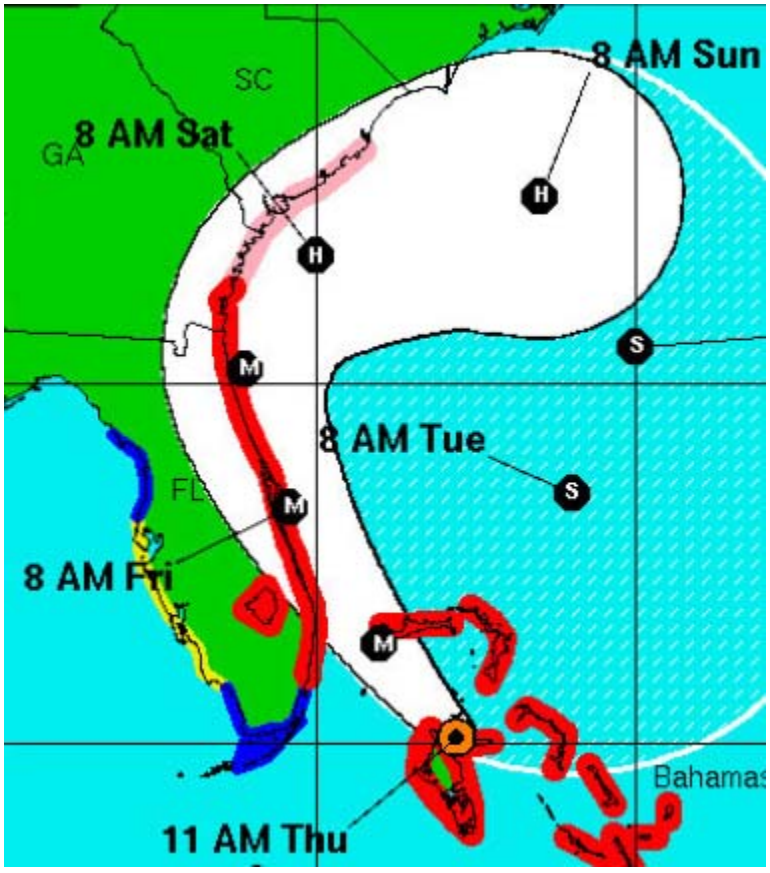
Power Delivery Performance

Hurricane Matthew

Report Date: November 17, 2017



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Executive Summary

Cat 4 Hurricane Matthew impacted all FPL regions. Within two days of Matthew's departure from the Florida coast, FPL had restored power to 98.7% of the more than 1 million customers who had been impacted by the storm.

The Hurricane event time frame was Thursday 10/6/16 through Saturday 10/8/16

FPL was essentially fully restored at 10:00 PM on 10/9/16

General Information

Customers Out Total	1.185M
Transmission Out	39 line sections
Substations Out	22
Feeders Out	646
Laterals Out	3807
CI Avoided (Smart Grid)	112K
Peak Customers Out	699,586
Transmission Poles Down	0
Substations Damaged	1 (St. Augustine flooding)
Hardened Feeder Poles Down	0
Other Poles Down	408 (feeder, lateral and service)
Injuries	12
TCMS Tickets	11K
Hardened Feeder Performance *	31.6% better than non-Hardened
ALS Lateral Performance	1.0 times and equal to non-ALS laterals
Forensics Teams Deployed	67 personnel (trans., sub, dist.)

**When non-feeder related causes such as substation outages are excluded.*

Storm Characteristics

Storm Characteristic Facts:

The latest reports confirm that Matthew has been one of the most deadly and destructive Atlantic hurricanes of the 21st century. As of October 10th the storm has killed over 1,000 and caused around $6 billion in damage.

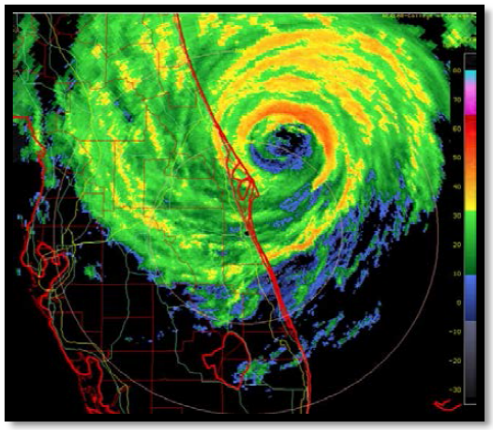
WIND
Cape Canaveral, Florida: 107 mph (Highest)
Tybee Island, Georgia: 96 mph
Daytona Beach, Florida: 91 mph
Hilton Head Island, South Carolina: 88 mph
Beaufort, South Carolina: 83 mph
Fort Pulaski, Georgia: 79 mph
Savannah, Georgia: 71 mph,
Melbourne, Florida: 70 mph

STORM SURGE
7.8' Fort Pulaski, GA
6.4' Fernandina Beach, FL
6.1' Charleston, SC

RAINFALL

Georgia:	17.49", Savannah/ Hunter Army Air Field
North Carolina:	15.65", William O. Huske Locke 3
South Carolina:	14.04", Beaufort MCAS
Florida:	7.89" Sanford/Orlando

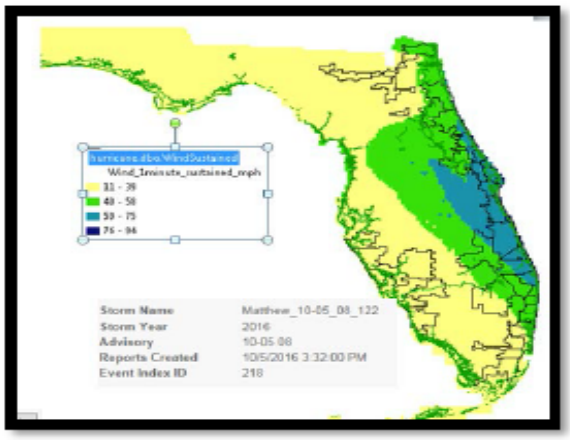
MISCELLANEOUS
Matthew was the lowest-latitude Category 5 hurricane on record in the Atlantic. Its rapid strengthening of 80 mph in just 24 hours was the third fastest on record for the Atlantic, behind only Wilma (2005) and Felix (2007).



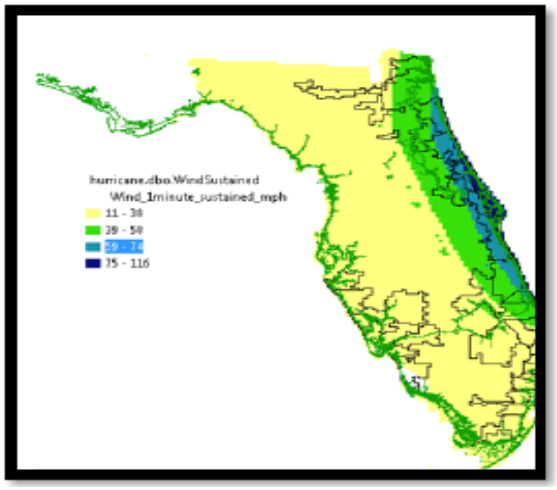
Damage Projections

Damage Model Estimates at key points:

- 24 hour pre landfall:
  - 133k – 142 CMH
  - 700k – 950k CI

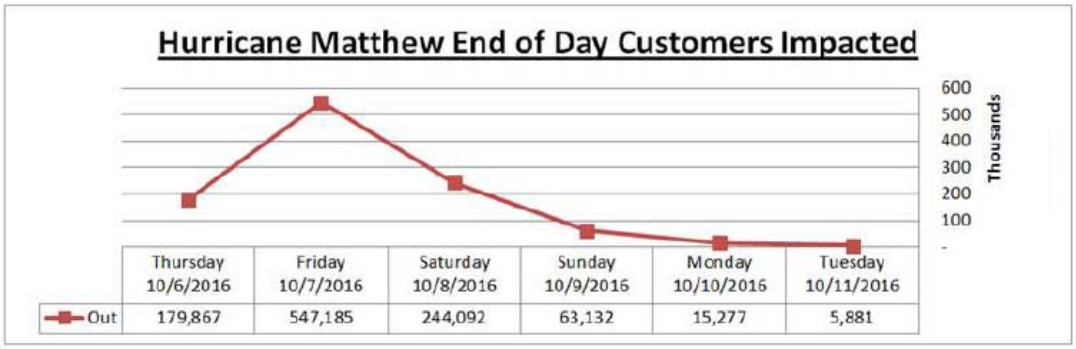


- Final Pre Landfall estimate:
  - 1.2 – 1.5M CI
  - 196k – 214k CMH
    - 201 Distribution Poles
    - 41 Transmission Line Sections
    - 16 Substations



Customers Impacted

Initial post landfall summary: 1.185M customers impacted



Actual Damage

Customers interrupted: 1.185M

The transmission structures which are built to extreme wind load performed as designed and expected with no reported failures. Trees falling from outside the right of way caused of 39 transmission line section outages. All other FPL pole types performed as designed and expected for the storms intensity. The preliminary site counts indicate just 408 poles were replaced. These impacts were caused by a mix of tree conditions and flying debris. No decayed FPL poles were reported.

Transmission:

- 39 Transmission Line Sections Impacted
- 22 Substations
- 9 tree damage to line section
- 1 substation de-energized for flooding

Distribution:

- 408 Poles
- 757 Feeders Interrupted
- 3800 Laterals
- 11K Total Tickets

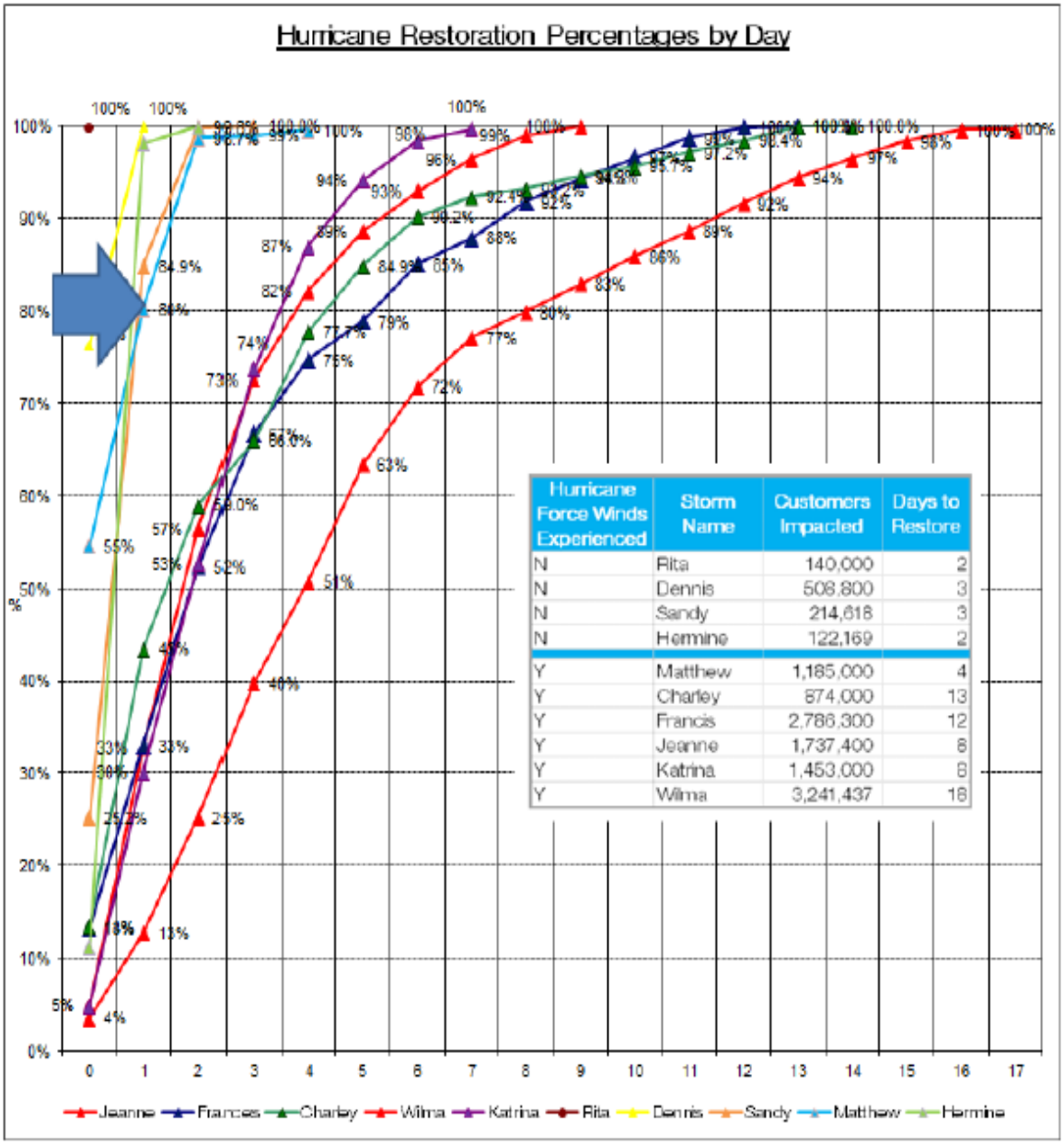
Resources

Field Resources:

			External Resources		
Resources	FPL	In-State Contractor	On Site	Committed	Total
Line - DIST	921	1,052	3,152		5,125
Underground	82	350	-	-	432
SL/INV	-	150	-	-	150
Vegetation	-	1,049	1,984	-	3,033
Sub Total	1,003	2,601	5,136	-	*8,740*
Line - T/S	86	227	-	-	313
SUBST Electrician	120	126	-	-	246
P&C Eng.	80	66	-	-	146
Total	1,289	3,020	5,136	-	*9,445*

Restoration

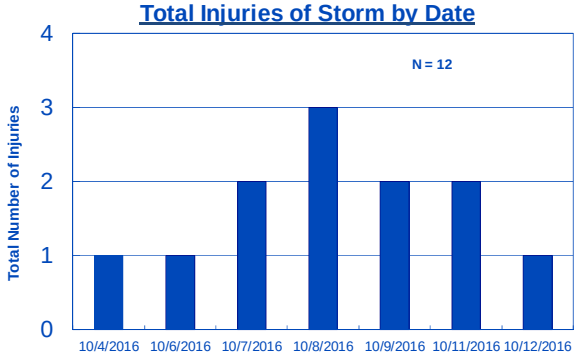
From the restoration curve for this event (below) we see that our hardening efforts are paying off. During the first days of the restoration effort with the hardened feeders we were able to restore 98.7% of our customers within 2 days. However, the back end slope is considerably flatter (and similar to historical storms) which points at opportunities to improve our execution on restoration of the single customer outages.

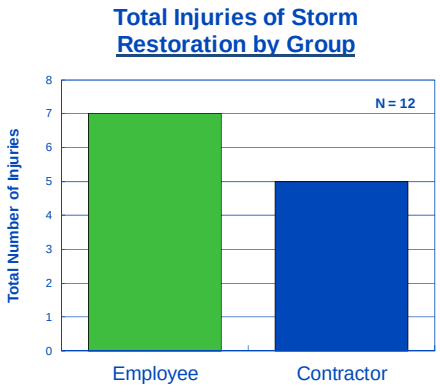


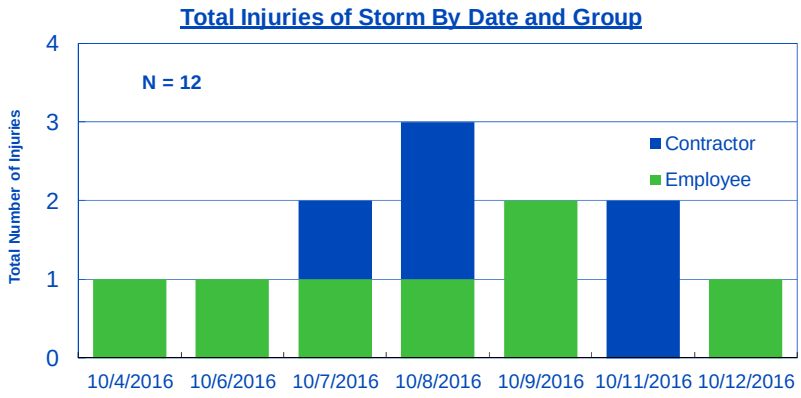
Hurricane Force Winds Experienced	Storm Name	Customers Impacted	Days to Restore
N	Rita	140,000	2
N	Dennis	508,800	3
N	Sandy	214,618	3
N	Hermine	122,169	2
Y	Matthew	1,185,000	4
Y	Charley	874,000	13
Y	Francis	2,786,300	12
Y	Jeanne	1,737,400	8
Y	Katrina	1,453,000	8
Y	Wilma	3,241,437	18

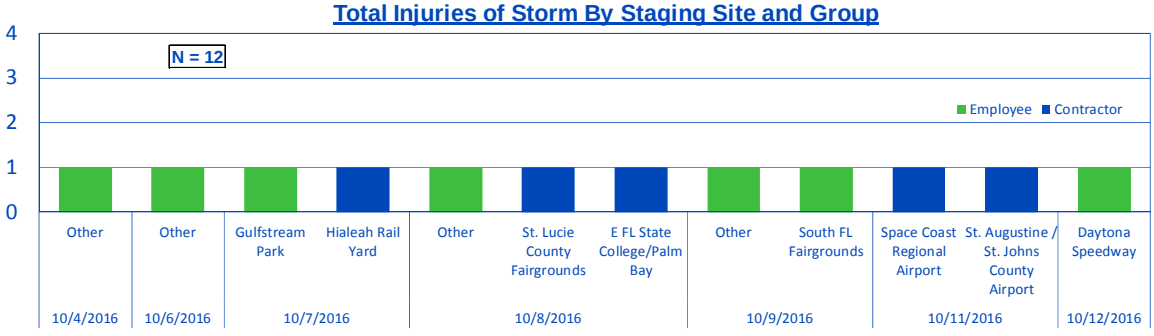
Safety

NextEra Energy Hurricane Matthew Restoration - Safety Performance 10/14/2016









Prior Storms Comparison

	Charley	Frances	Jeanne	Wilma	Matthew
Customers Interrupted	874,000	2,786,300	1,737,400	3,241,437	1,185,000
Pole Counts	6,878	3,757	2,227	12,419	408
Pre-Landfall Estimated CMH	220,936	531,642	1,017,043	2,059,754	214,000
Actual Applied CMH	450,328	511,670	374,664	1,317,767	230-260k

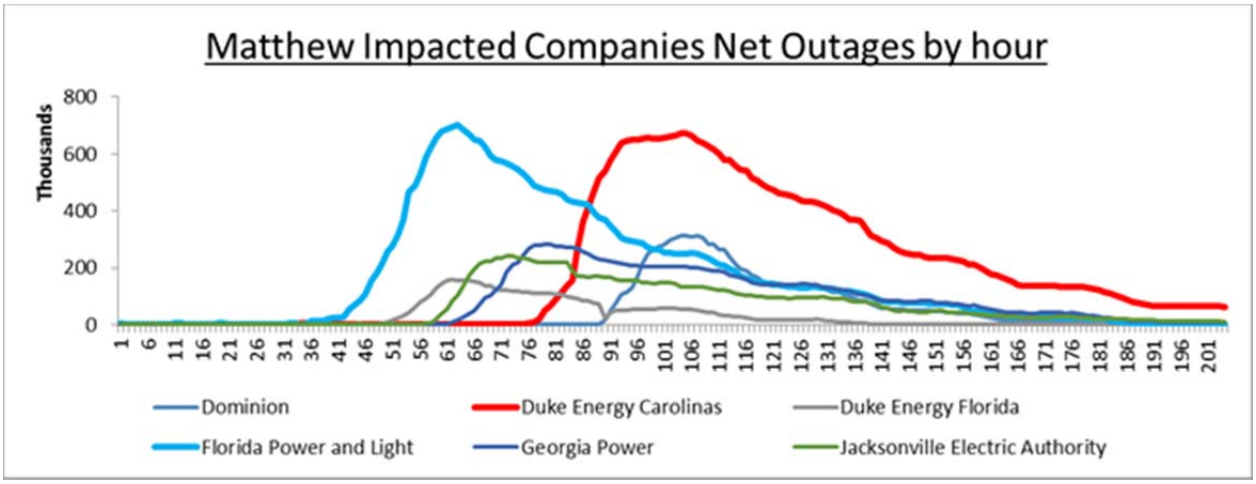
Utility Comparison

The chart below compares the utility impacts from Hurricane Matthew. It contrasts the performance of the systems and restoration efforts. Note that Matthew's highest recoded winds were felt at Cape Canaveral.

	FPL	Dominion	Duke Carolinas	Duke Florida	Georgia Power	JEA
Intensity of Direct Storm Impacts	Cat 2 - 3	Cat 1	Cat 1	TS - Cat 1	Cat 2	Cat 2- 3
Total Reported Customers Impacted	1,185,000	462,000	1,100,000	300,000	342,000	253,725
Peak Outages	699,586	313,843	671,389	157,484	283,649	240,720
Days to restore 90% of Customers	2	3	5	3	4	5
Essentially Restored	4	5	Website indicates essentially restored at day 5 with 60k customers still showing out. Restore map still indicates assessing damage in some areas - they have significant flooding in some areas	4	5	8
Customers Served	4,800,000	2,000,000	4,000,000	1,700,000	2,250,000	447,000
Percent of customers Impacted by Matthew	25%	23%	28%	18%	15%	54%

*The data used above is information that is publicly sourced through subscription. FPL data would have been the data available through the power tracker website; we did not change any data sources in order to be consistent with the other utilities comparisons.

The line graph below is an indication of restoration progress using the net outages by hour for each company on the overall storm timeline.



Transmission Performance

Overall transmission performance was very good during the storm event. Equipment and conductor damage was minimal. System protection operated as expected with only one known missed-operation at this time. 2 breaker events were reported. TELCO Communications were lost at 7 stations and 5 stations lost wireless communications.

35 Transmission lines experienced 123 relay operations

39 line sections were isolated

22 Substations outages

75 BES Operations w/ 1 known missed operation at Mill Creek

Damage

0 poles down

3 phases down

1 guy wire broken

2 OHGW down

1 pole base eroded by wave action

Transmission Performance

One transmission pole was replaced due to wave action washing out the foundation

This event did not cause an interruption

Transmission Performance

39 line sections were isolated during the storm

Lines were patrolled after the storm

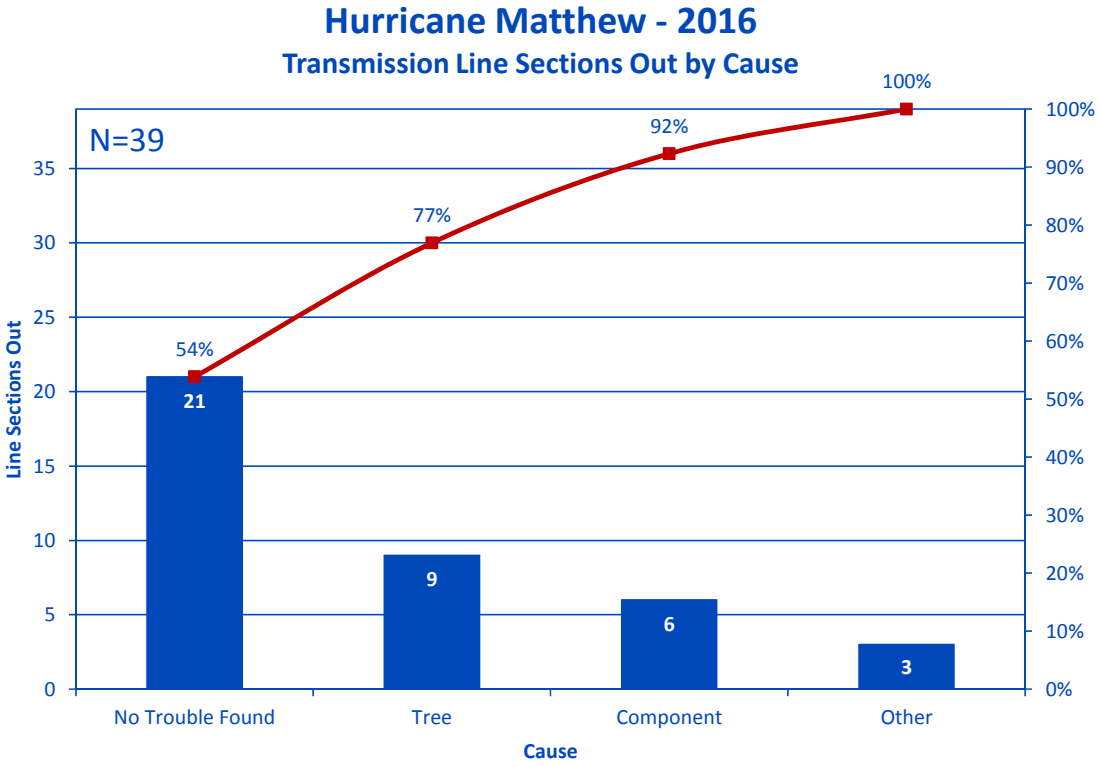
These are typically caused by vegetation and wind blown debris

Component Failures

3 phases down, 2 due to OHGW failure, 1 guy wire

2 sections de-energized to isolate St Augustine substation due to flooding

1 section de-energized to isolate a fault on a different line section due to loss of communication to a substation



Transmission Performance P&C

FPL Bulk Electric System (BES)

Experienced a total of 75 BES operations with 8 single end trips are currently under investigation as potential missed operations

BES Operations – Completed Investigations

Millcreek-Sampson 230kV Transmission Line Fault (Root Cause = High Impedance Fault)

Millcreek Line Panel failed to trip for line fault

Correct Operation – Microprocessor relays not set to trip for this high impedance fault

Remote clearing at St. Johns – Matanzas terminal

Correct Operation – Settings were verified that relay would trip for this high impedance fault

Lighthouse – Single End Trip

North Cape Terminal tripped at Lighthouse for a fault on the Delta to 624A line

Correct Operation-Slow SF6 breaker at Delta – 6W95 (Root Cause = Mechanism Lubrication)

Ormond - Breaker Failure Lockout Trip

Correct Operation - Slow oil breaker 6W84 (Root Cause = Mechanical Issue)

Event #	IR #	Time Start	Time Stop	Station	Station	KV	Notes
9	10386	10/7/16 1:32 AM	10/7/16 1:34 AM	Emerson	West	138	Single end at West
10	10387	10/7/16 1:36 AM	10/7/16 10:33 AM	Emerson	West	138	Single end at West
19	10459	10/7/16 5:39 AM	10/7/16 5:39 AM	Barna	C-5	115	Single end trip at C-5 during Cocoa Beach-South Cape relay
22	10460	10/7/16 6:06 AM	10/7/16 6:06 AM	Daytona	Volusia 1	115	Single End Trip at Daytona during Ormond /Volusia Line relay
26	10462	10/7/16 6:52 AM	10/7/16 6:52 AM	Barna	C-5	115	Single end trip during Lighthouse - North Cape line relay
28	10405	10/7/16 6:57 AM	10/7/16 6:57 AM	Norris	Volusia	230	Single end trip during Norris / Geneva
34	10413	10/7/16 7:42 AM	10/7/16 7:42 AM	Barna	C-5	115	Single end trip during Delta/624A relay
38	10464	10/7/16 8:18 AM	10/7/16 8:18 AM	Eau Gallie	Patrick	138	Single end Trip at Eau Gallie during the Cocoa Beach/Patrick line relay. Dairy/Holland park was isolate prior to this even with Indian Harbor N.O. closed

Millcreek Event

The Millcreek-Sampson 230kV Transmission Line experienced a fault during Matthew resulting in an impact to 8 distribution substations.

Millcreek-Sampson 230kV Transmission Line Fault

Millcreek Line Panel failed to trip for line fault

Remote clearing at St. Johns – Matanzas terminal

Removes feed from Pellicer – Matanza s– St. Johns 115kV

Line sections already open at time of event

Putnam – Tocoi 230kV line

Gator – St Augustine – Kacie 115kV

Durbin – Tolomato 115kV line section

Hastings – Elkton 115kV line section

Stations de-energized when line relayed at St. Johns

Gator, Riverton, Kacie, Durbin, Lewis, Tolomato, Elkton, Orangedale

Substation Performance

Overall substation performance was very good during the storm event. Equipment damage was minimal with the exception of the flooded damaged equipment at St. Augustine. Even in this case the system, including flood monitoring preformed as expected and in a fashion to minimize damage and speed restoration. System protection operated as expected. 2 breaker events were reported. TELCO Communications were lost at 7 stations and 5 stations lost wireless communications. 6 stations experienced battery loss due to extended outages. Eight (8) stations were impacted by transmission operations.

22 substations were out of service

7 substations experienced transformer lock outs

St. Augustine substation experienced flooding and was de-energized

Damage was contained to the switch motor operators

2 line switches were impacted

2 transformer circuit switcher were impacted

Substation Performance

Outage Summary

Substation	Area	County	Customer Count	Date De-energized	Date Energized	Hours	Cause
Banana River	Central	Brevard	1	10/7/2016 08:33:53	10/7/2016 14:35:33	6	Lost Communications
Crescent City	North	Putnam	1,979	10/7/2016 15:04:27	10/7/2016 16:11:13	1.1	Transmission
Delta	Central	Brevard	1	10/7/2016 14:47:00	10/7/2016 14:50:36	0.1	Transmission
Durbin	North	St Johns	4,753	10/7/2016 19:07:58	10/7/2016 19:24:56	0.3	Transmission
Edgewater	North	Volusia	13,843	10/7/2016 06:36:49	10/7/2016 19:17:14	12.7	Transmission
Fleming	North	Volusia	7,334	10/7/2016 6:09:06	10/7/2016 8:38:18	2.5	Transmission Breaker Issue
				10/7/2016 11:32:12	10/7/2016 18:06:50	6.5	Transmission
Gator	North	St Johns	4,703	10/7/2016 19:07:58	10/7/2016 19:24:56	0.3	Transmission
Hammond	North	Putnam	1	10/7/2016 15:04:27	10/7/2016 16:11:13	1.1	Transmission
Holland Park	Central	Brevard	5,424	10/7/2016 03:04:11	10/7/2016 11:40:18	8.6	Line Switch Motor Operator Issue
Kacie	North	St Johns	4,932	10/7/2016 19:07:58	10/7/2016 19:24:56	0.3	Transmission
Lewis	North	St Johns	10,141	10/7/2016 19:07:58	10/7/2016 19:24:56	0.3	Transmission
Mills	North	Nassau	5,688	10/7/2016 18:56:55	10/08/2016 03:38:32	8.67	Transmission
North Cape	Central	Brevard	1	10/7/2016 14:47:00	10/7/2016 14:50:36	0.1	Transmission
Orangedale	North	St Johns	10,236	10/7/2016 19:07:58	10/7/2016 19:24:56	0.3	Transmission
Ormond	North	Volusia	11,990	10/7/2016 6:06:52	10/7/2016 8:38:16	2.5	Transmission Beaker Failure
Riverton	North	St Johns	3,811	10/7/2016 19:07:58	10/7/2016 19:24:56	0.3	Transmission
Slag	Central	Brevard	1	10/7/2016 05:54:59	10/7/2016 17:36:22	11.7	Transmission
Spruce	North	Volusia	11,459	10/7/2016 06:36:49	10/7/2016 23:04:30	16.5	Transmission
St Augustine	North	St Johns	6,488	10/7/2016 12:53:05	10/8/2016 14:37:36	25.7	Flooding
Wright	North	Volusia	5,019	10/7/2016 13:00:34	10/7/2016 19:32:46	6.5	Transmission

Summary of Substation Outages

19-Transmission Issues

1-Equipment Issue

1-Flooding

1-Other

Substation Performance

Transformer Events

7 transformer locked-out Events:

5 feeder breaker failures

1 transformer to ground fault (GIT) - Cause unknown

1 overcurrent relay trip – Cause Unknown, under investigation

6 transformer Alarm Events:

4 gas alarms – 2 loss of Cooling

Regulator Events

1 GIR Event

1 Derby regulator experienced a GIR target, no trouble found by regulator tests, P&C will investigate

Distribution Breaker Events

7 breaker Failures

6 breakers failed and were replaced due to water intrusion in the high voltage compartment

(Aurora 3 breakers, Verena, Sistrunk, and St Augustine)

1 breaker failed due to motor issues in the low voltage compartment (Holly Hill)

Transmission Breaker Events

2 transmission breaker events

Delta 6W95 slow breaker – lubrication cleaned

Ormond 6W84 slow breaker – trip coil replaced

St. Augustine Case Study

St Augustine station flood monitor warning alarmed at 12:19 pm on 10/7

Station flood monitor emergency alarmed shortly after at 12:34 pm

System Operations de-energized substation around 12:53 pm

Only one feeder was in-service at the time of this event

Both outdoor flood monitor alarms cleared at 1:28 pm

Relay vault was not impacted

Both operating busses were energized at 14:37 on 10/8

St. Augustine Case Study

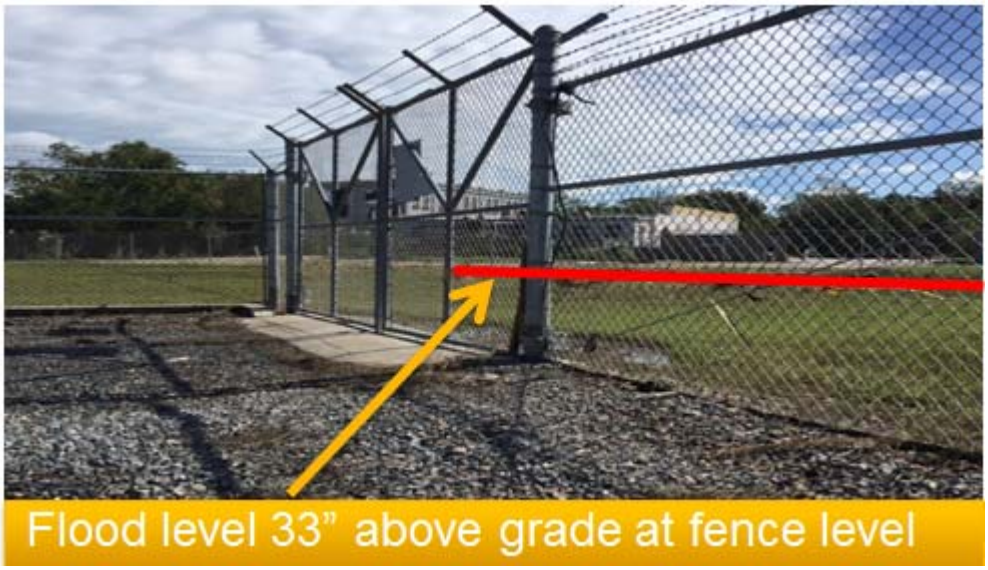
Flooding level was significant

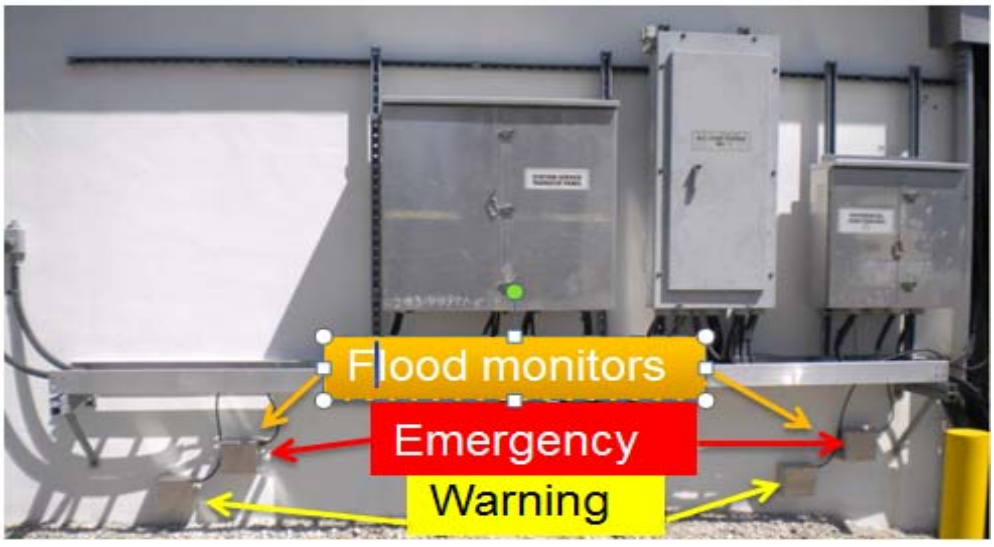
Damage was contained to the switch motor operators

2 line switches were impacted

2 transformer circuit switches were impacted

Fault bus current transformer schemes (Transformer, Feeders, Regulators)





Distribution Performance

The investments in the distribution hardening program, pole inspection program (PIP) and smart grid have helped reduce the number and severity of outages during hurricane Matthew.

FPL's pole down count for Matthew is 408, primarily due to fallen trees. This is significantly better than previous storms. For comparison, the number of poles down for the storms in 2004 and 2005 were as follows: Charlie - 6,878; Francis - 3,757; Jeanne - 2,227; Wilma - 12,419. No poles were down on hardened feeders

The benefit of having less severe damage is evident in the faster restoration performance. Within two days of Matthew's departure from the Florida coast, FPL had restored power to 98.7% of the more than 1 million customers.

FPL's investments in the smart grid also were of benefit to FPL customers. More than 118K customers avoided an interruption as a result of FPL's automated feeder switch fleet.

Kacie Feeder Case Study

Below are pictures and a brief analysis of the concentration of pole failures on the 7.4 mile long non-harden Feeder 3742 in St. John's County. Estimated winds were approximately 65-75 mph in this location between 11am and 3pm. The poles experienced excessive loads due to trees in the lines which caused these poles to fail; they didn't fail directly because of wind.

Poles down on wildwood Drive

There were 13 broken poles on Wildwood Drive (3.7mi).The majority of the poles were 40ft Class 3 wood poles in good condition that broke approximately 1/3 to 1/2 from the top of the pole; they were last inspected in 2015 with no strength or other rejects found. The poles broke due to large trees falling into the line. Distribution poles are naturally tapered, so it is not uncommon to have the point of maximum stress (and failure) 5ft or more above ground line for overloaded conditions (such as trees or debris in the lines), these poles broke even higher due to several factors. When a tree falls on a line, the wire experiences a sudden and very large increase in tension force in that span of wire. With the steel cross arm and triangular framing that we have on this line, these forces are transferred to the very tip of the pole. The foreign utility and guy wire attachments lower down on the pole can both restrain the pole and, like the ground, transfer some of the load from the pole. This restraint can move up the point of maximum stress (and thus failure) higher up the pole. The majority of these poles failed just above the foreign utility or guy wire. Internal defects in the pole (knots, etc.) can also cause the maximum stress location to change.

Kacie Feeder Case Study

Rail Road Crossing

Two tall wood poles over a railroad crossing were both broken; east pole very close the top of the pole and west pole near the attachments near the top 1/3 of the pole. Both poles were creosote of unknown age. Inspection of these poles show they failed near the top due to trees falling on the line and the weakness at the aged top of pole when under the impact loads of trees falling on the lines and other poles failing.

IntelliRupter Pole

One square concrete pole supported an IntelliRupter AFS switch. The IntelliRupter was damaged as a result of a pine tree falling into the feeder line and will be replaced. The concrete pole itself was not damaged and will remain in service. When the pine tree fell on the feeder lines, several of the line insulators and dead end insulators broke apart, and fell to the ground. The IntelliRupter support hardware was bent by the force, damaging the components shown. The switch will need to be replaced.

Maytown Road Lateral Case Study

The non-hardened lateral along Maytown Road through the Turnbull Hammock Conservation Area in Volusia County was seriously impacted by Hurricane Matthew on October 07, 2016. The preliminary estimated winds were around 55-65 mph and occurred between 9am and 6pm. The poles and wires experienced excessive loads due to trees in the lines or adjacent pole failures. The poles did not fail due to excessive wind.

Numerous sections of wire were down, 3 poles were broken, and 24 poles had severe leaning along the three mile section of Maytown Road. The restoration effort required five poles which were replaced with stronger poles set deeper, FPL wire down and other damage was repaired and restored. Pull-offs and services to homes were restored as quickly as possible. The line section was re-energized at approximately 6:30am on October 12, 2016.

The failed poles were 40ft Class 4 or 5 wood poles. Two were owned by AT&T and one was owned by FPL. The line was last inspected in 2011.

The poles that were leaning the most had soft soil foundations. The rain from Hurricane Matthew saturated the soils so that the foundations failed before the poles did when the trees came down and broke the wire.

Maytown Road Lateral Case Study

The poles that failed had varying factors that caused the failure. All failed at or just above ground line. The root cause of the pole failures were the tree failures.

The AT&T pole with a pull-off to a home failed due to trees coming down on the lateral and on the pull-off to the home.

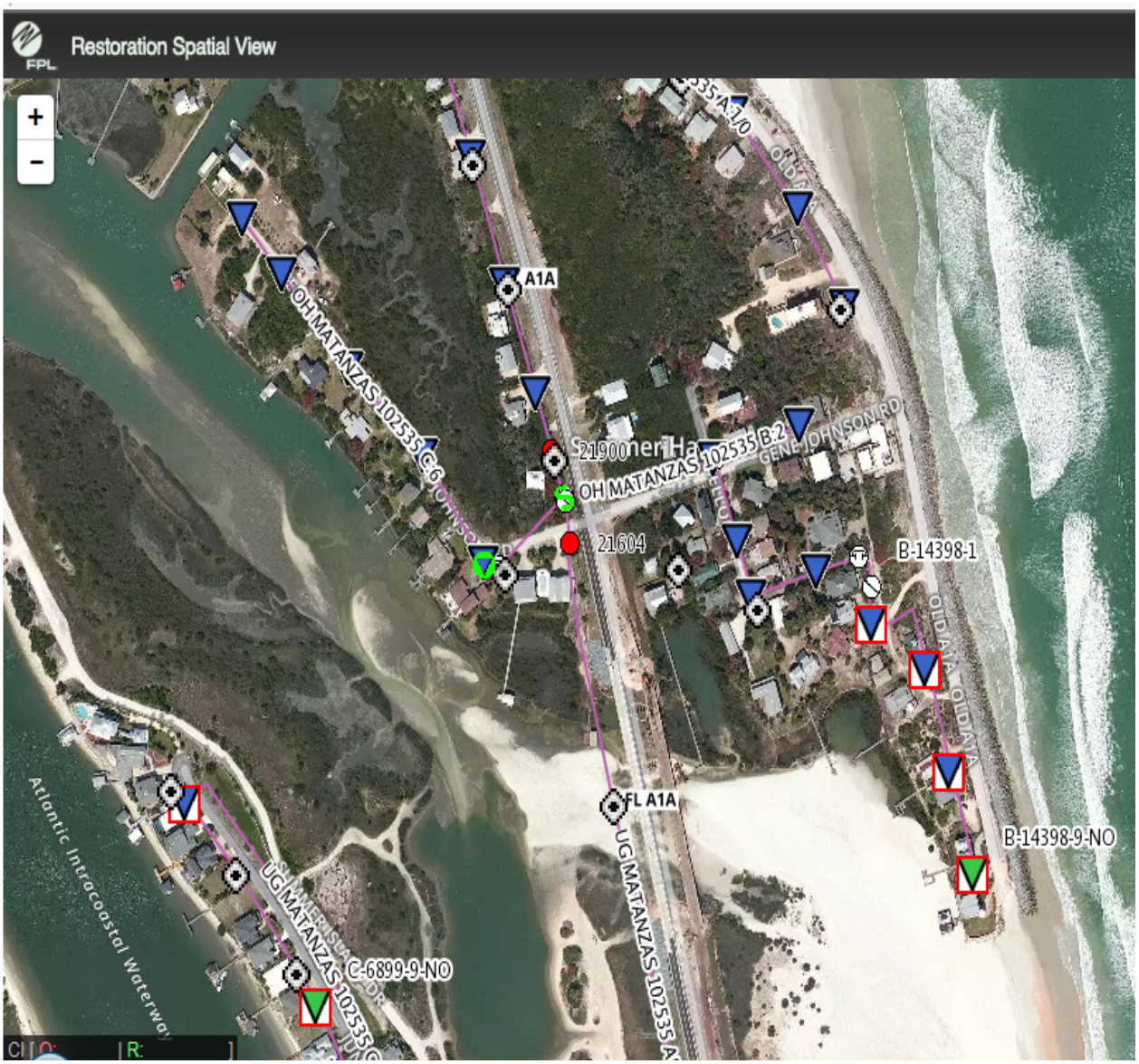
One AT&T pole that failed was in process of being replaced. The new pole had been installed and some but not all utilities had transferred their attachments to the new pole. The new pole did not fail. The old pole failed; it had significant ground line corrosion and had been reinforced

The FPL pole failed in-line due to being pulled along the line when wire broke due to tree failures. This pole was in good condition and broke just above ground line as would be expected.

Overall, the structures performed well given the loading placed on them by the tree failures.

Matanzas Inlet Case Study

Matanzas Inlet is located just south of St. Augustine. The pad mounted equipment experienced severe effects of waves and scouring which resulted in the catastrophic failures of the equipment shown below. This type of failure can lead to extended restoration times.



Matanzas Inlet Case Study

Riverton Feeder Case Study

Riverton 5761 experienced heavy winds and related tree damage. There were 4 areas each with multiple spans of Hendrix cable down or broken, 4 damaged/down poles (veg related), 20+ locations of vegetation and ~5 locations of broken Hendrix brackets/spacers. 12 line crews were engaged (around 50 line personnel from three different companies) and a sufficient amount of vegetation crews. This case is on SR 13 - scenic road along the St. John's River

Forensics Performance

Broken poles

Hardened Feeder 0

Non Hardened Poles 408

FPL poles 294*

ATT poles 114*

**Based on the following pole sampling from staging sites:*

Site	FPL Poles	ATT Poles	Total Poles	% ATT
St Augustine	23	4	27	15%
Daytona	6	7	13	54%
Total	**29**	**11**	**40**	**28%**

East Coast	800,000	200,000	1,000,000	20%

Number of Lateral outages

Total number of lateral outages = 3807

Re-fuse Percentage = 32.4%

Transmissions & Substations

There was minimal forensic damage investigation required for T&S during this storm event. The majority of activity centered on the St. Augustine Substation detailed in other portions of this report.

Conclusion

Hardened feeders performed as expected with no poles down. There was pole damage related to direct tree strikes. For this event Hardened feeders performed statistically better than non-Hardened feeders.

Distribution Forensics Background

FPL's Storm Forensic Organization was formed after the 2004-2005 active storm seasons to help evaluate Distribution infrastructure performance during extreme wind weather events.

The data collected serves to meet FPL commitments to the FPSC which include annual summary reporting of infrastructure performance during hurricane events. The field forensic teams were created to investigate affected areas and collect damage information to analyze performance of:

Hardened Feeders

Overhead Feeders

Overhead vs. Underground Laterals

Note: Forensic investigations exclude locations under safety, property damage or other special investigation team.

Matthew Activation

Based on the projected path and intensity of Matthew the Forensics Team was pre-activated but not pre-positioned to perform investigations in the affected areas. When the storm passed but prior to dissipation the team was directed to the most affected areas and data was collected by the team. All Hardened feeders impacted and not related to substation outages were patrolled.

Hardened Feeders

The primary objective of hardening is to reduce restoration times by minimizing the number of pole failures during extreme wind weather events. Pole failures typically lead to extended restoration times and longer outages. As a result, FPL forensic investigators use pole failure rates as the primary measurement criteria to evaluate performance of hardened vs. non-hardened feeders within the impacted areas. Feeder field forensic data was collected to conduct root cause analysis and failure mode of previously hardened feeders that locked out during the storm. Data used for analysis was provided by TCMS.

Overhead Feeders

Investigation of selected overhead feeders impacted by extreme wind events is an annual reporting requirement to the FPSC. Inspection locations are defined based on selected routes within the path of the storm. The objective of inspections is to collect sample data on selected feeder locations in order to evaluate infrastructure performance during extreme wind events.

Field data from ESDA patrols, TCMS and other sources will be utilized.

Overhead vs. Underground Performance

The investigation and performance of overhead vs. underground infrastructure during extreme wind events is an annual reporting requirement to the FPSC. Forensic investigators examine selected underground or overhead lateral facilities that were affected within the path of the storm. The objective of these inspections is to collect sample data from overhead or underground damage locations in order to evaluate and compare infrastructure performance of overhead and underground facilities during extreme wind event.

Field data from ESDA patrols, TCMS and other sources will be utilized.

Defining Storm Affected Areas

The emergency preparedness department performs the storm tracking activities from forecast to actual storm path. This information is available to the GIS group Technology Coordinator and is used to identify the storm affected area. Prior to a storm event, the Forensic Leads and the Technology Coordinator will be in close contact to execute the below plan based on the latest possible forecast or pre-storm plan. After the storm has passed, the Forensics Team executes the pre-storm plan unless the actual event was significantly different; at which time a new plan based on the actual storm path will be developed.

During Matthew, the affected areas encompassed FPL's Dade, East, North and West Regions in the following Management Areas: Central Dade, North Dade, South Dade, West Dade; Boca Raton, Central Broward, North Broward, South Broward, West Palm; Brevard, Central Florida, North Florida and Treasure Coast; and Manasota, Naples, Toledo Blade.

System Performance

Hardened Feeders

Forecast

The up to 107 mph winds experienced during Matthew slightly exceeded some of the extreme wind zone ratings of 105-145 mph within the affected areas. Based on these wind speeds, minimal to modest pole and equipment damage was expected during this event as a result of **wind**.

Statistical Comparison

For this event Hardened feeders performed 31.6% better than non-hardened feeders

(See Statistical analysis below)

Conclusions

Hardened feeders performed as expected with no pole damage.

Data shows there was a statistical difference in performance between hardened and non-hardened feeder outages.

Random Overhead Feeders

Forecast

Based on the wind speeds projected during Matthew, moderate pole damage was expected during this event as a result of tress, flying debris and **wind**.

Interruption Summary of Affected Area

Non-Hardened Feeders	280 of 2031	(13.4%)

Forensic Analysis

No Random Overhead Feeder field analysis was performed during Matthew.

Overhead vs. Underground Performance

Based on the wind speeds experienced, minimal to moderate pole damage was expected during this event as a result of **wind driven debris**.

Forensic Analysis

Statistical Overhead vs. Underground Performance field analysis was performed.

Forensics Performance

Pole Performance

With formal deployment of the Overhead vs. Underground Performance Forensics, there is a valid sample to determine performance.

The winds experienced during Matthew were less than the NESC 250 C and NESC 250 B construction standards. Based on these wind speeds, minimal pole damage was expected during this event as a result of wind.

Conclusions

The System performed as expected with minimal pole and equipment damage. The damage reported was related primarily to vegetation.

Recommendations

Continue follow up work through Pole Inspection.

Smart Grid

AFS device availability was reduced during Matthew.

No Smart Grid Device damage exceptions occurred on the Hardened Feeders during the patrols

AFS Performance noted below:
- 118K Customer Interruptions avoided during the storm
- 90% Overall availability

ALS Performance noted below:
- ALS Laterals did not perform statistically better than Non-ALS Laterals

Forensics Performance

Statistical Analysis

2-Sample % Defective Test for Non-ALS vs ALS Laterals

Summary Report

Do the % defectives differ?

The % defective of Group 1 is not significantly different from the % defective of Group 2 (p > 0.05).

Individual Samples

Statistics	Group 1	Group 2
Total number tested	54039	26961
Number of defectives	2380	1189
% Defective	4.40	4.41
95% CI	(4.23, 4.58)	(4.17, 4.66)

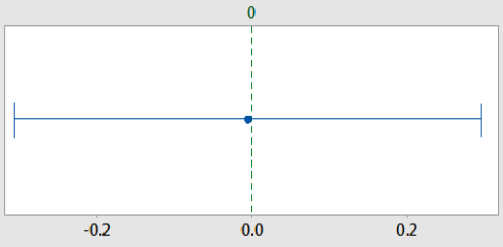
Difference Between Samples

Statistics	*Difference
Difference	-0.01
95% CI	(-0.31, 0.29)

*Difference = Group 1 - Group 2

95% CI for the Difference

Is the entire interval above or below zero?

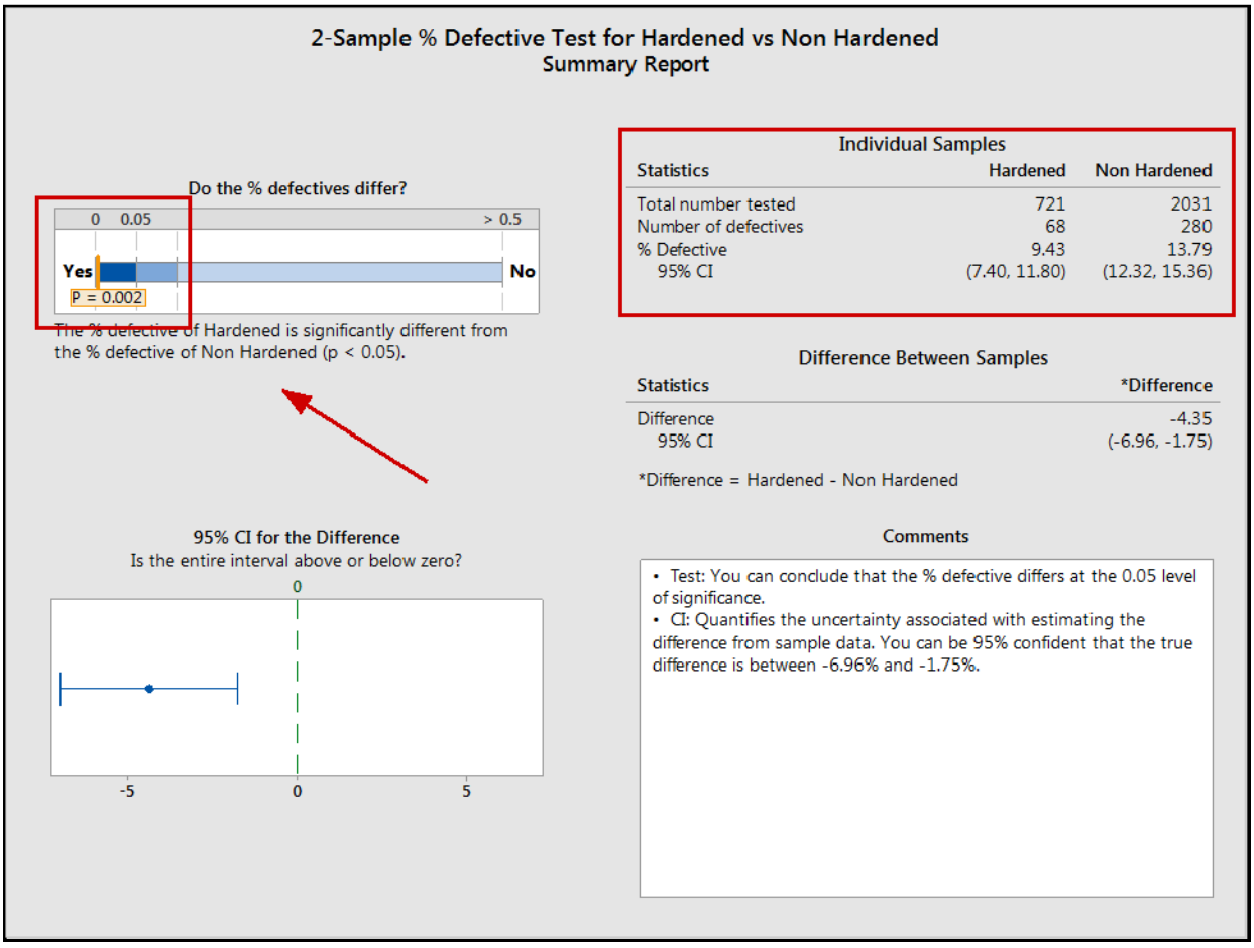


Comments

- Test: There is not enough evidence to conclude that the % defectives differ at the 0.05 level of significance.
- CI: Quantifies the uncertainty associated with estimating the difference from sample data. You can be 95% confident that the true difference is between -0.31% and 0.29%.

Forensics Performance

Statistical Analysis



Weather

Hurricane Matthew Update

Issued: Wednesday, October 5, 2016 at 02:00pm EDT

New:

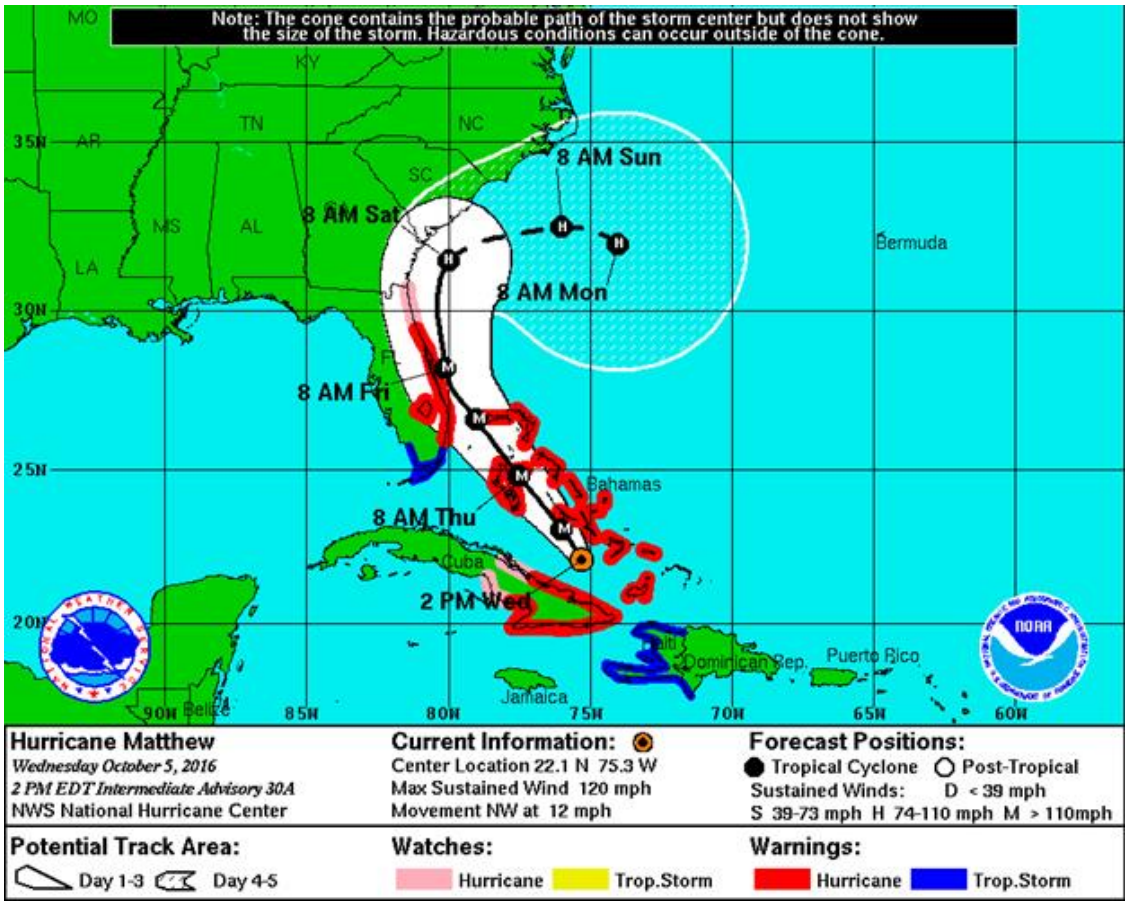
- Landfall chances in the Cape Canaveral area have increased.
- A Hurricane Warning is in effect for areas from North of Golden Beach to the Flagler/Volusia county line (Broward County northward through Volusia County along the east coast), including Lake Okeechobee.
- A Hurricane Watch is in effect from the Flagler/Volusia county line to Fernandina Beach (northern Flagler County northward through Nassau along the east coast).
- A Tropical Storm Warning is in effect from Golden Beach southward along the Florida east coast (Miami/Dade County) and then northward along the Florida west coast to Chokoloskee including Florida Bay.

Discussion:

- Hurricane Matthew is located about 70 miles south of Long Island Bahamas or about 400 miles southeast of Miami.
- Maximum sustained winds are near 120 mph with higher gusts. Matthew is a category 3 hurricane on the Saffir-Simpson Hurricane Wind Scale. Some strengthening is forecast during the next couple of days, and Matthew is expected to remain at category 3 or stronger while it moves through the Bahamas and approaches the east coast of Florida.
- Matthew is moving toward the northwest near 12 mph, and this motion is expected to continue during the next 24 to 48 hours. On this track, Matthew will be moving across the Bahamas today and tomorrow, and is expected to be very near the east coast of Florida by Thursday evening.
- Hurricane force winds extend outward up to 45 miles from the center and tropical storm force winds extend outward up to 175 miles from the center.
- When a hurricane is forecast to take a track roughly parallel to a coastline, as Matthew is forecast to do near Florida, it becomes very difficult to estimate impacts this far in advance. For example, only a small deviation of the track to the left of the forecast could bring the core of a major hurricane onshore, while a small deviation to the right could keep all of the hurricane force winds offshore. It will likely take another day for the potential impacts of Matthew in Florida to clarify. Currently, the model consensus points toward a solution of a forecast track through the Bahamas and then land falling Matthew near Cape Canaveral on Friday morning.
- Matthew remains a potentially dangerous storm for the Florida peninsula. Tropical cyclone impact timing is forecast to be between Thursday and Friday with outer bands probably reaching the peninsula late tonight or early Thursday morning. Assuming

Weather

Matthew remains just off the Florida east coast, sustained winds of 55-90 mph with gusts to 110 mph are possible with the stronger bands along the Florida east coast during the period. If Matthew landfalls in Florida then stronger winds are likely near the land falling area.



Weather

Hurricane Matthew Update

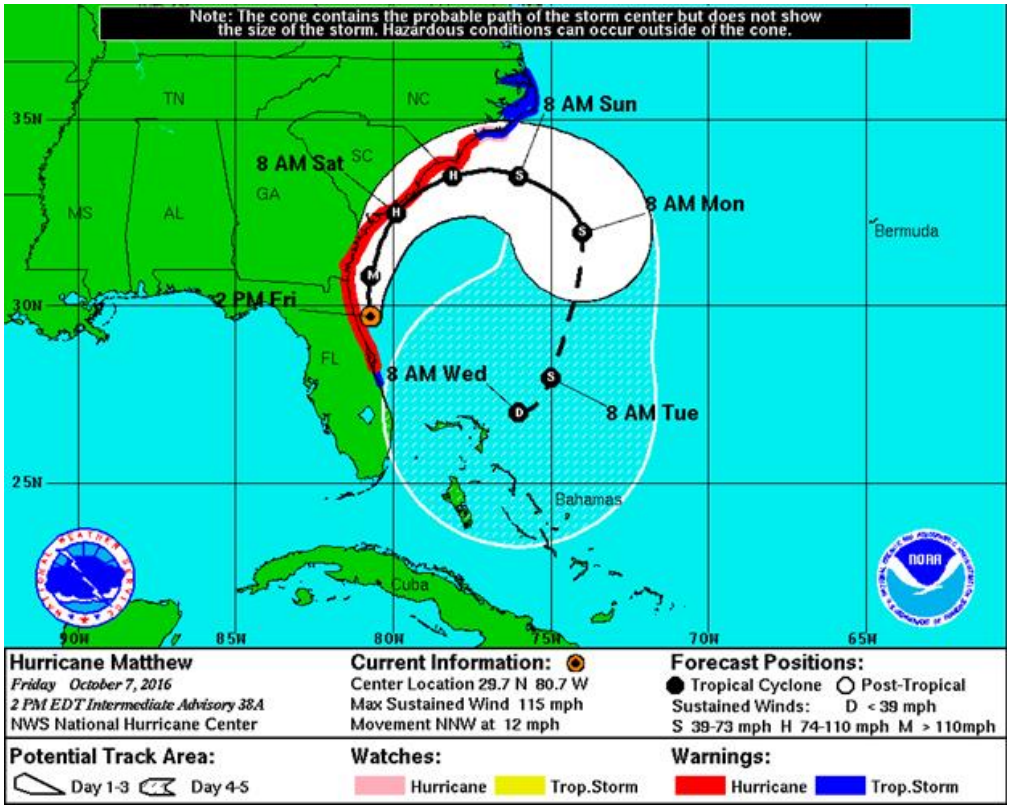
Issued: Friday, October 7, 2016 at 02:00pm EDT

- Matthew is tracking near the Florida east coast from Volusia County northward through today.
- A Hurricane Warning is in effect from Cocoa Beach northward along the east coast.
- A Tropical Storm Warning is in effect from Sebastian Inlet to Cocoa Beach.

Discussion:

- Hurricane Matthew is located about 60 miles southeast of Jacksonville Beach.
- Maximum sustained winds are near 115 mph with higher gusts. Matthew is a category 3 hurricane on the Saffir-Simpson Hurricane Wind Scale. Although weakening is forecast during the next 48 hours, Matthew is expected to remain a hurricane until it begins to move away from the United States on Sunday.
- Matthew is moving toward the north northwest near 12 mph, and this general motion is expected to continue today. A turn toward the north is expected tonight or Saturday. On this forecast track, the center of Matthew will continue to move near or over the coast of northeast Florida and Georgia through tonight, and near or over the coast of South Carolina on Saturday.
- Hurricane force winds extend outward up to 60 miles from the center and tropical storm force winds extend outward up to 185 miles from the center.
- Matthew will continue to track near the Florida east coast today. When a hurricane is forecast to take a track roughly parallel to a coastline, as Matthew is forecast to do along the Florida east coast, it becomes very difficult to specify impacts at any one location. Only a small deviation of the track to the west of the forecast could bring the core of a major hurricane onshore within the hurricane warning area in Florida. Modest deviations to the east could keep much of the hurricane-force winds offshore.
- Storm surge of generally 1-3 feet with isolated 6 foot surges possible from Merritt Island northward remains possible today.

Weather


Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.
TN
NC
SC
GA
MS
AL
FL
8 AM Sun
8 AM Mon
8 AM Sat
2 PM Fri
8 AM Wed
8 AM Tue
Bermuda
Bahamas
Cuba
35N
30N
25N
90W
85W
80W
75W
70W
65W
Hurricane Matthew
Friday October 7, 2016
2 PM EDT Intermediate Advisory 38A
NWS National Hurricane Center
Current Information:
Center Location 29.7 N 80.7 W
Max Sustained Wind 115 mph
Movement NNW at 12 mph
Forecast Positions:
Tropical Cyclone
Post-Tropical
Sustained Winds: D < 39 mph
S 39-73 mph H 74-110 mph M > 110mph
Potential Track Area:
Day 1-3
Day 4-5
Watches:
Hurricane
Trop.Storm
Warnings:
Hurricane
Trop.Storm

Appendix

1. Restoration Guidance

Matthew Restoration Guidance

(October 6, 2016)

Objective:

The purpose of the Matthew Restoration Guidance is to expedite restoration of service to largest number of customers while minimizing rework and providing the highest possible level of safety.

Approach:

The overall approach contains 3 steps.

- Restore feeders to one feeder switch beyond where a significant number of customers can be energized on laterals.
- Restore laterals with moderate lengths up to ~2000' which can be completed relatively quickly with a reasonable amount of work.
- Continue along the feeder / lateral by line section to restore the highest number of customers able to accept power for the effort expended.
    a. Customers unable to safely accept power should have their service made safe and if the service is down, coiled and left on the pole.

Poles, Framing and Fusing:

- Poles should be installed as close as possible, or in their existing location, match or exceed the existing pole class and be of the same height. Class 2 is the minimum pole class for feeders. Class 3 for laterals. Observe setting depths requirements by class.
- Conductor should match or if not possible exceed the size of the existing conductor. Conductor is 568 minimum for feeders and 1/0A for laterals.
- Framing should be modified vertical E-5.0.0 for accessible areas and Crossarm I-46.0.0 for inaccessible areas. See page 25 and 33-44 of the restoration guidebook for details. If these standards cannot be met it is acceptable to match the existing framing.
- Open wire secondary should be reused or replaced with service wire if it will speed the restoration.

- Fusing should follow the I-19.0.0 guidelines on page 29 of the restoration guidebook for transformers. If ALS is not available then lateral fusing should be 65KS for OH and 65-80K for underground. DO NOT OVERFUSE.

End of Report