point with FP&L*
**** Interconnection point with OUC*

2023 Planned Duke Energy Florida - Tower Replacements

Location	Unit Count	Customer count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
WINTER PARK EAST - WINTER SPRINGS 230KV	19	0*	$ 4,519,528.00	$ 55,285.00	3/16/2023	9/30/2023
ECON - WINTER PARK EAST 230KV	2	0*	$ 480,472.00	$ 5,820.00	3/16/2023	9/30/2023

*Notes: * Customer count is zero due to GRID Redundancy*

2023 Planned Duke Energy Florida - Cathodic Protection

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
SPP - (CFW) Central Florida - Windermere - Cathodic Protection	105	0*	$ 999,865	22,184	6/30/2023	11/30/2023
CFO - Central Florida - Silver Springs	107	0*	1,022,385	22,684	6/30/2023	11/30/2023
NC - Northeast - Curlew	50	0*	477,750	10,600	6/30/2023	11/30/2023

*Notes: * Customer count is zero due to GRID Redundancy*

2023 Planned Duke Energy Florida - GOAB

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
Crystal River North Tap	1	2485	397,202	1,796	9/1/2023	10/31/2023
Port St. Joe Industrial Tap	1	745	397,202	1,796	9/1/2023	10/31/2023
Ochlockonee Tap	1	2362	565,028	1,796	11/1/2023	1/31/2024
City of Fort Meade Tap	1	1*	$1,820,284	1,796	11/1/2023	1/31/2024
Taunton Road Tap	1	2,752	$1,820,284	1,796	11/1/2023	1/31/2024

*Notes: * Interconnection point with municipality (City of Fort Meade)*

2023 Planned Duke Energy Florida - OH Ground Wires

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
Parnell Road Tap to Wauchula City Tap	13	2807	$ 2,623,925	0	9/30/2023	3/30/2024
Babson Park Tap - Indian Lake Estates Tap	5	3708	$ 975,215	0	9/30/2023	3/30/2024
SPP Indian Lakes Estates Tapline- Poles & Static	13	1982	$ 2,535,559	0	9/30/2023	3/30/2024
Crooked Lake - Babson Park Tap	7	1978	$ 1,365,301	0	9/30/2023	3/30/2024

2023 Planned Duke Energy Florida - Ground Patrol Inspections

Location	Unit Count	Customer Count	Start Date	Finish Date
INTERCESSION CITY DE-ENERGIZED 69KV, ICLW-7, 69.0 KV	1	0(6)	3/16/2023	6/30/2023
LAKE MARION - MIDWAY 69KV, LMP-1, 69.0 KV	212	9524	3/16/2023	6/30/2023
CAMP LAKE - FERNDALE SEC 69KV RADIAL, CLFX-1, 69.0 KV	4	3976	3/16/2023	6/30/2023
CAMP LAKE - GROVELAND - CAMP LAKE LOOP 69KV, CLG-1, 69.0 KV	239	5560	3/16/2023	6/30/2023
BARBERVILLE - DELAND WEST 69KV, DWB-1, 69.0 KV	177	4185	3/16/2023	6/30/2023
BAYVIEW - TRI CITY 115KV, HD-2, 115.0 KV	12	4188	3/16/2023	6/30/2023
FISHEATING CREEK - SUN N LAKES 69KV, ALP-SUC-1, 69.0 KV	476	12451	3/16/2023	6/30/2023
CHIEFLAND-GA PACIFIC 69KV, CGP-1/IS-5, 69.0 KV	106	4616	3/16/2023	6/30/2023
CASSADAGA - SMYRNA UTILITIES 115KV, CNS-1, 115.0 KV	92	1(2)	3/16/2023	6/30/2023
COUNTRY OAKS - EAST LAKE WALES 69KV, LEL-1, 69.0 KV	158	3004	3/16/2023	6/30/2023
COUNTRY OAKS - LAKE WALES 69KV, LEL-2, 69.0 KV	65	0(1)	3/16/2023	6/30/2023
NEWBERRY - TRENTON 69KV, NT-1, 69.0 KV	198	1835	3/16/2023	6/30/2023
LAKE ALOMA - WINTER PARK EAST 69KV, WL-1, 69.0 KV	51	3277	3/16/2023	6/30/2023
COLEMAN - SUMTERVILLE 69KV, BCF-4, 69.0 KV	61	8	3/16/2023	6/30/2023
HOMELAND - MULBERRY 69KV, BH-2, 69.0 KV	68	0(1)	3/16/2023	6/30/2023
BAY RIDGE - KELLY PK 69KV, BK-1, 69.0 KV	86	2637	3/16/2023	6/30/2023
LAKE LOUISA SEC - CLERMONT EAST 69KV - HAINES CITY, CEB-3, 69.0 KV	105	12589	3/16/2023	6/30/2023
CRYSTAL RIVER SOUTH 115KV - LECANTO, CSB-1, 115.0 KV	85	3454	3/16/2023	6/30/2023
HOLDER - INVERNESS 69KV, HB-3, 69.0 KV	195	6216	3/16/2023	6/30/2023
ATWATER - US HYDRO WOODRUFF DAM 115KV, QX-2, 115.0 KV	96	4(5)	3/16/2023	6/30/2023
ALTAMONTE - SPRING LAKE 230KV, ASW-1, 230.0 KV	64	0(1)	3/16/2023	6/30/2023
ARCHER - GINNIE 230KV, FO-1, 230.0 KV	181	1(3)	3/16/2023	6/30/2023
LARGO - PALM HARBOR 230KV, LTL-1, 230.0 KV	153	0(1)	3/16/2023	6/30/2023
HOLOPAW - POINSETT (FP&L) 230KV, WLXF-2, 230.0 KV	159	1(4)	3/16/2023	6/30/2023
TRI CITY - ULMERTON 115KV, HD-8, 115.0 KV	12	0(1)	3/16/2023	6/30/2023
SOUTH POLK - SOUTH FT MEADE 115KV RADIAL, AF2-2, 0.0 KV	75	3	3/16/2023	6/30/2023
MARTIN WEST - MARTIN 69KV RADIAL, MM-1, 69.0 KV	28	3506	3/16/2023	6/30/2023
EUSTIS SOUTH - SORRENTO 69KV, SES-1, 69.0 KV	173	4912	3/16/2023	6/30/2023
LAKE LOUISA SEC - CLERMONT EAST 69KV - WILDWOOD, CEB-4, 69.0 KV	3	0	3/16/2023	6/30/2023
BELLEVIEW - MARICAMP 69KV, CFO-SSB-1, 69.0 KV	26	13190	3/16/2023	6/30/2023
BEVERLY HILLS - HOLDER 115KV, HBH-1, 115.0 KV	83	3336	3/16/2023	6/30/2023
HIGGINS PL - SAFETY HARBOR 115KV, HD-7, 115.0 KV	11	0(1)	3/16/2023	6/30/2023
OCCIDENTAL SWIFT CREEK #1 - OCCIDENTAL METERING 115KV, JS-3, 115.0 KV	261	721	3/16/2023	6/30/2023
OCC SWIFT CREEK #1 - OCC SWIFT CREEK #2 115KV, SCSC-1, 115.0 KV	33	1(3)	3/16/2023	6/30/2023
IDYLWILD - PHIFER CEC 69KV RADIAL, IR-1, 69.0 KV	131	1583	3/16/2023	6/30/2023
APALACHICOLA - CARRABELLE 69KV, JA-1, 69.0 KV	249	6477	3/16/2023	6/30/2023
(PX-1) - PORT ST JOE - CALLAWAY (GULF PWR), PX-1, 230.000 KV	148	1(4)	3/16/2023	6/30/2023

BROOKRIDGE - BROOKSVILLE WEST (BBW CKT) 115KV, BBW-1, 115.0 KV	134	33468	3/16/2023	6/30/2023
BROOKSVILLE WEST - SILVERTHORNE WREC 115KV RADIAL, BWSX-1, 115.0 KV	39	16794	3/16/2023	6/30/2023
FT GREEN SPRINGS - VANDOLAH #2 CKT 69KV, VFGS-1, 69.0 KV	77	3	3/16/2023	6/30/2023
BARCOLA - FT MEADE 69KV, BF-1, 69.0 KV	110	1[3]	3/16/2023	6/30/2023
COUNTRY OAKS - DUNDEE 69KV, DCO-1, 69.0 KV	182	0[1]	3/16/2023	6/30/2023
HANSON - CHERRY LAKE TREC 115KV RADIAL, HC-1, 115.0 KV	36	1628	3/16/2023	6/30/2023
FT MEADE - SAND MOUNTAIN 69KV RADIAL, FSM-1, 69.0 KV	34	185	3/16/2023	6/30/2023
ALAFAYA - UCF 69KV, AUCF-1, 69.0 KV	137	5045	3/16/2023	6/30/2023
HOLDER - INGLIS 69KV, IB-1, 69.0 KV	46	6268	3/16/2023	6/30/2023
NEW RIVER - ZEPHYRHILLS NORTH 115KV, ZNR-1, 115.0 KV	144	5511	3/16/2023	6/30/2023
DUNDEE - LAKE WALES 69KV, ICLW-3, 69.0 KV	148	2069	3/16/2023	6/30/2023
GA PACIFIC - TRENTON 69KV, IS-2, 69.0 KV	74	0[6]	3/16/2023	6/30/2023
CHAMPIONS GATE - DAVENPORT 69KV, ICLW-5, 69.0 KV	73	4709	3/16/2023	6/30/2023
BUSHNELL EAST - SUMTERVILLE 69KV, BCF-5, 69.0 KV	67	0[1]	3/16/2023	6/30/2023
SILVER SPRINGS - SILVER SPRINGS SHORES 69KV, OCF-1, 69.0 KV	201	0[1]	3/16/2023	6/30/2023
BAY RIDGE - SORRENTO 69KV, SB-1, 69.0 KV	93	2645	3/16/2023	6/30/2023
ALTAMONTE - DOUGLAS AVE 69KV, ASL-1, 69.0 KV	77	2455	3/16/2023	6/30/2023
FT WHITE - HIGH SPRINGS 69KV, FH-1, 69.0 KV	232	5327	3/16/2023	6/30/2023
(AO-1) - ALAFAYA - OVIEDO, AO-1, 69.000 KV	58	10294	3/16/2023	6/30/2023
IDYLWILD - UNIVERSITY FLA 69KV, IG-GUF-1, 69.0 KV	51	1[2]	3/16/2023	6/30/2023
CHIEFLAND - INGLIS 69KV, IS-1, 69.0 KV	422	2870	3/16/2023	6/30/2023
LOCKHART - WOODSMERE 230KV, ASW-2, 230.0 KV	44	0[1]	3/16/2023	6/30/2023
JASPER - OCC SWIFT CREEK #1 115KV, JS-1, 115.0 KV	108	1[3]	3/16/2023	6/30/2023
QUINCY - ATTAPULGUS (GA PWR) 69KV, QB-1, 69.0 KV	117	3[5]	3/16/2023	6/30/2023
IDYLWILD - WILLISTON 69KV, SI-3, 69.0 KV	208	3075	3/16/2023	6/30/2023
REEDY LAKE - DISNEY WORLD NORTHWEST 69KV, CET-3, 69.0 KV	54	2340	3/16/2023	6/30/2023
MONTICELLO - BOSTON (GA PWR) 69KV, DB-2, 69.0 KV	101	2(5)	3/16/2023	6/30/2023
INGLIS CKT#2 - POWER CKT#2, IT-CKT2, 115.000 KV	2	0[1]	3/16/2023	6/30/2023
40TH ST - 51ST ST 115KV, FSF-FSP-1, 69.0 KV	6	0[1]	3/16/2023	6/30/2023
CYPRESSWOOD - HAINES CITY 69KV, ICLW-2, 69.0 KV	155	4005	3/16/2023	6/30/2023
INTERCESSION CITY PL - CABBAGE ISLAND 69KV, ICP-1, 69.0 KV	91	0[1]	3/16/2023	6/30/2023
CRAWFORDVILLE - PORT ST JOE 230KV, CPS-1, 230.0 KV	743	0[1]	3/16/2023	6/30/2023
MIDWAY - POINCIANA 69KV, LMP-2, 69.0 KV	49	0[1]	3/16/2023	6/30/2023
LIBERTY - HOSFORD TEC 69KV RADIAL, JH-3, 69.0 KV	21	3013	3/16/2023	6/30/2023
BAYBORO - CENTRAL PLAZA 115KV, BCP-1, 115.0 KV	69	0[1]	3/16/2023	6/30/2023
CITRUS HILLS - INVERNESS 115KV, BI-1, 115.0 KV	50	2189	3/16/2023	6/30/2023
BROOKRIDGE - TWIN COUNTY RANCH 115KV - CLEARWATER, CRB-1, 115.0 KV	124	3048	3/16/2023	6/30/2023
HAVANA - QUINCY 69KV, TQ-1, 69.0 KV	5	1505	3/16/2023	6/30/2023
HAVANA - TALLAHASSEE 69KV, TQ-HH-1, 69.0 KV	194	10197	3/16/2023	6/30/2023
DOUGLAS AVE - SPRING LAKE 69KV, ASL-2, 69.0 KV	62	2345	3/16/2023	6/30/2023
BOGGY MARSH - LAKE LOUISA SEC 69KV, CEB-2, 69.0 KV	217	909	3/16/2023	6/30/2023
CENTRAL FLA - LAKE ELLA (SEC) 69KV, CFO-3, 69.0 KV	11	0[1]	3/16/2023	6/30/2023
DALLAS - SILVER SPRINGS SHORES 69KV, DW-OCF-1, 69.0 KV	270	12271	3/16/2023	6/30/2023
NORTH BARTOW - ORANGE SWITCHING STA 69KV, FMB-3, 69.0 KV	65	0[1]	3/16/2023	6/30/2023
ATWATER - QUINCY 115KV, QX-1, 115.0 KV	173	0[1]	3/16/2023	6/30/2023
TURNER PL - DELTONA EAST 115KV, TDE-1, 115.0 KV	83	0[1]	3/16/2023	6/30/2023
LAKE WEIR - CENTRAL TOWER CEC 69KV RADIAL, LC-1, 69.0 KV	190	5576	3/16/2023	6/30/2023
HUDSON - LAKE TARPON 230KV, CC-5, 230.0 KV	99	0[1]	3/16/2023	6/30/2023
BRONSON - NEWBERRY 230KV, CF-2, 230.0 KV	165	0[1]	3/16/2023	6/30/2023
FT WHITE - NEWBERRY 230KV, CF-3, 230.0 KV	300	0[1]	3/16/2023	6/30/2023
AVALON - CAMP LAKE 230KV - WILDWOOD, CFW-3, 230.0 KV	3	0[1]	3/16/2023	6/30/2023
LOCKHART - SPRING LAKE 230KV, ASW-3, 230.0 KV	51	0[1]	3/16/2023	6/30/2023
BEVERLY HILLS - LECANTO 115KV, CSB-2, 0.0 KV	125	3708	3/16/2023	6/30/2023
FLORIDA GAS TRANSMISSION - ST MARKS EAST 230KV, CP-3, 230.0 KV	489	0[1]	3/16/2023	6/30/2023

BUSHNELL EAST - CENTER HILL RADIAL 69KV, BW-1, 69.0 KV	73	4154	3/16/2023	6/30/2023
LAKE WALES - WEST LAKE WALES CKT#2 69KV, WLL-1, 69.0 KV	105	0(1)	3/16/2023	6/30/2023
ALDERMAN - CURLEW 115KV, HTW-1, 115.0 KV	8	6975	3/16/2023	6/30/2023
CYPRESSWOOD - DUNDEE 69KV, ICLW-1, 69.0 KV	35	2371	3/16/2023	6/30/2023
DEBARY PL - ORANGE CITY 230KV, DDW-1, 230.0 KV	95	0(1)	3/16/2023	6/30/2023
DELAND WEST - SILVER SPRINGS 230KV, SDW-1, 230.0 KV	622	0(1)	3/16/2023	6/30/2023
FT GREEN #6 69KV TAP, VFGS-1-TL3, 69.0 KV	66	1(3)	3/16/2023	6/30/2023
MT DORA EAST SEC 69KV TAP DE-ENERGIZED, SES-1-TL1-DE, 69.0 KV	10	0(6)	3/16/2023	6/30/2023
LADY LAKE 69KV TAP, DLL-OCF-1-TL1, 69.0 KV	3	4542	3/16/2023	6/30/2023
BOWLING GREEN PREC 69KV TAP, FFG-1-TL1, 69.0 KV	1	2828	3/16/2023	6/30/2023
ALAFAYA - OVIEDO (AO-1A) - LOCKWOOD TAP, AO-1A, 69.000 KV	48	6028	3/16/2023	6/30/2023
BLICHTON SEC 69KV TAP, MS-1-TL1, 69.0 KV	136	2426	3/16/2023	6/30/2023
CONTINENTAL SEC 69KV TAP, BCF-2-TL1, 69.0 KV	2	16041	3/16/2023	6/30/2023
OAK CITY (CITY OF TALLAHASSEE) 69KV TAP, TQ-HH-1-TL3, 69.0 KV	6	1(2)	3/16/2023	6/30/2023
LITTLE PAYNE CREEK #2 69KV TAP, FFG-1-TL8, 69.0 KV	3	1(3)	3/16/2023	6/30/2023
TOWN OF HAVANA SUTTERS CREEK 69KV TAP, TQ-HH-1-TL4, 69.0 KV	11	1(2)	3/16/2023	6/30/2023
LYNNE CEC 69KV TAP, LC-1-TL1, 69.0 KV	71	5576	3/16/2023	6/30/2023
DIXIE SEC 69KV TAP, BCF-BW-2-TL2, 69.0 KV	2	1(2)	3/16/2023	6/30/2023
PEMBROKE 69KV TAP, FMB-1-TL3, 69.0 KV	7	19	3/16/2023	6/30/2023
GOSPEL ISLAND SEC 69KV TAP, HB-3-TL1, 69.0 KV	38	6268	3/16/2023	6/30/2023
MT DORA EAST SEC 69KV TAP, SES-1-TL1, 69.0 KV	39	4884	3/16/2023	6/30/2023
DACO 69KV TAP, FFG-1-TL10, 69.0 KV	2	1(3)	3/16/2023	6/30/2023
NORALYN #1 69KV TAP, BH-2-TL1, 69.0 KV	2	1(3)	3/16/2023	6/30/2023
SUMTERVILLE SEC 69KV TAP, BCF-BW-2-TL3, 69.0 KV	1	674	3/16/2023	6/30/2023

*Notes: * The total inspection cost for 2023 is $500k O&M*
1 – Zero customers due to redundancy
2 - Interconnection point with municipality
3 - Interconnection point with industrial customer
4 - Interconnection point with other utilities
5 - Interconnection point with utility and municipalities
6 – De-energized line

2023 Planned Duke Energy Florida - Drone Inspections

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
(CCF) Crystal River - Central Florida 230kV	211	0*	$0.00	$ 48,319.00	3/16/2023	9/30/2023
(NC) Northeast - Curlew 230kV	87	0*	$0.00	$ 19,923.00	3/16/2023	9/30/2023
(UL) Ulmerton - Largo 230kV	26	0*	$0.00	$ 5,954.00	3/16/2023	9/30/2023
(CFW) Central Florida - Windermere 230kV	135	0*	$0.00	$ 30,804.00	3/16/2023	9/30/2023

*Notes: * Customer count is zero due to GRID Redundancy*

Substation Flood Mitigation

Vision

Substation Flood Mitigation is a targeted program upgrading 10 sites identified as being at risk for significant flooding during extreme weather events.

Description

The Substation Flood Mitigation program builds in protection for substations most vulnerable to flood damage using flood plain and storm surge data. It includes a systematic review and prioritization of substations at risk of flooding to determine the proper mitigation solution, which may include elevating or modifying equipment, or relocating substations altogether.

Flood mitigation will be a targeted application of mitigation measures for substations. New assets could include control houses, relays, or total station rebuilds to increase elevation, etc.

Cost

It is expected that the 10-year cost will be approximately $38M Capital. This would cover approximately 8 substations on the DEF system.

	DEF		
Substation Flood Mitigation	**2023**	**2024**	**2025**
Totals	$ 3,800,000	$ 3,800,000	$ 3,800,000
Capital	$ 3,800,000	$ 3,800,000	$ 3,800,000
O&M	$ -	$ -	$ -
Total Units	2	2	2

Cost Benefit Comparison

The Substation Flood Mitigation Program is scheduled to start in 2023 and estimated to take 15 years to complete. Based on today's costs, the Program will cost an estimated $38M in Capital. At the completion of the Program 10 targeted substations will be hardened with flood mitigation strategies.

When the Substation Flood Mitigation Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Transmission system by approximately $0.6M to $0.7M annually based on today's costs.

When the Substation Flood Mitigation Program is complete, DEF estimates it will reduce Transmission MED CMI by approximately 6 million to 8 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and do not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a line), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each asset, and the hardened configuration resulting from completion of the program. The difference between the existing condition and the hardened configuration is the program impact.
3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Year 1 Project List

2023 Planned Duke Energy Florida - Substation Flood Mitigation						
Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
Cross Bayou	1	15521	$ 1,900,000	0	11/1/2023	6/30/2024
Ulmerton West	1	12459	$ 1,900,000	0	11/1/2023	6/30/2024

Loop Radially-Fed Substations

Vision

The Loop Radially-Fed Substation program will convert radially-fed substations to networked substations. The targeted program will address approximately 17 sites over 20 years.

Description

The Loop Radially-Fed Substations program builds a more resilient and networked transmission system by creating a secondary feed into substations that are more likely to experience long outage durations during extreme weather events. As part of the construction of the additional feed, other assets could include equipment such as breakers, switches, bus work, structures, insulators, potential transformers, lightning arresters, relays, control houses.

Cost

The estimated 10-year cost will be approximately $82M. This would cover approximately 7 substations on the system.

	DEF		
Loop Radially Fed Substations	2023	2024	2025
Totals	$ -	$ -	$ 10,300,000
Capital	$ -	$ -	$ 10,300,000
O&M	$ -	$ -	$ -
Total Units	0	0	1

Cost Benefit Comparison

The Loop Radially-Fed Substations Program is scheduled to start in 2025 and estimated to take 20 years to complete. Based on today's costs, the Program will cost an estimated $206M in Capital. At the completion of the program 17 targeted substations will be addressed.

When the Loop Radially-Fed Substations Program is complete, it will provide an alternate source of power to limit interruptions experienced by customers.

When the Loop Radially-Fed Substations Program is complete, DEF estimates it will reduce Transmission MED CMI by approximately 900,000 to 1 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and do not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last

200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.

2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a line), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each asset, and the hardened configuration resulting from program completion. The difference between the existing condition and the hardened configuration is the program impact.
3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Year 1 Project List

The Loop Radially-Fed Substations Program is scheduled to start in 2025, there are no projects for 2023.

Substation Hardening

Vision

The Substation Hardening Program started as part of DEF's Grid Investment Plan which was partially funded through the 2017 Revised and Restated Settlement Agreement and continued through SPP 2020. DEF is continuing this Program through SPP 2023. The Substation Hardening Program will focus on upgrading oil breakers and electromechanical relays. The Program will eliminate 317 oil breakers within 15 years. Within 20 years, this Program will also upgrade approximately 300 electromechanical relay groups to electronic relays to properly isolate line faults and reduce storm restoration duration by automating fault identification.

Description

Substation Hardening will address two major components:1) Upgrading oil breakers to state-of-the-art gas or vacuum breakers to mitigate the risk of catastrophic failure and extended outages during extreme weather events; and 2) Upgrading electromechanical relays to digital relays will provide communications and enable DEF to respond and restore service more quickly from extreme weather events.

Breaker Upgrades

Replacing oil circuit breakers with state-of-the-art breakers will result in the transmission system being able to more effectively and consistently isolate faults, reclose after momentary interruptions, and improve the customer experience through fewer interruptions. Oil circuit breakers are more unreliable than gas or vacuum breakers, especially in circumstances where they are operating numerous times over a short period, such as during extreme weather events. When oil circuit breakers are repeatedly called to operate, they can generate arcing gasses within the oil tank that can accumulate and result in catastrophic failure. Existing vintage oil breakers are less reliable when isolating line faults and can contribute to increased and longer customer outages when there is a failure.

Electronic Relays

The Electronic Relay upgrades eliminate noncommunicating electromechanical and solid-state relays with digital relays. Upgrading to modern relay designs with communication capabilities and microprocessor technologies will enable quicker restoration from outage events. Another benefit is increased overall system intelligence, which will improve restoration planning. One digital relay replaces a variety of legacy single-function electromechanical relays. Two-way communications and event recording capabilities allow them to provide device performance information following a system event to support continuous system design and operational improvements.

Grid automation will be implemented to reduce duration and impacts from system issues. Digital relays will be installed to add remote monitoring and operations to key assets, which allows for rapid service response and better protection and monitoring of equipment during extreme weather events. Restoration times will be reduced due to remote monitoring and control which will allow quicker pinpointing and resolution of issues.

Cost

The estimated 10-year cost for Substation Hardening Program is expected to be approximately $133M.

This would upgrade approximately 80 oil filled breakers and approximately 140 relay groups on the DEF system.

	DEF		
Substation Hardening	2023	2024	2025
Totals	$ 9,500,000	$ 11,500,000	$ 14,000,000
Capital	$ 9,500,000	$ 11,500,000	$ 14,000,000
O&M	$ -	$ -	$ -
Total Units	16	18	21

Cost Benefit Comparison

The Substation Hardening Program is estimated to take 20 years to complete. Based on today's costs, the Program will cost an estimated $199M in Capital.

When the Substation Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Transmission system by approximately $90,000 to $120,000 annually based on today's costs.

When the Substation Hardening Program is complete, DEF estimates it will reduce Transmission MED CMI by approximately 6 million to 8 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and do not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, eight years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a line), observed

outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each asset, and the hardened configuration at project completion. The difference between the existing condition and the hardened configuration is the program impact.

3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Year 1 Project List

2023 Planned Duke Energy Florida - Substation Hardening						
Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
Belleview	1	1753	$ 315,151	$0.00	3/1/2023	4/30/2023
Bithlo	1	2144	$ 315,151	$0.00	3/1/2023	4/30/2023
Econ	1	1455	$ 315,151	$0.00	3/1/2023	4/30/2023
Bay Hill	4	5002	$ 1,363,965	$0.00	12/1/2023	6/30/2024
Starkey Road	4	13780	$ 2,727,929	$0.00	12/1/2023	5/31/2024
Monticello	1	886	$ 710,701	$0.00	12/1/2023	5/31/2024
Elfers	4	9397	$ 2,966,609	$0.00	9/1/2023	3/31/2024
Engineering/Materials for 2024 Projects	0	5573	$ 785,343	$0.00	12/1/2023	4/30/2024

Transmission Vegetation Management

Vision

DEF will continue to utilize Integrated Vegetation Management (IVM) to minimize the impact of vegetation on the transmission assets.

Description

DEF's Transmission IVM program is focused on ensuring the safe and reliable operation of the transmission system by minimizing vegetation-related interruptions and adequate conductor-to-vegetation clearances, while maintaining compliance with regulatory, environmental, and safety requirements or standards. The program activities focus on the removal and/or control of incompatible vegetation within and along the right of way to minimize the risk of vegetation-related outages and ensure necessary access within all transmission line corridors. The IVM program includes the following activities: planned threat and condition-based work, reactive work that includes hazard tree mitigation, and floor management (herbicide, mowing, and hand cutting operation).

Cost

It is expected that the 10-year cost will be approximately $126M Capital and $127M O&M. This would cover the inspection and vegetation remediation activities. The estimated contractor ratio is 93%. The estimated utility personnel ratio is 7%.

2023-2025 Labor / Equipment Breakout		
	Labor	Equipment
Utility Personnel Totals	$ 4,980,707	$ 199,050
Capital	$ 2,988,424	$ 102,213
O&M	$ 1,992,283	$ 96,836
Contract Personnel Totals	$ 44,006,170	$ 20,708,785
Capital	$ 20,546,379	$ 9,668,884
O&M	$ 23,459,791	$ 11,039,901

	DEF		
VM - Transmission	2023	2024	2025
Totals	$ 21,840,896	$ 24,894,658	$ 23,159,158
Capital	$ 10,312,889	$ 12,052,127	$ 10,940,884
O&M	$ 11,528,007	$ 12,842,530	$ 12,218,273
Approximate Miles	550	550	550

Cost Benefit Comparison

The IVM program's planned threat and condition-based work includes danger tree identification and mitigation, reactive work that includes hazard tree mitigation, and floor management (herbicide, mowing, and hand cutting operation) to reduce event possibilities during extreme weather events and enhance overall system reliability.

Prioritization Methodology

Planned work for DEF is conditioned based and is prioritized and scheduled using threats and conditions identified through patrols, inspections and assessments while considering factors like the date of previous work activities and outage history. Set trigger distances identify incompatible vegetation within and outside the Transmission Right of Way that does not allow for safe or reliable operations of the transmission facilities under all operating conditions. These distances allow for approximately 6 years of typical vegetation re-growth and support minimum safe worker distances. As systems and technologies can be developed and implemented, DEF intends to leverage those technologies/systems and analytics to evaluate numerous variables coupled with local knowledge to optimize the risk-based planning and scheduling of work.

Revenue Requirements and Rate Impacts

Rule 25-6.030(3)(g): An estimate of the annual jurisdictional revenue requirements for each year of the Storm Protection Plan.

Estimated Annual Jurisdictional Revenue Requirements for Each Year of the Storm Protection Plan										
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
($ Millions)	$149.4	$221.3	$296.8	$381.4	$457.5	$533.0	$604.7	$676.5	$744.6	$812.1

Rule 25-6.030(3)(h): An estimate of rate impacts for each of the first three years of the Storm Protection Plan for the utility's typical residential, commercial, and industrial customers.

Estimated SPP Rate Impacts Residential $/1,000 kWh	2023	2024	2025
(1) Estimated SPP Rate Impact	$4.21	$6.52	$8.75
(2) Typical Commercial % Increase from prior year Bill	1.0%-1.2%	1.4%-1.6%	1.3%-1.5%
(3) Typical Industrial % Increase from prior year Bill	0.8%-1.2%	1.2%-1.7%	1.1%-1.6%

(1) Estimates the first three years of the SPP Residential Rate factor.

(2) Commercial & Industrial % increase incorporates base rate increases set forth in DEF's 2021 Settlement, approved in Order No. PSC-2021-0202A-AS-EI.

Storm Protection Plan for Duke Energy Florida

Final Report

Prepared for:

DUKE ENERGY FLORIDA

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April 2022

Table of Contents

Disclaimer

Executive Summary

Duke Energy Florida (DEF) engaged Guidehouse Inc. to update the 2020 DEF Storm Protection Plan (referred to herein as SPP 2020) using the best available data. The updated version (referred to herein as SPP 2023) leverages the approach applied in SPP 2020 and builds upon DEF's plan to strengthen the electric grid infrastructure to withstand extreme weather conditions and enhance overall reliability. As part of this effort, Guidehouse assisted DEF with analytics to prioritize and target the most cost-effective and beneficial grid strengthening solutions.

This document provides Guidehouse's recommendations for a strategic 10-year investment plan and corresponding detailed 3-year capital investment plan for DEF's SPP update. Program assumptions related to impacted assets, costs, and expected benefits are provided to support the recommendations. The project team used a wide range of data sources—both from DEF and from publicly available studies and sources—to complete the analysis and to develop a detailed bottom-up simulation of program impacts. Examples of key data updates include locational risk probabilities, DEF outage data, DEF asset data, and detailed program definitions. Guidehouse used these data sources and others to model the locational impacts of extreme weather conditions and the anticipated reduction in restoration costs and outage times used to develop SPP program and investment recommendations.

The recommended plan focuses on core programs deployed on the distribution grid, within substations, on the transmission grid, and for vegetation management. These programs and associated projects will cost-effectively prevent or reduce the impacts of extreme weather events to DEF customers while enhancing the overall reliability of the electric system across DEF's service area.

Within the SPP, DEF includes 10 programs. The following table lists these programs by major investment category.

Table-ES 1. List of SPP Programs

Category	SPP Program
Distribution	D1: Feeder Hardening
	D2: Lateral Hardening
	D3: Self-Optimizing Grid
	D4: Underground Flood Mitigation
Transmission	T1: Structure Hardening
	T2: Substation Flood Mitigation
	T3: Loop Radially Fed Substations
	T4: Substation Hardening
Vegetation Management	VM1: Distribution Vegetation Management
	VM2: Transmission Vegetation Management

Source: Guidehouse Inc.

SPP Deployment Plan

In 2022, DEF will file its 10-year SPP for strengthening the electric grid infrastructure to withstand extreme weather conditions and enhance reliability within its service area. Full deployment of many SPP programs will span beyond the 10-year timeline defined in DEF's SPP 2023 regulatory filing. Some of the individual programs—e.g., Distribution Lateral Hardening—may require more than 30 years to complete. For this assessment, the Guidehouse project team regarded completion of 3-year (2023 to 2025) and 10-year (2023 to 2032) plans as milestones towards achieving the greater benefits of a longer-range, fully hardened state of the DEF electric system.

After full deployment of the 10-year plan, the extreme weather protection and reliability improvements offered by SPP 2023 will produce significant ongoing benefits to DEF customers. The annual average benefits expected from the SPP investments include expected avoided restoration costs and projected reduced customer minutes of interruption (CMI).

Table-ES 2 and Table-ES 3 highlight the average annual avoided restoration costs and CMI reductions, respectively, for major event days (MEDs). The restoration costs and CMI reductions are probabilistic estimates based on the previous 200 years of extreme weather events observed in Florida. These are average expected impacts for each future year and there will be variations year-to-year depending on the actual storm frequencies and intensities observed. Note that there are no Avoided Restoration Costs or CMI Reduction benefits explicitly tied to Vegetation Management programs, as these benefits are captured in the totals for Distribution and Transmission programs.

Table-ES 2. Estimated Annual Avoided Restoration Costs for the 10-year SPP

	Average Storm Frequency	Elevated Storm Frequency
Program Category	**Avoided Restoration Costs 2023 Dollars**	Avoided Restoration Costs 2023 Dollars
Distribution	$41.2 million	$51.5 million
Transmission	$15.3 million	$19.1 million

Source: Guidehouse, Inc.

Table-ES 3. Estimated Annual CMI Reduction for the 10-year SPP

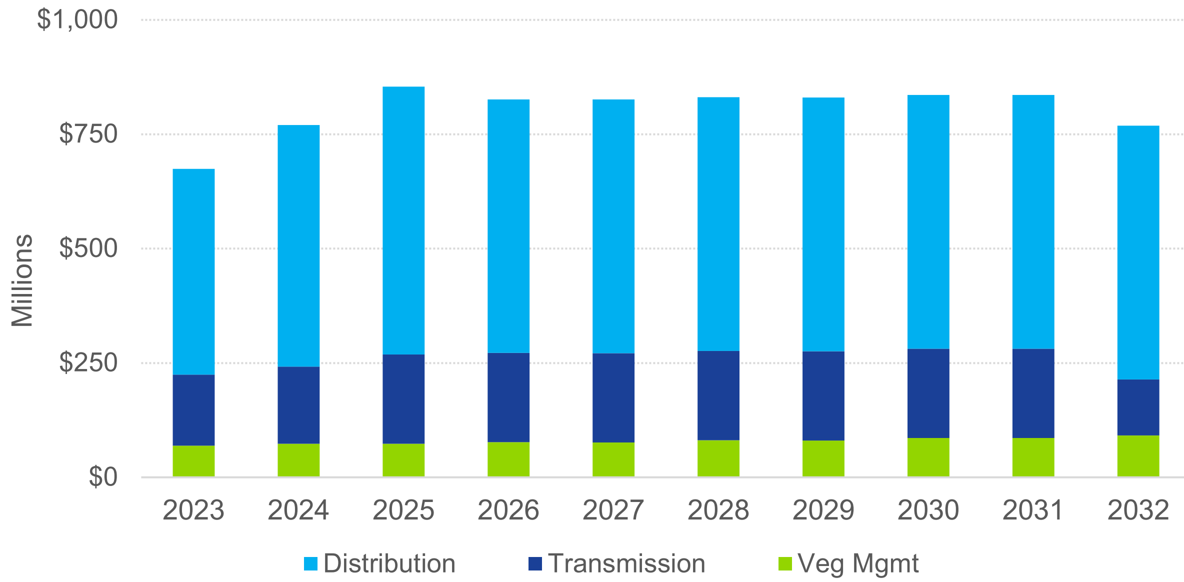
	Average Storm Frequency	Elevated Storm Frequency
Program Category	**CMI Reduction Minutes**	CMI Reduction Minutes
Distribution	375.2 million	469.0 million
Transmission	24.2 million	30.2 million

Source: Guidehouse, Inc.

10-Year SPP Roadmap

DEF estimates a total investment of $8.1 billion in capital and associated O&M to deploy its proposed 10-year SPP. Forecasted annual capital and O&M expenditure by distribution, transmission, and vegetation management programs is depicted in Figure-ES 1 below.

Figure-ES 1. SPP 10-Year Investment by Major Category



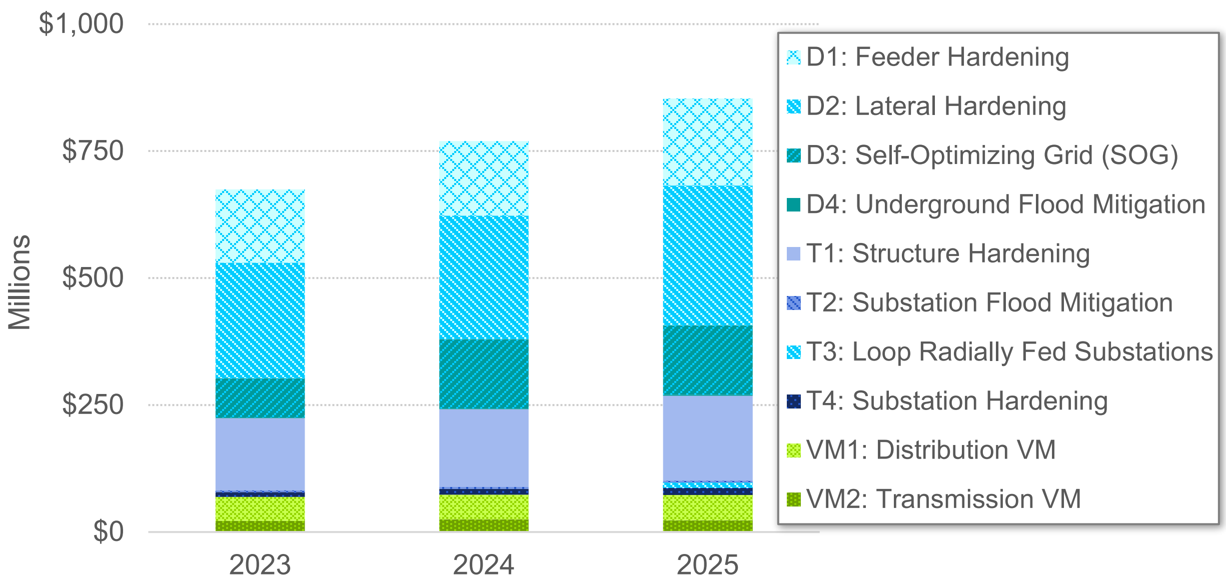
Source: Guidehouse, Inc.

The majority of this spending is targeted on the distribution system to address those portions of the grid that are most vulnerable to extreme weather events. Detailed program definitions for Distribution, Transmission, and Vegetation Management are provided later within this report.

3-Year SPP Details

Over the next three years, DEF estimates a total SPP investment of approximately $2.3 billion in capital and associated O&M, as depicted in Figure-ES 2.

Figure-ES 2. SPP 3-Year Investment by Program



Source: Guidehouse, Inc.

The body of this report details the estimated investment and expected activities associated with each of these SPP programs.

1. Introduction

Duke Energy Florida (DEF) engaged Guidehouse Inc. to update the 2020 DEF Storm Protection Plan (referred to herein as SPP 2020) using the best available data. The updated version (referred to herein as SPP 2023) leverages the approach applied in SPP 2020 and builds upon DEF's plan to strengthen the electric grid infrastructure to withstand extreme weather conditions and enhance overall reliability. As part of this effort, Guidehouse assisted DEF with analytics to prioritize and target the most cost-effective and beneficial grid strengthening solutions.

SPP 2023 focuses on core programs deployed on the distribution grid, within substations, on the transmission grid, and for vegetation management. These programs and associated projects will cost-effectively prevent or reduce the impacts of extreme weather events to DEF customers while enhancing the overall reliability of the electric system across DEF's service area.

This document provides Guidehouse's recommendations for:

- Strategic 10-year investment plan for the DEF SPP (Section 2)
- Detailed 3-year capital investment plan for the DEF SPP (Section 3)

Program assumptions related to impacted assets, costs, and expected benefits are provided to support the recommendations. Guidehouse also assessed historical DEF, industry, and national weather data to model the locational impacts of various extreme weather conditions; the analysis estimates the anticipated reduction in restoration costs and outage times associated with the project team's SPP recommendations.

Guidehouse references the following data sources in the modeling and analysis of DEF's SPP programs.

- GIS data (DEF-specific)
- Asset management data (DEF-specific)
- Outage management system data (DEF-specific)
- Fragility analysis data[1]
- Inspection data (DEF-specific)
- Historic storm reports (DEF-specific)
- Vegetation coverage data (DEF-specific)
- Historic hourly National Oceanic and Atmospheric Administration (NOAA)[2] weather data from 199 weather stations
- Predictive windspeed frequency models

[1] Panteli, Mathaios, et al. "Power system resilience to extreme weather: fragility modeling, probabilistic impact assessment, and adaptation measures." *IEEE Transactions on Power Systems* 32.5 (2016): 3747-3757.; Guikema, Seth, and Roshanak Nateghi. "Modeling power outage risk from natural hazards." *Oxford Research Encyclopedia of Natural Hazard Science*. 2018.

[2] NOAA is an agency within the US Department of Commerce that focuses on understanding, predicting, and information sharing on the conditions of the oceans, atmosphere, and related ecosystems.

- Predictive flood frequency models
- Customer and load data (DEF-specific)
- Customer value of unserved energy
- Financial and other miscellaneous data[3]

Section 3 provides program-specific modeling assumptions included in Guidehouse's recommended investment plan. DEF engineering and planning personnel, regional staff, and other subject matter experts will be able to use the results of this analysis to inform detailed planning, design-level analysis, and considerations on resource availability.

The modeling methodology is discussed in Appendix A, weather and storm scenario modeling details are presented in Appendix B, and the SPP programs are defined in detail within Appendix C.

1.1 SPP Deployment Benefits

Full deployment of many SPP programs will span beyond the 10-year timeline defined in DEF's SPP 2023 regulatory filing. Some of the individual programs—e.g., Distribution Lateral Hardening—may require more than 30 years to complete. For this assessment, the Guidehouse project team regarded completion of 3-year and 10-year plans as milestones towards achieving the greater benefits of a longer-range, fully hardened state of the DEF electric system. When fully deployed, the extreme weather protection and reliability improvements offered by the SPP will produce significant ongoing benefits to DEF customers. Table 1 and Table 2 highlight the estimated annual avoided restoration costs and reduced customer minutes of interruption (CMI), respectively, given the average expected storm frequency and the potential for elevated storm frequency. Note that there are no Avoided Restoration Costs or CMI Reduction benefits explicitly tied to Vegetation Management programs, as these benefits are captured in the totals for Distribution and Transmission programs.

Table 1. Estimated Annual Avoided Restoration Costs for the 10-year SPP

	Average Storm Frequency	Elevated Storm Frequency
Program Category	**Avoided Restoration Costs 2023 Dollars**	Avoided Restoration Costs 2023 Dollars
Distribution	$41.2 million	$51.5 million
Transmission	$15.3 million	$19.1 million

Source: Guidehouse, Inc.

[3] This includes inflation rates, DEF's weighted average cost of capital (WACC), valuation horizons, and more.

Table 2. Estimated Annual CMI Reduction for the 10-year SPP

	Average Storm Frequency	Elevated Storm Frequency
Program Category	CMI Reduction Minutes	CMI Reduction Minutes
Distribution	375.2 million	469.0 million
Transmission	24.2 million	30.2 million

Source: Guidehouse, Inc.

Upon full deployment of SPP 2023, DEF can expect to avoid an estimated $56.5 million in storm restoration costs annually and an estimated annual reduction of about 399 million CMI. The restoration costs and CMI reductions are probabilistic estimates based on the previous 200 years of extreme weather events observed in Florida. These are average expected impacts for each future year and there will be variations year-to-year depending on the actual storm frequencies and intensities observed.

Guidehouse used data from storm damage experienced since 2015 as well as customer outage data collected over this same period to support this analysis. The average storm frequency referenced in the tables above considers the weather conditions most likely to be experienced across the DEF service territory each year based on weather data from the past 200 years.[4] Should storm activity intensify or become more frequent, the SPP would deliver even more value in avoided restoration costs and CMI reduction.

Details on the 10-year and 3-year portions of Guidehouse's SPP recommendation are provided in the sections below.

[4] Storm frequencies were derived from HAZUS MH model runs. See www.fema.gov/hazus, msc.fema.gov/portal/home, and Schneider, Philip J., and Barbara A. Schauer. "HAZUS—its development and its future." Natural Hazards Review 7.2 (2006): 40-44.

1.2 Program Categorization

Guidehouse evaluated dozens of program elements and hundreds of assets as part of the SPP analysis and modeling. The project team categorized SPP programs into three program types: standards-based, targeted, and enabling, as defined in Table 3. The team used these program types in the analysis and modeling activities to drive how individual projects within each program are prioritized into the 10-year and 3-year investment plans.

Table 3. SPP Program Types

Program Type	Description
Standards-based	Programs that leverage standards to specify the hardening approach and to determine the conditions (including locational specifics, system characteristics, and vulnerabilities) that are eligible for deployment.
Targeted	Programs that seek to harden specific areas of the system that have specific characteristics (e.g., flood-prone areas) and merit deployment at those locations.
Enabling	Programs that are necessary to maintain the resilience of the system and that require continuous application to be effective.

Source: Guidehouse, Inc.

1.3 Program List

Table 4 lists the programs considered in the SPP analysis, the categories to which they belong, and their associated program types.

Table 4. DEF SPP Programs

Category	SPP Program	Program Type
Distribution	D1: Feeder Hardening	Standards-based
	D2: Lateral Hardening	Standards-based
	D3: Self-Optimizing Grid	Standards-based
	D4: Underground Flood Mitigation	Targeted
Transmission	T1: Structure Hardening	Standards-based
	T2: Substation Flood Mitigation	Targeted
	T3: Loop Radially Fed Substations	Targeted
	T4: Substation Hardening	Standards-based
Vegetation Management	VM1: Distribution Vegetation Management	Enabling
	VM2: Transmission Vegetation Management	Enabling

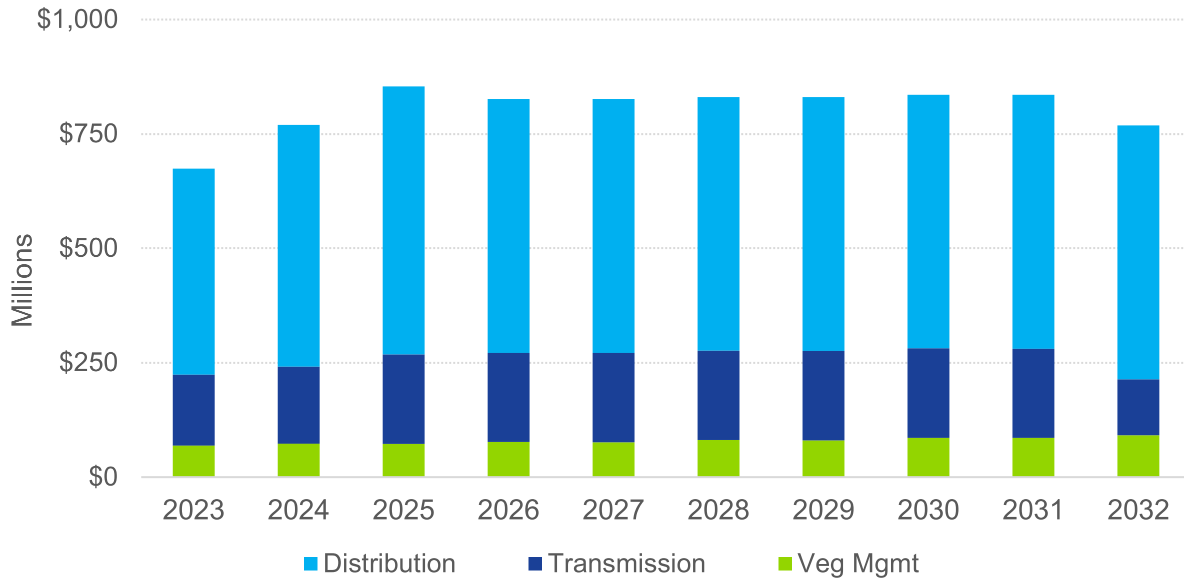
Source: Guidehouse, Inc.

Appendix C describes each program and how they were considered in the analysis process. Section 2 and Section 3 detail on Guidehouse's recommended 10-year and 3-year investment plan. Section 3 also offers additional details for each individual program and their associated extreme weather benefits.

2. Storm Protection Plan 10-Year Investment Plan

The recommended 10-year SPP, which spans 2023 through 2032, calls for a total investment of approximately $8.1 billion in capital and associated O&M. Figure 1 shows this investment by year and investment category.

Figure 1. SPP Investment by Category Over 10 Years



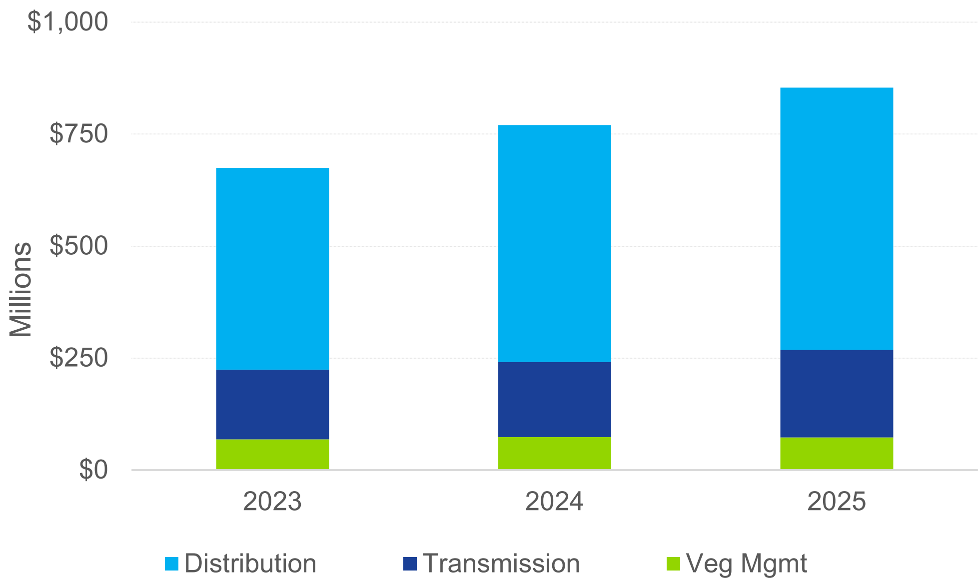
Source: Guidehouse, Inc.

The majority of this expenditure is targeted on the distribution system to address the portions of the grid that are most vulnerable to extreme weather events. Detailed program definitions for Distribution, Transmission, and Vegetation Management are provided later within this report.

3. Storm Protection Plan 3-Year Capital Plan

The following subsections provide a detailed program-level view of the next 3 years of this SPP. A total of approximately $2.3 billion in capital and O&M for SPP investments is estimated over the 3-year period, 2023 through 2025, as shown in Figure 2.

Figure 2. SPP 3-Year Investment by Major Category



Source: Guidehouse, Inc.

Guidehouse used program definition details provided by DEF subject matter experts to define the program within its modeling and analysis approach. These details allowed the analysts to assess program costs, estimate benefits, and develop recommended program prioritization. A brief overview of program definitions is provided to facilitate understanding of the Guidehouse assessment teams' results.

3.1 Distribution Programs

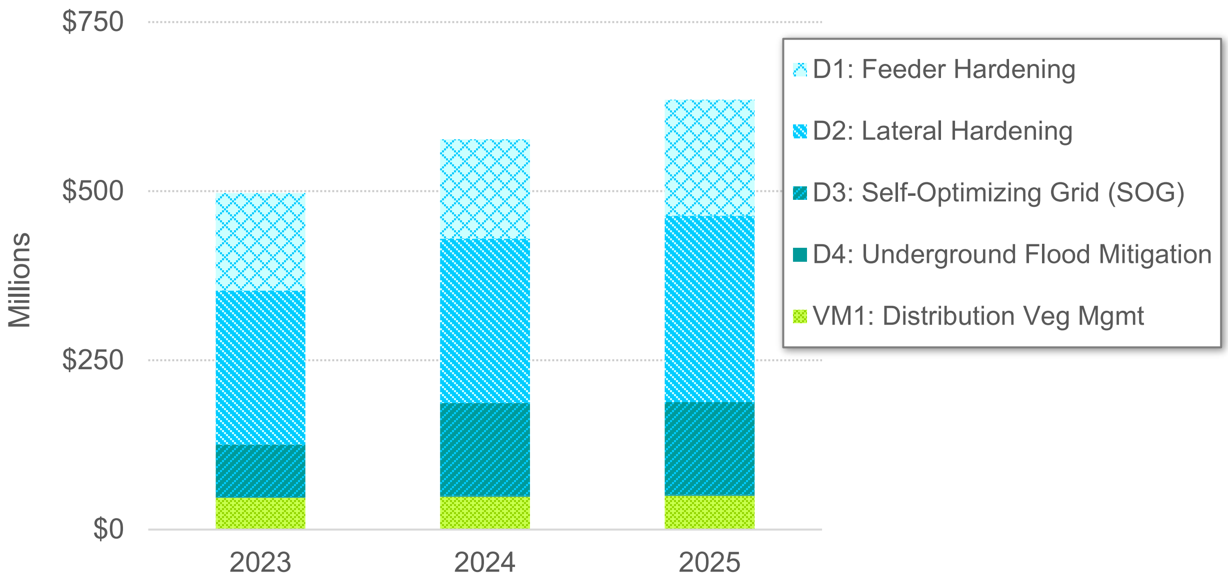
Distribution programs are proactive actions designed to upgrade the capabilities and resilience of distribution assets to reduce system and customer outages and susceptibility to extreme weather events. These actions can be generally categorized as one or more of the following:

- Accelerated replacement of prioritized infrastructure assets to lower the risk of failures during extreme weather conditions.
- Structure hardening to decrease susceptibility to extreme weather and wind damage to infrastructure through replacing and upgrading to current engineering standards, and relocation to more accessible locations for repair crews and undergrounding to avoid tree-related outages.
- Installation of automation technologies to improve system measurement, monitoring, and control and installation of alternate distribution line sources to provide system redundancy to reduce outages and improve operational efficiency.

- Proactive preventive and corrective maintenance programs to evaluate and mitigate asset deterioration to avoid equipment failures.

Figure 3 shows a breakout of investment for the individual distribution programs, and Table 5 contains the specific investment dollars by year.

Figure 3. Distribution Programs Summary Spend by Year



Source: Guidehouse, Inc.

Table 5. Distribution SPP Programs Investment for 2023 Through 2025

Distribution SPP Programs	2023	2024	2025
D1: Feeder Hardening	$143.9 M	$147.0 M	$171.5 M
D2: Lateral Hardening	$227.8 M	$243.0 M	$275.6 M
D3: Self-Optimizing Grid	$77.4 M	$136.7 M	$136.8 M
D4: Underground Flood Mitigation	$1.0 M	$1.5 M	$1.5 M
VM1: Distribution Vegetation Management	$47.1 M	$48.5 M	$49.9 M

Notes: Amounts shown for each program reflect the capital investment and associated O&M spend required. Guidehouse's use of bottom-up modeling methodology may result in slight variations from reported budgeted spend amounts. Please see Appendix A for a description of Guidehouse's modeling methodology.
Source: Guidehouse, Inc.

DEF anticipates a total of approximately $1.7 billion in capital and O&M for SPP distribution investments (including distribution vegetation management) over the 3-year period, 2023 through 2025.

3.1.1 D1: Feeder Hardening

The Feeder Hardening program is a standards-based program that systematically upgrades the feeder backbone to meet extreme wind loading requirements defined in the National Electric Safety Code (NESC) Rule 250C. This upgrade enables the feeder backbone to better withstand extreme weather events.

Work includes strengthening structures, updating basic insulation level to current standards, updating the conductor to current standards, relocating difficult-to-access facilities, undergrounding sections of the feeder to mitigate clearance encroachments, and replacing oil-filled equipment. As part of this program, poles supporting the feeder backbone line undergo strength testing, inspection. Poles showing signs of decay will be treated or replaced.

Table 6 outlines the investments and scale of the Distribution Feeder Hardening Program included in the SPP.

Table 6. Distribution Feeder Hardening Program (3-Year Plan)

D1: Feeder Hardening	2023	2024	2025
SPP Program Investment	**$143.9 M**	**$147.0 M**	**$171.5 M**
Approx. No. of SPP Projects	**81**	**52**	**55**
Approx. No. of Line Miles	*150.0*	*150.0*	*174.0*

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated line miles and unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology.

Source: Guidehouse, Inc.

3.1.2 D2: Lateral Hardening

The Lateral Hardening standards-based program has two strategies: Lateral Undergrounding and Lateral Overhead Hardening.

The Lateral Undergrounding strategy focuses on branch lines that historically experience the most outage events, contain significantly aged assets, are susceptible to damage from vegetation, and/or often have facilities that are inaccessible to trucks. These branch lines will be replaced with a modern, updated, and standard underground design of today. Relocating lateral segments underground greatly reduces both damage costs and outage durations for DEF customers.

The Lateral Overhead Hardening strategy will include structure strengthening, deteriorated conductor replacement, removing open secondary wires, replacing fuses with automated line devices, pole replacement (when needed), line relocation, and hazard tree removal.

Lateral branch line poles also receive inspection and preventive maintenance to identify wood poles that are showing signs of decay or that fall below the minimum strength requirements. Decayed poles with reduced structural integrity are identified for replacement or treated for pole life extension.

Table 7 outlines the investments and scale of the Distribution Lateral Hardening Program included in the SPP.

Table 7. Distribution Lateral Hardening Program (3-Year Plan)

D2: Lateral Hardening	2023	2024	2025
SPP Program Investment	**$227.8 M**	**$243.0 M**	**$275.6 M**
Approx. No. of SPP Projects	**143**	**128**	**139**
Approx. Underground Line Miles	*96.9*	*94.0*	*105.0*
Approx. Overhead of Line Miles	*126.0*	*155.0*	*181.0*

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated line miles and unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology.
Source: Guidehouse, Inc.

3.1.3 D3: Self-Optimizing Grid

The Self-Optimizing Grid (SOG) program consists of three major components: capacity, connectivity, and automation and intelligence. SOG is a standards-based program that redesigns portions of the distribution system into a dynamic smart-thinking, self-healing network. SOG equips the grid with the ability to automatically reroute power around trouble areas, such as contact between a fallen tree and a power line, to quickly restore power to the maximum number of customers and rapidly dispatch line crews directly to the source of the outage. Completion of the SOG program will result in an overall reduction in the number of customers affected by outages, and the duration of outages stemming from extreme weather events.

Table 8 outlines the investments and scale of the Self-Optimizing Grid Program included in the SPP.

Table 8. Self-Optimizing Grid Program (3-Year Plan)

D3: Self-Optimizing Grid	2023	2024	2025
SPP Program Investment	**$77.4 M**	**$136.7 M**	**$136.8 M**
Approx. No. of SPP Projects	**189**	**210**	**172**

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology. The number of projects shown above represents the number of circuits impacted, not the number of automated devices.
Source: Guidehouse, Inc.

3.1.4 D4: Underground Flood Mitigation

Underground Flood Mitigation is a targeted program which will harden existing underground lines and equipment to withstand a storm surge in flood prone areas. The primary purpose of this hardening activity is to minimize the damage caused by a storm surge to the equipment and thus expedite restoration after the storm surge has receded.

Table 9 outlines the investments and scale of the Underground Flood Mitigation Program included in the SPP.

Table 9. Underground Flood Mitigation Program (3-Year Plan)

D4: Underground Flood Mitigation	2023	2024	2025
SPP Program Investment	$1.0 M	$1.5 M	$1.5 M
Approx. No. of SPP Projects	1	1	1

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated line miles and unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology. The number of projects shown above represents the number of circuits impacted, not the number of units.

Source: Guidehouse, Inc.

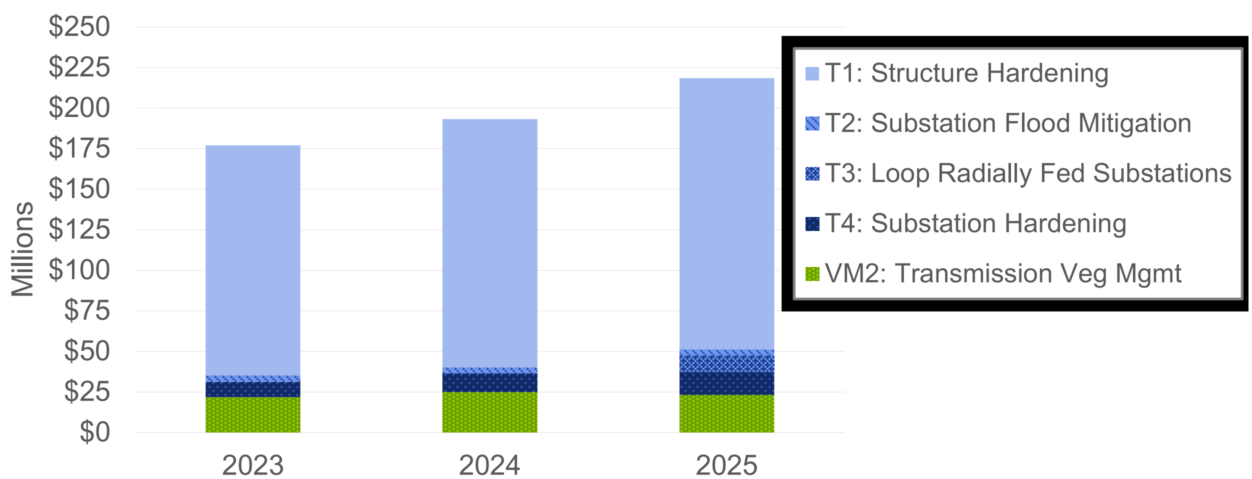
3.2 Transmission Programs

Transmission programs are designed to upgrade the capabilities and resilience of transmission assets to reduce system and customer outages and susceptibility to extreme weather events. These actions can be generally categorized as one or more of the following:

- Accelerated replacement of prioritized infrastructure assets to lower the risk of in-service failures during extreme weather conditions.
- Structure hardening to decrease susceptibility to extreme weather and wind damage to infrastructure through replacement and upgrading to current engineering standards.
- Installation of automation technologies to improve system measurement, monitoring, and control and installation of alternate transmission line sources to provide system redundancy to reduce outages and improve operational efficiency.
- Programmatic preventive and corrective maintenance programs to evaluate and mitigate asset deterioration to avoid in-service failures and capture detailed asset condition data. These comprehensive programs evaluate structures, foundations, insulators, conductor, and other hardware components. In cases where structures are difficult to access and/or more detailed inspection is required, fixed wing quadrotor drones are used.

Figure 4 shows a breakout of investment for the individual transmission programs, and Table 10 contains the specific investment dollars by year.

Figure 4. Transmission Programs Summary Spend by Year



Source: Guidehouse, Inc.

Table 10. Transmission SPP Programs Investment for 2023 Through 2025

Transmission SPP Programs	2023	2024	2025
T1: Structure Hardening	$142.0 M	$153.1 M	$167.3 M
T2: Substation Flood Mitigation	$3.8 M	$3.8 M	$3.8 M
T3: Loop Radially Fed Substations	-	-	$10.3 M
T4: Substation Hardening	$9.5 M	$11.5 M	$14.0 M
VM2: Transmission Vegetation Management	$21.8 M	$24.9 M	$23.2 M

Notes: Amounts shown for each program reflect the capital investment and associated O&M spend required. Guidehouse's use of bottom-up modeling methodology may result in slight variations from reported budgeted spend amounts. Please see Appendix A for a description of Guidehouse's modeling methodology.

Source: Guidehouse, Inc.

DEF anticipates a total of approximately $589 million in SPP transmission investments (including transmission vegetation management) over the 3-year period, 2023 through 2025.

3.2.1 T1: Structure Hardening

Structure Hardening is a standards-based program that upgrades transmission wood pole structures with steel poles or other materials based on engineering design. Where applicable, manual transmission gang-operated air-break (GOAB) switches are upgraded to supervisory control and data acquisition (SCADA) enabled GOAB switches.

Prioritized transmission towers are upgraded to the current design standard. The cathodic protection (CP) measures include anode installations to mitigate active groundline corrosion on the lattice tower system. The anodes serve as sacrificial assets that corrode in place of structural steel, preventing loss of structure strength to corrosion.

On both pole and tower structures, overhead transmission ground wires susceptible to damage or failure are upgraded to optical ground wire. Optical ground wires provide improved grounding and lightning protection as well as high-speed data transmission for system protection and control and communications.

Inspections are an enabling activity providing programmatic structure inspections of the overhead transmission system. Through inspections, structure health is evaluated by reviewing components that affect reliability including but not limited to right of way hazards, interference from foreign objects, load bearing member conditions, and insulator health. Programmatic ground inspections include the previously mentioned components and comply with the sound and bore requirements of the PSC to ensure wood pole health. Tower drone inspections capture data for structures in difficult-to-access areas and/or instances where closer inspection is required. DEF is incorporating drone patrols into the inspections because drones have the unique ability to provide a close vantage point with multiple angles on structures that is unattainable through aerial or ground patrols with binoculars.

Table 11 outlines the investments and scale of the Transmission Structure Hardening Program included in the SPP.

Table 11. Transmission Structure Hardening Program (3-Year Plan)

T1: Structure Hardening	2023	2024	2025
SPP Program Investment	**$142.0 M**	**$153.1 M**	**$167.3 M**
Approx. No. of SPP Projects	**57**	**63**	**46**
Approx. No. of Poles Replaced	*1977*	*1929*	*1837*
Approx. No. of Towers Replaced	*31*	*51*	*89*
Miles of Overhead Ground Wire	*38.5*	*55.0*	*73.2*

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated line miles and unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology. The number of projects shown above represents the number of lines impacted.

Source: Guidehouse, Inc.

3.2.2 T2: Substation Flood Mitigation

Transmission Substation Flood Mitigation is a targeted program that evaluates flood mitigation measures for substations to protect against terrestrial flooding and storm surge conditions. New assets may include containment curbing, pumps, pits, walls, and total station rebuilds to increase elevation or other measures.

Table 12 outlines the investments and scale of the Substation Flood Mitigation Program included in the SPP.

Table 12. Substation Flood Mitigation Program (3-Year Plan)

T2: Substation Flood Mitigation	2023	2024	2025
SPP Program Investment	**$3.8 M**	**$3.8 M**	**$3.8 M**
Approx. No. of SPP Projects	**2**	**1**	**1***

* The 2025 work includes a continuation of a project started in 2024.

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated line miles and unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology. The number of projects shown above represents the number of substations impacted.

Source: Guidehouse, Inc.

3.2.3 T3: Loop Radially Fed Substations

The Loop Radially Fed Substations targeted program evaluates radially fed substations fed from a single transmission line source. When the radial transmission line assets are damaged during extreme weather events, customers may experience long outages during repair activities because an alternate feed is not present. Enabling transmission system redundancy and the ability to serve customers from an alternate power source can eliminate or shorten long outage durations. Assets required within a substation may include breakers, switches, bus work, structures, insulators, potential transformers, relays, and control houses. A transmission tie line may also be required.

Table 13 outlines the investments and scale of the Loop Radially Fed Substations Program included in the SPP.

Table 13. Loop Radially Fed Substations Program (3-Year Plan)

T3: Loop Radially Fed Substations	2023	2024	2025
SPP Program Investment	-	-	$10.3 M
Approx. No. of SPP Projects	0	0	2

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated line miles and unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology. The number of projects shown above represents the number of substations impacted.

Source: Guidehouse, Inc.

3.2.4 T4: Substation Hardening

Substation Hardening is a standards-based program that will address two major components:

1. Upgrading oil breakers to state-of-the-art gas or vacuum breakers to mitigate the risk of catastrophic failure and extended outages during extreme weather events, and

2. Upgrading electromechanical relays to digital relays with advanced system protection functions and communications to enable DEF to respond and restore service more quickly from extreme weather events.

Table 14 outlines the investments and scale of the Transmission Substation Hardening Program included in the SPP.

Table 14. Transmission Substation Hardening Program (3-Year Plan)

T4: Substation Hardening	2023	2024	2025
SPP Program Investment	$9.5 M	$11.5 M	$14.0 M
Approx. No. of SPP Projects	7	8	9

Notes: Guidehouse's prioritization methodology may result in variations from other reported estimated line miles and unit counts for future years. Please see Appendix A for a description of Guidehouse's modeling methodology. The number of projects shown above represents the number of substations impacted.

Source: Guidehouse, Inc.

3.3 Vegetation Management Programs

Vegetation Management is an essential, widely accepted baseline practice for storm hardening electric transmission and distribution systems against severe weather events. Vegetation management (that is, tree pruning, cutting, danger tree removal, mowing, and chemical control of undesirable vegetation) is combined with other severe weather event hardening measures as part of DEF's overall SPP for electric transmission and distribution line systems.

Severe weather events, including high winds, heavy rain, and coastal surges, can cause trees to uproot and branches to break; this debris falls or flies into power lines, causing damage. For transmission systems, the primary cause of tree-related damage is trees outside the utility easement falling into conductors and creating damage. For distribution systems, which often cross heavily vegetated areas, the primary cause of power outages and asset damage is trees within or outside the utility easement. Fallen trees and branches also impede service restoration and emergency service response due to blocked roadways and streets.

3.3.1 VM1: Distribution Vegetation Management Program

The Distribution Vegetation Management enabling program includes tree trimming, tree removals within easement, and associated activities on the distribution system. Also included are danger and hazard tree removals on the distribution system outside of easement requiring landowner permission. Table 15 outlines the investments of the Distribution Vegetation Management Program included in the SPP.

Table 15. Distribution Vegetation Management Program (3-Yr Plan)

VM1: Distribution Vegetation Management	2023	2024	2025
SPP Program Investment	$47.1 M	$48.5 M	$49.9 M

Source: Guidehouse, Inc.

3.3.2 VM2: Transmission Vegetation Management Program

The Transmission Vegetation Management enabling program includes tree pruning, tree removals within easement, and other vegetation management activities on the transmission right-of-way as well as danger tree removals outside of the easement to protect the transmission system. Table 16 outlines the investments of the Transmission Vegetation Management Program included in the SPP.

Table 16. Transmission Vegetation Management Program (3-Yr Plan)

VM2: Transmission Vegetation Management	2023	2024	2025
SPP Program Investment	$21.8 M	$24.9 M	$23.2 M

Source: Guidehouse, Inc.

Appendix A. Storm Protection Plan Methodology

This appendix provides the key approaches, methods, and assumptions Guidehouse used to develop its analysis for the DEF SPP investment plan.

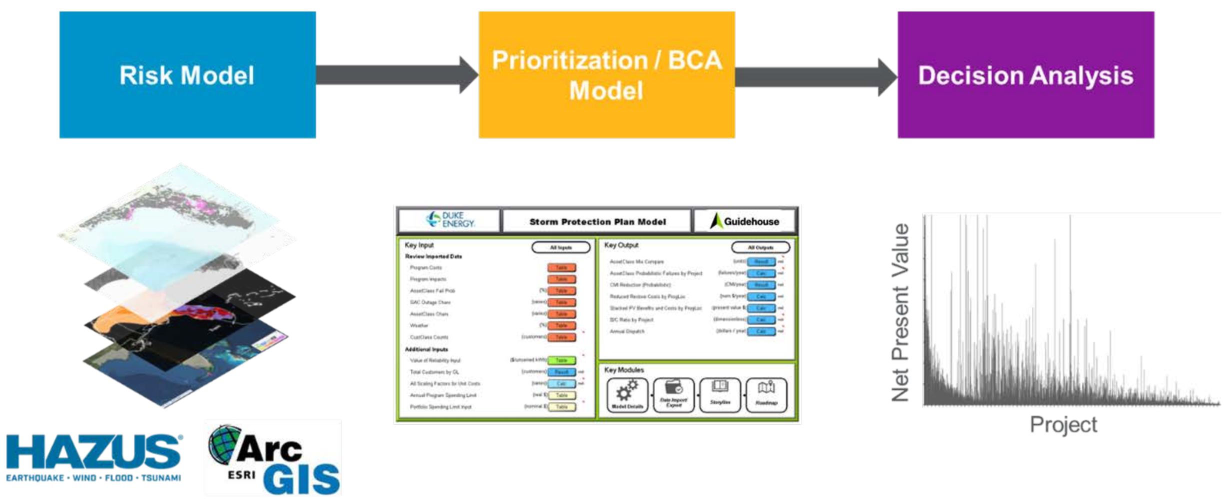
A.1 Overview of SPP Model

Similar to the SPP 2020 filing, Guidehouse applied a three-tiered modeling and analysis approach to assess the effectiveness of proposed storm hardening programs and to inform the implementation prioritization process. This approach allowed the project team to simulate the deployment of SPP programs at every applicable location and under a range of weather conditions within the DEF service area. The following subsections describe the modeling approach and each of the three tiers of analysis (risk model, benefit-cost analysis, and decision analysis) incorporated into the SPP model to support the evaluation and prioritization of individual DEF SPP programs.

A.1.1 High Level Modeling Approach

Figure A-1 illustrates the data flow of program information through the three tiers of modeling and analysis.

Figure A-1. High Level Overview of DEF SPP Modeling Solution



Source: Guidehouse, Inc.

The first stage, the risk model, imports layers of data from the DEF GIS related to asset (e.g., asset type, age, condition), the latitudinal and longitudinal position of assets, and their relational configuration—that is, the way in which the assets interconnect. The risk modeling stage also imports probabilistic weather models to assess the risk exposure to grid assets in varying extreme weather conditions (storm surge, flooding, high winds). Each simulated location in the territory reflected DEF's asset mix at that location and the probability of experiencing a range of weather conditions. The output of the risk model stage characterizes the degree and associated cost of damage that would occur under a defined weather scenario.

The benefit-cost analysis (BCA) model analyzes the benefits and costs of each relevant combination of program and location. The model uses outputs from the risk model and other information to simulate the expected present value of costs and benefits associated with each program.

The decision analysis is a high-level prioritization of projects according to the BCA model's outputs. This high-level prioritization does not account for real-world constraints such as the availability of work crews, site-specific engineering considerations, and other prioritization factors.

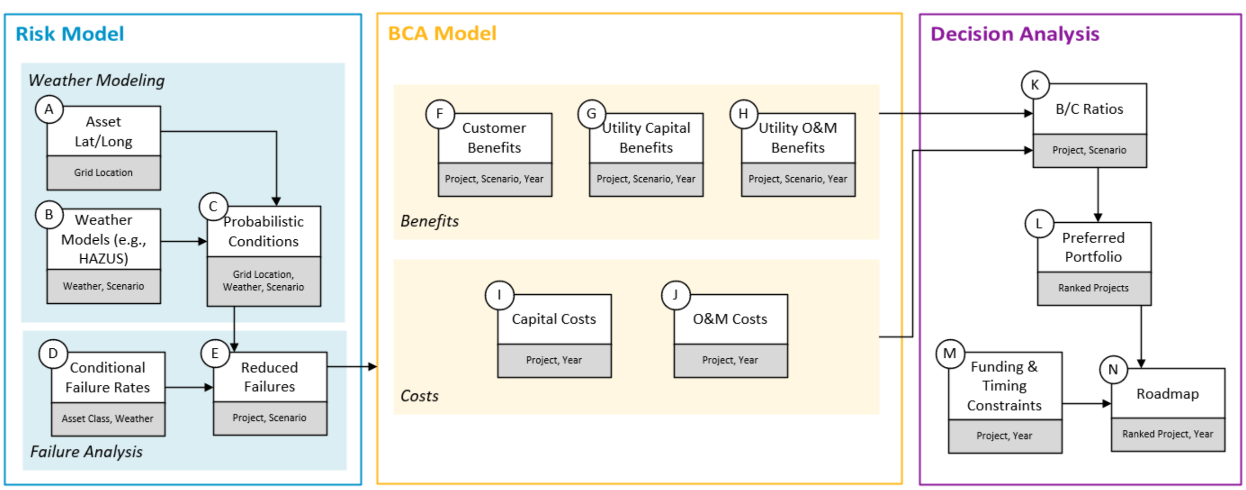
A.1.2 Detailed Modeling Approach

The SPP model characterizes individual transmission and distribution assets and storm hardening measures into broader categories, referred to as asset classes. Each program can then be defined based on the asset classes in place before and after the program is implemented. Programs are deployed at a locational level. Locations are defined as distribution circuits, transmission substations, and transmission lines. A project is one program deployed at a single location. The scope of the project depends on the number of assets present at the location.

Binning individual assets into asset classes is a practical method for estimating the value of each project without having to carry each individual asset (e.g., an individual utility pole) through the risk, BCA, and decision analysis modules. This method maintains the locational quantities of asset classes, the locational probability of weather conditions, and the relationship between customers and assets in the GIS.

The approach leverages a synthetic modeling technique to develop the portfolio of projects that are best suited to increase grid hardening and resiliency and to develop a high-level prioritized investment plan for project implementation. This solution is illustrated in Figure A-2, split by modules for risk, BCA, and decision analysis.

Figure A-2. Detailed Modeling Approach Flow Diagram



Source: Guidehouse, Inc.

The following sections summarize the concepts, logic, inputs, and outputs associated with each element of the flowchart in Figure A-2.

Risk Model

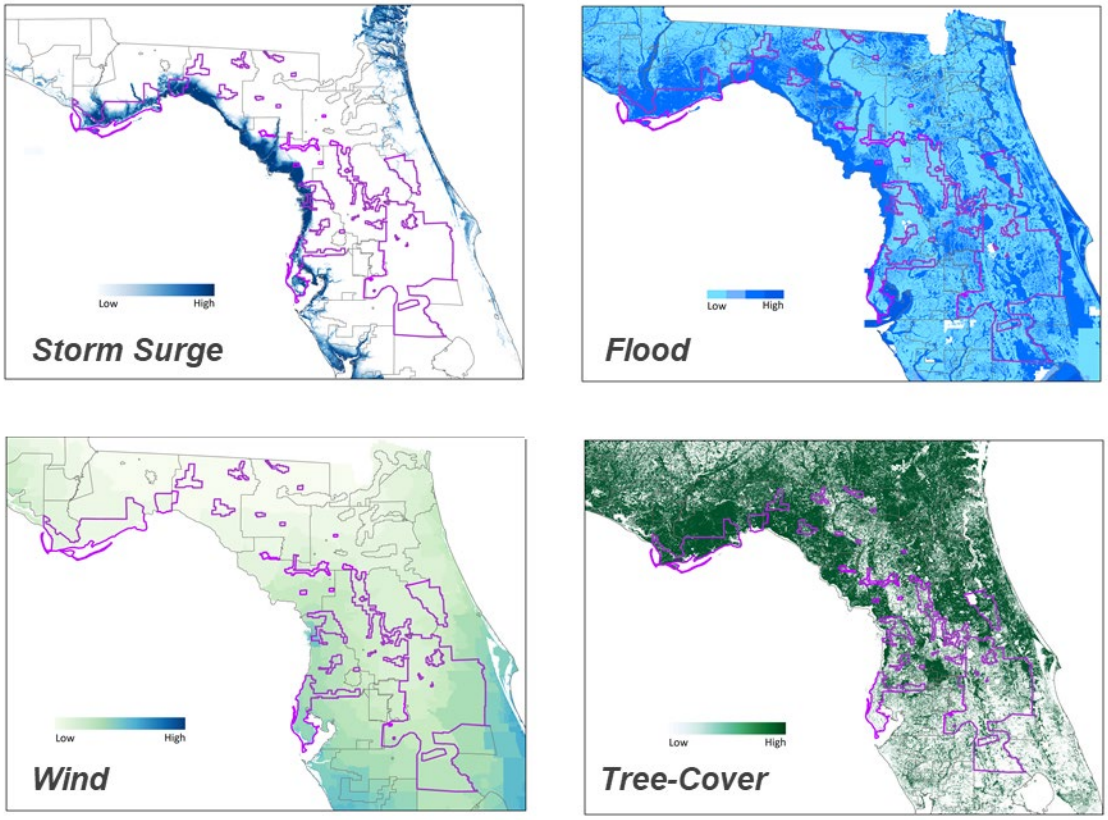
The primary purpose of the risk model is to estimate the expected frequency of asset failures under various weather conditions before and after the programs are implemented. The risk model is a bottom-up simulation of asset performance, calibrated to observed customer impacts and restoration costs in DEF territory. Components A through E from the risk model section in Figure A-2 are summarized as follows.

A	**Asset Lat/Long**	• Latitude and longitude of the asset (points), or latitude and longitude of vertices (line)
B	**Weather Models**	• Federal Emergency Management Agency (FEMA) and National Oceanic and Atmospheric Administration (NOAA) historic data and probability simulations of weather conditions (flood, storm surge, and wind speed) • FEMA HAZUS[5] model used for wind speed • FEMA SLOSH[6] model used for storm surge • NOAA and FEMA flood risk layers
C	**Probabilistic Conditions**	• Annual probability of occurrence for a given weather condition and location combination • Conditions are specific to each location
D	**Conditional Failure Rates**	• Probability of asset class failure when exposed to a given weather condition • Conditional failure rates applied to each location, thus picking up the location-specific probabilistic conditions in C
E	**Reduced Failures**	• Reduction in probability of asset class failure when a measure/program is applied • Dependent on the probabilistic conditions (weather) in C • Reduced outage time as well as equipment failure counts allow the value to reducing either or both to be incorporated into the BCA

Guidehouse simulated the weather conditions in the model through detailed environmental GIS data streams (Figure A-3).

[5] FEMA's Hazards US – Multi-Hazard (HAZUS) Model; https://msc.fema.gov/portal/resources/download
[6] FEMA's The Sea, Lake and Overland Surges from Hurricanes (SLOSH) Model; https://slosh.nws.noaa.gov/slosh/

Figure A-3. Environmental GIS Layers

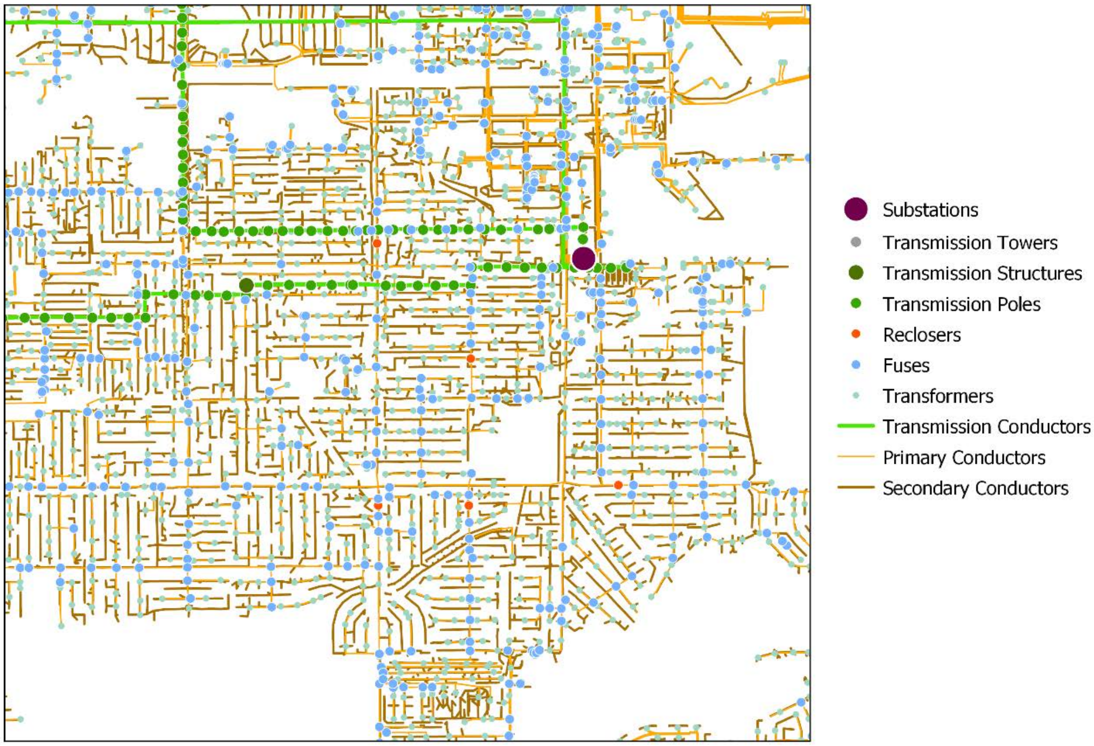


Source: HAZUS-MH, SLOSH, USGS, NOAA, Ventyx Energy Velocity

Guidehouse synthesized various data streams from the US Geological Survey (USGS), FEMA, and NOAA, including HAZUS simulations on storm surge and wind speeds, tree cover, and flood plains (Figure A-3), into a GIS. When formatted and regularized, the project team used these layers to generate probabilistic future conditions in DEF territory. Each combination of an asset location and weather scenario has an expected annual frequency of flooding, storm surge, and high wind conditions.

The impact of a program can then be estimated given the location-specific weather condition modeling and the mix of assets deployed. The asset mix is determined from DEF GIS and asset management system data (Figure A-4).

Figure A-4. Partial Illustration of GIS Asset Data

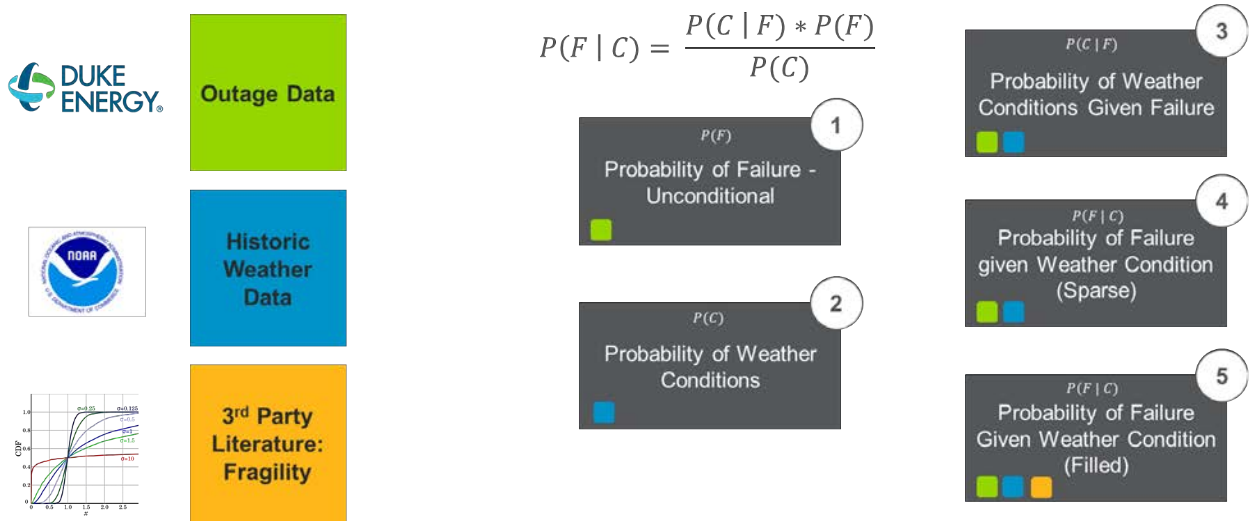


Source: Guidehouse, Inc., Duke Energy Florida

Guidehouse performed conditional failure analysis using historic DEF outage data, DEF asset data, and NOAA weather data. Each outage event was matched to historic data from the nearest weather station to the outage and the time of the outage. Figure A-5 illustrates the process for developing the probability of failure given weather conditions.

To forecast the value of SPP programs, Guidehouse overlays location-specific risk factors with the mix of grid assets at each location (e.g., circuit). This approach requires the use of a combination of DEF asset data, historic DEF outage data, risk data, and National Oceanic and Atmospheric Administration (NOAA) weather station data. By quantifying the risk frequencies at each location, the mix of asset classes at each location, and the probability of failure of each asset class given those conditions, the SPP model can estimate the probabilistic failures (and therefore CMI) before and after the storm hardening programs are implemented. An overview of the conditional probability formula and process for developing the probability of failure is illustrated in Figure A-5 below.

Figure A-5. Conditional Failure Analysis Approach



Source: Guidehouse, Inc.

The five steps used for the conditional failure analysis approach to derive conditional failure rates by asset class are described below:

1. **Probability of Failure: P(F)**

   The probability of failure is calculated based on asset classes rather than calculating probabilities for each individual asset (e.g., each individual utility pole). The SPP model bins the individual transmission and distribution assets into broader categories of asset classes defined by the specifications of the storm hardening measures. Binning individual assets into asset classes is a practical method for estimating the value of each project without having to carry each individual asset through the entire analysis. The total number of outages for each asset class is then counted and divided by the total number of assets in each class, adjusted for the average event time based on data from NOAA weather stations.

2. **Probability of Weather Condition: P(C)**

   The probability that a weather condition will be observed at a location is a function of time. For a given time window, this probability accumulates to a frequency. The frequency of each risk/weather condition is recorded for each asset location based on the observed historical record of weather data. The risks being assessed for the model are high winds from hurricanes, storm surge, and terrestrial flooding using data from NOAA and FEMA. The risks and their data sources are listed in Table 17.

   - **High winds** – windspeeds per storm category, the frequency of the storm categories, and the probability of damage for categorical windspeeds are calculated using FEMA's HAZUS model for hurricanes and tropical storms.[7] The HAZUS hurricane model incorporates hurricane data over the approximately 200-year historical record and generates event risk exposure at the census tract level.

[7] FEMA Hazards US – Multi-Hazard (HAZUS) Model; FEMA Flood Map Service Center | Hazus

- **Storm surge** – storm surge data is provided by NOAA's Sea, Lake and Overland Surges from Hurricanes (SLOSH) model.[8] The SLOSH model estimates the storm surge heights from historical, hypothetical, or predicted hurricanes. For the SPP project, the maximum potential storm surge heights are selected for each storm category. Guidehouse used a minimum of 4 ft storm surge at each location as a threshold for damage accumulation.
- **Terrestrial flooding** – the frequency and probability of flood events are generated from FEMA's Digital Flood Insurance Rate Maps (DFIRM).[9] DFIRM provides GIS based datasets that delineate the areas according to the probability of 100-year (1%), 500-year (0.2%), and minimal flood events.

Table 17. Risk Descriptions Summary

Risk	Data Description	Data Source
High Winds	Wind speeds for the following storm categories/intensities: ▪ Tropical Storms ▪ Category 1 ▪ Category 2 ▪ Category 3 ▪ Category 4 ▪ Category 5	FEMA HAZUS Hurricane model generated windspeeds at the census tract level
Storm Surge	Maximum potential storm surge height given Category 1, Category 2, Category 3, Category 4, Category 5 storm	NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH)
Terrestrial Flooding	1-percent-annual-chance flood event (100 year), the 0.2-percent-annual-chance flood event (500 year), and areas of minimal flood risk	FEMA Digital Flood Insurance Rate Maps (DFIRM)

3. Probability of Weather Conditions Given Failure: P(C|F)

Using a large historic dataset from local weather stations, Guidehouse matched the conditions observed at each location to each outage event based on the location and time of the outage. This gives the best possible estimate of the existing weather conditions at the time of each outage in the system.

4. Probability of Failure Given Weather Condition (Sparse): P(F|C)

Using conditional probability statistics, we calculate the probability of failure (step 1) given the probability of the weather condition (step 2) and the conditional probability of failure given an observed condition (step 3). Each combination of an asset location and weather scenario has an expected annual frequency of high wind, storm surge, and flooding

[8] NOAA | The Sea, Lake and Overland Surges from Hurricanes (SLOSH) Model; Sea, Lake, and Overland Surges from Hurricanes (SLOSH) (noaa.gov)
[9] FEMA Digital Flood Insurance Rate Maps (DFIRM); National Flood Hazard Layer | FEMA.gov

conditions. The resulting empirical probability of failure is sparse since every condition has not been observed in the outage data for each asset class and location.

5. **Probability of Failure Given Weather Condition (Filled): P(F|C)**

   To fill in any gaps (conditions not observed for a location and asset class combination) using fragility analysis literature.[10]

Using the approach described above, Guidehouse defined the risk associated with each location on DEF transmission and distribution systems. Using the characteristics and locations of each asset on the system, Guidehouse quantified the likelihood of failure given that risk. Successful hardening approaches are those that reduce the likelihood of failure. The asset upgrades and hardening approaches were defined for each program to calculate the benefits of each SPP program implemented at each grid location.

BCA Model

The BCA model is a tool used to calculate annual cash flows of each value stream relevant to the BCA. The model aggregates information and data from multiple sources and calculates results under different weather scenarios. Guidehouse assessed costs and benefits over a 30-year period for distribution programs and a 40-year period for transmission programs.

One of the core benefits assessed in the BCA model is customer outage benefits. This benefit is calculated based on the customer value of electricity (in terms of $/unserved kWh). The customer value of electricity varies based on the length of the outage and customer class.[11] The other benefits include utility capital and operations and maintenance (O&M) benefits associated with a hardened grid that experiences less asset failures relative to the conditions before the program implementation. The project team estimated the costs of program implementation on a location level based on the number of units deployed. The unit costs were developed by DEF and account for labor, material, indirect costs, staging and logistics, and contingency.

Referring back to Figure A-2, components F through J from the BCA model section are summarized below.

F	**Customer Benefits**	• Quantify reduction in outage time and associated downstream load by customer class. • Value of avoided outages is based on the value of an unserved kWh, which depends on the type of customer and the length of the outage. • The ICE calculator typically applies to outage times less than or equal to 16 hours. For outage times greater than 16 hours, Guidehouse applied the 16-hour outage values as a simplifying assumption.

[10] Panteli, Mathaios, et al. "Power system resilience to extreme weather: fragility modeling, probabilistic impact assessment, and adaptation measures." IEEE Transactions on Power Systems 32.5 (2016): 3747-3757.; Gu kema, Seth, and Roshanak Nateghi. "Modeling power outage risk from natural hazards." Oxford Research Encyclopedia of Natural Hazard Science. 2018.

[11] The Interruption Cost Estimate (ICE) Calculator is an electric reliability planning tool developed by Lawrence Berkeley National Laboratory and Nexant, Inc. Available at https://icecalculator.com/home.

G	**Utility Capital Benefits**	• Calculated based on the reduced asset failures and the capital cost to replace those assets. • Value of deferring future capital replacement of existing assets by replacing them before the end of their expected useful lifetime with hardened equipment.
H	**Utility O&M Benefits**	• Calculated based on the reduction in O&M restoration costs associated with the reduction in asset failures.
I	**Capital Costs**	• The capital costs required to deploy the programs.
J	**O&M Costs**	• The O&M costs required to deploy the programs.

Decision Analysis

In the decision analysis portion of the model, the project-level BCA results were used to determine the prioritization and deployment plan for the programs. Thus, any prioritization shown in this report is driven only by the project BCA results; they do not include many crucial factors for project implementation. Guidehouse's analysis in this report does not consider other important factors that should be considered in program implementation that were outside the scope of this study, such as technology and regulatory risk, broader community benefits, customer inconvenience, viewshed, customer engagement, and local engineering expertise. This may mean that the actual implementation may differ from the BCA-based prioritization presented in this report.

Components K through N from the decision analysis section of Figure A-2 are summarized below.

K	**B/C Ratio**	• The costs and benefits of each project and scenario over the analysis period are converted into present values using discount rates for each cost test. Net present values and benefit-cost (B/C) ratios are then calculated for each project and scenario. • The B/C ratios are based on a theoretical deployment of the solution starting in the first year of the analysis period.
L	**Preferred Portfolio**	• Using the B/C ratios, the project team ranked each project from most preferred to least preferred. • Interactive effects were accounted for by counting the benefits of a program after other interacting programs' impact (e.g., self-optimizing grid impacts were estimated after feeder hardening). This ensured that program benefits were not double counted.
M	**Funding & Timing Constraints**	• Guidehouse applied program- and portfolio-level funding constraints, which DEF provided. These represent practical limits on program implementation.
N	**Roadmap**	• Projects were deployed algorithmically according to the ranking in step L and the constraints in step M. Annual program deployment analysis was guided by practical limitations on achievable implementation provided by the DEF project team and subject matter experts.

Appendix B. Weather Scenario Modeling

Guidehouse's model uses a detailed GIS representation of DEF territories, providing weather conditions specific to the exact latitude and longitude of an asset. This area-specific GIS representation allows for simulated weather conditions and exposure probabilities to be generated for each specific asset. The project team developed three weather scenarios that categorize the range of storm occurrence from average frequencies to high frequencies designated as the following:

- **Scenario 1** – Average Storm Frequency (Base Case)
- **Scenario 2** – Above Average Storm Likelihood
- **Scenario 3** – High Average Storm Likelihood

Each weather scenario is designed as a discrete, consistent, representative outlook on storm frequency and intensity applied at each asset location across the DEF service area throughout the planning horizon.

Hurricane activity was analyzed for Florida from 1851-2020 using NOAA's Atlantic Basin hurricane database (HURDAT). This database is the most comprehensive hurricane dataset available for state specific storm occurrence. The data provides the maximum 1-min average windspeed associated with the tropical cyclone at an elevation of 10m with an unobstructed exposure[12]. The storms were then categorized based on those data according to the Saffir-Simpson Scale shown below:

Saffir-Simpson Scale	
Category	**Wind Speed (mph)**
Blue Sky	0 – 40
Tropical Storm	40 – 74
Category 1	74 – 96
Category 2	96 – 111
Category 3	111 - 130
Category 4	130 - 157
Category 5	157+

[12] National Hurricane Center: https://www.nhc.noaa.gov/data/; Landsea, C. W. and J. L. Franklin, 2013: Atlantic Hurricane Database Uncertainty and Presentation of a New Database Format. Mon. Wea. Rev., 141, 3576-3592

B.1 Scenario 1 – Average Storm Frequency

The average storm frequency scenario is defined by average conditions experienced in DEF territory: the frequency is the total number of events over all years, divided by the number of years. This is the annual average likelihood of each storm category to strike West Central Florida based on 1851-2020 NOAA data. It is common to refer to a hurricane by the highest point on the Saffir-Simpson scale that it achieves, although the actual windspeeds at any given location affected by the hurricane will tend to be lower. As hurricanes achieve landfall and move inland, windspeeds typically decrease. These factors are accounted for in the detailed locational probabilities in the Guidehouse model.

The base case represents the typical storm likelihood over the long run, as informed by the HURDAT dataset. This is the long-run annual average chance for each storm category to strike west central Florida, as measured by NOAA from 1851-2021. Note that these frequencies will not sum to 1, since there can be more than one storm event per year. Frequency (F) for each storm severity condition (S) is calculated as follows:

$$F_{S,22} = \frac{\sum_{i=1}^{T}(n_{S,22})}{T_{years}}$$

The frequency F is determined by number of 22 hour event windows[13] (n) that have occurred of a given storm severity S over the full 1851-2020 time period T, given an event duration. Because tropical cyclones have variable durations, and damage is a function of the duration of exposure to high winds and flooding, we calculate the number of events based on the average event window duration observed for tropical cyclones of 22 hours.

Table 18 illustrates the frequency of the windspeed conditions for each scenario described below. Importantly, this table shows number of 22 hour windows per year in which the given condition was observed, averaged over all of DEF's locations (distribution circuits, transmission networks, substations). The number of storms in an average Florida hurricane season will tend to be higher than this, since the majority of DEF locations are inland. The frequencies are rounded in the table for readability. Finally, because each location is a different size, this will not be fully representative of the system as a whole. It is included here in order to demonstrate the change in frequency observed between scenarios without including the full list of locations in a single table.

B.2 Scenario 2 – Above Average Storm Frequency

Above average storm frequency is defined by increasing the annual likelihood of storm strike by 10%. That is to say, the overall likelihood of storms increases by a factor of 0.1. Note that $F_{Blue\ Sky,22}$ is also reduced slightly, but the effect of the scenario increase is negligible on the likelihood of getting a blue sky day in the year.

[13] NOAA weather data suggests the long-run historic average storm duration is 22 hours. While there is some evidence that more recent hurricanes have longer durations, Guidehouse held this event window constant for this forecast in all scenarios.

B.3 Scenario 3 – Increased Storm Frequency

The increased storm frequency scenario is defined by increasing the annual likelihood of a storm event by 25% relative to the base scenario. This results in the increased average frequencies in Table 18.

Table 18. Average Condition Frequency by Scenario

	Tropical Storm	Category 1	Category 2	Category 3	Category 4	Category 5
Scenario 1 (Base Case)	1.1586	0.0843	0.0168	0.0057	0.0015	0.0002
Scenario 2 (Above Average)	1.2745	0.0927	0.0185	0.0062	0.0016	0.0002
Scenario 3 (High Average)	1.4483	0.1053	0.0210	0.0071	0.0018	0.0003

While the table illustrates the methodology applied across the entire state, in the GIS model, weather conditions were simulated at a detailed location level (latitude/longitude) before being applied to the BCA.

The frequencies above are relative to observed wind speed. The maximum windspeed present during a given 22-hour window was then used to assign those 22 hours to a severity class.

By summing the hours in each severity class and annualizing, we obtain the frequencies $F_{S,22}$ of any given 22-hour event over the year belonging to severity class S. The frequency of blue sky events for each scenario is then given by survival equation below.

$$F_{no\ S,year} = \left(T - F_{S,22}\right)$$

Appendix C. SPP Programs Descriptions for Modeling

This section describes the transmission, distribution and vegetation management programs evaluated in the SPP 2023 model. Each program description will include the following elements:

- **Program description:** Programs descriptions provide a general overview of the severe weather hardening actions and associated assets considered for model evaluation.
- **Extreme weather benefits:** Extreme weather benefits provide an overview of how each program provides benefits for outage prevention, system hardening, and outage reduction.
- **Program elements:** Program elements are the specific modeled assets added to or upgraded within each program that will provide severe weather storm hardening benefits.

Guidehouse developed these descriptions to facilitate the modeling and analysis activities. More complete program descriptions are provided by DEF.

C.1 D1: Feeder Hardening Program

C.1.1 Feeder Hardening (Overhead)

Description	The Feeder Hardening program is a standards-based program that systematically upgrades the feeder backbone to meet extreme wind loading requirements defined in the National Electric Safety Code (NESC) Rule 250C. This upgrade enables the feeder backbone to better withstand extreme weather events. Work includes strengthening structures to higher class wood or concrete, updating basic insulation level to current standards, updating the conductor to current standards, relocating difficult-to-access facilities, undergrounding sections of the feeder to mitigate clearance encroachments, avian and animal mitigation and protection and replacing oil-filled equipment. Feeder backbone line poles also receive preventive maintenance and undergo inspection to identify poles showing signs of decay or identify those falling below minimum strength requirements.
Extreme Weather Benefit	**Outage prevention**. Upgrading assets lowers the risk of in-service failure during extreme weather conditions. **System hardening.** Replacing or upgrading infrastructure to make it less susceptible to extreme weather and wind damage.
Elements	Rebuilds existing primary backbone non-hardened circuit assets with new upgraded construction. This project type includes upgrading assets to current standards: poles, overhead conductors, reclosers, and overhead transformers.

C.1.2 Feeder Wood Pole Replacement and Treatment

Description	The Feeder Wood Pole Inspection and Treatment enabling activities are an inspection and preventive maintenance activity to determine if wood poles are showing signs of decay or if they fall below the minimum strength requirements. Poles with decay determined to be State 5 (Priority 1 - Replace immediately) or State 4 (Priority 2 - Replace as soon as practicable) are scheduled for replacement. Poles with minor deterioration (State 3) or deemed still serviceable (States 3, 2) may receive treatment to extend life of the pole.
Extreme Weather Benefit	**Outage prevention.** Identifying decayed poles more vulnerable to storm or severe weather damage and targeting them for strengthening measures, replacement, or treatment. Extreme weather benefits are not modeled for enabling activities.
Elements	Identifies decayed poles to be replaced or poles to be treated to extend the life of the pole.

C.2 D2: Lateral Hardening Program

C.2.1 Lateral Hardening (Underground)

Description	Lateral Hardening Undergrounding standards-based activity focuses on branch lines that historically experience the most outage events, contain significantly aged assets, are susceptible to damage from vegetation, and/or often have facilities that are inaccessible to trucks. These branch lines will be replaced with a modern, updated, and standard underground design of today.
Extreme Weather Benefit	**Outage prevention.** Reducing likelihood of outages caused by vegetation impacts during extreme weather. **System hardening.** Replacing or upgrading infrastructure to make it less susceptible to extreme weather and wind damage.
Elements	Replaces existing primary overhead branch line segments with new relocated underground line segments. All overhead assets are removed and replaced with underground distribution transformers, underground primary and secondary conductors, and a new overhead distribution fused riser pole is installed.

C.2.2 Lateral Hardening (Overhead)

Description	The Lateral Hardening program is a standards-based program that systematically upgrades the overhead lateral lines to meet extreme wind loading requirements defined in the National Electric Safety Code (NESC) Rule 250C. This upgrade enables the lateral lines to better withstand extreme weather events. Work includes strengthening structures, updating basic insulation level to current standards, updating the conductor to current standards, relocating difficult-to-access facilities, and replacing oil-filled equipment. Lateral pole lines also receive preventive maintenance and undergo inspection to identify poles showing signs of decay or identify those falling below minimum strength requirements.
Extreme Weather Benefit	**Outage prevention.** Reducing outage frequency by moving the line to the front of the premise from the back when applicable, thus avoiding exposure to vegetation in high winds. This activity reduces outage duration by making the line more accessible to crews. **System hardening.** Replacing or upgrading infrastructure to make it less susceptible to extreme weather and wind damage.
Elements	Upgrades existing non-hardened primary branch lateral distribution overhead primary circuits with extreme wind load standard construction and other associated asset upgrades. This includes upgrading assets: poles - Class 2 or greater, overhead primary conductor – 1/0 or greater, overhead service – triplex, reclosers – self-healing, fuses – trip savers, and overhead transformers – conventional.

C.2.3 Lateral Wood Pole Inspection and Treatment

Description	The Lateral Wood Pole Inspection and Treatment enabling activity is an inspection and preventive maintenance activity to determine if wood poles are showing signs of decay or fall below the minimum strength requirements. Poles with reduced strength determined to be State 5 (Priority 1 - Replace immediately) or State 4 (Priority 2 - Replace as soon as practicable) are identified for replacement. Poles with minor deterioration (State 3) or deemed still serviceable (States 3, 2) may receive treatment to extend life of the pole.
Extreme Weather Benefit	**Outage prevention.** Identifying poles more vulnerable to storm or severe weather damage and targets them for strengthening/uplift measures, replacement, or treatment. Extreme weather benefits are not modeled for enabling activities.
Elements	Identifies decayed poles to be replaced or poles to be treated to extend the life of the pole.

C.3 D3: Self-Optimizing Grid Program

Description	The SOG program consists of three major components: capacity, connectivity, and automation and intelligence. The self-optimizing grid standards-based program redesigns portions of the distribution system into a dynamic smart-thinking, self-healing network. The grid will have the ability to automatically reroute power around trouble areas, like a tree on a power line, to quickly restore power to the maximum number of customers and rapidly dispatch line crews directly to the source of the outage. The benefit from completing this program is fewer customers affected by long duration outages as a result of extreme weather events.
Extreme Weather Benefit	**Outage reduction.** Adding the ability to reroute power during severe weather events reduces outage duration, frequency, and number of customers affected.
Elements	Adds one overhead self-healing recloser per approximately every 400 customers on primary overhead backbone circuits.

C.4 D4: Underground Flood Mitigation Program

Description	Within flood prone areas, Underground Flood Mitigation is a targeted program which will harden existing underground lines and equipment to withstand a storm surge through the use of the applicable Duke Energy Florida storm surge standards. The primary purpose of this hardening activity is to minimize the damage caused by a storm surge to the equipment and thus expedite the restoration after the storm surge has receded.
Extreme Weather Benefit	**Outage prevention.** Limiting equipment failures due to flood intrusion. **System hardening.** Replacing or upgrading infrastructure to make it less susceptible to extreme weather and water damage.
Elements	Upgrades existing non-submersible underground distribution assets with new submersible underground assets and applies other flood and surge proofing measures such as sealing ducts and equipment enclosures.

C.5 T1: Structure Hardening Program

C.5.1 Wood Pole Replacement

Description	The Wood Pole standards-based activity prioritizes replacing transmission wood pole structures with steel poles or other materials based on engineering design. Where applicable, the program targets replacing manual transmission gang-operated air-break (GOAB) switches with supervisory control and data acquisition (SCADA)-enabled GOAB switches.
Extreme Weather Benefit	**Outage prevention.** Providing for the acceleration of the replacement of wood poles, which lowers the risk of pole failure-related outages. **System hardening.** Replacing or upgrading infrastructure to make it less susceptible to extreme weather and wind damage. **Outage reduction.** Sensing voltage and current and enabling SCADA operators or master system software to perform remote switching. This capability eliminates the need to operate the devices locally from the control cabinet, as well as automatic sectionalizing operations. Compared to manual switching, remote switching can significantly reduce outage durations times.
Elements	• On transmission lines, replaces existing prioritized transmission wood pole structures with new steel poles or other materials • Upgrades existing manual GOAB switches with SCADA-enabled GOAB switches.

C.5.2 Structure Inspections

Description	Inspections are an enabling activity providing programmatic structure inspections of the overhead transmission system. Through inspections, structure health is evaluated by reviewing components that affect reliability including but not limited to right of way hazards, interference from foreign objects, load bearing member conditions, and insulator health. Programmatic ground inspections include the previously mentioned components and comply with the sound and bore requirements of the PSC to ensure wood pole health.
Extreme Weather Benefit	**Outage prevention.** Proactively evaluating structure health lowers the risk of in-service failures during extreme weather conditions. Extreme weather benefits are not modeled for enabling programs.
Elements	Inspects poles and towers, insulators, guying, anchoring, and foundations; identifies defective towers and poles for replacement.

C.5.3 Tower Replacements

Description	The Tower Replacements standards-based activity upgrades prioritized transmission towers to the current standard design.
Extreme Weather Benefit	**Outage prevention.** Replacing prioritized steel, wood/steel towers with a new CP steel tower lowers the risk of in-service failure during extreme weather conditions. **System hardening.** Replacing or upgrading infrastructure to make it less susceptible to extreme weather and wind damage.
Elements	Replacement of existing prioritized transmission towers with a new steel transmission tower or steel/concrete structure.

C.5.4 Tower Cathodic Protection

Description	The Cathodic protection (CP) measures include anode installations to mitigate active groundline corrosion on the lattice tower system. The anodes serve as sacrificial assets that corrode in place of structural steel, preventing loss of structure strength to corrosion.
Extreme Weather Benefit	**Outage prevention.** Installing CP on prioritized steel towers to lower the risk of in-service failure during extreme weather conditions.
Elements	Installation of passive CP systems comprised of anodes on each leg of lattice towers for ongoing corrosion control.

C.5.5 Tower Drone Inspections

Description	The Tower Drone enabling activity uses drones to capture inspection data for structures in difficult to access areas and/ or instances where closer inspection is required. DEF is incorporating drone patrols into the inspections because drones have the unique ability to provide a close vantage point with multiple angles on structures that is unattainable through aerial or ground patrols with binoculars.
Extreme Weather Benefit	**Outage prevention.** Proactively evaluating towers for deterioration lowers the risk of in-service failure during extreme weather conditions. Extreme weather benefits are not modeled for enabling programs.
Elements	Conduct drone inspections on targeted lattice tower lines to identify otherwise difficult to see structure, hardware, or insulation vulnerabilities through high resolution imagery.

C.5.6 Overhead Ground Wires

Description	The Overhead Ground Wires standards-based activity targets replacement of transmission overhead ground wire susceptible to damage or failure with optical ground wire (OPGW). OPGW improves grounding and lightning protection and provides high speed transmission of data for system protection and control and communications.
Extreme Weather Benefit	**Outage prevention.** Lowering the risk of overhead ground wire in-service failure during extreme weather conditions due to lightning damage or mechanical failure. **System hardening.** Providing redundant sources of fiber optic communications for system protection and control and supports faster identification of trouble spots on the transmission system and enables faster restoration following line faults.
Elements	Upgrades existing overhead ground wire with overhead OPGW.

C.6 T2: Substation Flood Mitigation Program

Description	The Substation Flood Mitigation targeted program evaluates substations for the application of flood mitigation measures. New assets may include containment curbing, pumps, pits, walls, and total station rebuilds to increase elevation or other measures.
Extreme Weather Benefit	**Outage prevention.** Reducing risk of prolonged outages caused by flooding. **System hardening.** Replacing or upgrading infrastructure to make it less susceptible to water intrusion and extreme weather conditions.
Elements	Removes existing non-flood mitigated substations and upgrades with flood mitigation substations (flood mitigation applied to existing non-flood mitigated substations).

C.7 T3: Loop Radially Fed Substations Program

Description	The Loop Radially Fed Substations targeted program evaluates radially fed substations that are fed from a single transmission line source. When the radial transmission line assets are damaged during extreme weather events, long customer outages may be experienced during repair activities because an alternate transmission feed is not present. Enabling transmission system redundancy and the ability to serve customers from an alternate power source can eliminate or shorten long outage durations. Assets required within a substation may include breakers, switches, buss work, structures, insulators, potential transformers, relays, and control houses. A transmission tie line may also be required.
Extreme Weather Benefit	**Outage reduction**. Enabling substation and customer load to be fed from an alternate source while repairs to damaged line segments are completed.
Elements	Adds new circuit segment (line tie) and required substation modifications/equipment and controls to an existing radially fed substation.

C.8 T4: Substation Hardening Program

Description	Substation Hardening is a standards-based program that will address two major components. 1) Upgrading oil breakers to state-of-the-art gas or vacuum breakers to mitigate the risk of catastrophic failure and extended outages during extreme weather events. 2) Upgrading electromechanical relays to digital relays with advanced system protection functions and communications to enable Duke Energy Florida to respond and restore service more quickly from extreme weather events.
Extreme Weather Benefit	**Outage reduction.** Reducing risk of in-service failures of breakers and relays during extreme weather conditions. Enabling more rapid identification and location of faults on transmission lines. **Outage prevention.** Supporting prompt and accurate diagnosis of grid events and operations to prevent recurrence.
Elements	Removes existing electromechanical relays and oil-filled substation breakers and upgrades with programmable electronic relays and gas-filled substation breakers.

C.9 VM1: Distribution VM Program

Description	The Distribution Vegetation Management enabling program includes tree trimming, tree removals within easement, and associated activities on the distribution system. Also included are danger and hazard tree removals on the distribution system outside of easement requiring landowner permission.
Extreme Weather Benefit	**Outage prevention.** Removal of vegetation likely to interfere with system operation during extreme weather reduces the likelihood of outages.
Elements	Application of cycle trimming, removal, demand trimming, herbicide, and hazard tree removal.

C.10 VM2: Transmission VM Program

Description	The Transmission Vegetation Management program includes tree pruning, tree removals within easement, and other vegetation management activities on the transmission right-of-way as well as danger tree removals outside of the easement to protect the transmission system.
Extreme Weather Benefit	**Outage prevention.** Removal of vegetation likely to interfere with system operation during extreme weather reduces the likelihood of outages.
Elements	Application of condition-based vegetation management that includes inspections, pruning, removal, mowing, herbicide, and danger tree removal.

Duke Energy Counts by Distribution Sub Area

Duke Energy Florida, LLC
Docket No. 20220050-EI
Witness: Lloyd
Exhibit No. ___(BML-3)
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Legend:

Customers

- 0 - 1000
- 1001 - 5000
- 5001- 10000
- 10001 - 20000
- 20001 - 50000
- Distribution Area

0 4.5 9 13.5 18 Miles