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September 7, 2007

Ann Cole, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Re: Docket No. 070297-EI
Review of 2007 Electric Infrastructure Storm Hardening Plan filed pursuant to Rule 25-6.0342, F.A.C., submitted by Tampa Electric Company

Docket No. 070298-EI
Review of 2007 Electric Infrastructure Storm Hardening Plan filed pursuant to Rule 25-6.0342, F.A.C., submitted by Progress Energy Florida, Inc.

Docket No. 070299-EI
Review of 2007 Electric Infrastructure Storm Hardening Plan filed pursuant to Rule 25-6.0342, F.A.C., submitted by Gulf Power Company

Docket No. 070301-EI
Review of 2007 Electric Infrastructure Storm Hardening Plan filed pursuant to Rule 25-6.0342, F.A.C., submitted by Florida Power & Light Company

Dear Ms. Cole:

Enclosed for filing in the above-referenced matters are an original and 15 copies of the Direct Testimonies of Dr. Lawrence M. Slavin and Sanford C. Walker on behalf of Verizon Florida LLC. Service has been made as indicated on the Certificate of Service. If there are any questions regarding this filing, please contact me at (678) 259-1449.

Sincerely,

Dulaney L. O'Roark III

Dulaney L. O'Roark III

tas
Enclosures

CMP 2
COM 5
CTR 1
ECR
GCL 2
OPC
RCA 1
SCR
SGA
SEC
OTH

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that copies of the foregoing were sent via U. S. mail on September 7, 2007 to the parties on the attached list.

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Review of 2007 Electric Infrastructure Storm Hardening Plan filed pursuant to Rule 25-6.0342, F.A.C., submitted by Tampa Electric Company	Docket No. 070297-EI
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In re: Review of 2007 Electric Infrastructure Storm Hardening Plan filed pursuant to Rule 25-6.0342, F.A.C., submitted by Florida Power & Light Company	Docket No. 070301-EI

DIRECT TESTIMONY OF DR. LAWRENCE M. SLAVIN
ON BEHALF OF VERIZON FLORIDA LLC

SEPTEMBER 7, 2007

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Dr. Lawrence M. Slavin. My business address is 15 Lenape Avenue, Rockaway, NJ 07866.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Outside Plant Consulting Services, Inc. and am a Principal of the company.

Q. PLEASE DESCRIBE YOUR EMPLOYMENT BACKGROUND.

A. I started my career at Bell Laboratories, where I worked from 1961 to 1989, primarily in telecommunications product design and development. At Bell Laboratories, I was selected to be a Distinguished Member of Technical Staff, an award created to honor those who have sustained a level of excellence throughout their career. After retiring from Bell Labs in 1990, I joined Telcordia Technologies (formerly Bellcore) as a member of its research and professional service organizations, where I worked during the period 1990-2001. At Telcordia, I served as Director of the Network Facilities, Components, and Energy Group, responsible for requirements, testing, and analysis of outside plant media, components, and powering for telecommunications applications, as well as related installation and construction guidelines. In 2002, I started a consulting practice with Outside Plant Consulting Services, Inc., focusing on issues related to the communications and power industries. Exhibit LMS-1 provides more detailed information concerning my experience in the telecommunications and related utility industries, including my activities in relevant professional organizations, such as the Executive Subcommittee, Main Committee and several subcommittees for the National Electric Safety Code ("NESC").

Q. PLEASE SUMMARIZE YOUR INVOLVEMENT WITH THE NESC AS RELEVANT TO THIS PROCEEDING.

A. I have been an active member of NESC Subcommittee 4 (Overhead Lines – Clearances), Subcommittee 7 (Underground Lines) and Subcommittee 5 (Overhead Lines – Strength & Loading) since 1998, and actively participated in the development of the 2002 edition of the NESC and the recently issued 2007 edition. As a principal member of these subcommittees, and a representative of the Alliance for Telecommunications Industry Solutions, I help develop and evaluate change proposals for upcoming editions of the NESC. In particular, Subcommittee 5 is responsible for specifying the storm loads and associated structural strength requirements referenced by Florida Power & Light Company ("FPL"). I am Chair of Working Group 5.7 (Seminars and Presentations; Subcommittee 5), and have served on Working Group 5.2 (Complete Revision of Sections 25 and 26), and on Working Group 5.8 (Application of Extreme Wind to All Structures). I have also been Chair of Working Group 4.10 (New Ice Loads and Clearances) of Subcommittee 4. In addition to my NESC work, I serve on the Accredited Standards Committee ASC-O5 (responsible for *ANSI O5.1, Wood Poles, Specifications and Dimensions*) and several other industry related organizations, as listed in Exhibit LMS-1.

Q. HAVE YOU BEEN RESPONSIBLE FOR NESC INDUSTRY INFORMATION SESSIONS RELATING TO UTILITY POLE STRENGTH AND LOADING?

A. Yes. As Chair of Working Group 5.7, I have been responsible for organizing and coordinating several industry information sessions, as well as providing some of the associated technical presentations. Among others, these include:

- *Panel Session: NESC 2007 Panel Session (Strength & Loading),* IEEE Power Engineering Society, Towers, Poles & Conductors (TP&C) Subcommittee Meeting, 2007
- *Panel Session: Structural Reliability-Based Design of Utility Poles and the National Electrical Safety Code*, 2003 IEEE Transmission & Distribution Conference and Exposition, 2003
- *Panel Session on National Electrical Safety Code (NESC), 2002 Edition, ANSI C2*, 2001 IEEE Transmission & Distribution Conference and Exposition, 2001
- *Panel Session on Proposed Changes to Strength & Loading Requirements for the 2002 Edition of the National Electrical Safety Code (NESC)*, IEEE Power Engineering Society, Towers, Poles & Conductors (TP&C) Subcommittee Meeting, 2000

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A. I have received the following college and university degrees:

- Ph.D. - Mechanical Engineering, New York University, 1969
- Master of Science - Engineering Mechanics, New York University, 1963

- Bachelor of Science - Mechanical Engineering, The Cooper Union for the Advancement of Science & Art, 1961

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. The NESC has been developed by the NESC Committee (a term I use generically to include the various NESC subcommittees and the Main Committee), which is a national standards body comprised of knowledgeable individuals representing utility organizations (including power, telephone and cable), professional associations, government organizations, unions and other interested parties, such as consultants, engineers, and erectors. Throughout most of the United States, including Florida, the NESC is considered to be authoritative with respect to basic safety rules for outdoor utility lines, including pole loading and strength. The NESC specifies that Combined Ice and Wind District Loading shall be used to determine pole loading and associated strength for poles not exceeding 60 feet in height, which includes most distribution poles. The NESC has considered whether extreme wind loading ("EWL") should be required for poles less than 60 feet in height and has decided against such a requirement, because the high cost of attempting to design such poles to withstand EWL does not justify its benefits. The benefits of EWL are projected to be slight for such cases, because in most storms involving extreme winds, damage to structures results primarily from falling trees and branches and flying debris striking the vulnerable lines, rather than the wind pressure itself imposed on the structures and lines. Moreover, the attempt to design the shorter structures to EWL can have unintended consequences, such as the following: (i) longer restoration times because, in spite of the attempt to design distribution poles to withstand EWL, the significantly greater number of required poles or stouter poles (or both), may result in longer restoration times when such poles are nonetheless damaged; (ii) more (and more serious) traffic accidents because of the greater number and/or size of poles; and (iii) errors and delays resulting from greater complexity required to engineer structures for EWL. FPL's arguments for applying EWL in its service territory have not been presented to, or accepted by, NESC Subcommittee 5, and, in any case, are based on limited data that has not been subjected to examination and scrutiny by the industry. I therefore recommend that FPL's proposal that it apply EWL to its distribution plant be rejected. If EWL is to be applied at all, it should be done as a pilot project over a limited time.

I. NESC LOADING AND STRENGTH REQUIREMENTS

A. NESC BACKGROUND

Q. WHAT IS THE NESC?

A. The NESC is an American National Standards Institute ("ANSI") standard based on a consensus of those substantially concerned with its scope and provisions, including the Institute of Electrical and Electronic Engineers, which also acts as the Secretariat. Other members of the NESC Committee include organizations representing providers of electric power or communications service, their suppliers, and other affected or interested parties, including unions, and consultants, engineers, and erectors. Individual candidates desiring membership for available positions must submit their credentials for approval by the NESC Executive Subcommittee. The National Association of Regulatory Utility Commissioners is represented on several of the NESC subcommittees. Power companies in Florida, including FPL, are members of organizations represented on the NESC Main Committee and several subcommittees, including Subcommittee 5. The NESC includes various provisions for the safeguarding of persons from hazards from the installation, operation, and maintenance of electric supply and communication lines and equipment. The rules contain the basic provisions that are considered necessary for the safety of employees and the public.

Q. HOW DO THE POWER AND TELECOMMUNICATIONS INDUSTRIES USE THE NESC WITH RESPECT TO POLE LOADING AND STRENGTH DETERMINATIONS?

A. Although the NESC does not purport to be a "design specification," the basic safety rules provided therein are typically used throughout the industry as the basis for designing distribution pole lines. Many states and agencies throughout the United States routinely adopt the latest edition, or specific editions, of the NESC for application within their jurisdictions. For example, the 2007 edition is effective in Florida.

Q. THE NAME "NATIONAL ELECTRIC SAFETY CODE" MIGHT SUGGEST THAT THE NESC IS NARROWLY FOCUSED. DOES THE

NESC SPEAK TO THE STORM-HARDENING ISSUES BEFORE THE COMMISSION IN THIS DOCKET?

A. Yes. In the NESC, safety issues are generally considered to include those that would result in damaged poles or downed lines, because these situations may affect the safety and well being of the public through associated hazards and loss of essential services. The NESC Committee therefore weighs the benefits of increasing the number and size of poles along with the attendant costs and risks, including problems associated with increased design complexity and possible other issues.

Q. WHAT NESC SECTIONS ADDRESS POLE LOADING AND STRENGTH?

A. Sections 25 and 26 of the NESC provide the required loadings and associated strengths of utility poles and other structures. Section 25 specifies the type of storm loads that Grade B or Grade C utility lines are required to withstand. ("Grades of construction" are discussed below.) Section 26 specifies the required strengths of the structures required for the storm loadings specified in Section 25. Two types of storms are specified in the 2007 edition that are relevant to this discussion -- (1) Combined Ice and Wind District Loading (Rule 250B) and (2) EWL (Rule 250C). Combined Ice and Wind District Loading applies to all Grade B and C poles, including those that do not exceed 60 feet in height (which include distribution poles), while EWL only applies to those structures that are greater than 60 feet tall, for reasons I will explain.

B. NESC SECTION 25: POLE LOADING

Q. PLEASE EXPLAIN WHAT IS MEANT BY "LOADING."

A. Loading involves the force (generally expressed in pounds) that is exerted against a structure. The biggest consideration in pole loading is typically not the weight of the pole or its attachments, but rather the wind pressure that is applied transversely (horizontally) to the profile of the pole and attachments. In much the same way that the speed of a sail boat depends on the speed of the wind and the square footage of the sail, the load applied to a pole depends on wind speed and the square footage of the pole and attachments.

Q. PLEASE EXPLAIN GENERALLY HOW DISTRIBUTION POLE LOADING IS CALCULATED UNDER SECTION 25 OF THE NESC.

A. Loading for Grade B and C distribution poles is determined using Rule 250B, which deals with Combined Ice and Wind District Loading. Rule 250B refers to the Loading District map, NESC Figure 250-1, reproduced below. The three loading districts in the United States (Heavy, Medium and Light) specify the amount of radial ice buildup and a concurrent wind pressure. The Heavy and Medium districts in the north and central portions of the United States are subject to one-half and one-quarter-inch radial ice buildup, respectively, on all power and communications wires, cables, and other conductors, and a concurrent wind pressure corresponding to approximately 40 m.p.h. (4 p.s.f. wind pressure). The Light district in the southerly portion of the country, including Florida, is assumed to experience no ice buildup, but a wind pressure corresponding to approximately 60 m.p.h. (9 p.s.f. wind pressure). The latter wind speed, although only 50% greater than that assumed in the rest of the country, corresponds to a wind pressure of more than twice that in the Heavy or Medium districts, due to the strong dependence of the wind force on wind speed. (The wind pressure, or force, is proportional to the square of the wind speed.) The lower pressure in the Heavy or Medium districts, however, is applied to a greater "sail area" due to the ice buildup on the conductors (*i.e.*, the cables and wires). Depending on the conductor diameters, and the ice buildup levels, the resultant transverse loads in the "Light" district may exceed that in the so-called "Heavy" or "Medium" areas. In addition, under Rule 250B, a net design ("safety") factor of approximately 2-to-1 is applied to the common Grade C wood pole construction, and a net design factor of approximately 4-to-1 is applied to Grade B wood pole construction, where required. The design factor is equal to the "load factor" of NESC Table 253-1 divided by the corresponding "strength factor" of Table 261-1A. (This description assumes "tangent" pole lines, without significant corner angles where guys may be required. For such tangent lines, the transverse wind loads typically represent the critical design condition.) This procedure results in a reasonably robust design, which experience has shown to provide reliable, safe service.

PART 2. SAFETY RULES FOR OVERHEAD LINES

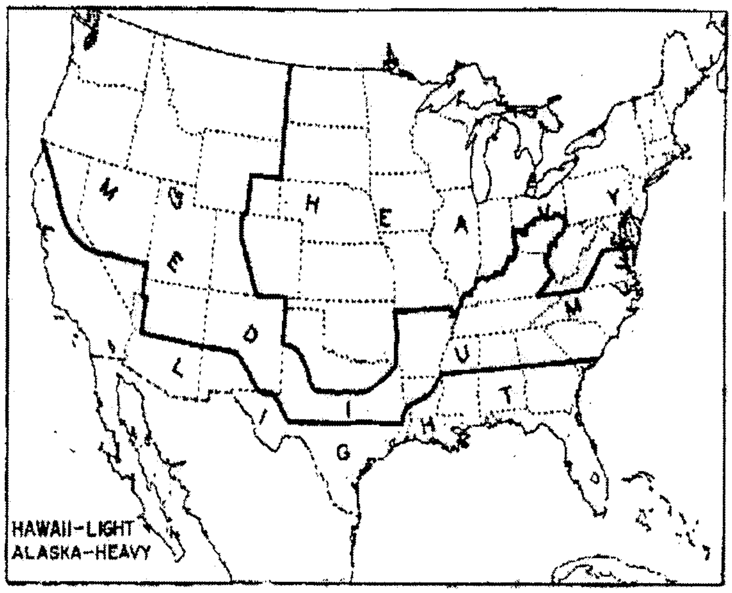

Fig 250-1
General Loading Map of United States
with Respect to Loading of Overhead Lines

Q. WHAT IS MEANT BY GRADES OF CONSTRUCTION?

A. Section 24 of the NESC defines three grades of Construction intended to distinguish between various situations, requiring varying levels of reliability. In general, these grades depend on the combination of voltage levels present in the power and communications conductors supported on the same poles, as well as various details, as specified. Most distribution poles carrying "primary power" (> 750 volts) at the upper portion of the pole, and communications cables below, are in the Grade C category. If the adjacent lines cross railroads tracks or limited access highways, a greater reliability level is required, corresponding to Grade B. Most power utility-owned poles are in the Grade C category.

The third and lowest grade of construction is Grade N, and applies if the voltages do not exceed 750 volts. This includes joint-usage poles supporting only "secondary power" (< 750 volts) or poles supporting only communications cables. NESC Section 25 (Loadings for Grades B and C) and most of Section 26 (Rule 261) apply to Grade B or Grade C construction. The NESC does not provide specific storm loading or strength requirements for Grade N structures.

C. NESC SECTION 26: POLE STRENGTH

Q. HOW IS POLE STRENGTH CLASSIFIED?

A. Wood pole sizes and strengths are specified in *ANSI O5.1, Wood Poles, Specifications and Dimensions.* ANSI-O5.1 provides a pole classification system based on the ability of a pole to withstand lateral loads placed near the top of the pole, in a cantilever situation, such as may correspond to transverse wind loads on a pole with attachments. For example, a popular size Class 4 pole would on average withstand a lateral load of 2,400 pounds applied 2 feet from the tip of the pole. A Class 3 pole is stronger, and would withstand 3,000 pounds. Within poles of Class 1-10, lower class number poles correspond to stronger (*i.e.*, larger diameter) poles. Poles of strength greater than Class 1 are classified beginning with H1, with strength increasing with the H-number. Thus, a pole may be described as that supporting a specific "grade" of construction, corresponding to a level of required reliability (Grade B or C), or by a "class" size which is selected to match the strength needed to achieve the required reliability level.

Q. ONCE IT IS ESTABLISHED WHAT LOAD A POLE MUST BEAR, HOW IS POLE STRENGTH DETERMINED?

A. The required strength is determined and calculated based on the number, size (diameter) and location (height) of the attachments to the pole, the span length between adjacent poles, and the grade of construction (via the design factors discussed above).

D. APPLICATION OF EXTREME WIND LOADING

Q. UNDER THE NESC, DOES EWL APPLY TO DISTRIBUTION POLES?

A. No. Under the NESC, EWL applies only to poles greater than 60 feet in height, which excludes most distribution poles.

Q. PLEASE EXPLAIN HOW POLE LOADING IS CALCULATED USING EWL.

A. NESC Rule 250C refers to various wind maps, of which Figure 250-2(d), including Florida, is reproduced below. The wind speeds correspond to 50-year events, and vary from approximately 95 m.p.h. in the north of the state to as much as 150 m.p.h. at the southern tip. The minimum 95 m.p.h. speed corresponds to a wind pressure of two and one-half times that of the 60 m.p.h. wind assumed in the Light loading district. The maximum 150 m.p.h. speed corresponds to a wind pressure of more than six times that of the 60 m.p.h. wind. But the corresponding design factors for Rule 250C are lower than that of Rule 250B, somewhat reducing the wide divergence in pole strength requirements. Nonetheless, if EWL were applicable to distribution poles, the impact on pole strength and sizes in Florida, and on utility construction practices and costs, would be major, as illustrated for the cases described below.

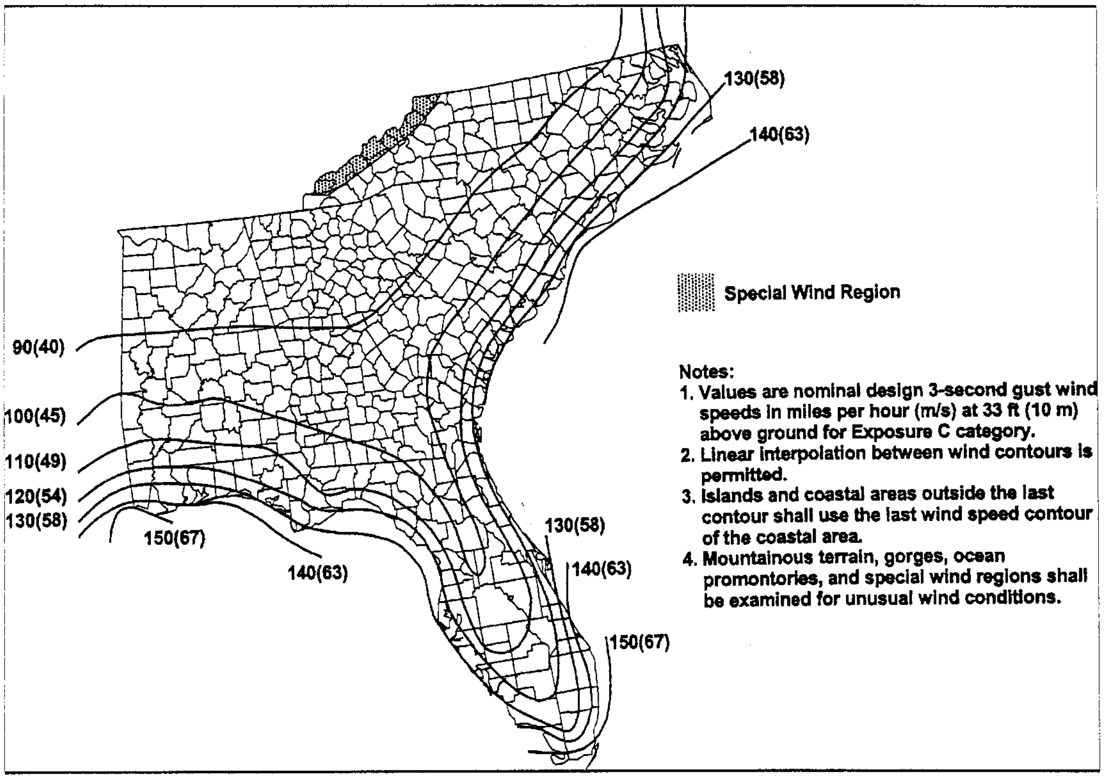

Figure 250-2(d)—Eastern Gulf of Mexico and southeastern US hurricane coastline

Q. HAS NESC SUBCOMMITTEE 5 ADDRESSED THE ISSUE OF WHETHER EWL SHOULD APPLY TO POLES THAT ARE 60 FEET OR LESS IN HEIGHT?

A. Yes. There have been continuing discussions within Subcommittee 5 to consider eliminating the 60-foot exemption -- so that poles of all heights would be subject to EWL. Such a revision was discussed with regard to the 2007 edition but, as had happened previously (such as when the 2002 edition was prepared), the related proposals were rejected. The proposed change that was discussed most seriously would have limited the effective wind loading to a relatively low level (corresponding to wind speeds that would cause wind blown debris) and typically would not have increased the required wind loadings for distribution poles in Florida. Nonetheless, even this diluted version of an extreme wind requirement was rejected for incorporation into the NESC.

Q. WHY DID THE SUBCOMMITTEE REJECT EWL FOR DISTRIBUTION POLES?

A. The rationale for rejecting consideration of extreme winds for "distribution" poles (i.e., poles not taller than 60 feet) is that the vast majority of industry experiences demonstrate that almost all damage to such poles is caused by trees, tree limbs and flying debris and not by the wind forces acting directly on the wires and poles. When that is the case, little is gained by attempting to design such poles to withstand the direct hurricane wind forces. As stated in the NESC decision to reject such a change:

> "Designing structures with heights less than 60 ft for extreme winds will increase pole strengths for distribution systems resulting in large increases in cost and design complexity without commensurate increase in safety. Safety of employees and the public is provided using the current NESC loading requirements."

NESC Section 25 does not explicitly use the term "distribution" when referring to poles not exceeding 60 feet, but has specified the 60-foot threshold to exclude most such poles that would tend to be vulnerable to the effects of wind-blown debris. In contrast, taller structures, such as transmission towers, with lines generally above the fray of falling trees, branches and debris, would benefit from such an application of EWL requirement.

Q. IF EWL WERE APPLIED IN FLORIDA, WOULD THE INCREASED COSTS OF MORE AND STOUTER DISTRIBUTION POLES NECESSARILY PRODUCE ANY SIGNIFICANT BENEFITS FOR FLORIDIANS?

A. No. Because typically most damage to poles during high wind storms results from trees, branches and flying debris rather than the wind pressure itself, I would not expect there to be significant benefit to having more or stouter distribution poles. This is so essentially because poles, with attached lines spanning the distance to other poles, suffer disproportionately large exposure and associated effects during hurricanes as compared to individual structures, including bare poles or buildings. In most cases the high cost of EWL would not produce commensurate benefits because even poles that are strengthened to EWL standards are vulnerable to failure caused by trees, branches and flying debris. The loads imposed by these objects striking the lines result in high, unbalanced wire tensions, which impose extremely large lateral loads on the poles, which is compounded by the domino effect of damaged individual poles placing increased loads on adjacent poles along the line.

Q. COULD THERE BE ANY NEGATIVE, UNINTENDED CONSEQUENCES ASSOCIATED WITH EWL?

A. Yes. Restoration efforts following a "typical" hurricane event, in which a combination of a greater number and stouter poles would be damaged by falling branches and wind-blown debris, would be hampered by the greater number and larger poles that would have to be replaced. In addition, the increased number and size of the poles would have a direct and negative impact on vehicular safety, and conflict with the objectives of the U.S. Department of Transportation and presumably that of the DOTs of many states. Still another negative consequence relates to the engineering support associated with the implementation of the proposed EWL. The determination of the corresponding wind force is considerably more complicated than that of the existing transverse wind force based on the present required Combined Ice and Wind District Loading. While such calculations are within the capability of experienced transmission engineers, with civil engineering training, they are beyond that of most distribution engineers. Although new or available software packages may alleviate the burden, there will be inevitable confusion and delays in the design and installation of new facilities to the detriment of consumers.

Q. HAS SUBCOMMITTEE 5 DISCUSSED IMPOSING EWL REQUIREMENTS FOR GRADE N CONSTRUCTION?

A. No. To the best of my knowledge, the Subcommittee 5 has never discussed extending any of the detailed storm loading requirements, including design (load and strength) factors, as specified in Section 25 and Section 26 of the NESC to Grade N applications, which include communications-only poles or joint-use poles with only secondary power (< 750 volts). Thus, any proposal to extend Rule 250C to all distribution poles, regardless of height or grade of construction, would be a major departure from present considerations in the NESC Committee, or industry in general.

II. ASSESSMENT OF FPL PROPOSAL

Q. WHAT DOES FPL PROPOSE WITH RESPECT TO EWL?

A. FPL proposes to (i) apply EWL to critical infrastructure, (ii) implement incremental hardening projects that would strengthen certain existing infrastructure (but not necessarily applying EWL); and (iii) apply new design guidelines to new overhead construction, major planned work, relocation projects and daily work activities, with the intention of moving FPL's system to EWL gradually over time. FPL states that it plans to divide its territory into three wind regions, corresponding to extreme winds of 105, 130 and 145 m.p.h. (except for the southern tip of Florida, which would be designed for 150 m.p.h.). FPL's proposed design guidelines call for an increase in pole strength and size (class) in various scenarios, and for shorter pole spans, which would increase the number of poles.

Q. SHOULD THE COMMISSION ENDORSE FPL'S PROPOSAL TO APPLY EWL TO ITS DISTRIBUTION NETWORK?

A. No. The unlimited application of Rule 250C to all poles would have a major impact on the cost and operations of the utilities and the third-party attachers, and would likely have a negative effect on system restoration efforts and public safety.

Q. HOW WOULD FPL'S PLAN AFFECT POLE COSTS?

A. For electric utility-owned joint-use Grade N, Grade B or Grade C pole applications, the additional pole costs will depend on the extent to which the proposed extreme wind load would exceed "reasonable" (albeit non-mandated) Grade N loads, and the already required Combined Ice and Wind load for Grade B or Grade C applications for poles not exceeding 60 feet in height. Any increased strength requirement leads to stronger (larger diameter) poles, and/or a greater number of poles (resulting from shorter span lengths), both of which would obviously be more expensive.

Q. PLEASE ILLUSTRATE THE IMPACT OF MOVING TO EWL ON REQUIRED POLE STRENGTH, ASSUMING POLE ATTACHMENTS AND SPAN LENGTHS REMAIN THE SAME.

A. Figure 1 below illustrates the relative wood pole strength in comparison to that currently required for a Grade C joint-usage distribution application; *e.g.*, including primary power (> 750 volts) with communications cables mounted below the power cables. Assuming the pole does not exceed 60 feet in height (65 feet in length), such a pole must be designed to the Combined Ice and Wind Loading. (See

NESC Rule 250B, Figure 250-1 and Tables 250-1, 253-1 and 261-1A.) For present purposes, a tangent line (no corner angles), for which the design is based on the ability to withstand the transverse wind loading, and a pole length of 40 feet is assumed. (Pole length and attachment height has only a minor effect on the results.) Florida, located in the NESC Light Loading District, corresponds to a wind speed of approximately 60 m.p.h., but with an additional net design factor of approximately 2-to-1 for Grade C, and 4-to-1 for Grade B. For Grade N, a 1-to-1 design factor is assumed. For the proposed application of Rule 250C, I have evaluated wind speeds of 105, 130 and 145 m.p.h., representing the regions served by FPL. Consistent with the FPL Distribution Engineering Reference Manual (DERM) Addendum for EWL, a Grade B load factor of 1.0 is implemented, rather than the lower 0.75 factor specified in NESC-2007 for typical Grade C construction for the specified wind speeds.

Relative Distribution Pole Strength
(NESC-2007, Grade B Extreme Wind Load Factor)

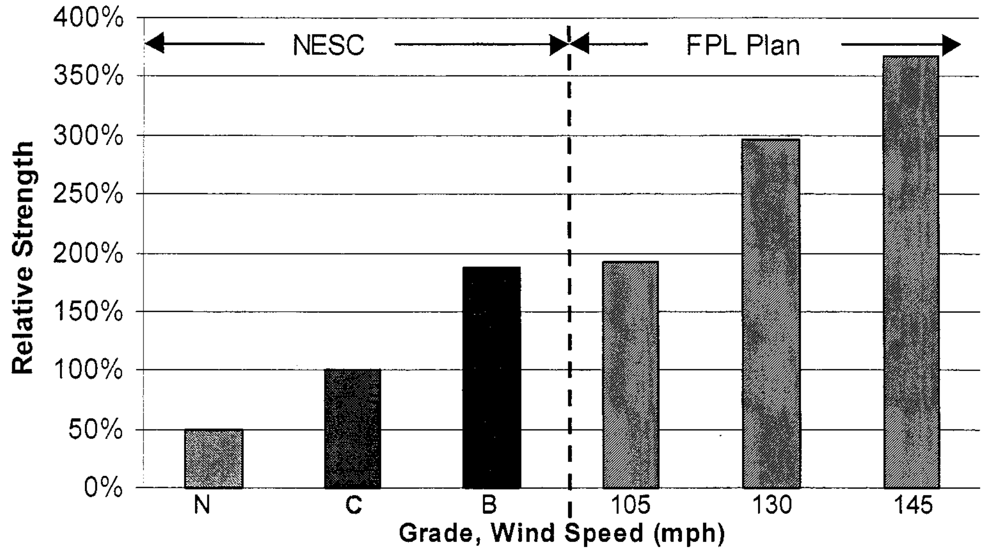

Figure 1

FPL Plan Distribution Wood Pole Strength vs. NESC Requirements

The three solid bars to the left side of Figure 1, labeled "N", "C" and "B," depict the relative magnitude of the present required pole strength for a Grade N, Grade C, or Grade B application. The three cross-hatched bars to the right depict the relative magnitude of the required pole strength due to extreme wind loads, at the wind speed indicated, should Rule 250C be directly extended to such applications, as proposed by FPL. The results in Figure 1 show that the EWL required pole strength ranges from almost double (105 m.p.h.) to more than three and one half times (145 m.p.h.) that required for the normal Grade C pole strength. For a Grade N pole application, the required strength would increase by a factor ranging from almost four to more than seven. For the less commonly required Grade B applications, the required strength would increase by only a few percent for the 105 m.p.h., to double the required strength at 145 m.p.h. Thus, the EWL requirement as proposed by FPL would represent a major increase in pole strength requirements, when considered in comparison to any of the present NESC requirements for the various grades of construction, including Grade B, which FPL has apparently been routinely implementing based on Rule 250B (Combined Ice and Wind Loading Districts).

Q. WHAT IS THE IMPACT OF EWL ON REQUIRED WOOD POLE SIZE (CLASS), ASSUMING POLE SPANS STAY THE SAME?

A. Figure 2 illustrates the corresponding wood pole class that would be required, assuming a Class 4 pole is necessary for the Grade C application, and the same number of poles (or span length) is maintained. Similar to Figure 1, the three solid bars to the left side of Figure 2 depict the representative pole class for a Grade N, Grade C, or Grade B application. The three cross-hatched bars to the right depict the required class pole corresponding to the FPL proposed application of the extreme wind loads. A minimum increase of four class sizes (to Class H1) would be required for the minimum 105 m.p.h. wind, and as much as eight class sizes (to Class H5) for the 145 m.p.h. case. A Class 7 pole would otherwise suffice for the Grade N construction. As above, the Grade B applications would be affected to a lesser degree, but the increased size would still be significant, ranging from one to five pole class sizes. The increased pole material costs, including shipping and storage, are directly related to the number of poles or pole size (class). For larger, stronger poles, increased installation costs for the heavier poles may also be expected. Furthermore, the availability of such larger size (diameter) wood poles may be an issue.

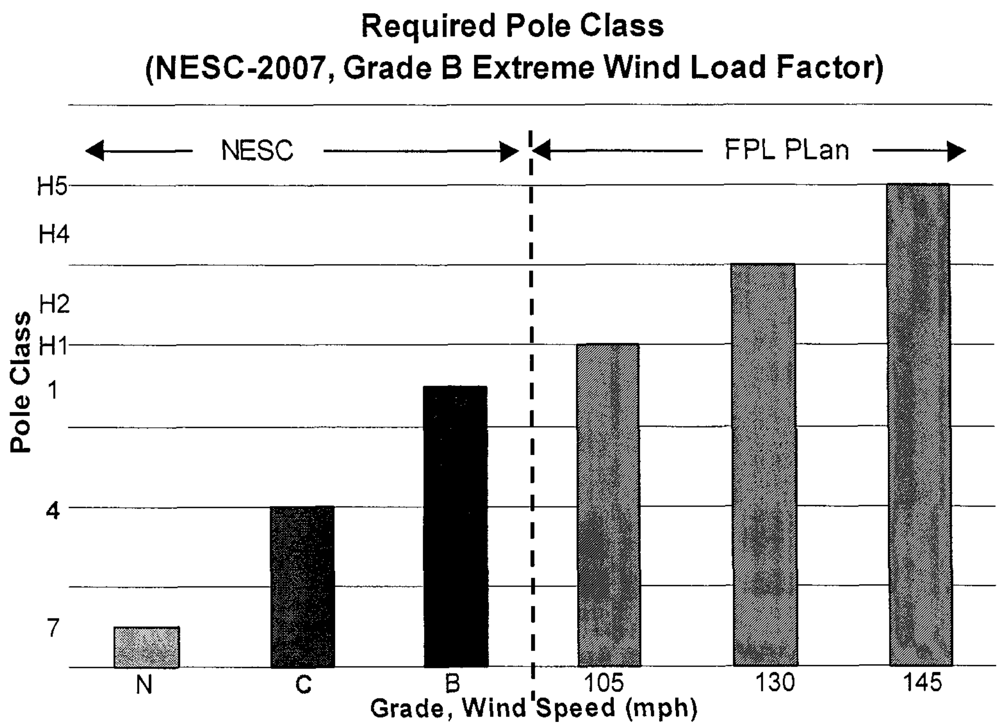

Figure 2

FPL Plan Required Distribution Wood Pole Class vs. NESC Requirements

Q. HOW DO YOU EXPLAIN FPL'S TESTIMONY THAT IT ONLY PLANS TO INCREASE POLE STRENGTH BY ONE POLE CLASS?

A. The illustrations above are useful for making an apples-to-apples comparison of the increases in pole strength necessary to achieve FPL's objectives. Rather than achieving EWL by relying on increased pole strength alone, FPL proposes to use a combination of somewhat stronger poles and shorter pole-to-pole spans, thus increasing the number and size of poles and thus significantly increasing costs. Regardless of whether FPL chooses to use much stronger poles or a higher number of slightly stronger poles, the result is the same: FPL's proposed plan would have a major impact on the cost of the distribution facilities, which, based on reported previous industry experience, would not provide significant additional protection against storm damage.

Q. FPL WITNESS MIRANDA REFERS TO PAST RESISTANCE FROM THE BUILDING INDUSTRY TO THE IMPOSITION OF STRICTER BUILDING CODES FOLLOWING HURRICANE ANDREW, BUT WHICH HAS APPARENTLY RESULTED IN SIGNIFICANT BENEFITS TO HOMES AND BUILDINGS. IS THIS A VALID ANALOGY?

A. No. The primary vulnerability of pole facilities is not due to the poles themselves, but to the lines and cables extending between poles. These lines represent a disproportionately large exposure to falling trees and branches and flying debris that results in high wire tensions that transfer extremely large unbalanced lateral loads to the pole, which is compounded by the domino effect of damaged individual poles placing increased loads on adjacent poles along the line. Thus, poles with attached lines will experience a disproportionately large load during hurricanes in comparison to individual structures, including buildings and bare poles, and generally would not receive a commensurate benefit associated with the large increase in strength and cost. Furthermore, utility poles and buildings have different physical characteristics, and cost-effective technologies and methods may be available for hardening buildings that may not be appropriate for simple pole geometries. Overall, the decision by the organizations responsible for developing building standards and codes made the decision appropriate for this category. The organization responsible for developing standards for the utility industry -- the NESC Committee -- has decided such a change would not be of significant benefit.

Q. HOW DO YOU RESPOND TO MR. MIRANDA'S TESTIMONY THAT TRANSMISSION LINES WITHSTOOD HURRICANE WILMA HURRICANES BETTER THAN DISTRIBUTION LINES BECAUSE THEY ARE DESIGNED TO WITHSTAND EXTREME WIND?

A. The greater survival rate of transmission structures is to be expected and has much more to do with their typically greater height than to their stricter design criteria. Because they are taller and their lines usually are higher, transmission poles are less vulnerable to falling trees, branches and wind-blown debris. This consideration is fundamental to NESC decisions to not require such extreme loadings for the shorter distribution poles, which would not significantly benefit from the required increased strength.

Q. PLEASE RESPOND TO MR. MIRANDA'S TESTIMONY CONCERNING THE KEMA REPORT.

A. Much of the decision to implement the FPL hardening plan is based on its experiences with Hurricane Wilma, as analyzed and documented in the January 2006 KEMA report. That report concludes that "wind only" was the highest contributing factor for pole failures during this storm event. Performing a forensic analysis is typically a difficult task, due to the inability to successfully collect information in the midst of the restoration efforts, combined with the possible lack of immediate objective information at a later date. One must therefore be cautious in using the conclusions of such a study, in the absence of an industry review, as the basis for extensive changes in the distribution plant, especially when the results would be in conflict with other widely reported industry experiences. As an example of the difficulties in attempting to arrive at a unified or consistent explanation of the causes for damage during Hurricane Wilma, at page 77 the KEMA report states that:

> "Compared to other counties, Broward County shows the highest failure rates . . . . *These findings virtually eliminate the potential Grade C construction as a contributing factor.*"

(Emphasis added.) Similarly, at page 80 the report states:

> "This engineering analysis showed most other relevant pole break scenarios were of minor importance. Possible design overload due to double circuits or attachments, weakening of poles by Hurricane Katrina with Hurricane Wilma taking them out, *the potential grade C issue* in Palm Beach County and potential brittleness of CCA poles all

have been evaluated *without evidence of substantial contribution to the number of pole breakages*."

(Emphasis added.) Such conclusions would appear to be in conflict with the "wind only" explanation, because Grade C poles would be expected to have greater rate of failure than the stronger Grade B construction otherwise implemented. In any case, ignoring the inconsistencies and assuming the conclusions about "wind only" are entirely accurate for this event, it should be concluded that Hurricane Wilma was a unique storm whose behavior and effects differed from those more typical extreme wind events in the past, as widely reported to the NESC Committee. The NESC Committee has many members of the utility industry from across the country, including the Southeast and Gulf states, and receives comments from numerous other utilities in response to recommended change proposals for the NESC. It would not be reasonable to introduce dramatic design changes to the distribution plant based on a single storm.

Q. PLEASE ADDRESS MR. MIRANDA'S TESTIMONY CONCERNING THE DAVIES CONSULTING STUDY AND EXHIBIT MBM-3.

A. Exhibit MBM-3, as provided by FPL, supposedly illustrates that its network, built to Grade B requirements, fared better than other utilities that only built to Grade C levels. If accurate, and there were no other factors involved, this might imply that the extreme wind requirement would provide additional reliability during hurricanes. Because this conclusion would be in contradiction to the previously noted experiences of the rest of the industry across the United States, this matter would require further investigation -- including understanding the relative exposure and practices of the reporting utilities -- before accepting the stated implication. Furthermore, as indicated above, the experiences gained during Hurricane Wilma, as provided in the KEMA report, do not necessarily support the benefit of Grade B vs. Grade C construction.

III. RECOMMENDATION

Q. WHAT GENERAL APPROACH DO YOU RECOMMEND TO THE COMMISSION CONCERNING EWL?

A. I recommend that the Commission proceed with caution. The NESC is a well-respected document that is generally recognized as having served the industry and public well. As I already have noted, the imposition of an EWL requirement would greatly increase costs, without delivering significant benefits, and might result in unfortunate unintended consequences, as sometimes occurs when changing long-standing practices that have generally been deemed successful. An appropriate response would attempt to limit the otherwise dramatic impact to as small a category of facilities as possible, or to reduce the magnitude of the impact. Thus:

- Any approval of EWL should be limited to NESC-defined Grade B or Grade C applications only. Thus, Grade N applications -- which include joint-use poles with only secondary power (< 750 volts), as well as several categories of electric-only poles -- should be excluded explicitly from the proposed application of Rule 250C.

- The extension of the NESC Rule 250C to distribution poles (≤ 60 feet tall) in the Grade C category, as defined by the NESC, should use the load factors provided in the 2007 edition of the NESC. Thus, a load factor of 0.75 should apply to the hurricane loads of 105, 130 and 145 m.p.h. The resulting required strength would be reduced by 25% compared to those illustrated in Figure 1.
- Any approval of EWL should be on a trial basis, initially limited to a specified geographic area or areas and a defined period (*e.g.*, 1-2 years), to better understand the potential benefits and consequences of EWL. The application of EWL to certain critical infrastructure may serve this purpose.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes.

About Outside Plant Consulting Services, Inc. (OPCS)

(Dr. Lawrence M. Slavin)

Outside Plant Consulting Services, Inc. (OPCS) was established in 2002 to help meet the needs of the telecommunications and power industries in establishing standards, guidelines and practices for outside plant facilities and products. The OPCS Group provides related support services for field deployment, and product evaluation and analysis. Dr. Lawrence (Larry) M. Slavin, Principal of OPCS, has extensive experience and expertise in such activities, based upon his many years of service at AT&T/Lucent Bell Telephone Laboratories (Distinguished Member of Technical Staff) in telecommunications product design and development, followed by a career at Telcordia Technologies (Bellcore) in its research and professional service organizations.

As Principal Consultant and Manager/Director of the Network Facilities, Components, and Energy Group at Telcordia, Dr. Slavin was responsible for professional services related to the telecommunications industry. These activities included technical leadership in developing installation and construction practices and "generic requirements" documents, introducing new construction methods, and performing analyses on a wide variety of technologies and products (such as poles, duct, wire and cable, electronic equipment cabinets, flywheel energy storage systems and turbine-generators). Throughout his career, he has had a leading role in the evolution of many telecommunications related fields and disciplines -- including aerial and buried plant design and reliability; advanced construction and cable and duct placement techniques; copper pair, coaxial, and fiber-optic technology; flywheel energy storage systems; physical design and development of hardware and electronic and electro-optic systems (such as the "SLC 96" digital loop carrier); cable media and equipment reliability studies; exploratory fiber-optic hardware development; and systems engineering.

Dr. Slavin is a member of several subcommittees of the National Electrical Safety Code Committee, responsible for specifying safety standards for aerial and buried telecommunications and power facilities in the United States. He is also an active member and participant on the Accredited Standards Committee ASC-O5 ("ANSI-O5") for wood poles and products, as well as on several related committees of the American Society of Civil Engineers. In addition, Dr. Slavin is a Charter Member of the North American Society for Trenchless Technology, has been instrumental in the development of directional drilling standards, and directly supports training activities for the directional drilling industry. He has been instrument in the development and publication of several ASCE manuals for the trenchless installation of buried pipelines. Specific present and recent industry activities are listed below.

Industry Activities

- **National Electrical Safety Code Committee**
  - Represents the national telephone industry, via Alliance for Telecommunications Industry Solutions, ATIS
  - Executive Subcommittee
  - Main Committee
  - Subcommittee 4 (Overhead Lines – Clearances)
  - Subcommittee 5 (Overhead Lines – Strength & Loading)
  - Subcommittee 7 (Buried Lines)
- **Accredited Standards Committee ASC-O5**
  - *ANSI O5.1, Wood Poles, Specifications and Dimensions*
  - *ANSI O5.2, Wood Products, Structural Glued Laminated Timber for Utility Structures*
  - *ANSI O5.3, Wood Products, Solid Sawn-Wood Products and Braces*
- **Pole Reliability Based Design (RBD) Committee, ASCE**
  - *Reliability-Based Design of Utility Pole Structures*
- **Distribution Pole Standard Committee, ASCE**
- Committee F17 on Plastic Piping Systems, ASTM
  - Subcommittee F17.67 on Trenchless Plastic Pipeline Technology
  - Task Group Leader for development of HDD Standard ASTM F1962
  - *ASTM F1962, Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings*

- Trenchless Installation of Pipelines (TIPS) Committee, ASCE
    - *ASCE Manual of Practice for Pipe Bursting Projects*
    - *ASCE Manual of Practice for Pipe Ramming Projects*
- Center for Underground Infrastructure and Research and Education (CUIRE) at the University of Texas, Arlington
    - Industry Advisory Board
- Trenchless Technology Center, Louisiana Tech University
    - Industry Advisory Board
- North American Society for Trenchless Technology (NASTT)
    - Charter Member
    - Chair of Directional Drilling Subcommittee
- Missouri Western State College
    - HDD Steering Committee