BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 070301-EI
FLORIDA POWER & LIGHT COMPANY

IN RE: FLORIDA POWER & LIGHT COMPANY'S 2007 ELECTRIC INFRASTRUCTURE STORM HARDENING PLAN FILED PURSUANT TO RULE 25-6.0342 F.A.C.

SEPTEMBER 14, 2007

REBUTTAL TESTIMONY OF:

JOHN J. MCEVOY

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

REBUTTAL TESTIMONY OF JOHN J MCEVOY

DOCKET NO. 070301-EI

September 14, 2007

Q. Please state your name and business address.

A. My name is John J. McEvoy. My business address is Florida Power & Light Company, 2455 Port West Boulevard, West Palm Beach, Florida, 33407.

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

A. I am employed by Florida Power & Light Company (FPL or the Company) as Manager of Product Support Power Systems Distribution.

Q. Please describe your duties and responsibilities.

A. I am responsible for maintaining the Distribution Construction Standards ("DCS"), Distribution Engineering Reference Manual ("DERM"), and Product Specifications for overhead ("OH") distribution equipment.

Q. Please describe your educational background and professional experience.

A. I have a Bachelor Degree in Electronic Technology from the University of Dayton, Dayton, Ohio. I joined FPL in 1973 and have served in a variety of positions in distribution operations. I have been an Engineering Technician, Industrial Engineering Analyst, Superintendent Meter Test Center, Manager responsible for customer metering and distribution product/standards since

1995. I have been actively involved for the past 15 years with various American National Standard Institute Committees, Edison Electrical Institute Committees, Association of Edison Illuminating Companies (Past Chairmen of Meter & Service Committee). For the past 12 years, I have managed the organization responsible for the DCS and the DERM for FPL.

Q. Please summarize your responsibilities relevant to this proceeding.

A. I am the manager for the engineering team that developed the DERM addendum for Extreme Wind Design and I manage the OH Forensic Team now and during the 2004 and 2005 storm forensic efforts.

Q. Are you familiar with the National Electrical Safety Code ("NESC")?

A. Yes. The NESC is the national safety code for the practical safeguarding of persons during the installation, operation, or maintenance of electric supply and communication lines and associated equipment. The NESC is not intended as a design specification or as an instruction manual. Rather it is a set of rules that comprise safety standards applicable on a national base. If, as is often the case, a utility has reasons to exceed these minimum standards, it is free to do so.

Q. Do you consider yourself knowledgeable concerning the NESC and its application to electric distribution systems?

A. Yes. Part of my responsibilities for the past 12 years has been to review the NESC rules to insure they are incorporated into our standards.

Q. What is the purpose of your rebuttal testimony?

A. I will respond to the portions of the testimony of Verizon Florida LLC witness Lawrence M. Slavin and Florida Cable Telecommunications Association, Inc. witness Michael T. Harrelson that relate to their objections to FPL's applying extreme wind loading criteria ("EWL") to distribution facilities under the May 7, 2007 Electric Infrastructure Storm Hardening Plan (the "Plan") because the NESC does not require FPL to do so.

Q. Dr. Slavin says that the NESC Committee has considered and rejected EWL for poles less than 60 feet, because the benefits of EWL are projected to be slight in most storms involving extreme wind since damage to structures results primarily from falling trees and branches and flying debris striking lines rather than the wind pressure imposed on the structures and lines themselves. Do you agree that this is a valid reason for FPL not to apply EWL to distribution faculties under its Plan?

A. No. I understand Dr. Slavin's and the NESC's position on this issue, as it is the same position that FPL took until Hurricane Wilma struck our service territory in 2005, the seventh storm that had impacted us over a 15-month period. I also understand that any change in a national construction standard, especially a significant change such as adopting EWL standards for distribution facilities nationwide, has to be carefully researched and analyzed before it can be adopted. However, my experience in the forensic effort for Hurricane Wilma and the conclusions of the KEMA report on that effort indicated that "wind only" was the predominant root cause of distribution pole breakage. FPL cannot ignore this direct, relevant data and simply hide behind the general 60 foot exclusion in the minimum national standard reached by the NESC Committee. The implications of this data must be addressed in our Plan.

The NESC clearly contemplates that utilities may decide to implement design standards that exceed the NESC's minimums. Section 25, 250A-4 of the NESC states that "It is recognized that loadings actually experienced in certain areas in each of the loading districts may be greater, or in some cases, may be less than those specified in these rules. In the absence of a detailed loading analysis, using the same respective statistical methodologies use to develop the maps in Rule 250C or 250D, no reduction in the loadings specified therein shall be made without the approval of the administrative authority."

Q. In response to FPL's Interrogatory No. 6, the FCTA outlined a procedure that it claims could be used to reflect the impact on EWL pole-strength requirements due to the guying effect of supply wire and telecommunications wire/cable. Has the NESC approved the use of the procedure outlined by the FCTA?

A. To the best of my knowledge, it has not.

Q. Is FPL aware of any NESC-approved adjustments that can be used to reflect the impact on EWL pole-strength requirements due to the guying effect of supply wire and telecommunications wire/cable?

A. No. There are currently no load factors that are specified in the NESC that provide for the possible guying affects of supply wire or telecommunications wire. As discussed earlier, the NESC has defined what is needed in order for the NESC to approve a reduction in loading requirements below those specified for EWL. "In the absence of a detailed loading analysis, using the same respective statistical methodologies used to develop the maps in Rule 250C or 250D, no reduction in the loadings specified therein shall be made without the approval of the administrative authority."

Q. Does FPL currently have the necessary information to develop the analysis that would be needed to propose such a change in the NESC EWL guidelines?

A. No. The idea on its surface has some merit but there are many considerations that must be better understood. For example, when evaluating FPL wires:

- A span of conductor may have the necessary strength, but this conductor is installed with some amount of sag and at much less tension than its rated breaking strength. To achieve the guying benefit, the pole will deflect until the crossing conductor has been pulled up to tension. At this point the pole may have already broken
- The method of attaching the conductor to the insulator is much different than attaching a down guy or storm guy. The weak point may be in the method of attachment, the insulator and/or crossarm.
- Most insulators are attached to the side of the pole. The effect of the torsional load on the pole due to this side attachment is not yet understood.

Also, the effect of the torsional load on the insulator mounting bolt is not yet understood.

When evaluating telecommunications wires/cables:

- How much sag is in the telecommunications wire/cable and how much the pole will deflect before the "guying effect" comes into play must be understood.
- How is the telecommunications wires/cables attached? If it is on the side of the pole, then it could induce torsional load on the pole.
- If you consider that the point of attachment for the telecommunications wires/cables is fixed, then the moment arm for the supply wires are reduced to that point. However, the diameter of the pole is much less than at ground line and this may now be the weak point of the pole. The pole may have a good chance of breaking above the telecommunication attachment (a condition that was observed during the Hurricane Wilma forensic investigation).

Although we have not formally begun an evaluation to look into these questions, we have had discussions both internally and with our design software vendor to better understand them. If these informal investigations indicate there is a possibility of using the guying effects of current wires (even if some design changes are needed) in future installations, we will proceed with a more formal evaluation. FPL is very interested in pursuing any means available to help control the cost of its hardening projects and certainly will take the necessary steps to pursue this issue thoroughly.

Q. Mr. Harrelson suggests that the wind loading effect of fiber optic cable, which he states has a 0.59"diameter and a weight of 0.05 pounds per foot, does not significantly increase the load on poles. Do you agree with Mr. Harrelson?

A. No. Assuming a 0.59" diameter cable (as referenced at pp. 40 & 42 of Mr. Harrelson's testimony) and a typical span of 200 feet, this means almost 10 square feet of additional surface area within a given span, which can catch wind like a sail. For a class 2 wood pole in the 145 mph EWL wind zone, this equates to approximately 10% of the available strength of that pole.

Q. Would you please discuss FPL's past forensic efforts?

A. After FPL was hit with 3 hurricanes in 2004, I managed an effort to develop a systematic approach for evaluating the root causes of equipment failure during hurricanes. FPL's previous storm restoration efforts had always focused on using all available resources to restore service after a storm event, without specifically setting aside resources to determine causes of system failures. Since this approach did not generate any specific data to determine causes of failures, FPL had to rely upon high-level indicators of failed equipment (e.g., number of poles replaced, feet of wire replaced, etc.) and interviews with crews.

Following the 2004 storm season, FPL recognized that this informal forensics system needed to be improved. The main recommendation of this review was to form a forensic team so that future hurricane damage could be investigated more rigorously. During the later part of 2004 and the beginning of 2005, FPL formed a forensic team comprised of engineers in my group representing over 150 years of cumulative experience with FPL's distribution system. Procedures and process were developed that we subsequently used to perform forensic evaluations of Hurricanes Katrina and Wilma in 2005. Four teams, each comprised of two of my engineers, were deployed immediately after the "all clear" signal was given, in order to gather data prior to restoration crews repairing the damage. As detailed in the KEMA report, a standardized check sheet was used to collect data, pictures were taken at each observation, and notes were made to help determine causes. Our intent was to determine as objectively as possible why equipment failed and to use this data to help us improve system performance and/or restoration time when exposed to future storms.

Q. What did FPL's forensic evaluation conclude when this system was used to evaluate storm damage from Hurricane Wilma?

A. Prior to the Hurricane Wilma forensic evaluation, I (and most of my team members) would have agreed with Dr. Slavin and Mr. Harrelson that trees and debris were the major causes of broken poles during a storm. However, as detailed in the KEMA report, we found that wind was the predominant cause for pole breakage during Wilma. I personally was involved in approximately 20% of the observations made, and in those cases where I observed broken poles that were categorized as due to "wind only," I am thoroughly convinced that was the cause of their failure.

Q. What caused you to arrive at this conclusion?

A. Multiple factors compelled the conclusion that the force of hurricane winds on the poles caused them to fail:

- In almost all of the cases, the pole was broken at least one foot above ground level.
- A significant number of the poles that I observed were relatively new (10 – 15 years old).
- None of these poles had the presence of wood decay.
- In the majority of the cases, the surrounding terrain was not cluttered, precluding the possibility of something getting into the lines causing damage.
- The conductors as well as other equipment did not show any signs of damage other than that sustained when it struck the ground.

Together, these factors all pointed to the conclusion that the poles had failed because they experienced a wind force greater than their design capability.

Q. What remedy has FPL chosen to reduce the likelihood of poles breaking due to hurricane force wind?

A. The remedy we are using is to design our system to EWL as described in the NESC. I know the NESC does not require this for distribution structures that do not exceed 60 feet above ground or water level, but for our service territory it is apparent that using the "Combined ice and wind loading," is inadequate and fails to produce a system that is well suited to withstanding hurricane force winds. The "combined ice and wind loading" category is especially illsuited to Florida because it is in the "light loading" area based on the absence of significant icing risk and therefore applies wind-loading criteria that assume exposure to only relatively modest winds. With Florida's exposure to storm winds that regularly exceed this assumption, designing to the "combined ice and wind loading" criteria simply does not seem logical.

EWL requires the designer to address specific wind speeds. The basic wind speed map in the NESC is nominal design 3-second gust wind speeds at 10 meters (33 feet) above ground. As is shown in Dr. Slavin's testimony in Figure 1, combined ice and wind loading Grade B construction is not even as strong as an EWL of 105 mph. This agrees with the conclusions in the KEMA report that, when evaluated against EWL criteria, Grade B Combined ice and wind loading is the equivalent of 104 mph. How can we expect a system designed for only 104 mph winds to perform well, when our experience indicates that winds can far exceed that figure during even moderately strong hurricanes? I should point out that the NESC itself recognizes the potential for strong hurricane force winds in our service territory: it defines the winds for EWL construction to be as high as 150 mph.

Q. **Do you agree with Dr. Slavin's comments that Hurricane Wilma was a unique event and "it would not be reasonable to introduce dramatic design changes to the distribution plant based on a single storm"?**

A. No. The force and character of the winds experienced during Hurricane Wilma were typical of what can be expected from a storm of Wilma's strength. The damage to the distribution system sustained from Wilma was in line with a storm of this magnitude. At its peak, Wilma was categorized as a low-end category 3 storm. Unfortunately, there is considerable historical precedent to anticipate that storms as strong as Wilma will impact FPL's service territory in the future.

While I agree with Dr. Slavin that performing a forensic analysis is a difficult task and that cautions must be exercised in using conclusions of such a study, the evidence , however, that "wind only" was the predominant cause of pole damage during Hurricane Wilma was overwhelming. There is no reason to believe that our facilities will not be exposed to these type storms in the future, and I do not think one can have a complete plan to address storm outages without designing for these type winds.

Q. Why is FPL using the EWL criteria that apply to Grade B rather than Grade C construction?

A. FPL's system has been traditionally designed to Grade B construction, and FPL does not believe it would be consistent to apply the EWL criteria for Grade C construction for a system that is built to Grade B. NESC allows for different load factors for EWL Grade B and Grade C construction. For Grade C, the NESC allows a load factor of 0.87 for winds of 100 mph or less, and an even lower load factor of 0.75 to be used for winds above 100 mph. If the reduced Grade C load factor were used as recommended by Dr. Slavin, then the effective wind speed for the 145 mph zone would be reduced by 13% to only 126 mph. FPL has no data to suggest that designing to these lower wind speeds would be appropriate.

FCTA WITNESS HARRELSON

Q. Mr. Harrelson states that square concrete poles are more likely to fail than round poles in the event of a storm. Do you agree?

A. No. Mr. Harrelson correctly states that the NESC requires the use of a 1.6 wind load shape factor for square concrete poles. This value is used to normalize the effect of wind on a square pole to that of a round pole. Using this shape factor results in the proper design strength for EWL when using square concrete poles.

Q. Mr. Harrelson states that the information reported by KEMA does not conclusively support improved resilience of hardened distribution facilities. Do you agree?

A. No, the KEMA report states on page 80 that, "With the forensic data received and assumptions made as described in this chapter, the following conclusions, based on statistical analysis sufficient to perform root cause analysis and to direct engineering solutions, can be drawn. The sample size was sufficient to guarantee results in a range plus or minus 2.2% with 95% certainty."

Q. Mr. Harrelson states that he does not necessarily agree with the KEMA report due in part to "disclaimers" and explanations of assumptions in the report. Do those "disclaimers" and explanations affect the validity of KEMA's conclusions?

A. No. A review of the "disclaimers" and explanations of assumptions that he discusses shows that they do not affect the validity of KEMA conclusions:

- Mr. Harrelson quotes the following from page 50 of the KEMA report: "Specific additions to this forensic study and data collection process together with improved accuracy in the pole population data would enable more specific and targeted engineering solutions." The first sentence in this paragraph, which Mr. Harrelson omits, is "The forensic data as gathered by FPL staff during the restoration of Hurricane Wilma damage was very useful for engineering analysis." The intent of these two statements was to convey that the Wilma forensic analysis was a good start but that developing specific location/feeder recommendations was not possible due to the wide geographical area surveyed. Also, KEMA observed that FPL did not have a pole population data base with all the specifics of each pole and associated equipment with mounting hardware to use for a detailed root cause analysis. These limitations do not affect the report's overall conclusions about "wind only" pole failures, but rather cautions that carrying those conclusions to the level of specific location/feeder recommendations would require additional information.
- The statement quoted from page 58 in Section 7.2.5 states: "FPL verbally confirms that assignment of root causes is a personal judgment call irrespective of the pole ownership." The intent of this statement was to confirm that KEMA agrees that FPL inspectors

investigated pole breakage not considering pole ownership. Thus the team had no bias based on pole ownership.

The forensic inspectors were charged with assigning cause based on their observation that if a assignable cause was obvious (tree on pole or wire, metal awning rapped around pole, etc.) that cause was documented; if there was no apparent cause, information was documented that was used to determine other probable causes such as presence of deterioration if pole contained some decay or if the pole had multiple circuits or large cable attachments. If there was no apparent reason for the pole failure and the pole broke above ground level this was documented as "wind only." Given the high level of experience of the investigators making these evaluations, it is a very accurate method to determine failure causes

- The statement quoted from page 77 in Section 7.4. States: "Design overload is not a major contributor to poles breaking during Hurricane Wilma. Focusing on the 53 FPL owned poles broken with the suspicion of design overload as a contributing factor, most of these were multiple breaks investigated by one inspector." Mr. Harrelson interprets this as KEMA discrediting the "personal judgment call" of the "one inspector". This is not the intent of this statement at all, as KEMA further goes on in that paragraph to explain that the reason that design load is not a major contributing factor is that more detailed evaluation of these 53 FPL poles did not yield any one identifiable cause other than the relatively high number of attachments.

- Mr. Harrelson states that the forensic data is questionable due to more data gathered on feeder poles while FPL has mostly lateral poles. However, in developing the statistic that 52% of the poles were broken by wind only, KEMA normalized the forensic data to more properly reflect the feeder/lateral pole population thus making the forensic data usable for general pole population results.
- Mr. Harrelson comments that as much as 85% of the broken poles were multiple failures, which is also known as cascading. He further states "that one defective pole or guy wire can allow one pole to break and take down several solid poles which would not have fallen otherwise. Cascading can be started by trees or flying debris hitting facilities on one pole." He fails to mention that cascading can also start by one pole broken due to the effect of wind only. In the cases of multiple pole failures, the investigator thoroughly looked at the entire set of breakage to try to determine what caused any one of the poles to break. If a cause such at a tree was found, that cause was used for all of the poles in that cascading occurrence. Thus, the assigned causes for multiple pole breakage could have come from any of the categories used. I also would like to point out that stronger facilities can limit the number of poles in a cascade, so EWL poles are more likely to stop a cascading failure once it has started.

- Mr. Harrelson quotes KEMA at page 77, Section 7.4 of the report: "the counties and areas with highest pole failure rates coincide with the area with the highest wind speeds and are bordering open areas in the path of hurricane Wilma." Mr. Harrelson then asserts that "This finding validates the well know fact that trees and building shelter lines from winds whereas open areas do not. The trees and flying debris can and do frequently break poles designed to EWL standards." His conclusion is not supported by any data. Certainly, the KEMA report does not support his conclusion. As mentioned earlier, the NESC states in section 25, 250A, paragraph 3 "In the absence of a detailed loading analysis, using the same respective statistical methodologies used to develop the maps in Rule 250C or 250D, no reduction in the loadings specified therein shall be made without the approval of the administrative authority." FPL is interested in investigating what changes can be made to reflect the affect of shielding on its distribution lines, but until shielding effects can be documented in accordance with the above guidelines; we cannot arbitrarily change the calculations shown for EWL in the NESC.
- Mr. Harrelson discusses page 59, Table 7-7 of the KEMA report. He states "that wind only was based upon the personal judgment calls of the inspectors". As I mentioned earlier, the FPL inspectors had a combined experience of over 150 years with FPL and are engineers in the group responsible for FPL construction standards. They used a

process that eliminated as much subjectivity as possible in determining the cause of pole failures. We were interested in collecting valid forensic information to help the distribution system better withstand hurricanes and knew that invalid data would not be helpful. There was no bias or incentive to influence the collection of data toward one cause of failure versus another. Frankly if there had been any bias at all, it would have been *against* concluding that poles failed due to wind only, based on the inspectors' prior experience and expectations.

In short, FPL's forensic team used a carefully structured forensic process that included multiple reviews of how to do an observation, and what to look for when recording data. Mr. Harrelson has not supplied any forensic data to support the conclusions about pole failures stated in his testimony. It is *his* conclusions, not those of the FPL inspectors, that rely heavily on personal judgment.

- Mr. Harrelson makes the statement "A better forensic analysis would have sought to determine the cause or causes of the cascading failures which accounted for 85% of the recorded failures." As I discussed in the previous bullet, this is exactly what the forensic team did, assign a cause for both single pole failures and multiple failures.
- Mr. Harrelson further refers to KEMA Table 7-7 indicating "Table 7-7 attributes only 12% of the lateral pole failures to wind only, 33% is attributed to tree and 47% to presence of deterioration. Lateral lines

are the smaller lines which serve such area as neighborhoods where more trees and building are common. Significantly, 55% of FPL poles broke during Wilma were lateral poles." Mr. Harrelson is correct in his statements. The reason the overall percentage of pole breakage due to Wilma is 52% is because, as Table 7-7 indicates, the feeder pole breakage due to "wind only" was 66%. While FPL is concerned with the storm resilience of all its distribution poles, it is especially important to harden the feeder poles because a feeder failure affects many more customers that a lateral failure.

- Mr. Harrelson cites page 68 of the KEMA report, which "refers to a group of wind only failures where half of them fell to the east and half of them fell to the west." He goes on to assert that "This is consistent with an embedded tornado-type wind for which EWL would not likely provide adequate protection." As it so happens, this location was approximately 10 miles from my house. The eye of hurricane Wilma passed directly over my house and this area described. Of course, the wind direction in the leading eye wall is opposite the direction in the following eye wall. I observed these pole breaks, and there was no surrounding area damage that would be consistent with tornado activity. Instead, the phenomenon of some poles falling in one direction while the others fell in the opposite direction resulted from the switch in wind direction after the hurricane's eye passed over the area in question.

- Mr. Harrelson states that "on page 80 KEMA concludes that wind was the predominant root cause of pole breakage in general and tree breakage causing pole breakage in particular." Mr. Harrelson is not correct; this statement was included in the KEMA report section 7.4 "Integral analysis and interpretation" page 78, not in the conclusions section. In section 7.4, KEMA discusses different factors that were used to analyze the data, ruling some factors as usable and some as not. However in the conclusion section 7.5, KEMA states "Wind is the predominant root cause of pole breakage based on analysis of the forensic data collected after Hurricane Wilma." In fact looking at all FPL wood pole breakage data in the report, 52% was due to "wind only," while only 20% was due to trees.

In summary, Mr. Harrelson has misinterpreted much of the data in the KEMA report. The report accurately reflects the efforts of the forensic team and is the most detailed analysis to date of any hurricane damage to a distribution utility system. I stand by its conclusions.

Q. Does this conclude your rebuttal testimony?

A. Yes.