BEFORE THE FLORIDA
PUBLIC SERVICE COMMISSION

DOCKET NO. 060038-EI
FLORIDA POWER & LIGHT COMPANY

IN RE: FLORIDA POWER & LIGHT COMPANY'S PETITION FOR ISSUANCE OF A STORM RECOVERY FINANCING ORDER

APRIL 10, 2006

REBUTTAL TESTIMONY & EXHIBITS OF:

BARBARA A. JAINDL

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Q. Please state your name and business address.

A. My name is Barbara Jaindl. My business address is 700 Universe Boulevard, Juno Beach, Florida 33408-0420.

Q. Did you previously submit direct testimony in this proceeding?

A. No.

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

A. I am employed by Florida Power & Light Company (FPL) as Director of Transmission.

Q. Please describe your duties and responsibilities in that position.

A. For the past six years I have been responsible for the siting, design, engineering, and construction of the transmission system. I recently assumed the additional responsibility of maintenance and restoration of the transmission lines.

Q. Please describe your educational background and professional experience.

A. I have a Bachelor of Civil Engineering degree from Georgia Institute of Technology and a Bachelor of Science in Electrical Engineering from

University of Miami. I have worked for FPL since 1976 in a variety of positions involving transmission and substation. I have been supervisor of civil/structural engineering, manager of design and standards, director of substations, director of transmission and director of transmission projects. I am a registered Professional Engineer in both Civil and Electrical Engineering in the state of Florida.

Q. What is the purpose of your rebuttal testimony?

A. The purpose of my testimony is to address transmission issues raised by OPC witness Byerley and provide details that support the reasonableness and prudence of FPL's inspection, maintenance and replacement programs for transmission facilities, especially with regard to the actions FPL took on the Conservation-Corbett 500 kV line, the Alva-Corbett 230 kV line, and the 69 kV line on the Herbert Hoover dike of Lake Okeechobee. I will also address the reasonableness of FPL's substation landscaping storm repair costs, which are the subject of Staff Audit Finding No. 2 sponsored by Staff witness Welch.

CONSERVATION-CORBETT 500 KV LINE

Q. On page 3 of his testimony, Mr. Byerley claims that failure of the Conservation-Corbett 500 kV transmission line is partly the result of poor construction management practices. Please describe the Conservation-Corbett 500 kV transmission line, its design and

construction specifications, and the construction quality assessment and quality control.

A. The Conservation-Corbett 500 kV line was energized in 1996. Twenty-eight of the 57 miles of this line are in the South Florida Water Management District Conservation areas. To minimize environmental impacts in the conservation area, significant portions of the line were designed to allow construction without building access roads.

Design considerations for roadless construction included structures that were designed to reduce weight so that the majority of structures could be installed with a helicopter. Overall, although the line design differed in some respects from previous designs, it was built to all applicable industry standards and guidelines including: National Electrical Safety Code (NESC) for clearance, loading and strength requirements including extreme wind; EPRI (Electric Power Research Institute) Transmission Line Reference Book (1982) for phase spacing; NESC/OSHA (Occupational Safety & Health Administration) requirements for safe minimum approach distance; ASCE (American Society of Civil Engineers) 74 "Guideline for Electrical Transmission Line Structure Loadings"; and ASCE 72 "Design of Steel Transmission Pole Structures" for the H-frame designs.

The construction specifications for the structures on the Conservation-Corbett 500 kV line included both FPL standard and job specific requirements for

structure erection. Although FPL developed the design criteria and participated in the design optimization, the structure design, fabrication and erection details for the new Conservation-Corbett 500 kV structures were developed by Thomas and Betts (T&B), and the T&B drawings were included as part of the construction specifications. These drawings showed assembly and erection requirements, including nut tightening specifications, which referenced the 9th edition of American Institute of Steel Construction (AISC) as the basis for these specifications. Specifically, the drawings called for the "turn of the nut" method, which requires that the nut be rotated a specified amount past snug. The specifications for the Conservation-Corbett 500 kV structures were consistent with the T&B erection drawings used on previous FPL 500 kV lines.

The industry standard practice for weathering steel connections, both at the time of construction and today, is for the patina (the change in an object's surface due to oxidation) associated with the weathering steel to secure the nuts on all bolted connections. FPL's use of this locking mechanism on more than 1,000 miles of weathering steel 500 kV structures has proven to be effective, even under hurricane winds.

FPL's construction inspection for this line, as for previous 500 kV lines, was consistent with industry practices for oversight and acceptance of foundations and anchors, structure assembly and erection, and conductor/overhead ground

wire (OHGW) sag and tensioning. FPL utilized experienced FPL construction supervisors to oversee the Conservation-Corbett 500 kV line construction.

Q. **On page 7 of Mr. Byerley's testimony, he states that the Rural Utility Service (RUS) requires use of locknuts on bolted connections to prevent loosening by vibration. Is that bulletin pertinent to weathering steel transmission structures?**

A. No. Rural Utilities Service (RUS) bulletin 1724e-200 section 15.4.1, is titled "Structure Related Hardware for Wood Structures." In contrast, Section 15.5 applies to concrete and steel structures. That section goes on to explain that hardware used on wood construction may be appropriate for steel structures but could differ because wood can shrink or swell with age and weather over time.

I also should note that even Section 15.5 would not directly apply to the Conservation-Corbett structures, because it is for galvanized steel hardware and does not address weathering steel. In the case of weathering steel, the industry standard practice for connections is for the patina associated with the weathering steel to secure the nuts on all bolted connections, not locknuts.

Q. **Mr. Byerley refers to loose and missing brace bolts on the Conservation-Corbett towers. How did FPL first discover that there were loose and missing bolts on the Conservation-Corbett transmission line and what was determined to be the cause?**

A. FPL became aware of the loose/missing bolt issue in early 1998 as the result of an outage investigation and follow-up inspections for an insulator failure. During these inspections, FPL observed excessive vibration on the conductors and also noted that some of the structure bolts appeared loose and that two were missing.

The root cause of the loose/missing bolts was determined to be excessive conductor vibration. The vibration caused some of the nuts on the bolt to loosen from the snug tight specifications before the weathering steel patina could "lock" them in place. The excessive conductor vibration was confirmed by field measurements in a 1998 study that FPL performed jointly with the Georgia Institute of Technology's National Electric Energy Testing Research and Application Center (NEETRAC) and Dulmison Products (provider of the original wire-type spacer dampening system).

Q. On page 6 of his testimony, Mr. Byerley states that "FPL did not take adequate measures to remedy the situation". Do you agree?

A. No. In early 1998, the bolt status was inventoried for each structure in the accessible area, and FPL took immediate action to replace missing bolts. The NEETRAC study was done to measure the line vibration. After determining that there was excessive conductor vibration and it was causing the bolts to loosen, FPL took action in late 1998 to tighten the loose bolts in addition to changing out corona rings and adding dampers to reduce the vibration. The addition of these dampers reduced the conductor vibration to within industry

standard limits. After a follow-up conductor condition analysis was complete, FPL installed additional vibration damping upgrades on the entire line in 1999.

Q. On page 8 of his testimony, Mr. Byerley asserts that the 1998 inspection results should have been entered into FPL's Asset Management System. Do you agree?

A. No. FPL's asset management system was developed at the component level for items such as poles, cross-arms, insulators, conductor, OHGW, etc. It did not have in 1998, and does not have today, the capability to record assets down to the bolt level. Keep in mind that FPL has had no history of loose or missing bolt problems on transmission structures such as those used on the Conservation –Corbett 500 kV line and we reasonably believed the 1998-99 experience to be a vibration-induced anomaly that had been fully resolved by the additional vibration dampers. Mr. Byerley's criticism is made only with the benefit of 20/20 hindsight.

Q. If the information was not entered into the asset management system, how do you know the bolts were replaced or tightened?

A. We confirmed that action was taken as planned by comparing bolt status post Wilma with the original 1998 inspection results. This comparison revealed that, of the 105 structures inspected in both 1998 and 2005, loose or missing bolts were found at 31 locations in 1998 and 23 locations post-Wilma, with only 15 locations common to both inspections. Thus, a little less than half of the structures that had loose or missing bolts in 1998 also had them in 2005.

We concluded from this comparison that the bolts were tightened as specified in 1998. Otherwise we would have found loose or missing bolts at all of the original 31 locations at the time of the 2005 inspection.

Q. On Page 11 of his testimony, Mr. Byerley states "clearly, the crews did not follow the recommendation in the November 1998 FPL staff report to peen the crossbrace bolt threads". Why was this not done?

A. At the top of the same page 11, Mr. Byerley summarized the recommendations at the time: "if a nut is frozen, leave it alone". This is the criteria that the crews used to determine if the threads needed to be peened. Clearly in hindsight this was not adequate and threads on all brace bolts are now being peened post-Wilma.

Q. On page 10 of his testimony, Mr. Byerley cites a statement from the "1998 Analytical Techniques, 500 kV Structure Fastener Problem" that refers to the loosening of structure bolts as an "independent problem." He concludes from this statement that the bolts "should have been addressed separately and effectively." Do you agree?

A. No. By "independent problem," the author of the study simply meant that the loose and missing bolts were another problem, in addition to insulator damage, both of which were caused by excessive conductor vibration. FPL knew at the time that conductor vibration, and not independent structural vibration, was the culprit because the NEETRAC measurements performed in March 1998 looked at vibration on both the conductors and structures. NEETRAC concluded from those measurements that the vibration of the

conductor was excessive whereas the structural vibration was within the expected range.

Q. If FPL already knew the root cause of the loose bolts in 1998, then what was the purpose of the "1998 Analytical Techniques, 500 kV Structure Fastener Problem" that is attached to Mr. Byerley's testimony as Exhibit JSB-6?

A. This 1998 study was a statistical analysis to determine if the "new", lighter, straight-leg H-frame structure was more prone to loose bolts from conductor induced vibration than the "old", slanted-leg H-frame structure. Both types of structures are used on the Conservation-Corbett line, and both had experienced loose bolts but in different proportions. In the conclusions of this study (see pages 22-23 of Exhibit JSB-6) the author relates the loose bolts to vibration and recommends the same solutions for the bolt issue without regard to the structure type.

Q. On page 3 of his testimony, Mr. Byerley claims that damages during hurricane Wilma were exacerbated by inadequate inspection practices. What are FPL's normal inspection standards pertaining to the Conservation-Corbett 500 kV transmission line?

A. As part of its transmission system inspection, FPL schedules and conducts detailed inspections on its 500 kV transmission structures on a 10% sample population every 4 years.

Q. Why is the practice of inspecting a 10% random sample of the 500 kV steel structures appropriate?

A. Sampling along with routine visual inspections and special assessments gives FPL a good view of the overall condition of the steel structures on a 500 kV line. The focus of the 10 % sampling is on a detailed inspection of the structures. Depending upon the results from the sample population, additional detailed inspections are scheduled accordingly.

The inspection for the other line components such as wire, insulator, and conductor are normally done with special assessments (in addition to sampling) based upon identified problems with age, manufacturer or environment.

Q. On page 8 of his testimony, Mr. Byerley states that, after the bolt issues were found "... the line should have been completely inspected frequently until the problem was resolved satisfactorily." Was this done?

A. Yes. FPL conducted follow up special assessments on the Conservation-Corbett 500 kV line post 1998 in addition to the 10% sample inspections.

Q. Describe the additional inspections that occurred on the Conservation-Corbett 500 kV line after the loose bolt issue was found.

A. FPL increased the frequency of inspection on the Conservation-Corbett line after the repairs in 1998/1999. Follow-up helicopter inspections on the line were performed in 2001 and 2003 to ensure that there was no evidence of a continuing vibration problem, which included an inspection of the bolts. All the line insulators were thermovisioned in 2003, and the condition of the structures was confirmed visually as part of that inspection. All these

inspections were in addition to the regularly scheduled climbing inspections that were conducted on 10% of the structures in 2002 and the routine ground patrols.

These additional inspections, well beyond the 10% standard inspection, were well suited to identifying any loose or missing bolts.

Q. Did FPL discover loose or missing bolts subsequent to 1998?

A. One missing bolt was reported in 2002 as the result of a routine ground patrol. None were reported from any of the other inspections.

Q. What was determined to be the cause of the missing bolt that was discovered in 2002?

A. No specific cause was identified. However, as no other missing or loose bolts were reported from the other inspections, FPL reasonably concluded that the single missing bolt was an anomaly.

Q. What does FPL now believe is the reason that the Conservation-Corbett line experienced the additional loose and missing bolts that were identified after Hurricane Wilma?

A. FPL has carefully evaluated the design, construction, maintenance and inspections of the Conservation-Corbett line. We have found nothing that definitively caused the loose and missing bolts. At this point, it appears possible that the loose and missing bolts may have resulted from subtle and unanticipated interactions of components in the line, perhaps exacerbated by the extraordinary loads imposed by hurricane-force winds. Because of this

uncertainty, we are taking all reasonably feasible measures to prevent recurrence.

Q. Please describe the corrective measures FPL is taking.?

A. FPL is inspecting every structure bolt (crossbrace, foundation, crossarm, etc) on the Conservation-Corbett 500 kV line, tightening them to a connection-specific specification where necessary, and peening the exposed threads on all cross brace and cross arm bolts to provide additional locking security beyond the natural patina. Follow up inspections on the bolts are scheduled to be completed prior to the start of hurricane season.

Additionally a detailed helicopter and ground inspection is being done on the entire 500 kV system and is almost complete. No missing or loose bolts have been identified on any other of FPL's 500 kV transmission lines. FPL is not charging the cost of any of these measures as part of the storm recovery.

Due to physical damage, the conductor damping system for the entire line was replaced post Wilma. The damping system was designed by a damper manufacturer based upon line sag and tension characteristics. In order to ensure the conductor vibration issue is effectively addressed with this new system, FPL has installed conductor vibration monitors on the line. Data will be reviewed over the next several months to ensure the system is working as designed. The repair of this damage is part of storm recovery.

Q. Was the foundation failure on the Conservation-Corbett 500 kV line the result of insufficient quality specifications and inspection, as Mr. Byerley suggests?

A. No. The job specifications for cast-in-place foundations spelled out comprehensive quality control and inspection criteria for the acceptance of each foundation including: dimension checks, concrete checks, and concrete placement surveillance with emphasis on ensuring a clean hole and continuous pour. Although the contractor was responsible for inspecting and approving work to ensure compliance with FPL drawings and specifications, FPL had experienced construction supervisors doing surveillance inspections to ensure foundations were being constructed to specifications. FPL's actions were consistent with good industry practice to ensure that the foundations met the specifications by specifying the quality requirements, requiring quality checks on each foundations and doing surveillance inspection while the foundations were being installed.

As a result of the foundation failure discovered after Hurricane Wilma, FPL has visually inspected and "sounded" all the foundations and, where warranted, is following up with core borings. FPL is not seeking to recover the costs for this testing as part of the storm recovery.

ALVA-CORBETT 230 KV LINE

Q. Please respond to Mr. Byerley's observations on the deterioration of the wood structures on Alva-Corbett line and his assertion that they contributed to the failure that occurred in Hurricane Wilma.

A. I disagree with Mr. Byerley's conclusion that the failed transmission structures on the Alva-Corbett 230 kV transmission line were a result of deterioration. In May 2005, the most recent climbing inspection was completed on the Alva-Corbett 230 kV line. During this inspection, no problems were reported on the six (6) transmission poles that required replacement as a result of hurricane Wilma.

Q. What comments do you have in respect to the two deteriorated poles referenced to by Mr. Byerley.

A. We know from our hurricane forensics that none of the six structures that failed on the Alva-Corbett line from hurricane Wilma was the result of deterioration. Mr. Byerley's Exhibit JSB-2, photo 54 does not illustrate transmission structure damage from hurricane Wilma but rather a stub that was abandoned in place after damage from hurricane Frances (September 2004).

Similarly, Exhibit JSB-2, photo 51 simply shows a deteriorated pole on the ground. The work site Mr. Byerley visited on the Alva-Corbett line is currently under construction. I cannot conclude whether this particular

photograph was even from the Alva-Corbett 230 kV transmission line or the timeframe from which it existed.

Q. Please respond to Mr. Byerley's conclusion that FPL made an economic decision to replace a portion of Alva-Corbett line that was leaning/ deteriorated rather than repair it.

A. FPL indeed made economic decisions following the 2004 storm season regarding the most cost-effective way to maintain the Alva-Corbett 230 kV transmission line, and rightly so. FPL is currently rebuilding a portion of the Alva-Corbett 230 kV transmission line as part of a planned system expansion project. Knowing the rebuild project was forthcoming, FPL made an economic decision after the 2004 storm season to temporarily brace 10 miles of poles that were leaning as a result of Hurricane Frances in order to minimize the cost to storm recovery. Since this particular rebuild project is not storm related, the charges are not included in FPL's petition.

Q. Please respond to the statements on page 15 of Mr. Byerley's testimony that the leaning structures also indicate a potential for foundation failure in a future storm.

A. As discussed above, this portion of the line will be rebuilt prior to the 2006 storm season.

OTHER TRANSMISSION LINE FAILURES

Q. On page 17 of his testimony, Mr. Byerley addresses the failure of a number of other transmission structures. Please describe the ove rall

performance of the transmission system during the 2005 hurricane season.

A. There were 100 transmission structure failures as a result of Hurricane Wilma: 30 were on the Conservation-Corbett 500 kV line, which also caused five wood H-frame structures to fail on the Alva-Corbett line; 46 were single pole unguyed wood (or wood equiv) on three 69 kV line sections located on berms in the vicinity of Lake Okeechobee which I will discuss below; and there were 19 random structure failures. Thus, out of 64,000 transmission structures in the FPL system, only about 0.16% failed, which is very good performance in the face of Wilma's strong winds.

Q. On page 17, Mr. Byerley states that the failure of other 69 kV transmission structures in western Palm Beach County could have been avoided if they had been relocated prior to 2005. What structures is he referring to?

A. There are three 69 kV lines in the vicinity of Lake Okeechobee that are installed on raised berms and that experienced failures in 2005. One was a line that also failed in 2004 and had been partially relocated and rebuilt.

Q. Mr. Byerley states that since the replaced and relocated poles performed well during Wilma, that FPL should have taken some action on the remaining poles to mitigate future damage. Please describe these transmission structures and FPL's efforts to relocate the line after the 2004 hurricanes.

A. The line that failed in 2004 was a 69 kV line that was constructed of single unguyed wood poles located on the Herbert Hoover dike and dated back to approximately 1963. It experienced failures as a result of hurricanes in both 2004 and 2005. The primary cause for these structure failures was the older design standard and the high winds associated with the "coastal" effect of Lake Okeechobee and the topographic speed-up effect associated with the surrounding earth berm.

After the 2004 storm season, FPL relocated the portion (approximately 5.8 miles) of this transmission line section north of Canal Point that was previously located along the Herbert Hoover Dike. It was relocated approximately 300 feet east of the Herbert Hoover Dike and was rebuilt with round spun concrete poles and polymer post insulators consistent with FPL's current design standard. FPL was able to quickly relocate and rebuild the structures in this area because of limited commercial and residential development along this portion of the transmission line. None of the structures along this rebuilt portion of the transmission line required replacement after Hurricane Wilma.

The southern portion of this transmission line south of Canal Point was also located along the Herbert Hoover Dike. Relocation of this southern line section was problematic, as it would either have significant community impact by routing through residential and commercial areas or would require a

routing study and significant right of way acquisition to avoid the developed areas. After the 2004 hurricane season, in order to ensure reliable service to the area, this southern portion of the transmission line was rebuilt on the dike with wood poles while an alternative route, permitting, right-of-way acquisition and community outreach could properly be evaluated and completed. The temporary rebuild of this line section could not be done to current standards, because the poles could not be set as deep into the dike surrounding Lake Okeechobee as would normally be FPL's practice. The rebuilt section on the dike failed as a result of Hurricane Wilma. FPL is aggressively pursuing relocation of this line section and anticipates completion by mid 2006.

Q. Would it have been possible for FPL to relocate all of the transmission structures on the Herbert Hoover Dike prior to the 2005 hurricane season?

A. No. It was not possible to identify a new line route, conduct community outreach, and acquire necessary permits and easements for the southern part of the line prior to the 2005 hurricane season.

SUBSTATION LANDSCAPING

Q. On page 4 and 5 of her testimony, Ms. Welch discusses the amount of costs related to substation landscaping that the company should remove from the storm reserve account if the Commission were to decide that these costs should not be recovered. Is landscaping required at FPL

substations and is FPL required to replace or restore landscaping damaged by hurricanes?

A. Yes. Landscaping installed at substations is in response to local development orders or code requirements. The landscaping shown on approved landscape plans must be planted and then maintained by FPL; otherwise the site would be in violation of the approved development order, which would result in code enforcement action by the local jurisdiction. The effect of not restoring/replacing landscaping would be to create the potential for "Notices of Violation" (NOV's) and/or monetary fines imposed by local jurisdictions.

Q. Please summarize your testimony.

A. FPL's actions with regard to the design, construction, maintenance and inspection of the transmission system, specifically including the facilities that Mr. Byerley takes issue with, were all consistent with applicable standards and codes and represent good utility practice. Mr. Byerley's testimony raises no valid points to the contrary.

The repair of substation landscaping is required to meet conditions of the original site plan approval.

Q. Does this conclude your rebuttal testimony?

A. Yes.