Report to the Legislature
On Enhancing the Reliability of
Florida's Distribution and Transmission Grids
During Extreme Weather

(Update to July 2007 Report)

Submitted to the Governor and Legislature

Florida Public Service Commission
July 2008

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Terms and Acronyms

CIAC	Contribution-in-aid-of-construction
EOC	Florida's Emergency Operation Center
EWL	Extreme wind loading
F.A.C.	Florida Administrative Code
FCTA	Florida Cable Telecommunication Association, Inc.
FPL	Florida Power & Light Company
FPUC	Florida Public Utilities Company
GIS	Geographic information system
GULF	Gulf Power Company
ILEC	Incumbent local exchange company
IOU	Investor-owned electric utility
IOUs	The five investor-owned electric utilities: FPL, PEF, TECO, GULF, and FPUC
MUUC	Municipal Underground Utilities Consortium
NESC	National Electrical Safety Code
PEF	Progress Energy Florida, Inc.
FPSC	Florida Public Service Commission
PURC	Public Utility Research Center, University of Florida
TECO	Tampa Electric Company
URD	Underground residential distribution

Executive Summary

The Florida Public Service Commission (FPSC or Commission) submitted a report on enhancing the reliability of Florida's distribution and transmission grids during extreme weather to the Governor and Legislature in July 2007, pursuant to Chapter 2006-230, Section 19(2) and (3), at 2615, Laws of Florida. In the July 2007 report, we noted a number of ongoing activities and committed to providing follow-up. On February 1, 2008, an addendum to the July 2007 report was provided to the Governor and Legislature. The FPSC also promised to provide a complete update to the July 2007 report by July 1, 2008.

The Commission continues to pursue multiple strategies for achieving and maintaining a stronger transmission and distribution system.

- Electric utilities are required to appear before the Commission annually to provide details of their preparations for the upcoming hurricane season.

- All five investor-owned electric utilities (IOUs) met their goals for wood pole inspections during 2007 and are on target to complete inspections of wood pole inventories within an eight year-cycle.

- Vegetation has been trimmed and dangerous trees have been removed along thousands of miles of electric lines throughout the state.

- Electric utilities are on schedule to meet the vegetation management goals associated with their Commission-approved trim cycles.

- Electric utilities, telecommunications, and cable companies are cooperating to perform inspections and conduct strength tests to determine whether attached facilities are overloading poles.

- Poles are being reinforced and replaced, and attached wires and cables are being relocated as necessary to comply with the National Electric Safety Code Standards.[1]

Collaborative research on the costs and benefits of undergrounding overhead distribution lines has produced a model that utilities are currently evaluating as a potential tool that utilities and customers can use to determine whether undergrounding a specific location is appropriate. Each of the four major electric utilities plans to rigorously and comprehensively test the model. The testing may involve applying the methodology to future undergrounding projects in a utility's service area, or other approach that the utility finds appropriate and effective. The status and results of the testing will be reported to the Commission as part of each utility's annual status report filed according to its storm hardening plan approved December 28, 2007.

[1] Electrical facilities constructed on or after February 1, 2007, shall comply with the 2007 National Electric Safety Code (NESC). Electrical facilities constructed prior to February 1, 2007, shall be governed by the edition of the NESC in effect at the time of the facility's initial construction. (Rule 25-6.0343, Florida Administrative Code)

The tasks that the Commission has directed utilities to perform to harden the existing transmission system are interrelated. IOUs, municipals, cooperatives, and incumbent local exchange companies (ILECs) have implemented many overlapping procedures to inspect and repair their facilities and also collect and analyze data to improve the reliability of the Florida electric system. Florida's citizens have been fortunate that no hurricanes and few severe storms have occurred during the past 18 months. The milder weather patterns have allowed utilities to implement inspections and upgrades of critical infrastructure so Florida will be better prepared for future severe weather. Whether utility efforts and investments to storm harden the state's electric infrastructure have improved reliability and restoration time will only be determined, however, through trial and experience over time.

The Commission makes no new recommendations in this report. Electric utilities should continue the programs implemented by the Commission that are designed to strengthen Florida's electric infrastructure to better withstand severe weather. The Commission will continue to carefully balance the need to strengthen the state's electric infrastructure to minimize storm damage, reduce outages, and lessen restoration time with the need to mitigate excessive cost increases to electric customers.

Introduction

The reliability of the electric service system is critical to Florida's economy and the health and well-being of its citizens. Electricity powers every aspect of modern life: business, education, health care, tourism, and entertainment. Therefore, safe, reliable, and affordable electric service is essential to economic prosperity in Florida.

As a peninsular state, Florida is particularly vulnerable to the hurricanes that often form over the Atlantic Ocean and Gulf of Mexico. As the hurricane seasons of 2004 and 2005 so clearly demonstrated, storms and the severe winds and water surges that may accompany them are capable of causing great damage to electric transmission and distribution systems. Mindful of this possible damage, the 2006 Legislature directed the Commission to conduct a review and determine what should be done to enhance the reliability of the state's transmission and distribution grids during extreme weather events.

Chapter 2006-230, Sections 19(2) and (3), at 2615, Laws of Florida, enacted by the 2006 Florida Legislature, states:

> (2) The commission shall conduct a review to determine what should be done to enhance the reliability of Florida's transmission and distribution grids during extreme weather events, including the strengthening of distribution and transmission facilities. Considerations may include:
>
> > (a) Recommendations for promoting and encouraging underground electric distribution for new service or construction provided by public utilities.
> >
> > (b) Recommendations for promoting and encouraging the conversion of existing overhead distribution facilities to underground facilities, including any recommended incentives to local governments for local-government-sponsored conversions.
> >
> > (c) Recommendations as to whether incentives for local-government-sponsored conversions should include participation by a public utility in the conversion costs as an investment in the reliability of the grid in total, with such investment recognized as a new plant in service for regulatory purposes.
> >
> > (d) Recommendations for promoting and encouraging the use of road rights-of-way for the location of underground facilities in any local-government-sponsored conversion project, provided the customers of the public utility do not incur increased liability and future relocation costs.

(3) The commission shall submit its review and recommendations to the Governor, the President of the Senate, and the Speaker of the House of Representatives by July 1, 2007.

The Commission submitted a report to the Legislature in July 2007, as required. An addendum to the July 2007 report was provided on February 1, 2008. The FPSC also committed to give a complete update to the report by July 1, 2008. The following serves as the Commission's July 1, 2008 update to the Governor and Legislature.

As a preface to this report, the July 2007 Report and the February 1, 2008 Addendum are summarized in separate paragraphs of Section I. Because many of the activities associated with storm hardening are recurring and ongoing, some overlap of key topics and events may occur in various sections. Section II discusses Commission and utility actions with regard to storm hardening initiatives and issues in 2007-2008. Section III describes initiatives and issues associated with converting overhead electric distribution lines to underground service. Finally, Section IV reiterates the Commission's recommendations for enhancing the reliability of the Florida's electric distribution and transmission grids during extreme weather. No new recommendations are being made at this time.

Section I. Background

Synopsis of July 2007 Report

Studying the 2004-2005 hurricane impacts led to three overarching recommendations. First, Florida citizens and utilities should maintain a high level of storm preparation, regardless of whether recent hurricane seasons have been mild or severe. Second, Florida utilities should use a wide range of hardening activities implemented continuously over time to strengthen the state's electric infrastructure to better withstand the impacts of severe weather. Third, making informed decisions about conversion of existing overhead electric facilities to underground will require the development of comprehensive planning tools.

In order to implement these recommendations, beginning in January 2006, the Commission initiated the following actions:

- Annual hurricane preparedness briefings
- A formal electric utility pole inspection program
- Annual assessment of comprehensive reliability reports by the electric utilities
- Ten additional storm hardening initiatives that include Florida specific research
- University research to measure the effects of storm wind speeds on electric utility infrastructure
- University research on best practices for vegetation management
- Rules governing investor-owned utility storm restoration costs
- Rulemaking regarding overhead and underground storm hardening construction standards
- Rulemaking to expand the calculation of contribution-in-aid-of-construction (CIAC) for new underground facilities and overhead to underground conversions to reflect the cost impacts of storm hardening and storm restoration
- Tariffs promoting underground electric distribution facilities
- University research to develop cost/benefit methodologies to identify areas and circumstances to facilitate the conversion of overhead distribution facilities to underground facilities

The 2007 report noted that achieving a transmission and distribution system capable of better withstanding hurricanes will take time and require financial resources. Cost-effective achievement of storm hardening goals will require active monitoring by the Commission. A

number of the storm hardening activities initiated by the Commission are ongoing and will continue for several years.

Synopsis of February 1, 2008 Addendum

As part of the Commission's ongoing multi-faceted storm hardening efforts, further activity to enhance the reliability of Florida's transmission and distribution grids continued during the period of May 1-December 15, 2007. The Commission took the following actions:

- Promulgated Rule 25-6.0342, F.A.C., which requires utilities to file storm hardening plans at least every three years. The first hardening plans were filed on May 7, 2007.

- Issued orders approving the storm hardening plans of Progress Energy Florida Inc. (PEF), Tampa Electric Company (TECO), Florida Power & Light (FPL), and Gulf Power Company (GULF) on December 28, 2007. Pursuant to the orders, the affected utilities are required to file annual status reports with the Commission. The next storm hardening plans are due May 10, 2010.

- Held a public workshop on May 23, 2007, where electric utilities reported on their state of preparedness for the 2007 hurricane season.

- Approved a pilot program filed by FPL in May 2007 that provides an incentive for local governments to pursue community-wide conversions of overhead distribution lines to underground.

- Issued an order on July 3, 2007, making the storm hardening plan of Florida Public Utilities Company (FPUC) a substantive issue to be considered in an upcoming rate case.

- Held an evidentiary hearing to review the investor-owned utility storm hardening plans pursuant to Commission rules on October 3-4, 2007.

- Approved tariffs designed to promote and encourage installation of underground distribution facilities.

- Monitored ongoing research on the costs and benefits of undergrounding electric distribution facilities that is a collaborative research effort between Florida electric utilities and universities.

Section II. Storm Hardening Updates and Achievements

The Commission continues to pursue the multiple strategies it has developed for achieving and maintaining a stronger transmission and distribution system. These strategies include improvements to Florida's electric system aimed at better withstanding severe weather, experiencing fewer and shorter service interruptions, and sustaining less damage to facilities. The success of these strategies can only be determined with time and experience. The following paragraphs discuss the measures used to achieve these goals and the ongoing activities that will contribute to maintaining the strongest infrastructure possible without imposing excessive costs on Florida ratepayers.

Implementation of Rules Requiring Storm Hardening Plans

On February 1, 2007, the Commission amendments to Rule 25-6.0342, Florida Administrative Code (F.A.C.), Standard of Construction, became effective. The new rule requires each investor-owned utility (IOU) to file, for Commission review and approval, a comprehensive storm hardening plan on May 7, 2007, and an updated plan at least every three years. The Commission directed the utilities to obtain input from telecommunications and cable companies whose facilities are attached to electric distribution poles. Pursuant to the rule, each utility's plan is required to address:

(1) All prior Commission-ordered storm hardening initiatives

(2) Compliance, at a minimum, with the appropriate version of the National Electric Safety Code (NESC) required by Rule 25-6.0343, Florida Administrative Code

(3) The applicability of extreme wind loading standards for new and replacement distribution facilities

(4) Mitigation of damage to underground facilities and supporting overhead facilities due to flooding and storm surge

(5) Safe and efficient access for the installation and maintenance of new and replacement distribution facilities

The IOU storm hardening plans were filed on May 7, 2007. The plans included input from telecommunications and cable companies whose facilities are attached to electric distribution poles. On October 3-4, 2007, the Commission held an evidentiary hearing to review the IOU storm hardening plans. During the hearing, the electric utilities and cable and telecommunications intervenors were able to resolve their concerns through a stipulated agreement called a "Process to Engage Third-Party Attachers," which the Commission approved. This process allows for the exchange of information between the parties and requires annual status reports to be filed with the Commission.

Annual Pre-Hurricane Season Hurricane Preparedness Briefing

Utilities must maintain a high level of storm readiness at all times.

All electric utilities and incumbent local exchange companies (ILECs) are required to provide a hurricane preparedness briefing at a Commission workshop prior to each annual hurricane season. The purpose of the briefing is to gauge the storm readiness of each utility prior to each summer storm season. At the most recent briefing on May 1, 2008, all IOUs, representatives of municipal and cooperative electric utilities, and the three largest ILECs provided a comprehensive overview of their preparations for the upcoming hurricane season. In general, utilities have completed storm preparations such as trimming vegetation from feeders and laterals, inspecting critical infrastructure facilities, practicing emergency exercises, ensuring adequate fuel supply reserves, and having work crews and mutual assistance plans in place. Based on information presented at the public workshop, utilities appear to be well-prepared to protect their transmission and distribution assets during the upcoming hurricane season.

Inspections and Replacements of Wooden Poles

Electric utilities are on track to meet pole inspection goals.

The Commission ordered electric utilities to conduct inspections of all wooden distribution poles at least every eight years.[2] The Commission also requires each electric utility to provide a report of its inspections by March 1 of each year. The report must include summary data and results of the company's previous year's transmission and distribution wood pole inspections that address strength, structural integrity, and loading requirements based on the National Electric Safety Code. Generally, inspections to determine safety and stability of wooden poles are conducted visually, by excavation, prodding, sounding, boring, or using a resistograph device. The cause of each pole failure and specific actions the company has taken or will take to correct each pole failure must also be disclosed.

Figure 1. Failure Rates for Wooden Pole Inspections Performed in 2007

Utilities	Failure Rate (% of Annual Inspection)		
	Average	Highest	Lowest
IOUs	5.92%	7.97% FPUC	2.20% Gulf
Electric Cooperatives	2.68%	8.80% Florida Keys	0.12% Escambia River
Municipal Electrics	4.03%	29.90% Keys Energy Services	0.00% Town of Havana

Source: Annual Reliability Reports of electric utilities.

All five IOUs met their goals for the number of poles inspected during 2007 and are on target to complete inspections of all wood pole inventories within the eight-year cycle. In total, IOUs inspected 327,081 poles during 2007. The pole failure rate for all IOUs averaged

[2] Order No. PSC-06-0144-PAA-EI, issued February 27, 2006, in Docket No. 060078-EI.

approximately 6 percent during the most recent inspection cycle, as illustrated in Figure 1. More detailed pole inspection data for each IOU is contained in Appendix A (page 30).

Of the municipal electric utilities reporting, 62,500 pole inspections were completed during 2007. Approximately 4 percent of poles failed inspection, and all failing poles have been designated for replacement. Appendix B (page 31) summarizes the results of the pole inspections for municipal electric utilities.

Rural electric cooperatives inspected 163,186 poles during 2007, and approximately 3 percent failed inspection. Appendix C (page 34) summarizes the results of pole inspections reported by electric cooperatives.

Annual Distribution Service Reliability Reports by the IOUs

The Commission has required all IOUs to file an annual Distribution Service Reliability Report since 1993. In 2006, the Commission amended its rules to require that reliability data for extreme weather events also be included in the report. As a result, the Commission is able to monitor utility compliance with a variety of storm hardening initiatives ordered by the Commission in 2006.[3] Staff examines these reports with a focus on a variety of reliability metrics as well as assessing the day-to-day impact of storm hardening efforts. The Commission staff's review of the IOU's 2006 Distribution Service Reliability Reports did not identify any trends that would require a formal investigation.[4]

Vegetation Management

The Commission directed each IOU to perform necessary tree trimming on all its distribution circuits in a three-year cycle, or propose an alternative that is equivalent or better in terms of both cost and reliability in preparing for future storms. The Commission approved variations to the three-year trim cycles proposed by several utilities after determining the proposals would reasonably meet reliability requirements.

Vegetation management programs generally consist of tree trimming, vine removal, herbicide applications, dead tree removal, and other maintenance performed at regular intervals. These cyclical maintenance routines are designed to prevent tree-caused outages and contribute to overall system reliability. When customers request tree trimming,

Distribution circuits *consist of feeder circuits and lateral circuits.* ***Feeder circuits*** *begin at substations and lead outward with the capability of serving thousands of customers. Feeder circuits are designed for heavy loads and are typically located along or near major roads.* ***Lateral circuits*** *begin at the feeder circuits and provide service to tens or hundreds of customers, such as to a single street. Lateral circuits are often located on back lots between homes.*

[3] PSC-06-0781-PAA-EI, issued September 19, 2006, in Docket No. 060198-EI.
[4] http://www.psc.state.fl.us/publications/reports.aspx#eng

utilities rely on procedures for evaluating individual situations to ascertain that effective procedures are followed to meet both individual and system needs. Customer education about appropriate tree planting and trimming can prevent tree-caused outages and help reduce restoration times. Many utilities provide consumer brochures describing appropriate trees to plant, safety precautions, and utility tree-trimming practices. Utilities have programs in place for prioritizing work in a manner that will have the greatest impact on system reliability.

In general, IOUs are on schedule to meet the vegetation management goals associated with their Commission-approved trim cycles, as indicated in Figure 2 below. The majority of municipals and cooperatives also appear to be on track with vegetation management schedules.

When asked to identify obstacles to meeting their goals, some utilities cited (1) difficulty retaining qualified contract tree workers, (2) local ordinances and customer refusals preventing the removal of trees not within the right-of-way, and (3) problems finding a disposal site to accept non-chipped tree debris.

Figure 2. IOU Vegetation Management Performed in 2007

	Feeder		Lateral			
Utility	**Trim Cycle**	**Miles Trimmed**	**Trim Cycle**	**Miles Trimmed**	**Goal Achieved**	**Costs**
FPL	3 Years	4,454	6 Years	2,215	Yes	$65,200,000
PEF	3 Years	2,112	5 Years	2,203	Yes	$19,626,584
TECO	3 Years	363	3 Years	945	Yes	$10,300,000
GULF	3 Years	1,878	6 Years	675	Yes	$1,456,000
FPUC	3 Years	36	6 Years	54	Yes	$527,507

Source: Responses to FPSC staff data requests and distribution service reliability reports.

FPL's main distribution lines (feeders) each serve approximately 1,500 customers. FPL's lateral lines serve approximately 35 customers each. FPL is on schedule to meet the vegetation management goals associated with its Commission-approved trim cycle. In addition to the cyclical trimming of lateral and feeder lines detailed in Figure 2, FPL performs targeted trimming of circuits identified as critical infrastructure between normal trimming cycles. For example, in 2007, FPL trimmed 5,271 circuit miles in mid-cycle to address conditions most likely to cause an interruption before the next regularly scheduled trimming cycle. Also in 2007, FPL identified and trimmed numerous hotspots to deal with specific trouble locations rather than entire line segments. Hotspots include customer-reported trouble locations. FPL trimmed 19,118 hotspots on service laterals and 167 hotspots on feeders in 2007.

In 2007, PEF exceeded its annual goal for number of miles trimmed, and the company is on schedule to meet the vegetation management goals associated with its Commission-approved trim cycle. Additionally, 12,253 hotspot trims were performed on feeders, and 18,247 were performed on laterals in 2007. PEF developed a feeder prioritization model to minimize tree

caused outages by ranking feeders based on such factors as number of customers per mile, percentage of outages on backbone feeders, customer minutes of interruption caused by trees, and past performance. PEF removed 1,146 trees identified as priority candidates, while another 306 identified trees were trimmed rather than removed because the trees were located on private property and the owners refused PEF's request for removal.

TECO manages over 6,100 miles of distribution and 1,200 miles of transmission lines over 5 counties within Florida. During 2007, TECO increased total miles trimmed by 15 percent over the prior year. The company has implemented a new procedure that routes all externally based tree trim requests to TECO's Customer Service–One Source Department to be put into the work order management system. Line clearance personnel or contractors conduct a field inspection and make contact with the customer prior to taking any action. Approximately 63 percent of all customer driven tree trim requests processed under this new procedure resulted in some form of tree trimming. The balance of the requests did not require immediate action or were not TECO facilities. Efficiencies associated with implementation of this process combined with the company's increased efforts to work with local communities on vegetation management issues likely account for the slight decrease in the number of tree trim requests TECO received from its customers in 2007. TECO performed hotspot trims 322 times on feeder lines and 2,901 times on lateral lines in 2007.

In 2007, GULF inspected every mile of its main line distribution system and performed maintenance trimming on one-third of its feeder miles. Annual schedules are established based on company reliability reports, field patrol data, and customer feedback to ensure that the worst performing lateral circuits are identified and scheduled for maintenance. In addition to the cyclical trimming of lateral and feeder lines detailed in Figure 2, GULF performed 139 hotspot trims on feeder lines and 737 trims on lateral lines in 2007. GULF also identified and removed 13,100 hazard trees adjacent to distribution system right-of-way corridors.

FPUC's vegetation management plan was modified, stipulated to by the parties, and approved by the Commission in the company's joint storm hardening and rate case proceeding (Docket No. 070304-EI). The company's total budget for tree trimming in 2007 was $527,507, and FPUC will incur no additional expenses for tree trimming in 2008 as no additional crews will be required.

Of the thirty-three municipal electric utilities reporting on their vegetation management programs, the majority trimmed all distribution lines annually. Trim cycles for distribution lines ranged from one to four years. If not performing vegetation management on an annual basis, cities usually complete trimming and inspection for vegetation growth on about one-third of their distribution system each year. Thirty-one of the thirty-three utilities reporting were up-to-date with work completed as scheduled. Two cities were still developing their vegetation management schedules. Specific information on the vegetation management reports of municipal electric utilities appears in Appendix D (page 35).

Seventeen rural electric cooperatives provided data on their vegetation management programs. Trim cycles for transmission lines range from one to three years, while trim cycles for distribution lines ranged from three to six years. All cooperatives are on schedule to complete

the trim cycles defined in their plans, based on the trimming accomplished in 2007. Specific information on the vegetation management reports of each rural electric cooperative utility appears in Appendix E (page 41).

Joint-Use Attachment Agreements

In order to ensure that the facilities of third-party attachers were not overburdening poles and impairing their structural integrity, the Commission ordered each IOU to establish a plan for assessing the strength of its poles including the impact of attached facilities.[5] The Commission determined that these assessments should be conducted as part of each IOU's pole inspection program.[6] During these inspections, the IOUs also verify that each attachment is authorized based on a legitimate agreement between the IOU and the third-party attachers.

Third-party attachers *are telecommunications and cable companies that attach wires and cables to electric poles to serve their own customers. Each attachment has an impact on the overall strength of the pole.*

It appears that joint-use processes and procedures, along with cooperation from joint pole owners and third-party attachers, are resulting in properly maintained joint-use facilities since no problems have been observed at this time.

Approximately 20 percent of FPL's jointly used poles (feeders and laterals) are audited annually, resulting in all joint-use poles being audited on a 5-year cycle. FPL performs loading assessments on each pole at the same time it performs strength tests to determine compliance with NESC standards. FPL inspects its poles based on the NESC Grade B standard, while other Florida investor-owned electric utilities use the Grade C standard. The loading assessment is based on a combination of field measurements, span length, attachment heights (including third party attachments) and wire sizes. In 2007, FPL found that 2,602 of the 128,885 poles inspected were overloaded due to attachments. However, only 20 of the 2,602 poles would be considered overloaded under Grade C NESC standards. FPL is coordinating with attachers to ensure that all overload conditions either have been or will be corrected no later than December 2008.

PEF performs a full system audit of its joint-use pole attachments every 5 years. Partial system audits are conducted annually. PEF audited 100 percent of its transmission and distribution system in 2007. Of the 755,893 distribution poles with attachments that PEF inspected, 299 failed the strength test and were either replaced (30) or strengthened by adding a down guy wire (269). Of the 6,011 transmission poles with attachments that PEF inspected, 105, or 1.7 percent, were determined to be overloaded. PEF is reviewing these 105 transmission poles further using exact wind speeds and the weight spans of attachments and will replace or otherwise modify the poles after consultation with attachers.

To identify unauthorized attachments, TECO audited 25 percent of its system in 2007 and expects to complete audits by fourth quarter 2009 and thereafter continue a 3-year cycle. TECO

[5] Order No. PSC-06-0351-PAA-EI, issued April 25, 2006, in Docket No. 060198-EI.
[6] Order No. PSC-06-0781-PAA-EI, issued September 19, 2006, in Docket No. 060198-EI.

has also streamlined its receipt, review, and authorization processes to better manage applications it receives to attach facilities to electric utility poles. TECO's review includes engineering assessments, loading analysis, and confirmation of compliance with the more stringent of either NESC or TECO electric construction standards. In 2008, TECO plans to integrate these processes with its geographic information system (GIS). Out of the 5,049 poles TECO assessed through the pole attachment application process and the comprehensive loading analysis, 910 poles were found to have NESC violations due to joint-use attachments, and 107 poles had NESC violations due to TECO attachments. All poles with NESC violations were either corrected through adjustments to attachments, pole replacements, or by joint-use entities' removal of the attachments in violation.

GULF performs a joint-use inventory audit of its distribution poles every 5 years. The last audit was performed in 2006 and covered 100 percent of the overhead distribution system. GULF has also initiated an annual program to perform pole strength and loading analysis of 500 poles located along major evacuation routes. This audit is focused on poles that are 20 or more years old and have at least 3 attachments by third parties. GULF performed strength tests on 500 distribution poles, 41 of which were determined to be overloaded. All 41 overloaded poles were replaced, shored up by setting additional poles, or completely removed along with the attached facilities.

In 2007, FPUC continued with the same wood pole inspection program it had performed in previous years, completing inspections of 2,798 poles. FPUC's pole inspection program in accordance with its storm hardening plan began in 2008 after the Commission rendered its decision in the company's rate case proceeding. A total of 3,050 poles per year will be inspected to complete an eight-year inspection cycle. FPUC has budgeted $20,909 for audits of joint-use pole attachments in 2008.

Transmission Structure Inspection Program

Transmission structures are the backbone of the electric system.

The Commission required each IOU to establish a plan, an implementation timeline, and a calculation of rate impacts to fully inspect all transmission towers and other transmission line supporting equipment on a six-year cycle. Some of the methods utilities use to conduct these inspections are ground patrols, aerial infrared patrols, above ground inspection, and substation inspections. Inspections of some structures, such as substations, are performed more frequently than every six years. Other types of inspections are dictated by events, such as a pre-climb inspection that is performed on any transmission structure prior to commencing work.

Overall, FPL inspected approximately 13,500 or 20 percent of all its transmission structures in 2007. These inspections included all 468 of the company's distribution substations and all of its 89 transmission substations. Over half of FPL's 949 total transmission circuits and approximately 25 percent of its non-wood transmission towers were inspected in 2007. The number of inspections completed puts FPL ahead of schedule to complete its 6-year inspection cycle. Strength tests FPL conducted on 3,535 transmission poles in 2007 resulted in 13 poles failing due to overload and 581 failing for other reasons. In 2007, FPL replaced 9 of the overloaded poles and 352 of the poles that had failed inspection for other reasons. FPL plans to conduct strength testing on 3,955 transmission poles in 2008. FPL's inspections also resulted in the replacement of 339 existing single pole, un-guyed wood transmission structures and 773 ceramic post insulators on concrete poles during 2007. FPL plans to replace 229 single pole, un-guyed wood transmission structures and 443 ceramic post insulators during 2008. FPL's plans call for upgrading all wood structures to current standards within 25 years. Wood pole replacements will be coordinated and engineered with system expansion projects, line relocations, pro-active maintenance rebuilds, and storm hardening projects. Upgrading entire line sections should result in a more effective overall hardening of the system and have a greater impact on overall system integrity as opposed to the localized improvements under the current approach.

PEF completed inspections of all 461 of its transmission substations in 2007. Of PEF's 432 total transmission circuits, 159 or 37 percent were inspected in 2007. PEF inspected 5 percent of its 3,431 transmission towers in 2007. Ground inspections were conducted on 13,496 transmission pole structures during 2007, and PEF plans to inspect 10,075 wood, steel, and concrete transmission structures in 2008. PEF records show that 1,340 transmission poles failed inspection for reasons other than overloading, and 956 of these transmission poles were replaced in 2007. The remaining transmission poles that need to be corrected have been prioritized based on the status of the poles, and PEF is working through these corrections.

TECO is in the process of systematically replacing wood transmission structures with non-wood structures during annual maintenance reviews. Non-wood structures will be used for all new transmission line construction projects as well as system rebuilds and line relocations. In 2007, TECO hardened 524 structures at a cost of $7.5 million. This hardening work included 397 structure replacements with steel or concrete poles and 127 sets of insulators replaced with polymer insulators. In 2008, TECO's goal is to harden 660 transmission structures with a budget of $10.8 million. In 2007, TECO also conducted above-ground and groundline inspections on

approximately 17 percent of its transmission system. Additionally, all of TECO's 230 kV and 138 kV circuits and all critical 69 kV circuits were visually inspected during ground patrols at least once in 2007. TECO also performed an aerial infrared patrol on all of its transmission circuits in 2007. Standardized reports are generated for all formal inspections and deficiencies identified during the inspections and are entered into a database which is used to prioritize and manage required remediation.

GULF conducts inspections of its transmission structures on a 6-year rotating cycle between the comprehensive walking, steel ground-line, and wood ground-line inspections. GULF is installing guying on all H-frame structures not currently guyed. The installation of guying increases the probable load to failure rate of the structure. In 2007, guys were installed on 150 H-frame transmission structures. Installation of the transmission guys will be completed by December 2012 at a total estimated cost of approximately $1.5 million. GULF has also begun a program to replace all wooden cross-arms on H-frame structures with new steel arms for additional strength. During 2007, 192 cross-arms were replaced, leaving 727 more to be replaced by December 2017 at a total estimated cost of approximately $3 million.

FPUC completed inspections of 100 percent of its transmission circuits and towers and 92 percent of its transmission substations in 2007. FPUC will be implementing a program to test the strength of its transmission poles by the end of 2008. The cost associated with activities performed in 2007 was $18,540.

Transmission and Distribution Geographic Information System (GIS)

After holding workshops with electric utilities in 2006, the Commission determined that IOUs needed to include more location specific information on the performance of facilities. The Commission ordered electric utilities to develop a transmission and distribution geographic information system (GIS) to more accurately track and evaluate locations impacted by extreme weather.

In 2007, FPL made improvements to its systems to better collect and store asset data for its distribution system. For example, in 2007, FPL incorporated asset data from 115,000 pole inspections into its existing GIS-based Asset Management System. Data on post-hurricane forensics, pole inspections, joint use data, and other information associated with hardening activities will eventually be included in the company's distribution GIS system.

Geographic Information Systems (GIS) *integrate hardware, software, and data to capture, manage, analyze, and display information essential to managing electric utility services.*

PEF manually collects location information on its distribution poles during forensic inspections in the field and makes this data available for analysis through its GIS applications. Forensic data collected on transmission facilities is identified and cataloged by the structure number or GPS coordinate. The failure data can then be correlated with the data contained in the MapInfo GIS system. The maintenance history of the poles and structures will be populated in the GIS system.

TECO is in the process of implementing a GIS that will contain all facility data for its transmission, substation, distribution, and lighting facilities. Implementation should be complete by the summer of 2008. Use of the GIS should enhance many areas of the company's operations including post-storm damage assessment, forensic analysis, joint use administration, and evaluation of construction standards and potential hardening projects. TECO's cost for this project totaled $1.8 million in 2007, and TECO has budgeted $4.8 million in 2008.

GULF has completed its mapping transition to its new Distribution GIS. Combined with use of forensic data, GULF believes the new system will provide sufficient information on its distribution facilities to assess performance of its overhead system in the event of a major storm. GULF is currently in the process of entering its transmission assets into its GIS system. Over 50 percent of total transmission assets have been entered, and the company expects to incorporate all information into the GIS database by 2012.

FPUC has installed a GIS mapping and customer outage system in both the Northeast and Northwest service areas at a cost of $38,000.

Post-Storm Data Collection and Forensic Analysis

Forensic analysis is key to understanding the causes of storm related outages.

The Commission required each IOU to include the methods it would use to collect detailed outage data in its storm hardening plan. Improving these methods will allow a more meaningful analysis to be conducted and provide a more accurate measurement of overhead vs. underground service reliability during severe weather. The Commission expects that utilities will be able to combine their improved data collection methods with the geographic information systems described above to produce a post-storm analysis that is superior to what was previously available. No forensic teams were deployed in 2007 or to date in 2008 because no major storms impacted Florida.

FPL incorporated a forensic module into its existing mobile mapping and field automation software, so forensic teams could use one single software tool for their forensic work. Storm performance results will be obtained from these forensics and available storm work tickets. Since almost all of FPL's distribution feeders are hybrids (i.e., they contain both overhead and underground facilities) FPL will use laterals as a proxy for assessing overhead versus underground system performance.

PEF estimates total 2007 costs to consolidate and upgrade the GIS system as $1,270,000. As of March 1, 2008, the company had placed all of its overhead and underground distribution facilities in the GIS. In addition, all 58 miles of PEF's underground transmission assets and 95 percent of PEF's overhead transmission assets were included in the GIS system. PEF has established a forensics team and database format to collect information on distribution and transmission facilities following storm events. During field observations, forensic assessors will collect information regarding damaged poles. New measurements will allow PEF to record, analyze, and determine the cause and correlating factors regarding distribution and transmission poles damaged during storms.

TECO has established a process for collecting post-storm data and conducting a forensic analysis. In 2007, TECO established a forensics team to perform a post-storm forensic analysis to determine the root cause of damage. The analysis will be done by gathering data using a statistically significant representative sample of damage. TECO's existing data sources will form the basis of a database of distribution and transmission structures and facilities. Using the database will allow TECO to understand the total facilities exposed to storm conditions in a given area in order to effectively analyze the extent of damage.

GULF collects post-storm field data via hand-held computers. As outages occur, GULF records data on pole type (concrete or wood) and type of underground cables (direct buried, cable injected, or in conduit). The field data can then be analyzed to form the basis of a report that contains textual, tabular, and graphical information. GULF also assesses damage to the transmission system with aerial patrols by fixed wing aircraft and follow-up patrols by helicopter to capture and record GPS coordinates for each failure. Existing outage management software was modified to collect and record this data in 2007. Further software expansion may take place in 2008, depending on what type of added information is determined to be of value for making comparisons. GULF reported minimal costs for this initiative since existing systems and processes are used.

FPUC currently collects outage data for both its Northeast and Northwest service divisions and reports no incremental costs associated with this activity.

Utility Coordination with Local Governments

Most hardening efforts impact rights-of-way and easements.

Although utilities have generally established successful and productive working relationships with the communities they serve, after receiving comments from city and county government representatives, the Commission noted a need for improved communications in matters of mutual concern such as tree trimming, hazard mitigation, and undergrounding distribution lines.

In 2007, FPL continued its efforts to improve local government coordination with the following activities: using an e-mail distribution network to provide important news and updates to local officials; arranging for local and state officials, including the Governor, to observe FPL's hurricane dry-run event; initiating regional government workshops; and participating in local government hurricane preparedness activities. FPL also initiated a Community Outreach Program to educate communities on topics of interest including service reliability, energy conservation, storm readiness/response, and power generation.

PEF reports more than 70 resources assigned to coordination with local government as part of a community relations emergency planning and response program. There are 17 PEF employees assigned full-time, year round, to coordinate with local government on emergency planning, vegetation management, undergrounding, construction, and other service-related issues. PEF representatives communicate and hold meetings with all county Emergency Operations Centers (EOCs) prior to storm season. During these meetings, infrastructure for priority restoration is identified. In 2008, PEF plans continued enhancement of its capability to

produce detailed electronic outage information to county EOCs during storm events. PEF participates in many community hurricane and storm preparedness events held throughout its service territory to inform the public and encourage appropriate storm preparation by residents and businesses. PEF is also participating in numerous events being held for city and county first responders (emergency, fire, and law enforcement) during 2008.

TECO has assigned personnel from its Community Relations Department to each of the local governments it serves. These Community Relations representatives engage in ongoing discussions with local officials regarding critical issues such as storm restoration, underground conversions, and vegetation management. Prior to the 2007 hurricane season, TECO made presentations on emergency preparedness to government officials and emergency response leaders from Hillsborough, Polk, and Pinellas counties, and the cities of Plant City, Temple Terrace, Lake Alfred, Mulberry, and Winter Haven. Presentations were also made to federal and state officials, and meetings were held with the Florida Division of Emergency Management. Locally, the company participated in "Hurricane 2007," a Hillsborough County Storm Response Conference for Hispanic customers. Other communications during 2007 included hurricane season news releases, brochures, hurricane guides published in local newspapers, and a variety of informational postings to the company's web site. TECO also used these methods to educate local governments, communities, homeowners associations, and customers on the advantages and drawbacks of underground conversions and how interested entities can initiate a project to convert their electric service from overhead to underground.

GULF maintains year-round contact with city and county officials regarding planning and coordination of activities such as new service hook-ups, permits, facility planning, vegetation management, construction, right-of-way maintenance, and infrastructure needs. Within each community in its service area, specific GULF employees are designated to interact with city, county, military, and business leaders. District managers maintain regular contact with government officials regarding emergency preparedness and infrastructure needs at the federal, state, and local level. GULF works closely with County EOCs on storm preparedness and restoration activities. During 2007, GULF personnel participated in five hurricane drills in Escambia, Santa Rosa, Okaloosa, and Bay counties.

FPUC reports that field crews and supervisors work with local government personnel on a daily basis while completing normal construction and maintenance activities. FPUC managers and supervisors routinely communicate with local governments regarding vegetation management, relocation of facilities, and other issues that affect utility operations. For example, FPUC participates on the City of Fernandina Beach Utilities Board which is conducting a study of the practicality of undergrounding overhead lines.

Collaborative Research

In 2006, the Commission determined that although individual utilities and universities were engaged in independent research efforts to study the effects of hurricane winds and storm surge, a more coordinated effort would likely

Many impacts of storm related damage remain unknown. Research may result in new or improved hardening solutions.

yield greater benefits to Florida citizens. Consequently, the Commission's storm hardening initiatives included a directive for utilities to coordinate with universities on research efforts. The five IOUs, the Florida Municipal Electric Association, and the Florida Electric Cooperatives Association (collectively, the Project Sponsors) are coordinating their research efforts through the Public Utility Research Center (PURC), located at the University of Florida. The costs the Project Sponsors have incurred for the research projects are provided in Appendix F (page 44).

Several research projects are in various stages of completion. In 2007, PURC produced a report outlining utility best practices for vegetation management based on a workshop attended by IOUs, municipals, electric cooperatives, and regulatory staff. Long-term research on the effects of hurricane winds is an ongoing project being conducted through the University of Florida in partnership with a private vendor, WeatherFlow. PURC and the Project Sponsors hired Quanta Technology (formerly InfraSource Technologies) to research, develop, and test methodologies to identify and evaluate the costs and benefits of undergrounding distribution facilities and to study the effects of hurricane winds. The first two phases of Quanta's undergrounding research have been completed. A synopsis of each of these studies was provided in the July 2007 report and the February 1, 2008 Addendum. The final phase is the development of a model for projecting the benefits and costs of converting overhead distribution facilities to underground. This model is discussed in more detail in Section III.

Natural Disaster Preparedness and Recovery Program

No system can be designed to withstand every storm. Utilities and customers must have a plan to recover from a natural disaster.

A key element in mitigating storm-caused outages is having a natural disaster preparedness and recovery plan. A formal disaster plan provides an effective means to document lessons learned, improve disaster recovery training, conduct pre-storm staging activities, plan post-storm recovery, and ensure that data is collected for forensic reviews and performance assessments. An element common to all utilities' plans is the provision of accurate and timely information to its customers. Utilities reach out to customers through print and digital media, providing tips about storm preparation and safety through bill inserts, television, radio, and internet communications.

FPL's emergency plan covers its overall emergency processes and includes procedures for capacity shortages, severe storms, and long-term fuel supply shortages. Those processes describe the planning activities, restoration work, public communications, coordination with government, training, practice exercises, and lessons learned evaluation systems that FPL uses to prepare for, respond to, and follow up on emergencies.

PEF's disaster preparedness plan is updated annually and includes disaster recovery training, pre-storm preparation and staging activities, post-storm recovery plans, lessons learned, and plan modifications. The plan ensures that all employees are informed and aware of the roles they serve in the event of a major storm. An important feature of the plan is the incorporation of internal feedback and customer survey responses to document and apply the knowledge gained from experience.

TECO's Continuity of Operations and Emergency Contingency Response Plan details the procedures for responding to security, safety, environmental, and other types of emergencies or

hazards. TECO's plan can be activated on a stand-alone basis to address a localized emergency or system-wide for an emergency affecting the entire service area. Some functions TECO has identified as critical to supporting the company's tactical response are security, human resources, corporate communications, finance, legal, regulatory, and community relations. These and other critical functions must be ensured during an emergency to allow TECO to effectively respond. TECO appears to have established a current and reliable emergency plan with an incident command system in place, ready to be activated at any time.

GULF has developed and refined its planning and preparations for the possibility of a natural disaster by building on what has worked well and improving areas that have been less effective. For 2008, GULF incorporated several modifications into its Storm Preparedness and Recovery Plans: placing a core group of employees in the company's recently constructed bunker facility in the event of severe weather to ensure their safety; moving fleet maintenance personnel from a temporary facility to a new, more centrally located facility; and relocating the primary staging site for fuel tankers to a site that provides better access to the Interstate 10 corridor to allow fuel requests to be dispatched more efficiently.

FPUC reports that it is continuing to make improvements to the disaster preparedness plans the company will use in the event of severe storms in its service territory. Such plans include placing utility personnel at local EOCs during major storms. Given that the Northeast Florida Division is an island and is subject to evacuation by local officials, FPUC has divided its employees into two teams, First and Second Responders. The First Responder Team will evacuate and return as a single unit to ensure that FPUC has intact the critical personnel necessary to assess damage and initiate power restoration in the event of a major storm or hurricane. FPUC reports no incremental costs associated with its ongoing activities for disaster preparedness and recovery.

Section III. Undergrounding Initiatives and Issues

While most new distribution facilities are placed underground, customers must consider many factors before pursuing conversion of overhead facilities to underground.

Research has shown that placing distribution lines underground does decrease certain types of day-to-day outages, such as those caused by tree limbs and animals. However, research also documents that when outages do occur, they are often of longer duration if underground service is involved, since both locating and repairing the outage take longer. Current research on undergrounding is further discussed in the section describing collaborative research between utilities and universities.

Measuring the Impact of Undergrounding on Reliability

Comparisons that Florida utilities have been able to make with regard to the performance of existing overhead and underground service have been limited. The reliability indices that utilities have traditionally used to gauge system performance are useful measures but imperfect tools for determining the impact of undergrounding on reliability. Differentiating between overhead and underground reliability performance is also problematic because underground facilities are typically connected to overhead facilities to form a total interconnected system that is assessed by the reliability indices.

Reliability Indices

Customer Average Interruption Duration Index (CAIDI) *Average amount of time a customer is without power per interruption.*

System Average Interruption Frequency Index (SAIFI) *Number of times the average customer experiences an interruption lasting 1 minute or longer.*

System Average Interruption Duration Index (SAIDI) *Number of minutes the average customer is without power during a specific event lasting 1 minute or longer.*

L-Bar
Average duration of outage events.

The Commission recognized that reliability measures were needed that would encompass events such as severe storms and hurricanes in order to determine whether placing electric facilities underground was having an impact on reliability. To collect reliability data that would accurately reflect customers' actual outage experience during extreme weather events, the Commission needed to monitor more than the normal daily system reliability data. Consequently, in 2006, the Commission revised Rule 25-6.0455, F.A.C., to require each IOU to provide both actual and adjusted reliability performance data on an annual basis.

The majority of FPL's customers are fed from circuits that are a hybrid of both overhead and underground. Therefore, FPL has devised a classification system based upon the percentage of combined feeder and lateral underground miles to determine reliability performance. FPL classifies 182 feeders as overhead, 378 feeders as underground, and the remaining 2,505 feeders as hybrids. Historically, the underground system has had a better SAIDI

performance than overhead, driven by a better SAIFI score. Also, the CAIDI associated with underground systems has performed in line with overhead systems due to the nature of FPL's looped underground system, which allows for sectionalizing during each restoration event. Not surprisingly, the metric in which underground systems perform worse than overhead systems is the L-bar, which accounts for the average minutes out per interruption.

PEF has a process in place to separately track the reliability of overhead and underground systems under hurricane conditions. An internal hierarchy in PEF's outage management system models how all of the company's facilities are connected to each other. The system shows the connection from the feeder breaker down to the individual transformer, as well as which customer is tied to which individual transformer. PEF's geographical information system provides several sets of data and information points regarding the company assets. PEF uses these systems to help analyze the performance of many types of overhead and underground assets such as breakers, switches, transformers, and conductors. As part of this process, the location of each feeder circuit point is determined by approximating the geographic midpoint of each circuit. No hurricanes or named storm events occurred in PEF's service territory either in 2007 or to date in 2008. In the future, outages experienced as a result of a named storm will be extracted from system data. From this data, PEF will be able to calculate the percentage of customers interrupted per feeder circuit for both overhead and underground facilities, make appropriate comparisons, and generate graphic representations.

A review of the past five years of PEF's reliability indices shows that underground SAIFI (frequency) is historically less than half of overhead, while underground duration (CAIDI) has been almost double that of overhead. Because of these observations, PEF believes that performing underground construction projects for reasons other than aesthetics should be limited to specific targeted areas. For example, some areas in PEF's service territory are subject to frequent and prolonged flooding resulting in potential safety hazards and damage from water intrusion on underground equipment. In other areas, such as some coastal communities in Pinellas County, PEF has worked with local governments to identify areas where overhead facilities should be placed underground to help mitigate storm outages caused by vegetation and flying debris. PEF identified 24 overhead to underground conversion projects it had either completed or planned to complete as part of its storm hardening plan.

TECO completed an overhead to underground comparison reliability report after Tropical Storm Barry, the only storm that impacted its service area during 2007. TECO's report is organized by operating region and includes the number of outages, cause, duration, and restoration time. As expected, the data collected reveals that the overhead system experienced more outages than the underground system during Tropical Storm Barry, 203 and 14, respectively. Also, the outages on the overhead system averaged 238 minutes in duration compared with 410 minutes for underground systems and a 249 minute system-wide average outage duration. Finally, during Tropical Storm Barry, restoring service to underground facilities took over twice as long (171 minutes) as for overhead facilities (75 minutes), compared with a system wide average restoration time of 76 minutes.

GULF has implemented additional record keeping and analysis and now collects data with regard to whether underground cable is direct buried, cable injected, or in conduit. For

overhead lines, whether the pole is concrete or wood is noted. This data is collected as outages occur. Since 2007 was the first year of collecting data with this level of detail, no meaningful observations can be made at this time. GULF is in the process of reviewing its data collection systems to determine whether further expansion is warranted during 2008.

FPUC indicates that it currently collects outage data for overhead and underground systems throughout its service territory.

Specific Overhead to Underground Conversion Projects

Many communities and local governments, as well as individual customers, are interested in having overhead electric distribution lines placed underground for aesthetic reasons.

The cost difference between overhead and underground service is recovered from customers requesting underground service in the form of a contribution-in-aid-of-construction (CIAC).

FPL reported 24 government sponsored overhead to underground conversion projects over the past 5 years. Two projects have been completed. Customers paid $55,632 in CIAC charges for the City of Jupiter Island project completed in 2006. The City of Flagler Beach project required $275,982 in CIAC charges and was completed in 2007. Twenty projects are in engineering design and two projects are currently in construction. In addition, FPL has provided 61 conceptual (ballpark) cost project estimates for various governmental sponsors. Non-government sponsored overhead to underground conversions are not presently tracked by FPL. The number of customers served by a particular project has not been tracked in the past, but FPL intends to record this information in the future.

PEF reports an increased level of interest in undergrounding by communities in 2007. There were 32 projects completed in 2007, totaling 9 circuit miles placed underground. Overall, 12,790 of PEF's primary circuit miles are underground, representing 41 percent of all circuit miles. PEF reports a total of 208 overhead to underground conversions completed between January 1, 2003 and March 10, 2008, involving both residential and commercial distribution service. Five conversion projects have been completed to date in 2008. Customers paid $147,453 in CIAC charges for the 2008 conversion projects. PEF also reports that it has 102 requests for conversions open in various stages of consideration. PEF has not had any projects to convert transmission service from overhead to underground.

TECO has not performed any major overhead to underground conversions in the last five years. However, the company has two pending underground conversion projects. The cities of Temple Terrace and Oldsmar both requested and were provided with detailed estimates on underground conversions in redeveloping portions of their cities. Agreement was reached on a three-phase conversion process in Oldsmar that will be ongoing in 2008. The city of Temple Terrace project involves approximately 2,550 feet and will indirectly impact 1,950 customers. The differential cost of the project is estimated at $760,000, and will be paid by the city. Several small conversion projects are being considered in other areas, but details have not been finalized.

During 2007, GULF completed 4 projects that placed 4.61 miles of overhead feeder lines underground in Pensacola, Destin, and Panama City Beach. CIAC costs for the projects completed in 2007 totaled $9.7 million. Additional projects expected to be completed in 2008 include 1.24 miles in Pensacola and Panama City Beach.

FPUC has only had one request to convert overhead facilities to underground. The owner of a marina requested that FPUC bury approximately 250 feet of overhead primary distribution three phase line so sailboats could be transported between adjacent segments of the marina. The entire project took 2 weeks, and the customer paid $18,342 in differential costs. FPUC has no undergrounding projects pending.

Encouraging Undergrounding Through Utility Tariffs

FPL and PEF have filed updates to their underground differential tariffs for new construction to reflect the cost of hardening as well as operation costs, including storm restoration costs. Tariffs for both utilities were filed on April 1, 2008. The Commission expects to complete its review of the tariffs by mid summer. Cost estimates for conversions of overhead to underground facilities are handled on a case-by-case basis, pursuant to Commission rules which require calculations to include the impacts of storm hardening and operation costs.[7] For conversions requested by government entities, FPL offers a Governmental Adjustment Tariff (GAF) which provides a 25 percent discount to the otherwise applicable CIAC, to reflect storm restoration savings attributable to underground facilities. Originally approved on a pilot basis, the Commission recently approved FPL's request to extend the tariff through October 30, 2009 to gather more data to determine if the 25 percent accurately reflects the savings realized. At least 60 days prior to expiration of the tariff, FPL will file a report to provide the Commission with updated quantification of storm-restoration benefits based on any new storm-restoration data. Based on the analysis contained in the report, FPL will petition the Commission at that time to continue, modify, or discontinue the tariff.

The GAF tariff was developed because community leaders in FPL's service area indicated that cost was a major barrier to initiating underground conversion projects. The GAF tariff's goal is to lower storm restoration costs to all customers by providing an incentive for community-wide conversions. Local governments are in the best position to fulfill the GAF requirements since they are best able to guarantee the necessary 100 percent customer conversion participation, while other entities face significant logistical, and potentially legal, obstacles to ensuring such compliance. Local governments are also favorably positioned to facilitate the construction through managing permitting, securing locations for the underground facilities, and coordinating the negotiations with other utility providers. In order to deliver the storm restoration cost reductions as quickly as possible, FPL wants to pursue projects in the near-term that have the highest chance for successful completion.

[7] Rules 25-6.0342 and 25-6.115, Florida Administrative Code.

Development of Future Planning Tools

Even though utilities have attempted to quantify the costs and benefits of undergrounding in the past, no single formal mechanism has been in use industry-wide. Consequently, as described in the preceding section on collaborative research, the Commission directed utilities to coordinate with universities on research efforts.

Decisions about overhead to underground conversions require site specific information and assumptions.

Phase 1 of this research effort included a thorough review of the existing quantitative research on the subject of converting overhead electric distribution systems to underground to determine if a mechanism for calculating costs and benefits of undergrounding that could meet the needs of Florida utilities and customers existed. Analysis of the research literature led to the following general observations:

- Undergrounding is not justified based on quantifiable benefits
- No state requires undergrounding of existing facilities
- Few studies address negative impacts
- Few studies consider strengthening existing overhead systems
- *Ex post* analyses on actual undergrounding projects have not been done
- Current storm system and equipment reliability models are not sufficient for developing a cost/benefit methodology

Phase 2 of the research project examined actual case studies of overhead-to-underground conversions in four areas of Florida:

- Pensacola Beach (Gulf Power Company)
- Sand Key (Progress Energy Florida, Inc.)
- Allison Island (Florida Power & Light Company)
- County Road 30A (Choctawhatchee Electric Cooperative, Inc.)

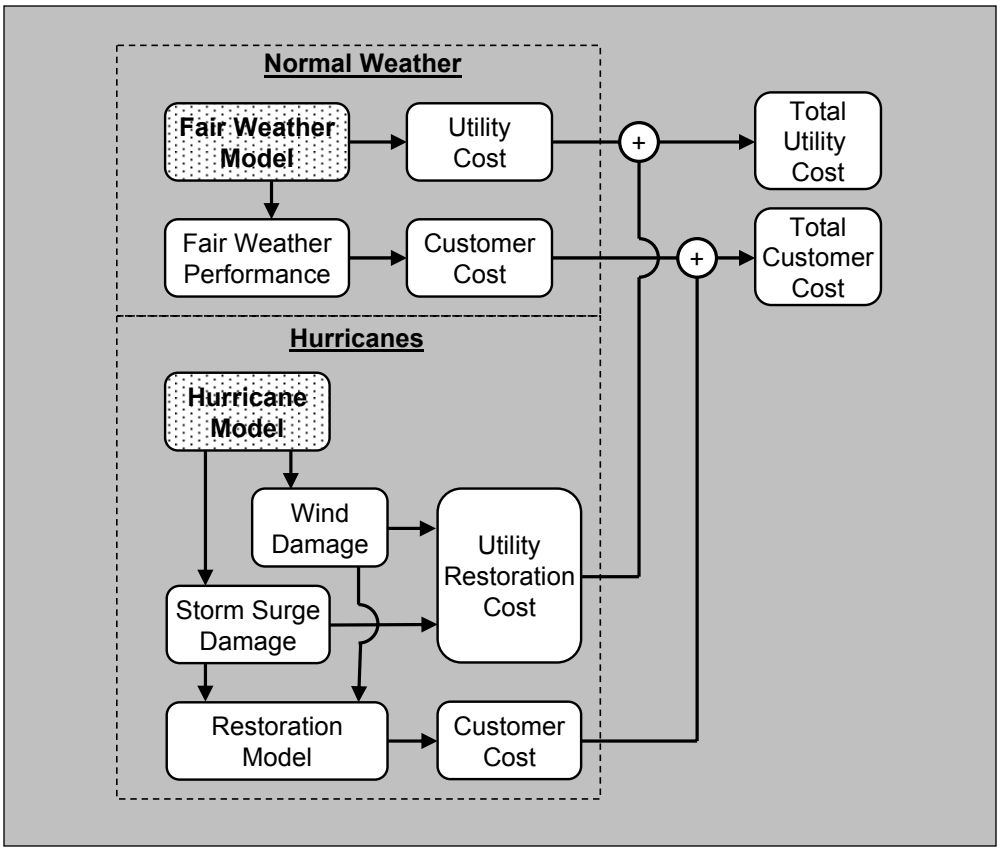
A review of the projects substantiated the conclusions reached in the Phase 1 literature review. The initial cost to convert overhead distribution to underground is high, and there is insufficient data to show that this high initial cost is offset by quantifiable benefits such as reduced operating and maintenance cost savings and reduced hurricane damage. Increased data collection can potentially increase knowledge about the amount of quantifiable benefits, but it is unlikely that these benefits will fully justify the high initial cost, unless an underground system

was struck by multiple severe hurricanes. Based on the case studies, by far the strongest reason for undergrounding is to improve the aesthetics of the area.

Phase 3 of the project develops and tests a methodology for analyzing the costs and benefits of specific undergrounding proposals in Florida. Often undergrounding proposals are either pursued or rejected without a systematic analysis of costs and benefits. At the request of the Project Sponsors, Quanta Technology developed a methodology that attempts to add consistency and thoroughness to these types of analyses. The methodology is implemented in a spreadsheet application that utilities may use as a tool for modeling various project design scenarios. The complete report is available from the Public Utility Research Center's website at http://www.cba.ufl.edu/purc/research/energy.asp.

The methodology is separated into two basic components: a normal weather assessment and a hurricane assessment. The normal weather assessment includes the basic cost of utility capital and operational cost information. It also includes high-level reliability information that allows for the calculation of customer interruption information and related costs. A flowchart presenting an overview of the methodology is shown in Figure 3 below.

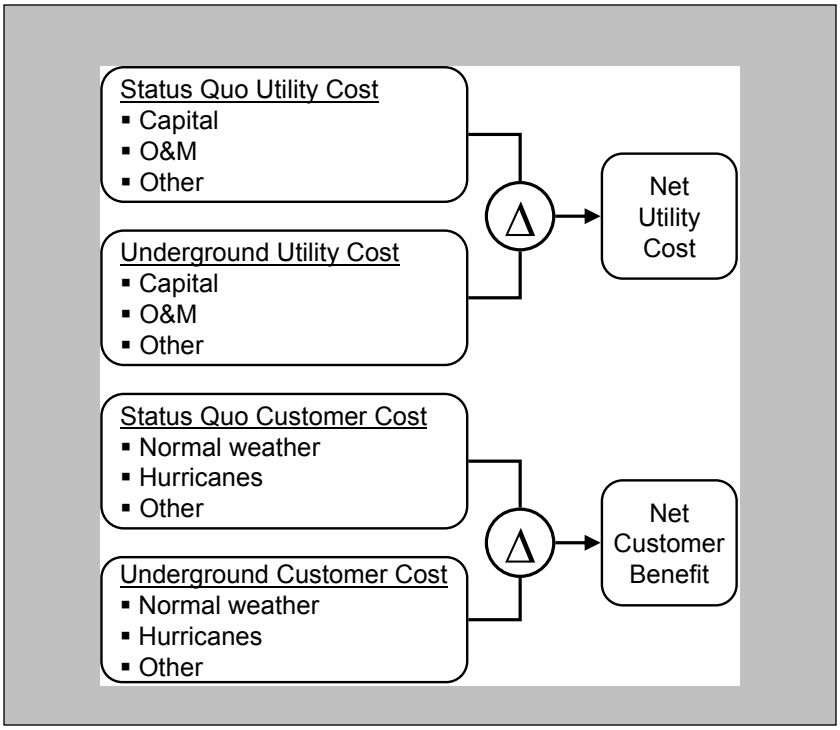
Figure 3. Overview of the Methodology for Analyzing Costs and Benefits



Source: Quanta Technology

The model is designed to compare two scenarios, typically, the status quo scenario and a proposed undergrounding option. Hurricane simulations are performed automatically for both cases so that costs and reliability differences can be compared. This approach is illustrated in Figure 4.

Figure 4: Approach to Costs and Benefits Calculation



Source: Quanta Technology

When considering an undergrounding project, a utility will first enter information about the existing system. This data allows the current utility costs, reliability performance, and customer costs to be calculated. The utility also enters information about the undergrounding project, including the initial costs, annual costs, annual savings, and so forth. The assessment is then able to simulate the performance of the underground system and compute associated underground costs, reliability performance, and customer costs. The difference in utility cost between the status quo and proposed scenario is defined as the "net utility cost." The difference in reliability performance is defined as "net reliability benefit." Reliability benefit translated into customer cost is defined as the "net customer cost." Net reliability benefit and net customer cost, taken together, constitute the "net customer benefit."

The methodology can also be used to compute costs and benefits of activities that have an impact on how electric facilities perform during hurricanes, such as options for hardening of existing overhead systems. For example, the model could help determine if a project should include a redundancy feeder to improve the feeder reliability. According to Quanta Technology, this calculator can also be used to plan hurricane restoration operations in order to maximize the

benefits from an underground conversion. For example, the model may provide useful information that could help determine how to arrange the available crew resources and plan restoration accordingly.

As the model was being developed, the four case studies examined in Phase 2 of the research project, referenced previously, were analyzed to gain insights into how different variables affect the costs and benefits of undergrounding. Based on studies of these four cases, an undergrounding project can either gain benefits or include more costs, depending on the feeder design (e.g., feeder length), geographic location (e.g., different storm surge zones), and actual system restoration practice (e.g., crew availability). However, the creator of the model, Quanta Technology, notes that this analysis is based on *assumed* parameters and cautions that when *actual* utility-provided parameters are input, the methodology is capable of generating an analysis representing actual scenarios.

Testing a Methodology for Determining the Costs and Benefits of Undergrounding

The Commission received a briefing on the model at the June 16, 2008 internal affairs meeting. Each of the four major electric utilities plans to rigorously and comprehensively test the model. The testing may involve applying the methodology to future undergrounding projects in a utility's service area, or other approach that the utility finds appropriate and effective. The status and results of the testing will be reported to the Commission as part of each utility's annual status report filed according to its storm hardening plan approved December 28, 2007.

As utilities begin to use the model, and as additional data becomes available, the model is expected to prove to be a useful tool providing insight and leading to more informed decisions about the placement of utility facilities.

IV. Conclusions

Utilities appear to be on track to meet pole inspection schedules and vegetation management goals. Annual reports, increased data collection, and periodic review of utility storm hardening plans will ensure that utility management actively practices storm hardening. Because no major storms or hurricanes have impacted Florida in the past 18 months, the effects of hardening electric infrastructure on reliability and restoration time have not yet been tested. The utilities should continue the programs described in this report, reviewing them for effectiveness and modifying them as appropriate based on experience gained.

The tasks that the Commission has directed utilities to perform to harden the existing transmission system are interrelated. IOUs, municipals, cooperatives, and incumbent local exchange companies have implemented many overlapping procedures to inspect and repair their facilities and also collect and analyze data to improve the reliability of the Florida electric system. Florida's citizens have been fortunate that no hurricanes and few severe storms have occurred during the past 18 months. The milder weather patterns have allowed utilities to implement inspections and upgrades of critical infrastructure so Florida will be better prepared for future severe weather. Whether utility efforts and investments to storm harden the state's electric infrastructure have improved reliability and restoration time will only be determined however, through trial and experience over time.

Collaborative research on the costs and benefits of undergrounding overhead distribution lines has produced a model that utilities are currently evaluating as a potential tool that utilities and customers can use to determine whether undergrounding a specific location is appropriate. Each of the four major electric utilities plans to rigorously and comprehensively test the model. The testing may involve applying the methodology to future undergrounding projects in a utility's service area, or other approach that the utility finds appropriate and effective. The status and results of the testing will be reported to the Commission as part of each utility's annual status report filed according to its storm hardening plan approved December 28, 2007.

The Commission makes no new recommendations in this report. Electric utilities should continue the programs implemented through the Commission actions discussed in the July 2007 Report.

The Commission will continue to carefully balance the need to strengthen the state's electric infrastructure to minimize storm damage, reduce outages, and lessen restoration time with the need to mitigate excessive cost increases to electric customers.

Appendix A: IOU Pole Inspection Report, 2007

	Total # of Wood Poles in Company Inventory	# of Pole Inspections Planned this Annual Inspection	# Poles Inspected This Annual Inspection	# Poles Failing Inspection this Annual Inspection	Pole Failure Rate (%) this Annual Inspection	# Poles Designated to be Replaced this Annual Inspection	Total # of Poles Replaced this Annual Inspection	# Poles Requiring Minor Follow-up this Annual Inspection	# Poles Overloaded this Annual Inspection	Methods V=Visual E=Excavation P=Prod S=Sound B=Bore R=Resistograph	# Poles Planned for Inspection Next Annual Cycle	Total # Poles Inspected in the 8-Year Cycle To Date	% of Poles Inspected in the 8-Year Cycle To Date
FP&L	1,069,819	120,043	128,885	9,737	7.55%	6,879	7,257	0	2,581	V,E,S,B	133,480	215,015	20.1%
FPUC	25,243	2,798	2,798	223	7.97%	223	226	0	0	V,S,B	3,050	3,773	14.9%
GULF	255,950	32,000	33,026	736	2.20%	667	0	69	41	V,E,S,B	32,000	33,026	12.9%
PEF	836,002	103,650	108,840	5,106	4.70%	2,431	2,086	63,115	404	V,E,S,B,P	103,000	187,612	22.4%
TECO	326,000	42,343	53,532	3,872	7.20%	2,577	2,030	217	768	V,S,B,E	41,617	71,232	21.9%

FPL - Poles are inspected for compliance with National Electric Safety Code Grade B and C Standards.
FPUC - Incomplete data provided with Pole Inspection Report. Request for additional data submitted to company.
PEF - Not all poles that "failed inspection" are in need of replacement. 384 poles are scheduled to be replaced in 1st and 2nd Quarter of 2008. The remaining poles can receive remediation.
TECO - Poles are inspected for compliance with National Electric Safety Code Grade B and C Standards. IJUS is evaluating the 290 Comprehensive Load Analysis Poles from the 2007 Transmission Pole Inspection for Overload in the first quarter of 2008.

Appendix B: Municipal Utility Pole Inspection Reports, January 1, 2007 – March 3, 2008

	Total # of Wood Poles in Company Inventory	# of Pole Inspections Planned this Annual Inspection	# Poles Inspected this Annual Inspection	# Poles Failing Inspection this Annual Inspection	Pole Failure Rate (%) this Annual Inspection	# Poles Designated to be Replaced this Annual Inspection	Total # of Poles Replaced this Annual Inspection	# Poles Requiring Minor Follow-up this Annual Inspection	# Poles Overloaded this Annual Inspection	Methods V=Visual E=Excavation P=Prod S=Sound B=Bore R=Resistograph	# Poles to be Inspected Next Annual Cycle	Total # Poles Inspected in the 8-Year Cycle To Date	% of Poles Inspected in the 8-Year Cycle To Date
City of Alachua	2,773	347	126	1	0.01%	1	1	0	No Data	No Data	347	356	12.83%
City of Bartow	No Data	300	300	40	13.33%	40	40	0	No Data	V	No Data	530	No Data
Beaches Energy Services	4,021	4,021	4,021	164	4.07%	164	164	No Data	No Data	No Data	0	4,021	100.00%
City of Bushnell	No Data	305	305	16	5.25%	16	5	0	No Data	V,S,B	No Data	305	No Data
City of Chattahoochee [8]	1,957	0	0	0	0.00%	0	0	0	0	N/A	0	1,957	100.00%
City of Fort Meade	2,725	342	342	7	2.04%	7	7	No Data	No Data	No Data	No Data	No Data	No Data
Gainesville Regional Utilities	No Data	3,018	3,018	30	0.01%	30	30	0	No Data	V,S,B	No Data	No Data	No Data
Town of Havana	1,169	1,169	1,169	0	0.00%	0	0	No Data	No Data	V	1,169	1,169	100.00%
Keys Energy Services[9]	7,453	7,453	7,453	2,232	29.90%	2,232	274	0	No Data	V,E,S,B	0	7,453	100.00%
Kissimmee Utility Authority[10]	No Data	2,207	5,749	83	1.40%	31	12	52	No Data	V,E,S,B	No Data	7,905	No Data
Lakeland Electric[11]	No Data	10,200	13,670	260	1.90%	223	6	37	No Data	V,E,S,B	No Data	No Data	No Data

[8] City of Chattahoochee inspects all poles every three years. 47 poles have been designated for replacement as follows: 24 poles in 2006, 11 poles in 2007, and 12 poles in 2008.
[9] Keys Energy Services inspected all poles in 2007 and will replace 2,800 poles with concrete poles over a 5-year period. 2011 is the expected completion date.
[10] Kissimmee Utility Authority will replace the remaining 19 poles coordinated with planned outages.
[11] Lakeland Electric has submitted work orders for the remaining poles designated for replacement.

Appendix B: Municipal Utility Pole Inspection Reports, January 1, 2007 – March 3, 2008

	Total # of Wood Poles in Company Inventory	# of Pole Inspections Planned this Annual Inspection	# Poles Inspected this Annual Inspection	# Poles Failing Inspection this Annual Inspection	Pole Failure Rate (%) this Annual Inspection	# Poles Designated to be Replaced this Annual Inspection	Total # of Poles Replaced this Annual Inspection	# Poles Requiring Minor Follow-up this Annual Inspection	# Poles Overloaded this Annual Inspection	Methods V=Visual E=Excavation P=Prod S=Sound B=Bore R=Resistograph	# Poles to be Inspected Next Annual Cycle	Total # Poles Inspected in the 8-Year Cycle To Date	% of Poles Inspected in the 8-Year Cycle To Date
City of Leesburg	10,200	6,220	6,220	163	2.60%	163	163	3,703	No Data	V,E,S,B	3,980	6,220	61.00%
New Smyrna Beach	10,670	700	700	26	3.71%	26	26	0	No Data	V	700	1,285	12.04%
City of Newberry	1,007	0	0	0	0.00%	0	0	0	No Data	No Data	0	1,007	100.00%
Ocala Electric Utility[12]	28,672	3,584	2,728	215	7.88%	112	112	103	65	V,E,S,B	3,584	2,728	9.50%
Orlando Utilities Commission	50,536	6,400	8,124	226	2.78%	1	1	81	No Data	V,E,S,B	6,400	13,242	26.00%
Reedy Creek Improvement District	18	0	0	0	0.00%	0	0	0	No Data	V	18	18	100.00%
City of Starke	3,389	3,389	3,389	87	2.60%	87	87	0	No Data	V	3,389	3,389	100.00%
City of Tallahassee	49,197	423	4,223	283	0.60%	283	283	592	No Data	V,S,B, Infrared	0	49,197	100.00%
City of Wauchula	1,800	600	600	< 6	0.01%	No Data	No Data	No Data	No Data	V,S,B	600	1,200	66.00%
City of Williston	1,100	363	363	5	1.37%	5	5	0	No Data	V,S	363	730	66.36%
City of Winter Park	6,500	0	0	0	0.00%	0	0	0	No Data	No Data	No Data	6,500	100.00%

[12] Ocala Electric Utility identified 65 poles as possibly overloaded and the company is researching replacement or reinforcement options on the poles.

Appendix C: Rural Electric Cooperative Pole Inspection Reports, 2007

	Total # of Wood Poles in Company Inventory	# of Pole Inspections Planned this Annual Inspection	# Poles Inspected This Annual Inspection	# Poles Failing Inspection this Annual Inspection	Pole Failure Rate (%) this Annual Inspection	# Poles Designated to be Replaced this Annual Inspection	Total # of Poles Replaced this Annual Inspection	# Poles Requiring Minor Follow-up this Annual Inspection	# Poles Overloaded this Annual Inspection	Methods V=Visual E=Excavation P=Prod S=Sound B=Bore R=Resistograph	# Poles Planned for Inspection Next Annual Cycle	Total # Poles Inspected in the 8-Year Cycle To Date	% of Poles Inspected in the 8-Year Cycle To Date
Central Florida	84,600	11,800	11,800	47	0.0%	47	47	No Data	No Data	No Data	8,500	22,800	27.0%
Choctawhatchee	59,390	6,162	6,162	42	0.0%	42	42	No Data	No Data	No Data	7,500	11,766	19.8%
Clay	190,000	25,653	28,926	217	0.0%	217	217	0	No Data	V,S,B,E	No Data	51,433	27.1%
Escambia River	No Data	3,740	4,063	5	0.1%	5	5	0	No Data	V,S,B	No Data	6,729	No Data
Florida Keys [13]	15,100	3,020	3,020	266	8.8%	266	170	No Data	No Data	V	3,020	3,802	25.2%
Glades	No Data	3,756	3,756	194	5.2%	102	102	92	No Data	V,S,B,E	No Data	8,097	No Data
Gulf Coast	45,560	10,275	10,275	241	2.3%	No Data	No Data	No Data	No Data	No Data	10,490	13,718	30.1%
Lee County	No Data	20,227	27,438	1,688	6.8%	101	101	1587	No Data	V	No Data	31,012	No Data
Okefenoke Rural	55,414	7,463	7,463	33	0.4%	10	10	23	No Data	V,S,B,E	No Data	13,998	25.3%
Peace River	53,717	2,561	2,561	84	3.3%	84	84	925	No Data	No Data	No Data	6,383	11.9%
Sumter	No Data	23,557	19,757	180	0.0%	No Data	No Data	No Data	No Data	V,S,B,E	No Data	35,559	No Data
Suwannee	No Data	8,316	8,316	218	2.6%	No Data	No Data	1,563	No Data	V,S,B	10,505	15,023	No Data
Talquin	No Data	10,811	10,811	121	1.1%	No Data	No Data	No Data	No Data	V, Other	No Data	19,822	No Data
Tri-County[14]	42,215	18,838	18,838	897	4.8%	897	355	0	No Data	No Data	No Data	24,738	58.6%

[13] Florida Keys have submitted work orders to complete the remaining poles.
[14] Tri-County is in the process of replacing the remaining poles.

Appendix D: Municipal Electric Utilities, Selected Storm Hardening Activities –2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Alachua, City of	Distribution Only Company D: 8 year cycle	D: 126 (5.5%)	1 (0.8%) Ground and pole decay	1 (0.8%) and 34 replaced as part of planned feeder upgrade.	D: annually	130 miles of Distribution System, trimmed 3% in 2007
Bartow, City of	Under development	D: 300 (2.5%)	40 poles failed, rot and decay.	40 poles replaced	D: 4 year cycle all circuits, 6 - 10 foot clearances	Not specified
Beaches Energy Services	T: Annually D: 8 year (sound bore), excavate over 14 years	T: 355 (100%) D: 4,657 (100%)	T: None D: 164 (3.5%)	T: None D: All 164 have been or are being replaced	T: NERC Reliability Std FAC-003-1 D: Avg. 2-3-year cycle all circuits.	100% of plan
Blountstown, City of	Distribution Only Company D: Annually	1,693 (100%)	D: 15 (0.9%) rot & clearance	15 replaced.	D: 4-year cycle all circuits.	100% of plan
Bushnell, City of	Distribution Only Company D: 3 year cycle	305 (32%)	D: 16 (5%), rot and decay	5 (31%) replaced	1 year cycle with cut-back to 3 year growth levels.	Not Specified
Chattahoochee, City of	Distribution Only Company. D: 3-year cycle.	1,957 (100% of system in 2006)	47 (2.4%) defective, decay, and animal damage	12 replaced in 2007 12 to be replaced in 2008	D: 1-year cycle all circuits.	100% of plan
Clewiston Utilities, City of	D: 8 year cycle, will complete within 4 years	25% in 2007, 25% will be inspected in 2008, 2009, and 2010. Then continue on 8 year cycle	31 (10.7%), rot and decay	31, all will be replaced or remediated with a steel truss in 2008	D: 1-year cycle all circuits.	100% of plan
Fort Meade, City of	Distribution Only Company D: 8 year	342 (12.5%)	7 (0.3%)	36	D: 3-year trimming program	33% completed.
Fort Pierce Utilities Authority	T: 250 wood poles, 1 year; 106 concrete and 90 steel, 3 years D: 8 years	T: 100% in 2007 D: No data (First inspection in mid-March)	T: None D: None	Not Applicable	T: 3 year cycle D: 3 year cycle all circuits	100% of plan

Appendix D: Municipal Electric Utilities, Selected Storm Hardening Activities –2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Gainesville Regional Utilities	T: visual 2 year, wood poles 8 year, all else 3 years D: 8 years	T: 164, 100% of plan D: 2,854, 100% of plan	T: 2 (1.2%) Woodpecker D: 28 (1.0%) (shell rot, decay, split pole top and carpenter ants.	T: 2 D: 28 Replaced - Class data provided	T: NERC Reliability Std FAC-003-1 (6-year cycle) D: 3-year cycle	100% of plan
Green Cove Springs, City of	Distribution Only Company. D: 8 year program under development	No details	D: 6 (0.20% of installed infrastructure)	D: 1 concrete pole replaced(wind impact) 6 wooden poles replaced due to rot.	D: 1-year cycle all circuits	100% of plan
Havana, Town of	Distribution Only Company. D: 1 year program under development	No details	A section of transmission lines; age	500 feet of 3 phase overhead transmission line replaced.	D: 1 year cycle all circuits	Not specified
Homestead, City of	T: All poles are concrete. D: Plan to inspect 800 poles, 8 year program under development.	T: 100% of system inspected in 2005; 0% in 2007 D: 12.5% of total poles per year.	0	0	T: Not Reported D: Estimated 2 year cycle all circuits with 6 ft clearance.	No plans have been completed yet except 100% of transmission inspected in 05
JEA	T: 2-4 year (30 circuits per year) D: 12.5% is done annually (sound bore and excavate) D: laterals w/ more than 3 outages / 90 days.	T: 10 circuits (33.3%) D: 6 (12.5%)	T: 7 (0.5%) ground line decay and 4 steel mono-poles (0.3%) failing for minor damage. D: 6%, 60% of failures for ground line decay, 40% for pole top decay.	No detailed class data. T: 7 (100%) of decayed poles replaced. D: 418 (56%) of rejected poles have been replaced. The others not rejected are ground treated.	T: NERC Reliability Standard FAC-003-1 2.5 year trim cycle for 2007.	100% of plan

Appendix D: Municipal Electric Utilities, Selected Storm Hardening Activities –2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Keys Energy Services	T: Visual/Infrared 2 years, Structures 4 years. D: Inspection frequency not specified.	100% completed in May 2007	T: 0 D: 2250 poles (20.3%) Exceeded standards for decay	274 replaced in 2007; 800 in 2008	T: NERC Reliability Standard FAC-003-1 D: 2 year cycle all circuits.	100% of plan
Kissimmee Utility Authority	T: Visual 1-year, Infrared 1-year.D: Visual 5-years; Infrared 1-year; 8-year for wooden; excavate for poles over 10-years old.	T: 207 woodD: Visual 5 years, 170 circuit miles (20%); 5,742 inspected.	T: 5 (2.4%), heart rot, pocket decay.D: 79 (1.4%) (shell rot, rotten butt)	T: 5D: 7 replaced plan to restore 52 and replace 19	T: NERC Reliability Std FAC-003-1 (1-year Cycle)D: 3-year cycle all circuits.	100% of plan
Lake Worth Utilities	T: Visual 1-year. D: Visual 2-3-years	No formal program in 2006.	No data	No additional data.	T: 2-year cycle D: 2-year cycle.	100% of plan
Lakeland Electric	No formal or cyclical program but plans to inspect all wooden poles on 8 year cycle (initiated in 2007)	T: 231 (19.7%) D: 13,439 (22.3%)	T: 4 poles (1.7%) due to decay D: 256 poles (1.9%) due to decay	T: All 4 poles are having work orders written for replacement this year. D: 6 poles have been replaced and 37 poles will be reinforced with struts before June 2008	T: 3-years cycle D: 4-years cycle all circuits.	100% of plan
Leesburg, City of	Distribution Only Company. 8-year inspection cycle	D: 6,220	163	163 (2.62%)	4-year trim cycle for all circuits.	100% of plan
Moore Haven, City of	Distribution Only Company Visual 1-year.	100%	0	5 poles replaced during relocation of distribution., wires from easements to right of ways to obtain easier access.	D: 1-year cycle all circuits.	100% of plan

Appendix D: Municipal Electric Utilities, Selected Storm Hardening Activities –2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Mount Dora, City of	No formal document or program. Distribution Only. Routinely makes a visual inspection of the 6 feeders.	No data	No data	No data	D: 1-year cycle all 6 feeders.	not applicable/ not reported
New Smyrna Beach	T: 4-5-years. D: 7-9-year (sound & spike)	T:100 (25%) D: 600 (6%)	T: 0 (0%) D: 26 (4%) old.	T: 0 D: 26 replaced.	No set cycles.	T: 20% D: 20%
Newberry, City of	Distribution Only Company D: 3-year	D: 1,007 (100%) in 2006. They will be inspected again in 2009. None inspected in 2007.	In 2006, 73 poles(7%) were defective. In 2007, 0 poles were as none was inspected in 2007.	28 (38% of failed poles-class 5, 45' wood poles, replaced in 2007) 2 (3%- class 5, 35' wood poles were replaced in 2007) 7(10%-class 5, 30' wood poles, replaced in 2007)	D: 3-year cycle all circuits.	100% of plan
Ocala Electric Utility	T: Wood 8-year (12.5%) D: Wood 8-year	T:672 (100%) D:2,056 (7.2%) Did not meet goal of 12.5% b/c of focus on completing Transmission poles	T: 35 rejected (5.2% rej. Rate) D: 180 rejected (7.1% rej. Rate)	T:23 poles restored & 12 replaced D: 80 poles restored &100 replaced	T: 3-year trim cycle D: 3-year cycle.	100% of plan
Orlando Utilities Commission & City of St. Cloud	T: Wood 8-years. D: 8-year. Annual inspection of essential distribution and transmission equipment.	No T&D details Planned 6,400 (12.5%); Completed 8,124 (16%)	No T&D details 226 (2.7%) decay	replaced 82 in 2007. Will replace remaining 144 in 2008	T: Urban - 1-year, Rural 3-year; D: 4-year cycle.	over 100% of plan

Appendix D: Municipal Electric Utilities, Selected Storm Hardening Activities –2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Quincy, City of	Monthly drive by patrols. New 8 year program began in 2007	T: 31 Concrete (100%) D: 2,842 wood (100%)	T: 0 D: 2 (.07%) Pole damage and rot.	Replace 2.	T: not stated separately D: 4-year cycle all circuits.	100% of plan
Reedy Creek Improvement District	T: 69 KV 5, wooden poles (2 years)D: 12.5 KV (Underground system), 13 wooden poles (2 years)	T: 5 D: 13	T: None perhaps, but not specified. Wooden poles were last treated in 2006D: Not specified. Wooden poles treated in 2006	T: None specifiedD: None Specified	T: Tree Trimming (1-year) each spring	90% of plan (right of ways)
Starke, City of	Annual visual inspections. No details re: T&D.	3,389 (100%)	87 (2.6%) 55 poles bad 14 splitting/animal contact 18 New-replacements for upgrade	All 87 poles were replaced in 2007.	T: not stated separately. City has annual tree trimming and vegetation contract with Gainesville regional utilities to provide 12 wks of annual tree trimming.	100% of plan. Will do 33% in 2008
Tallahassee, City of	T: 5-years. D: Wooden poles 8-years.	T: 3,006 D: 46,191	T: 3006 poles inspected D: 45833 poles inspected	T: 8 replaced (0.27% of poles inspected) D: all 275 faulty poles were finally replaced in 2007	18 Month cycle	100% of plan
Vero Beach, City of	T: Visual 2-3 month cycle. D: Once 5-year cycle (sound and bore) over 20-years of visual evidence. Plans to inspect 1000 to 1250 poles per year.	T: 4 visual inspection cycles (500%). All poles inspected D: 30%(1,794)	T: 0 D: 34 failures (1.9%)	T: 0 D: Replaced.	T: not discussed D: 3-year cycle.	100% of plan

Appendix D: Municipal Electric Utilities, Selected Storm Hardening Activities –2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Wauchula, City of	1/3 of all lines completed in 2007. No further details.	No details (1/3)	Less than 1% out of 1,800 poles. Failure due to poles rotting at ground line	1 of their 5 transmission poles was replaced.	Tree trimming 1/3 per year. No details	100% of plan
Williston, City of	Distribution Only Company D: 3-year cycle	33%	5 (1.75%) wood decay/below ground level	5 poles replaced.	T: not discussed D: 3-year cycle.	100% of plan
Winter Park, City of	Distribution Only Company D: Policy being drafted to meet 8 year or 12.5% per year.	No system wide sound and bore testing has been completed to date. Plans to begin sound and bore testing in 2008	None	None	3-year trim cycle.	100% of plan

Appendix E: Rural Electric Cooperative Selected Storm Hardening Activities – 2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Central Florida Electric Cooperative, Inc.	T: 1 year cycle D: 8 year cycle	T: 12 miles (100%) D: 11,800 (14.3%)	T: not specified D:47 out of 11,800 were deteriorated	No details	3 years into right of way plan. Trees are trimmed or removed 10 feet of all main lines.	5-year right of way vegetation clearance plan.
Choctawhatchee Electric Cooperative, Inc.	D: 8 year cycle (5,000 -7,000 poles annually)	D: 6,162 (10.4%)	D: 42(0.007%)	D: Replaced 42	D: 5-year cycle	20% of system
Clay Electric Cooperative, Inc.	T: Visual (2 year), climbing (4 year) D: 10 year cycle (2006)	T: 2,781 (100%) D: 28,926 (15.2%)	T: 36 decay (1.29%) D: 217 rejected (.75%)	T: 21 replaced D: (217)replaced	T: 3-year cycle D: avg 4-year cycle (City 3-year, Urban 4-year, Rural 5-year)	133% of plan
Escambia River Electric Cooperative	Distribution Only Company D: 8 year Cycle	D: 4,063 (13%)	Decay 5 (0.12%)	Replaced 5	5-year cycle for all Distribution lines.	102% of plan
Florida Keys Electric Cooperative Association, Inc.	T: Visual (1 year) D: 5 year cycle	T: (100%) D: planned 20% D: 3020 (20%) completed	T: 0 D: 266 (8.8%)	T: 0 D: 170 replaced. Remaining 96 are currently being replaced	T: 1-year cycle D: 3-year cycle	100% of plan
Glades Electric Cooperative, Inc.	10 year cycle (wooden poles)	T: 100% of 87 miles (aerial). 10.6% of system, 90 structures (climbing). D: 3,756 (9.4% of system)	T: 3 (3.3%) ground line decay D: 194 (5.2%) D: Decay 160 (4.3%) D: Other 34 (0.9%)	T: 3 Replaced D: 92 Repaired (banded truss reinforcement) D: 102 replaced.	3-year trimming cycle all circuits.	100% of plan
Gulf Coast Electric Cooperative, Inc.	Distribution Only Company D: RUS Bulletin 1730B-121 (avg 8-year Cycle)	D: 10,275 poles inspected (22.5%)	241 (2.3%%). No main reason stated.	Not reported.	5-year cycle	100% of plan

Appendix E: Rural Electric Cooperative Selected Storm Hardening Activities – 2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Lee County Electric Cooperative Inc.	T: Annual (230 kV) 2-year cycle (138 kV) D: 10-year	T: 1520 (57.5%) + 100% of 230 kV facilities + 47% of the 138 kV facilities D: 24,796 (23.6% of total no of poles.	T: 224 (14.7%) failed 56 rotted ; 168 woodpecker D: 1688 (6.8% of insp.. 1.6% of total) 101 rot; 1413 plumb; 174 woodpecker	T: 74 (33%) will be replaced between '07-'08; patched 150 (67%) D: 101 (6%) replaced; 1413 (83.7%) replumb; 174 (10.3%) patched	T: 230KV bi-annual; 138KV Annual D: 3-year (2&3 Phase circuits); 6-year (1 Phase circuits)	100% of plan for transmission. 141% of scheduled for distribution.
Okefenokee Rural Electric Membership Corporation	Distribution Only Company 8-year cycle, Rural Utilities Services Bulletin 1730B-121	D: 7,463 poles inspected (13.5% of the 55,414 poles on system	D: 33 (0.44% of inspected poles) decay	D: 10 replaced D: 23 scheduled for remediation in Spring 2008	D: 5-year trim cycle all circuits.	100% of plan
Peace River Electric Cooperative, Inc.	T: 2 year (wood) D: 1 year (wood)	T: 307 (100%) D: 2,561 (4.76%)	T: 1 (<1%failure) D: 84 (3.3%)	T: 1 D: 84 replaced + 123 (identified and replaced outside inspection program)	Rural Utilities Service Guidelines	D: 2,860 miles (18%)
Seminole Electric Cooperative, Inc.	Transmission Only Company T: 1-year	No details	Cross-arm, rot, & insulator. No other details.	No details	NERC Reliability Stds - annual visuals, with scheduled trimming 3-5 years	100% of plan
Sumter Electric Cooperative, Inc.	T: 5 year (climb); 8 year (ground) D: 8 year (ground)	T: 0 (0%) D: 18,357 (14% of total structures)	T: 0 D: 180 (1%) D: 94 (.5%) Ground Rot D: 67 (0.4%) Top Deterioration D: 19 (0.1%) reinforceable	T: 0 D: 180 Replaced or reinforced	D: 3-year cycle all circuits	100% of plan

Appendix E: Rural Electric Cooperative Selected Storm Hardening Activities – 2007

	Transmission & Distribution Facility Inspections				Vegetation Management	
Utility	Description of Policies, Guidelines, Practices and Procedures	Number and Percent of Poles Inspected	Number and Percent of Poles Failing	Number and Percent of Poles and Structures by Class, Replaced or Remediated	Policies, Guidelines, Practices, Procedures and Tree Removals	Quantity, Level, and Scope Planned and Completed
Suwannee Valley Electric Cooperative, Inc.	8 year cycle	T: 5 (100%) D: 8,311 (9.9%)	T: 0 D: 218 (2.8% of inspections)	T: 0 D: 1 563 poles were remediated by ground line treatment.	4-year cycle all circuits.	100% of plan
Talquin Electric Cooperative, Inc.	T: 1-year D: 8-year	T:199 (1.8%) D:10,625 (98%)	T: 0 D: 121 (1.14%) 15 for decay, 63 rejected and 58 priority poles.	T: 0 D: 58 priority poles replaced, 63 were repaired, rejected or replaced.	3-year inspection and trimming cycle	100% of annual plan avg.
Tri-County Electric Cooperative, Inc.	T: 303 transmission poles (115 kV) T: 412 transmission poles (69) D: 41,500 distribution poles	T: 668 (100%) D: 18 (170 poles inspected out of 41,500)	T: 11 (1.6%) D: 886 (4.9%) (No cause statistics)	T: 5, remainder to be replaced by spring 2008. D: 350, remainder being worked on.	5-year trim cycle.(requiring about 600 miles per year) 70 miles done in 2007. T: All lines completed 2006-2007.	About 90% of annual planned average
West Florida Electric Cooperative Association, Inc.	Distribution Only Company Rural Utilities Services Bulletin 1730B-121	Inspected 14% of its system in 2007.	6% required maintenance or replacement.	6% required maintenance or replacement.	4-year trim cycle.	(No statistics)
Withlachoochee River Electric Cooperative, Inc.	T: Annually, walking/riding/aerial patrol D: Annually, 4,200 miles out of 6,400 miles of system is physically checked	T: 100% Last Pole Inspection '04 - pole inspection program discontinued.	No details provided	No details provided	T: 1-year cycle D: 5-6 year cycle	100% of plan (No statistics)

Appendix F: Annual Costs Incurred by Project Sponsors

Sponsor	2006	2007	2008
Florida Power & Light Company	$22,584.07	$229,558.40	$52,916.21
Progress Energy Florida	8,160.32	82,957.51	19,122.80
Tampa Electric Company	3,349.90	34,057.80	7,850.77
Gulf Power Company	2,155.16	21,918.87	5,052.58
Florida Public Utilities Company	160.31	1,621.80	373.85
Florida Municipal Electric Association	6,967.65	70,818.60	16,324.62
Florida Electric Cooperatives Association	4,056.19	41,233.03	9,504.74
Lee County Electric Cooperative	516.35	9,288.49	2,141.11
Total	$47,949.95	$491,454.50	$113,286.68

Source: Project billings through April 2008 from Public Utility Research Center for research coordination, Quanta Technologies for undergrounding assessment project, and University of Florida Department of Engineering for hurricane wind monitoring project.