ORIGINAL

TOM LEE
President

Harold McLean
Public Counsel

STATE OF FLORIDA
OFFICE OF PUBLIC COUNSEL

c/o THE FLORIDA LEGISLATURE
111 WEST MADISON ST.
ROOM 812
TALLAHASSEE, FLORIDA 32399-1400
850-488-9330

EMAIL: OPC_WEBSITE@LEG.STATE.FL.US
WWW.FLORIDAOPC.GOV

ALLEN BENSE
Speaker

Charles J. Beck
Deputy Public Counsel

March 31, 2006

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Blanca S. Bayo, Director
Division of Records and Reporting
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Re: Docket No. 060038-EI

Dear Ms. Bayo:

Enclosed for filing, on behalf of the Citizens of the State of Florida, are the original and 15 copies of the Direct Testimony of James S. Byerley, P.E.

Please indicate the time and date of receipt on the enclosed duplicate of this letter and return it to our office.

Sincerely,

Charles J. Beck
Deputy Public Counsel

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Florida Power & Light Company's Petition for Issuance of a Storm Recovery Financing Order

DOCKET NO. 060038-EI
Filed: March 31, 2006

DIRECT TESTIMONY

OF

JAMES S. BYERLEY, P.E.

On Behalf of the Citizens of the State of Florida

Respectfully submitted,
Harold McLean
Public Counsel

Office of Public Counsel
c/o The Florida Legislature
111 West Madison Street
Room 812
Tallahassee, FL 38399-1400

(850) 488-9330

Attorney for the Citizens
Of the State of Florida

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Of the State of Florida

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 060038-EI

DIRECT TESTIMONY OF JAMES S. BYERLEY

ON BEHALF OF THE CITIZENS OF FLORIDA

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS.

A. My name is James S. Byerley. I am a Principal Engineer with R.W. Beck, Inc. My address is 400 Professional Park Drive, Goodlettsville, TN 37072.

Q. WHAT ARE YOUR RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. My responsibilities include assisting clients by preparing specifications and documents for engineering, design, procurement, construction and project management of substation projects from 46 kV through 500 kV. I perform system evaluations for various financial and utility clients. I investigate equipment failures and other system problems, and provide analysis, recommendations and expert testimony as requested.

Q. WHAT EXPERIENCE DO YOU HAVE IN ELECTRIC POWER SYSTEMS?

A. I was employed by the Tennessee Valley Authority (TVA) from 1959 until 1994. I held various engineering and management positions in Transmission Planning, Substation and Transmission Line Engineering, Transmission Operations and Maintenance, Transmission Construction, and Project Management. When I retired from TVA in December, 1994, I was Manager of Transmission Engineering and Construction (TE&C). In that position, I was responsible for all additions and modifications to TVA's transmission lines, plant switchyards, substations, and power telecommunications. The responsibilities included siting, routing, public meetings and hearings, negotiations with land owners, surveying, engineering, procurement, construction, contracting, transportation, and heavy equipment. I managed approximately 250 engineering and support employees, 350 full time construction employees, and 350 contract employees, and oversaw a capital improvement program with a budget of approximately $120 million per year.

As Manager of TE&C, I was second in command of TVA's Emergency Control Center (ECC) during periods of major system disturbances. My responsibility was to dispatch personnel, equipment, and material during several major tornado events, the blizzard of 1993 (which took out service to over one-fourth of TVA's customers) and the ice storm of 1994 (which darkened over half of TVA's customers). This function also included procuring outside utility and contractor crews, arranging for transportation, meals, and accommodations for in-house and outside crews, renting heavy equipment, and procuring and transporting additional material as needed.

I have performed several technical evaluations of electric power systems for different clients for various purposes. When the state of Ceara, Brazil privatized the state owned power system, COELCE, one other engineer and I performed an evaluation for Chase Securities. Chase was to provide the financing of up to $800 million (US$) for a prospective purchaser. The evaluation included a limited on-site review of the facilities, a data room review of capital and operation budgets and expenses and O&M records, and interviews with approximately ten management employees covering the utility policies and practices. I was one of four R.W. Beck engineers who performed a similar evaluation of the International Transmission Company assets for CIBC World Markets before these assets were acquired by KKR. I performed a distributions system assessment for the City of Winter Park, Florida before the City purchased the system from Progress Energy Florida. This assessment consisted of an on-site review of the facilities and uncovered numerous deficiencies in maintenance and vegetation management.

II. SUMMARY OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The Florida Office of Public Counsel has retained R. W. Beck, Inc. to review and evaluate the adequacy of Florida Power & Light Company's pre-storm inspection and maintenance practices, as they bear on the extent of system damages sustained in the 2005 Hurricane Wilma. The purpose of this testimony is to present the results of my evaluation.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. It is my observation that the extent of the damages caused by Hurricane Wilma to FPL's transmission and distribution facilities was exacerbated by prior inadequate inspection and maintenance practices. Specifically, the failures of the Corbett-Conservation 500 kV line and the Alva-Corbett 230 kV line appear to be the result of maintenance practices and construction management that were inadequate, especially in light of the fact that FPL knew as early as 1998 of loose and missing brace bolts on the Corbett-Conservation towers. Similarly, I believe the failure of many deteriorated wood distribution poles during Wilma must be attributed to inadequate inspection policies and practices, vegetation management, and record keeping. In my testimony, I will provide the basis for these conclusions.

Q. WHAT DOCUMENTS AND OTHER SOURCES OF INFORMATION HAVE YOU EXAMINED OR USED IN PREPARING YOUR TESTIMONY?

A. I have examined the testimony and exhibits submitted by Florida Power & Light Company in this case that are pertinent to my participation, FPL's answers to interrogatories and responses to document requests, and Standards, Manuals, and Guides published by the Institute of Electrical and Electronic Engineers (IEEE), American Society of Civil Engineers (ASCE), and Rural Utilities Service (RUS). I reviewed the annual Distribution Reliability Reports filed by FPL with the Commission, as well as a document prepared by the Florida PSC Staff dated July 2005 and titled "Preliminary Review of Vegetation Management, Lightning Protection and Pole Inspection at Florida Power & Light Company", herein referred to as "FPSC Staff Review", which drew from FPL's Distribution Reliability Reports. I also used a FPL document dated November 2005 titled "Hardening Distribution's Infrastructure-Plan to Mitigate Damage caused by Tropical Storms and Hurricanes," herein referred to as "Hardening Plan"

Q. HAVE YOU VISITED ANY OF FPL'S FACILITIES?

A. I visited a small portion of the FPL system located in Palm Beach County during the period of March 13-15, 2006. I was accompanied by Richard Jones, an experienced lineman under contract to R.W. Beck, and Earl Poucher, staff member of the Office of Public Counsel. We did not have a pre-determined route or area to examine, but we limited our observations to Palm Beach County in the interest of time. The purpose of our trip was to evaluate the condition of a very limited sample of various FPL facilities. We limited our visit to areas in which we could view the facilities from public rights-of-way. I recorded my observations and impressions of the field visit and the pole storage yard in documents that I have attached as Exhibits __and __ (JB-1, 3). I also took photographs of some of the facilities we saw. I took photos when we encountered inadequate, deteriorated, or suspect facilities. I have since reviewed the photographs; they depict very accurately what we saw at the time. I will refer to the record of my visit and to the photographs later in my testimony. The photographs are contained on a disc that I have attached as Exhibit ___(JB-2); (OPC has also provided several copies of the printed photographs for the use of the Commission Clerk.) During the trip, we did pre-arrange to meet John McEvoy of FPL on March 15, 2006, at the FPL pole retention yard in West Palm Beach to examine a number of failed poles.

III. OBSERVATIONS CONCERNING THE CONSERVATION-CORBETT 500 kV LINE FAILURE

Q. PLEASE EXPLAIN YOUR EVALUATION OF THE FAILURE OF THE CONSERVATION-CORBETT 500 kV TRANSMISSION LINE.

A. The maximum wind speed of Wilma in Palm Beach County is given, in data provided to OPC by FPL in discovery, as 86 mph (Bates 102887). This is well below the "old" (that is to say, applicable to facilities built prior to 2002) National Electrical Safety Code (IEEE Standard C 2) design requirement of 100 mph for extreme wind (Rule 250.C). Also, there are a number of similar lines in the vicinity that did not suffer wind damage. This leads me to believe that equipment failure, not wind speed, is the root cause of the damage suffered by this line. Further, I conclude that the equipment failed because of FPL's inadequate inspection and maintenance practices.

Q. SPECIFICALLY, WHAT ASPECT OF THE EQUIPMENT CAUSED THE TOWERS TO FAIL?

A. Loose or missing cross-brace bolts weakened the structural integrity of numerous towers, to the extent that wind speeds that ordinarily would not have caused the towers to fail did so in their weakened condition. The one exception was the tower that failed because of a badly constructed foundation.

Q. FPL'S WITNESS DR. RICHARD BROWN TESTIFIES THAT THE CAUSE OF THE FAILURE WAS AN INADEQUATE INSTALLATION GUIDELINE, PURSUANT TO WHICH FPL MANUALLY TIGHTENED THE BOLTS OF THE CROSS BRACES. DO YOU AGREE?

A. I agree that the installation guidelines, which incidentally were developed within FPL, called for manual tightening. I disagree that the installation guidelines caused the failure, because FPL learned that the bolts were loosening and even falling out several years prior to the 2005 storm season, but did not take adequate measures to remedy the situation.

Q. DR. BROWN CALLS THE MANUAL TIGHTENING A STANDARD INDUSTRY PRACTICE. DO YOU AGREE? IF SO, DOES THIS ELIMINATE THE POSSIBILITY THAT FPL MANAGEMENT IS RESPONSIBLE FOR THE COLLAPSE OF THE TOWERS?

A. The KEMA report (pg 7) states that the cross-brace bolts were installed snug-tight and describes this as a standard industry practice. I agree that snug-tight connections are in accordance with ASCE Manual 72, Design of Steel Transmission Pole Structures, and also that use of locknuts is not required by Manual 72. I agree that both the type of connection called for (that is to say, a bolt and nut) and manual tightening of the connection are standard practices that are used in the industry. If Dr. Brown is asserting that failure to apply locknuts to bolted utility structure connections is a standard industry practice, I would disagree with that. It should be noted that the Rural Utilities Service (RUS) requires the use of locknuts on bolted connections to prevent loosening by vibration (RUS Bulletin 1724e-200, Section 15.4.1). During my tenure at TVA, locknuts were required on bolted tower connections. Failure to use locknuts may not be unusual, but it is certainly is not a universal practice.

Still, I agree with KEMA that FPL was not imprudent at the outset, when the decision to use manual tightening alone was first made. I disagree strongly, however, with the balance of KEMA's analysis. I believe that an adequate maintenance policy and procedure would have required that some method of securing the nuts be implemented after an inspection in 1998 showed loose and missing bolts to be a serious problem.

Q. PLEASE ELABORATE.

A. The KEMA report acknowledges that in 1998 FPL discovered some 31 towers on the Conservation-Corbett transmission line that had loose or missing bolts. Here is the KEMA Report's (pgs. 43) account of what happened that time:

> "The exact actions to rectify the loose and missing bolts in 1998 is not known, but action was taken to fix this. Since manual tightening was used, it appears that some of the tightened cross-brace bolts subsequently became loose again."

Elsewhere, the KEMA report (pg. 44) states that "There is no record that it was known before the 2005 storms that bolts were loose or missing."

Q DO YOU HAVE ANY COMMENTS ON THIS PORTION OF THE KEMA REPORT?

A. Yes. First of all, the acknowledgment that FPL is unsure of the steps it took to address the loose bolt problem is revealing. This can only be the case if FPL failed to properly document and record the action it took in 1998 to deal with the serious problem of loose bolts on numerous towers of the 500 kV transmission line. This observation is reinforced by the statement that there was no "record that it was known before the 2005 storms that bolts were loose or missing.". In its answer to OPC's Interrogatory No. 126, FPL clarified this statement to confirm that FPL discovered the problem of loose bolts prior to 2005, but FPL did not record the 1998 inspection in FPL's asset management system used for scheduling and tracking inspections. A copy of FPL's answer to OPC's Interrogatory No. 126 is attached as my Exhibit No. ___ (JB-4).

The acknowledgment in FPL's answer to this interrogatory is highly significant. The possibility of inadequate cross-bracing in a transmission structure is not a trivial matter. It reduces the structural integrity of the tower. The crews should have recognized the significance of this glaring problem immediately. The missing cross-brace bolts should have been recorded, reported, and remedied promptly. Further, the line should have been completely inspected frequently until the problem was satisfactorily corrected. To me, the fact that the 1998 inspection results involving 31 of the 500 kV transmission line towers were not entered in FPL's asset management system is inexplicable, particularly in view of the fact that FPL's asset management system contains the information on which FPL bases inspection decisions and plans.

The additional statement in the KEMA Report to the effect that in 1998 manual tightening was used to address the issue is also revealing. In light of the earlier statement that the exact steps are unknown, it is difficult to understand how KEMA can state that anything in particular was done. The question is particularly appropriate in light of a statement by

FPL structural engineer Jerry Wong, whose name appears on many documents related to the Conservation-Corbett line over time, that "Many missing bolts were replaced (in 1998). However there is no evidence that the loosened bolts were re-tightened during the retrofit construction." This statement was made in a memorandum designed to serve as a "post-mortem" in-house analysis by FPL's structural engineer of the failure of the Conservation-Corbett transmission line during Hurricane Wilma. See memorandum of Jerry Wong, dated November 14,2005, which is attached to my testimony as Exhibit _____(JB-5). (I am informed that OPC has redacted the portions of this document asserted by FPL to be confidential.) During the deposition of FPL witness Richard Brown, OPC asked Dr. Brown to explain the assertion in the KEMA report that the bolts were retightened manually. I have been informed by Counsel for OPC that during his deposition Dr. Brown said the statement in the KEMA Report was based on an FPL employee's recollection. With respect to the apparent discrepancy with the informal recollection and Dr. Wong's memorandum, Dr. Brown said he regarded Dr. Wong's statement as related to the absence of documentation of the manual tightening, as opposed to a conclusion that no manual tightening occurred. That KEMA is relying upon an employee's "recollection" again shows the deficiency in FPL's maintenance records. However, the more important point is that, even if we accept KEMA's conclusion that the bolts were retightened manually in 1998, FPL's response to the problem in 1998 was inadequate under the circumstances.

Q. AT PAGE 42 OF IT'S REPORT, KEMA DESCRIBES FPL'S EFFEORTTO SOLVE THE PROBLEM OF EXCESSIVE VIBRATION ON THE CONSERVATION-CORBETT LINE IN 1998. DOES THE FACT THAT FPL WORKED ON THE VIBRATION PROBLEM IN 1998 MEAN THAT FPL DID ALL THAT WAS

NECESSARY TO DEAL WITH LOOSE AND MISSING CROSS-BRACE BOLTS AT THE TIME?

A. No.

Q. WHY NOT?

A. A document provided to OPC by FPL during discovery demonstrates that in 1998 FPL personnel determined that insulator damage was caused by Aeolian vibration but observed that "Loosening of structure fasteners is an independent problem" (Bates 103020). In the same document the author added, "Loose nuts and missing bolts can be a serious problem under wind load" (Bates 103040). I am attaching a copy of this document, entitled "1998 Analytical Techniques, 500 kV Structure Fastener Problem," to my testimony as Exhibit ___(JB-6). While it bears a "confidential" marker, I am informed that Counsel for OPC discussed this document with Counsel for FPL, and that FPL no longer claims confidentiality. Because, as FPL personnel recognized at the time, the loose bolts would pose a serious risk in high wind situations, and because FPL could not have known at the time whether its remedy for the vibrations would be effective, FPL should have addressed the cross-brace bolt situation separately and effectively. In fact, FPL documents obtained during discovery indicate this view was shared within FPL at the time.

Q. PLEASE EXPLAIN.

A. Loose and missing bolts were documented in an inspection report dated March 18, 1998 (Exhibit __ (JB-7) ;Bates 103010 -103012), and the report identified 31 structures as having loose or missing bolts. In an FPL staff report dated November 25, 1998 (Exhibit __(JB- 8); Bates 103016) the following recommendations were made:

1. It is recommended that all structures be checked for loose hardware.

2. If a nut is frozen, leave it alone.

3. It the nut has backed off ½ nut width, replace it and peen the threads.

4. If the crew finds that nuts are not frozen on the brace bolts, then we need to consider peening all brace bolts.

Q. **IS PEENING THE THREADS OF CROSS-BRACE BOLTS AN EFFECTIVE WAY OF PREVENTING THE BOLTS FROM BECOMING LOOSE?**

Yes. I consider that peening bolt threads, which involves damaging threads with a hammer or other tool, is not the most desirable method of securing nuts, because the nuts cannot then be removed without destroying the bolt. However, it is an effective method, particularly when the crews are on the towers and locknuts are not readily available. If FPL had peened the threads on all bolts when the problem was discovered and addressed in 1998, or at any time between 1998 and the 2005 storm season, this measure would have effectively prevented the bolts from loosening. The KEMA report accepts FPL's position that in 1998 FPL addressed the loose bolt problem by manually retightening them. My point is that even if this is true, the actions taken then and later were inadequate to deal with the situation, as it was known to FPL at the time.

Q. DID FPL EVER PEEN THE THREADS OF THE CROSS BRACE BOLTS?

A. No. An FPL internal report dated December 14, 2005 (Exhibit ___(JB- 9) :Bates 103044) identified 22 structures with loose and missing bolts. The report shows that 14 of them were the same structures that were identified in the 1998 inspection. Clearly, the crews did not follow the recommendation in the November 1998 FPL staff report to peen the cross-brace bolt threads.

Q. HAS FPL ADDRESSED A COMPREHENSIVE APPROACH TO THE LOOSE BOLT PROBLEM SINCE HURRICANE WILMA?

A. Yes. In the more recent, post-Wilma document that I mentioned earlier, Dr. Wong made several similar recommendations. They appear at Bates nos. 001223 and 001224. Among them are the following:

1. All bolts will be re-tightened or replaced in the normal inspection program.
2. Locking devices should be used to prevent bolts from loosening.
3. The vibration issue must be addressed.

Also, FPL has stated that it is now in the process of peening the threads of all of the bolts. (FPL's answer to OPC Interrogatory no. 125, attached as Exhibit __(JB-10).

Q. AT PAGE 44, THE KEMA REPORT OBSERVES THAT FPL MAINTAINED AN INSPECTION CYCLE OF 10% OF TOWERS EVERY 4 YEARS, AND SUGGESTS THAT THE LOOSE BOLTS ESCAPED FPL'S ATTENTION AFTER 1998 BECAUSE THE TOWERS SELECTED FOR INSPECTION DURING THE ESTABLISHED CYCLE DID NOT REVEAL THE PROBLEM. DO YOU ACCEPT THIS RATIONALE AS ADEQUATE TO DEMONSTRATE PRUDENCE ON FPL'S PART?

A. No.

Q. ON WHAT DO YOU BASE YOUR ANSWER?

A. Once the severe and widespread problem of loose and missing cross-brace bolts was discovered in 1998, prudence required FPL to monitor the Conservation-Corbett situation closely—far more closely than the "auditing" type of inspection that "business as usual" would have called for. The fact that FPL failed to note the loose bolt problem in its asset management system, the records upon which it bases its inspections, likely explains why FPL did not inspect all of the towers more frequently. In fact, the KEMA report does note that "Possibly this frequency was insufficient on this particular line to observe and rectify bolt problems." (pg 44). This suggests to me that KEMA and I may be close in our positions on this point.

Q. THE KEMA REPORT ALSO MENTIONS ISSUES WITH TOWER FOUNDATIONS AND CONDUCTORS. DO YOU BELIEVE THEY PLAYED A PART IN THE FAILURE OF THE CONSERVATION-CORBETT TOWERS?

A. I observed the remains of the failed foundation on March 14, 2006 and agree that faulty construction was the probable cause. Since the construction inspection process apparently failed in this case, it raises the question as to the integrity of the remaining foundations in the line. On page 42, KEMA states, the "At this stage, there is no reason to assume that more foundations in the transmission line are not reliable." I do not agree with this statement. If there are other questionable foundations remaining, they may fail in the next storm. The cost of replacing these structures and foundations is so great that it is prudent to investigate other foundations that were installed and inspected by the same crews at the same time as the failed foundation.

I do not believe the one conductor failure alone caused the towers to come down. Normally structures are designed to withstand failure of one conductor, among other failure cases. However, if adjacent structures did not have their cross-bracing intact due to missing bolts, the failed conductor certainly could contribute to cascading damage.

I believe that, except for the one foundation failure, the primary cause of both initial tower failures and the ensuing cascade failures was missing and loose cross-brace bolts.

Q. PLEASE SUMMARIZE YOUR P OSITION REGARDING FPL'S RESPONSIBILITY FOR THE DAMAGE TO THE CONSERVATION-CORBETT LINE, AND THE REASONS FOR YOUR POSITION.

A. FPL was aware of a widespread problem of loose and missing cross-brace bolts as early as 1998. Also in 1998, FPL was aware that this problem could pose a serious risk of failure in high wind situations. FPL failed to take adequate measures to rectify the loose bolts problem in 1998 and the following years. FPL failed to properly record the problem in its asset management system. Perhaps because of the resulting inadequate records, FPL failed to establish an inspection program adequate to monitor and correct the problem after 1998. Had FPL peened all of the bolt threads, as internal documents suggested at the time, or had FPL placed fasteners on all of the cross brace bolts, as its structural engineer recommended after 30 towers collapsed, in my view the towers would not have fallen during Hurricane Wilma. Further, putting the missed 1998 opportunity aside, proper record-keeping and inspections of sufficient frequency and scope would have disclosed the continuing nature of the situation which in turn should have led FPL to take corrective measures prior to Wilma. It is my opinion that the damages to this line were caused by equipment failure and not by wind overload during Wilma. In my opinion the root cause of the equipment failure was poor and inadequate maintenance practices, failure to follow staff recommendations, poor oversight of construction practices, and inadequate inspection records and reporting. I believe that this line should have withstood Wilma, as did several other similar 500 kV lines in the same area. I do not believe that FPL is entitled to recover any of the restoration cost of this line from customers.

IV. OBSERVATIONS CONCERNING THE ALVA-CORBETT 230 kV LINE

Q. PLEASE EXPLAIN YOUR EVALUATION OF THE FAILURE OF THIS LINE.

A. The KEMA report states (pg 41) that the Alva-Corbett 230 kV line failure was likely caused by the impact of the Conservation-Corbett 500 kV line collapsing on top of it. This could be a logical explanation. The wind speed was below the NESC requirement as mentioned above, so I would not attribute failure to wind overload. Neither the KEMA report nor FPL documents attribute the failure to wind.

An FPL report (Bates 001195) states that the 500 kV line came down between Structures A96V3 and A96V2, and neither of these structures required replacement. Four structures were damaged in various locations in a 10-mile section to the west of the impact. Apparently there were no cascade failures.

On March 14, 2006, I observed a portion of this line in the vicinity of the impact. I noted that the poles had a pretty severe tilt to the east. At first I suspected that this was due to the combination of high winds and the collapse of the 500 kV line. However, photos in the report mentioned above show the presence of prop poles at Structures A95V7 (Bates 001196) and A92V5 (Bates 001198), indicating that the line may have been in some distress before Wilma struck. In an answer to one of OPC's interrogatories, FPL acknowledged that the Alva-Corbett towers were leaning in 2004. The leaning structures also indicate potential foundation failure in a future storm.

I viewed the remains of several structures in this line. I found one deteriorated pole that had been removed and left lying on the ground (Exhibit __(JB-2, photo 51). I also found one deteriorated pole stub still in the ground. The pole had clearly broken in the deteriorated portion (Exhibit _(JB-2), photo 54).

I noted that a good portion of the wood H-frame line is currently being replaced with single-pole concrete structures. It also appears that the conductor is being reused, so there was apparently little conductor damage.

Q. WHAT CONCLUSIONS HAVE YOU REACHED REGARDING FAILURE OF THIS LINE?

A. I conclude that the impact of the 500 kV line sent a dynamic shock through the conductors that did not affect the immediately adjacent, sound Alva-Corbett structures, but destroyed deteriorated structures some distance away. I believe that FPL made an economic decision to replace a deteriorated line rather than repair it. My conclusions are based on the following facts:

1. The two structures adjacent to the impact did not fail.
2. Structures some distance away from the impact did fail.
3. All original structures that I viewed appeared to be leaning badly and have the potential for foundation failure.
4. I found evidence of two deteriorated poles in a small portion of line.
5. The conductor was not damaged.
6. A significant portion of the line is being replaced.

It is my opinion that the failure of the Alva-Corbett 230 kV line was initiated by collapse of the Conservation-Corbett 500 kV line (the causes of which are addressed above). I also believe that damages to this line were probably exacerbated by the existence of some deteriorated structures in the line.

V. OBSERVATIONS CONCERNING OTHER TRANSMISSION LINE FAILURES

Q. WHAT OBSERVATIONS HAVE YOU MADE CONCERNING OTHER TRANSMISSION LINE FAILURES?

A. The KEMA report addresses the failure of a number of 69 kV structures in three lines in west Palm Beach County (KEMA pgs. 40, 41). KEMA attributes these line failures to foundation failures and possibly some cascading. The report notes that the lines are primarily constructed on unguyed wood poles. The report also notes that two of the lines had failures during hurricanes in 2004. After that, portions of the lines were relocated and some wood poles were replaced with concrete poles. The replaced and relocated poles apparently performed well during Wilma. Since FPL had earlier recognized the unfavorable location of these lines and had experienced earlier storm failures, I believe it would have been prudent for the company to have taken some action before Wilma to mitigate future damage.

VI. OBSERVATIONS CONCERNING FPL'S DISTRIBUTION SYSTEM

Q. WHAT OBSERVATIONS HAVE YOU MADE CONCERNING FPL'S DISTRIBUTION POLE INSPECTION AND MAINTENANCE PROGRAMS?

A. The KEMA report (pgs 31-36) states that FPL currently has three separate pole inspection processes. They are the Osmose inspection and maintenance program, the Thermovision program, and the other pole "touchpoints" (KEMA's term) afforded by daily activities. For the reasons that follow, I regard only the Osmose program as a true, effective pole inspection plan. I will address each component in turn, beginning with the Osmose program.

Q. PLEASE CONTINUE.

A. First, I believe the history of FPL's pole inspection activities sheds light on the current situation. Two documents that OPC received from FPL during discovery provide insight as to the genesis of the current Osmose program. The document entitled "Reliability 2000 Deployment Plan," attached as Exhibit __(JB-11), indicates that FPL initiated a distribution wood pole inspection program in the early 1980's, then discontinued it in 1991 to reduce costs (Bates 004454). This document also describes a 1998 pole study conducted by FPL which showed that 26% of its creosote pole population was defective (Bates 004458). A second document titled "Program Evaluation Matrix"_(Bates 004449), which actually predates the Reliability 2000 Deployment Plan, appears to be a recommendation prepared by FPL personnel at the time that reintroduction of a pole inspection and maintenance program was being considered. This document shows that

FPL personnel associated with the project originally recommended that FPL implement a system-wide pole inspection and maintenance program designed to inspect all of FPL's 1,300,000 poles over a period of 4,7, or 10 years. I am attaching the document to my testimony as Exhibit ___ (JB-12). However, when FPL implemented its program in 1999 with Osmose as the contractor, the scope of the program was limited to a relatively small number of inspections in two distinct geographical areas.

Q. WHAT IS YOUR ASSESSMENT OF THE OSMOSE PROGRAM?

A. I am familiar with the inspection and treatment programs of Osmose and other similar contractors. In my experience, they employ capable professional inspectors with adequate training, equipment, and material to inspect and treat utility poles. An Osmose inspection consists of excavating 18-24" below ground level, sounding the poles, and drilling and taking core samples with which to measure shell thickness where indicated,. I have no reason to believe that these are not complete and adequate inspections. In 2004, Osmose inspected approximately 5600 FPL poles, about 0.4% of the FPL inventory. According to KEMA (pg. 34), during inspections from 1998-2004, Osmose identified about 5.63% of the poles inspected as being defective. About half the defective poles could be strengthened with bracing and the other half required replacement. A concentrated inspection of creosote poles only in 2005 identified the defective rate to be 15% for FPL poles and 24% for Non-FPL poles.

Q. PLEASE TURN TO THE INSPECTIONS ASSOCIATED WITH THE THERMOVISION PROGRAM.

A. The FPSC Staff Review states that FPL initiated the Thermovision program in 1998 to identify conductors and other electrical equipment in a pre-fail mode. In 2003, FPL added visual wood pole inspections as a part of the program. The Thermovision program consists of four equipment vans and four two-man crews trained to identify potential equipment hot-spots prior to failure. The Thermovision program uses infrared cameras to locate "hot spots" in electrical equipment such as arrestors, transformers, fuses, splices, etc. The equipment cannot be used to make any assessment of the condition of wood, concrete, or steel poles. Also, this inspection apparently addresses only feeder poles and not the laterals. The KEMA report states that the ratio of feeder poles to lateral poles is about 35/65%

(KEMA pg. 58). This indicates that over 700,000 FPL poles are not included in the Thermovision inspections.

Based on FPL's answers to OPC Interrogatories 116-120, it appears that the Thermovision operators are well qualified to operate their infrared equipment. However, the responses to those Interrogatories indicate that the operators are not trained inspectors; nor are they given any training or equipment which would allow them to perform adequate pole inspections.

Q. DID YOU TAKE ANY STEPS TO EVALUATE THE EFFICACY OF THE VISUAL INSPECTIONS PERFORMED BY THERMOVISION OPERATORS?

A. Yes. In an effort to determine what the operators were finding, I made a random audit of the inspection results for 2004 and 2005 (Bates 001225 & 001227). The results of my audit are given in Exhibit __(JB- 13). I reviewed a total of 26 feeder reports from 8 areas. If I assume, consistent with KEMA's analysis, that there are 113 poles per feeder (KEMA, pg. 32), then my audit covered about 2938 poles. The reports listed a total of 551 abnormalities, of which 8 were deteriorated poles. (From their pictures, I observed what appeared to be 4 deteriorated poles that were not reported.) In other words, the Thermovision cameramen determined, with visual inspections, that 0.27% of the poles they inspected were deteriorated. With their detailed routine of sounding, excavating, and boring, Osmose inspectors find deteriorated poles at a rate 20 times greater than that of the Thermovision crews.

This difference does not surprise me. KEMA acknowledges that a visual inspection, such as those performed by Thermovision crews, can detect only "obvious" damage. (pg 32).

Many times, deterioration begins below ground level or inside a pole having a shell that appears to be intact. That is why the Osmose protocol includes such steps as excavating, sounding, and boring.

Even if one takes into account the difference in geographical areas, this difference in inspection results leads me to believe that Thermovision inspections, while very good for their original intended purposes, are totally inadequate for pole inspections. In fact, they may provide a false sense of security by failing to identify possibly 95% of the deteriorated poles in the feeders.

Q. PLEASE ASSESS THE THIRD CATEGORY OF INSPECTIONS IDENTIFIED IN THE KEMA REPORT.

A. The third type of inspection is identified as "touchpoints" afforded by daily activities. The KEMA report (pg.35) states that daily pole activities totaled about 200,000 in 2004. The report then discusses the concept of touchpoints as pole inspections. In regard to the touchpoints, I agree that a competent lineman will perform a hazard assessment before he climbs any pole. However, a hazard assessment will only determine that the pole is safe for him to climb. This is not the same as a pole inspection. Most linemen will climb a pole, even if it shows some signs of deterioration, if he believes that he can safely perform his work. In the case where the work is performed from a bucket truck, which is quite common today, the pole hazard assessment may be abbreviated.

Further, there is a maxim of management that states that what gets measured gets done. The corollary is that what gets measured and not recorded might as well not have been measured. I found no evidence of any orderly record system showing which poles were visited, when visits occurred, or what anomalies were discovered. I also found no evidence to assume that two poles are touched in every visit nor that the visits are completely random. It is my opinion that many of the touchpoints could not truly be classified as pole inspections.

KEMA (pg.35) states that FPL "touches" 280,000 poles per year based on 69,000 Thermovision inspections, 12,000 Osmose inspections, and 200,000 touchpoints. From this number, KEMA lists a series of assumptions and performs mathematical calculations to conclude that between 80% and 90% of all lateral poles will be inspected over a 15-year period. While the calculations are elegant, KEMA acknowledges the uncertainty of their assumptions. I believe that their assumptions are so uncertain that their conclusions are suspect. I believe that only the Osmose inspections, which in 2004 numbered approximately 5600, and a fraction of the touchpoints may actually be considered as valid pole inspections, and of those the "touchpoints" do not yield any records of location and condition of the poles. In my opinion, prior to the 2005 storms FPL did not have a planned pole inspection program which adequately covered all their wood poles.

Q. DO YOU CONSIDER FPL'S PRE-WILMA INSPECTION CYCLE TO HAVE BEEN ADEQUATE?

A. Putting aside my criticism of the manner in which KEMA treats all of the three programs as somehow equivalent, even though only the smallest, in my view, constitutes a valid inspection program: Using KEMA's best assumptions (with which I do not agree), FPL was performing pole inspections on a cycle somewhat greater than 15 years. If their calculations are extended past 15 years, there would be some percentage of poles that, theoretically, would never be inspected.

Four of the respondents in the KEMA survey (pg. 95) perform inspections on a 10 year cycle. One respondent performs inspections on a 12 year cycle.

The Rural Utilities Service (RUS), a division of the U. S. Department of Agriculture, produces bulletins and manuals that govern the operation of America's rural electric cooperatives. The cooperatives, taken as a whole, have the largest number of distribution poles of any entity in the country. The RUS instructions have been developed and tested over many years and been shown to be effective in providing reliable electric service.

RUS Bulletin 1730B-121 addresses pole inspection and maintenance. At pages 6 and 7, the bulletin contains the following statements:

- The purpose of a planned inspection program is to reveal and remove danger poles and to identify poles which are in early stages of decay so that corrective action can be taken.
- The greatest economic benefit from regular inspection is in locating the decaying/serviceable group. Treatment of poles in this group can extend pole life, thereby *avoiding the cost of emergency replacement* (my italics).

At page 5, the bulletin identifies the entire state of Florida in Decay Zone 5 and recommends that all poles be inspected on an 8 year interval. It should be noted that investor owned utilities, including FPL, are not under the jurisdiction of RUS. An excerpt of this bulletin is attached as my Exhibit __(JB-14).

FPL is under jurisdiction of the NESC. Rule 214.A.2 states that lines shall be inspected at such intervals as experience has shown to be necessary. Based on FPL's 1998 pole inspection, the five respondents to the KEMA survey, and the RUS recommendations, it is my opinion that the pre-2005 storm FPL pole inspection cycle was not adequate.

Q. WHAT OBSERVATIONS HAVE YOU MADE CONCERNING THE CAUSE OF DISTRIBUTION POLE FAILURES DURING HURRICANE WILMA?

A. The KEMA report (pg. 16, 17) states that all FPL distribution poles are sized for Grade B construction, except for a few areas that were reduced to Grade C between 1993 and 2004. However, the KEMA report states that most Grade C poles were stronger than required, often meeting Grade B, and most were too young to have begun deterioration. The report further states (pg.77) that Grade C construction was not responsible as a contributing factor in the failures.

The wind velocity that the poles are designed to withstand, according to FPL's Distribution Engineering Reference Manual (DERM), is 118.6 mph for Grade B and 96.9 for Grade C. It has been stated that the maximum wind speed during Wilma was 92 mph in Collier and Lee counties, diminishing as the storm moved eastward (Bates 102887). In light of this, there should have been very few failures of poles which were properly installed and in good condition due solely to wind pressure.

During our inspection trip to areas of FPL's service area, we noted a number of leaning poles, mostly in feeder circuits. We surmised that the poles may have been set at too shallow a depth, because the birthmarks were located 8-10' above the ground line, rather than at or slightly above the eye level height that I would expect, based on my experience.

It is possible that some of the CCA poles may have experienced foundation failure and started a cascade failure which took down adjacent poles.

In an attempt to determine the cause of the many distribution pole failures, we visited the pole retention yard in West Palm Beach on March 15, 2006. My observations are recorded in Exhibits _(JB-1) and __(JB-3) . In our time there, we observed 188 CCA poles and 215 creosote poles for a total of 403 failed poles. Because the poles generally were in disarray, we were able to view only a small portion of the failed poles. Except for the outermost poles, we could view only a small portion of each individual pole. None of the CCA poles showed signs of deterioration, which is to be expected. I concur with KEMA's observation that CCA poles tend to be brittle, and I suspect many CCA poles were damaged by trees.

In viewing the creosote poles, we noted 46 poles that showed clear signs of serious deterioration. This leads me to believe that deterioration was the cause of at least 20-25% of the creosote pole failures we were able to observe in the yard.

An FPL Forensics team evaluated a sample of poles that failed during Wilma. The FPL team determined that 43% of the FPL creosote pole failures were caused by deterioration. Since the FPL team had better access to a much larger sample than we did and were better able to perform testing on the poles, I would expect their conclusions as to the extent of deterioration to be more accurate than ours. I am attaching an excerpt from the forensic team's preliminary report as Exhibit __(JB-15). I have been informed that FPL has withdrawn its assertion of confidentiality with respect to this excerpt, which is page 11 of the document.

An undated report titled "Hardening of the Infrastructure: A Five Point Plan" (Bates 102783, attached as Exhibit ___(JB- 16)) states that 46% of the non-tree related creosote pole failures during Wilma were due to deterioration It is my opinion based on this report that approximately 46% of the failures could have been prevented if FPL had an adequate, planned pole inspection process in place. In my opinion, FPL is not entitled to recover the cost of restoration of 46% of the failed creosote poles.. Further, because falling poles take good conductors with them,FPL is not entitled to recover the cost of restoring the conductors associated with the deteriorated poles.

Q. CAN YOU ESTIMATE THE COST ASSOCIATED WITH THE REPLACEMENT OF DETERIORATED POLES AND ASSOCIATED CONDUCTOR?

A. From FPL's answer to OPC Interrogatory 178, it appears that 7400 FPL-owned poles failed and were replaced after Wilma. Feeders poles make up 45% of the failed poles. 1/3 of them, or 1110 poles, are creosote poles. Lateral poles make up 55% of the failed poles. 2/3 of them, or 3837, are creosote poles. Earlier I accepted and employed FPL's determination that 46% of the creosote pole failures were due to deterioration. Applying the 46% factor to the total number of failed creosote poles yields a total of 1765 creosote poles that failed due to deterioration. FPL states (Exhibit __(JB-11), (Bates 004466) that the average cost of pole replacement during normal maintenance in 2005 is estimated to be $1700 each. Therefore, had the poles been replaced during routine maintenance, the cost would be $3,000,500. However, unit costs during storm recovery are much higher than normal, due to extensive use of multiple contractors and outside utility crews, their travel and accommodation expenses, extensive use of premium-time labor, expedited material and equipment deliveries, etc. I am not able to determine FPL's increase in unit cost precisely from the available data; however, in my experience, the items identified above increase the unit cost by a factor of at least four, and I believe that to be a deliberately conservative number. Based on this factor, the deteriorated pole replacement cost is $12.0 million. In response to OPC Interrogatories 8 and 9, FPL provided distribution repair costs for the 2004 storm season. The response shows $9.4 million for poles (Acct 364) and $8.3 million for conductor (Acct.365). The ratio of conductor cost to pole cost is 0.88, and I believe this is a reasonable value to use to calculate the Wilma distribution conductor restoration cost. Using this ratio, the cost of replacing conductor that was torn down by deteriorated poles is $10.6 Million. I estimate the total cost of repair that FPL is not entitled recover as a result of inadequate pole inspections and maintenance is $22.6 million.

Q. WHAT BEARING DID YOUR SITE VISIT HAVE ON YOUR CONCLUSIONS?

A. Let me preface my answer with some comments regarding the photographs that I have attached as my Exhibit __(JB-2). I acknowledge that I visited only a tiny sample of FPL's service area. Further, I took pictures only of the examples of deteriorating or problematic situations that I encountered, chiefly to help me remember everything that I saw that I regarded as pertinent after I returned from my trip. I do not claim that the pictures are representative of all of FPL's facilities in its service area. That being said, I think it is noteworthy that I encountered this number of situations in what amounted to a two day windshield tour of the area. To that limited extent, my impressions, as recorded in Exhibits ________(JB- 1,2,3), do tend to reinforce my comments regarding what I describe as inadequate maintenance activities.

Q. WHAT IS YOUR OPINION OF KEMA'S STATEMENT THAT "DISTRIBUTION POLE PERFORMANCE DURING WILMA IS KNOWN TO BE ACCEPTABLE" BASED ON THE COMPARISON OF POLE FAILURE RATES DURING WILMA

WITH FAILURE RATES DURING EARLIER HURRICANES (KEMA PGS. 4 & 57)?

A. The KEMA report states that the pole failure rate for Wilma was comparable with earlier hurricanes when adjusted for storm intensity. This statement appears to be valid, as far as it goes. Where the KEMA report falls short, however, is in failing to recognize that past failure rates themselves were the result of a long period of insufficient pole inspection and maintenance practices. To KEMA's observation that the poles performed "as expected," I would add, "as expected in light of a history of nonexistent and later inadequate pole inspection practices." Based on the fact that FPL did no pole inspections from 1991 to 1999, and that its pole inspection procedures after 1999 were inadequate, it is not surprising to me that pole performance during hurricanes has not improved over the past 14 years. It is surprising to me that FPL or KEMA would find the continuing lack of improvement in failure rate to be acceptable.

Q. PLEASE SUMMARIZE YOUR TESTIMONY ON FPL'S PRE-2005 STORM SEASON WOOD POLE INSPECTION AND MAINTENANCE PROGRAMS, AND THE EFFECT THEY HAD ON THE EXTENT OF DAMAGE SUSTAINED DURING HURRICANE WILMA.

A. Of FPL's three pole inspection programs, only one—the Osmose program—constitutes a detailed and effective inspection program. FPL initiated it in a small way in 1999, and has since reduced the scope of the program. In a recent year Osmose performed approximately 5600 inspections, covering less than 1% of FPL's pole inventory. Thermovision cameras can do nothing to detect deterioration in wood poles. The visual inspections performed by Thermovision operators are capable of detecting only obvious signs of deterioration, as the KEMA report acknowledges. In many instances, evidence of deterioration is not obvious—which explains why the Osmose program involves excavating below ground level, sounding the pole, and measuring borings with a shell gauge. It is revealing, rather than surprising, that the percentage of deteriorated poles detected by Osmose is 20 times greater than the percentage observed by Thermovision operators. The Thermovision visual inspections are not even applicable to laterals, which comprise 65% of FPL's pole population.

The "touchpoints" described by KEMA do not constitute an effective inspection program. As KEMA acknowledges, a workman generates a report only if he sees a condition that would be hazardous to his task, and even that document is not maintained in a data base that would enable FPL to keep track of pole location, condition, etc. Further, because the workmen are not required to document each assessment, there is no ability to verify the extent or adequacy of each assessment. In my view, past inspection practices have been, with the exception of the limited Osmose program, insufficient to identify and replace deteriorated poles, with the result that many of the poles that fell during Wilma did so—not because of high winds—but because of their deteriorated condition.

VII. OBSERVATIONS CONCERNING VEGETATION MANAGEMENT

Q. WHAT OBSERVATIONS HAVE YOU MADE CONCERNING VEGETATION MANAGEMENT PRACTICES AT FPL?

A. I reviewed the FPSC Staff Report and the FPL Annual Distribution Reliability Reports that provided the basis for the report. These reports show steadily increasing vegetation-related outages from 1999 through 2003, but they dropped in 2004. They also show steadily worsening CAIDI and SAIFI indices from 1999 through 2003, but they improved a small amount in 2004. In response to OPC's Interrogatory 121, FPL stated that its reliability indices exclude major storm events. On the basis of this statement, I am led to believe that the drop in vegetation-related outages in 2004 was quite likely due to excluding the 2004 hurricane outages from the results. Based on these decreasing distribution reliability results, I concur that the conclusions and concerns expressed in the FPSC Staff Report are well founded. FPL's vegetation management program may not be adequate.

I also reviewed the FPL "Hardening Plan". (Exhibit ___(JB-17)This plan addresses the history of damages to the distribution system during tropical storms and hurricanes and plans to mitigate these damages in future storms. This plan apparently was developed, for the most part, before Wilma, because the bulk of the data covers problems occurring up through and during Katrina. On pages 26-28, the report contains data on the cost and benefits of reducing the line clearing cycle for three alternative scenarios. The report appears to conclude that it is not cost effective (in terms of costs incurred by FPL before and after storms) to improve the vegetation management program by increasing the frequency of trimming using any of the scenarios. This part of the report, coupled with the fact that that FPL did not, prior to 2005, significantly increase its vegetation management budget, leads me to infer that FPL decided that it is more economical, in terms of costs incurred by FPL, to restore the system damaged by vegetation after hurricanes than to perform the preventive maintenance required to mitigate storm damage effectively.

I also reviewed a preliminary draft of the forensics team report on Hurricane Wilma. The data on page 9 indicates that 1742 failed poles were analyzed and 24 % of the failures were due to trees. Exhibit __(JB-18) I believe it is fair to use this relationship as representative of the poles that failed during Wilma. Further, on page 11 of the Hardening

Plan, it states that, during Katrina, 62% of the conductor damage caused by trees was on the laterals and 69% of the lateral tree-related damage was preventable. In response to Interrogatory 231, FPL defined preventable damage as "Standard trimming would have eliminated tree contact with distribution equipment." Based on the Katrina data, I believe that it is reasonable to assume that at least half the pole failures due to trees during Wilma were preventable. On this basis, I contend that inadequate vegetation management is responsible for 12% of the total poles failures. Since FPL has apparently concluded that it is more cost effective, for its purposes, to replace tree-damaged poles than to prevent the damage, I believe that FPL is not entitled to recover their preventable costs. I also believe that they are not entitled to recover the repair costs of the conductors associated with these poles.

Q. CAN YOU ESTIMATE THE COST OF REPLACING THE POLES DAMAGED BY TREES THAT WAS PREVENTABLE AND THE COST TO REPLACE THE CONDUCTOR ASSOCIATED WITH THE FAILED POLES?

A. Using the base of 7400 failed FPL poles established earlier, I estimate that 12% or 888 poles suffered tree damage that was preventable. Using the normal replacement cost of $1700 each, the replacement cost would have been $1.51 million. Multiplying that by a factor of 4, I estimate that FPL spent $6.0 replacing them during storm recovery. Using the conductor to pole ratio of 0.88 established earlier, I estimate that the conductor recovery cost to be $5.3. The total cost of recovery from preventable tree damage is $11.3 million.

Q. DOES THIS COMPLETE YOUR PREFILED TESTIMONY?

A. Yes, it does.

DOCKET NO. 060038-EI
CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a copy of the foregoing has been furnished by U.S. Mail or hand-delivery to the following parties on this 31st day of March, 2006.

Charles J. Beck

Mary Anne Helton
Cochran Keating
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Bill Feaster, Manager
Regulatory Affairs
Florida Power & Light Co.
215 S. Monroe Street
Suite 810
Tallahassee, FL 32301

Timothy J. Perry, Esquire
McWhirter Law Firm
117 S. Gadsden Street
Tallahassee, FL 32301

Michael B. Twomey
Post Office Box 5256
Tallahassee, FL 32314-5256

Tim Devlin
Director of Economic Regulation
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Patrick M. Bryan, Esquire
Florida Power & Light Company
700 Universe Blvd.
Juno Beach, FL 33408-0420

John W. McWhirter, Jr., Esquire
McWhirter Law Firm
400 North Tampa Street, Ste. 2450
Tampa, FL 33602

Robert Scheffel Wright, Esq.
John T. LaVia, III
Young van Assenderp, P.A.
225 South Adams Street, Suite 200
Tallahassee, FL 32301

Mr. Bill Walker
Vice President, Regulatory Affairs
Florida Power & Light Company
215 S. Monroe Street, Suite 810
Tallahassee, FL 32301-1859

Jack Leon
Senior attorney
9250 W. Flagler St., Suite 6514
Miami, FL 33174

Lieutenant Colonel Karen White
Captain Damund Williams
AFCESA/ULT
139 Barnes Drive
Tyndall Air Force Base, Florida 32403

INDEX OF EXHIBITS

DIRECT TESTIMONY—JAMES S. BYERLEY, P.E.

DOCKET NO. 060038-EI

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FPL FACILITY REVIEW	JSB_2	______
FPL POLE YARD INSPECTION	JSB_3	______
RESPONSE TO INTERROATORY NO. 126	JSB_4	______
MEMORANDUM OF C.J. WONG	JSB_5	______
1998 ANALYTICAL TECHNIQUES	JSB_6	______
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EXHIBIT I

FLORIDA OFFICE OF PUBLIC COUNSEL

REPORT OF FIELD INSPECTION TRIP

MARCH 13-15, 2006

Introduction

On March 13-15, 2006, I made a field inspection of various FPL facilities in Palm Beach County. I was accompanied by a lineman, Richard Jones, and OPC staff member Earl Poucher. We did not have a predetermined plan or area to survey except we had prearranged a visit to the FPL damaged pole retention yard at 2455 Port West Blvd., West Palm Beach on March 15. We visited various areas in West Palm Beach, Riviera Beach, South Bay, and Belle Glade observing the condition of distribution facilities. We also viewed the Conservation-Corbett 500 kV Line and the Alva-Corbett 230 kV Line in the western part of the county.

Attached is a group of photos of our observations and a list containing the location and comments about each photo.

Distribution Observations

Many of the laterals are located on back lot lines but we did not enter any private property to examine poles. We observed many leaning, weathered poles but could not determine their condition or reason for leaning. We did record instances of vines to the tops of poles and covering transformers (photos 1, 6, 60). We also noted numerous blackened and rusty transformers (photos 8, 21).

We examined several three-phase feeders located on public streets. The lineman tapped on suspicious creosote poles and determined that a number of them sounded like they were deteriorated (photos 9, 10, 12, 13, 15, 18, 37, 39). We did not drill or put a screwdriver in any poles to make a better determination. We found several deteriorated arms (photos 5, 17) and a number of woodpecker holes located dangerously close to arm attachments (photos 7, 11, 14,23). We found one case of a broken vacant pole and the badly leaning replacement pole adjacent to a school playground (see photo 4). Adjacent to another school, we found an exposed primary cable where an inadequate cover had been taped to the pole (photo 57).

We found numerous leaning poles and attempted to determine if the pole had been set too shallow by examining birthmarks (photos 3, 24, 25, 30, 42, 45, 58, 59). I am accustomed to seeing poles set with birthmarks at or slightly above eye level. All of the poles listed above had birthmarks more than 8' above the ground and all had large gaps behind the poles. We did find two poles (photos 41, 44) where the pole butt was approximately 4" below the dirt in the bottom of the gap, indicating the pole was set no more than 3' deep. One particularly disturbing leaning pole held the transformers supplying the Municipal Water Plant (photo 27), a critical part of the City infrastructure.

On US Highway 27 we observed a three-phase regulator bank platform at a dangerous angle (photos 35, 36). As can be seen in the second photo, the regulators are very close to the highway. One regulator has nearly fallen off and all of them are restrained by one steel cable.

Transmission Observations

While traveling north on US Highway 27, we observed one 500 kV structure in the distance with a broken cross-brace and a missing cross-brace (photo 34). I believe this may be a structure in the Conservation-Corbett line, but we could not access the structure to be certain. Further north we encountered Structure 16Z66 in a public rest area. With the naked eye, I determined that all four cross-brace bolts had backed off enough for a gap to be clearly visible. Using binoculars, I estimate the gap to be 1/2" or more. There was no evidence that locknuts had been installed. A photo could not be taken because of the distance to the hardware. A short time later, we examined a new replacement structure, 16Z213, and determined that the cross-brace bolts appeared to be tight but no evidence that locknuts had been installed.

On Highway 880 at the King Ranch, we encountered the Alva-Corbett 230 kV line and an adjacent unidentified 115 kV line. All the 230 kV structures visible in either direction were leaning severely to the east (photos 46, 47, 48). The 115 kV line also leans but not as severely. We found a deteriorated pole on the ground that had recently been replaced with a concrete structure (photo 51). We also found a deteriorated pole in Structure A96V6 that apparently failed during a storm and been temporarily replaced with two concrete poles.

FPL Pole Retention Yard

On March 15, 2006, we met John McEvoy (FPL) at the pole retention yard to examine a number of poles damaged in the hurricane. The poles are stored in several areas around the complex. The poles had been unloaded in such disarray in several areas as to make a safe examination impossible. One area contained about seven stacks of poles arranged in a more orderly fashion that did lend itself to examination (photo 72). We examined three of the stacks. We counted the total number of poles in the stacks and categorized them as CCA or creosote. We then attempted to determine the number of deteriorated creosote poles in each stack by observation and by tapping them where possible. We did not observe any deteriorated CCA poles. We counted 188 CCA poles and 215 creosote poles. We believe that 46 of the creosote poles, or 21.4%, had suffered significant deterioration (photos 62-85). Because of the way they were stacked, we were only able to see the ends of many poles and we were not able to determine ownership of the poles.

The results of our pole survey are given in Exhibit III. I believe this is a representative sample, indicating that probably 20-25% of the failed creosote poles that we were able to see were in a deteriorated condition before the hurricane.

James S. Byerley, PE
Principal Engineer
R. W. Beck, Inc.

Docket No. 060038-EI
Byerley Exhibit No.___ (JSB-2)
FPL Facility Review
Index Page i

PRIVILEGED ATTORNEY-CLIENT MATERIAL

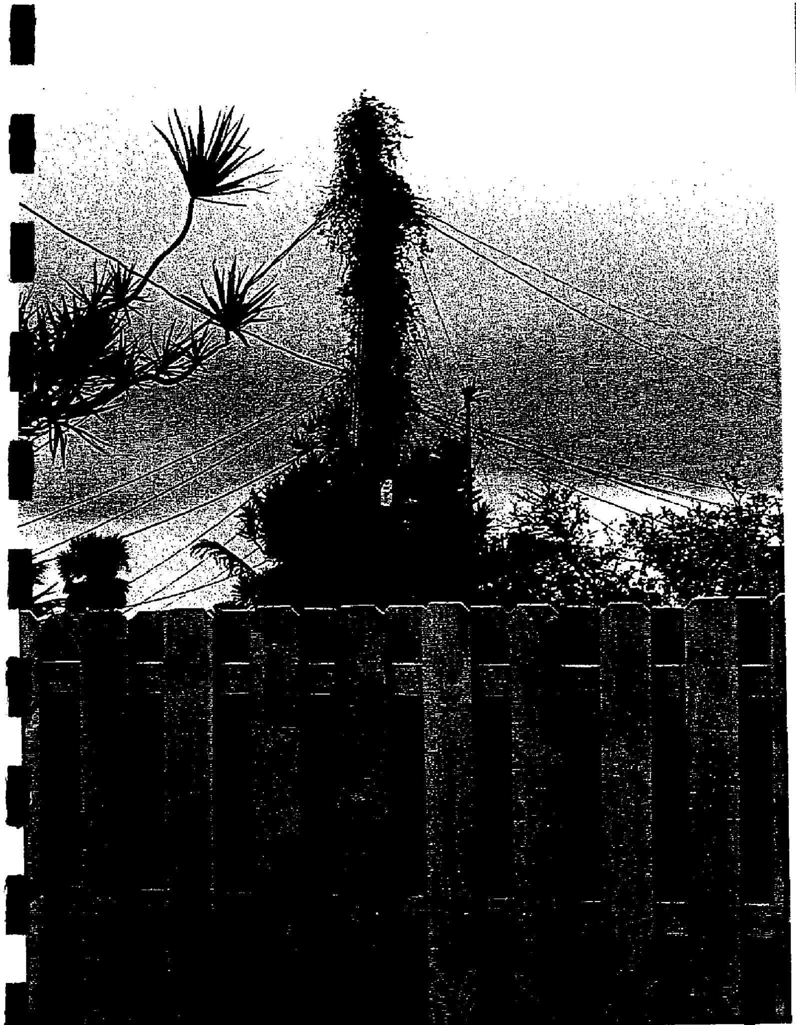
FLORIDA OFFICE OF PUBLIC COUNSEL

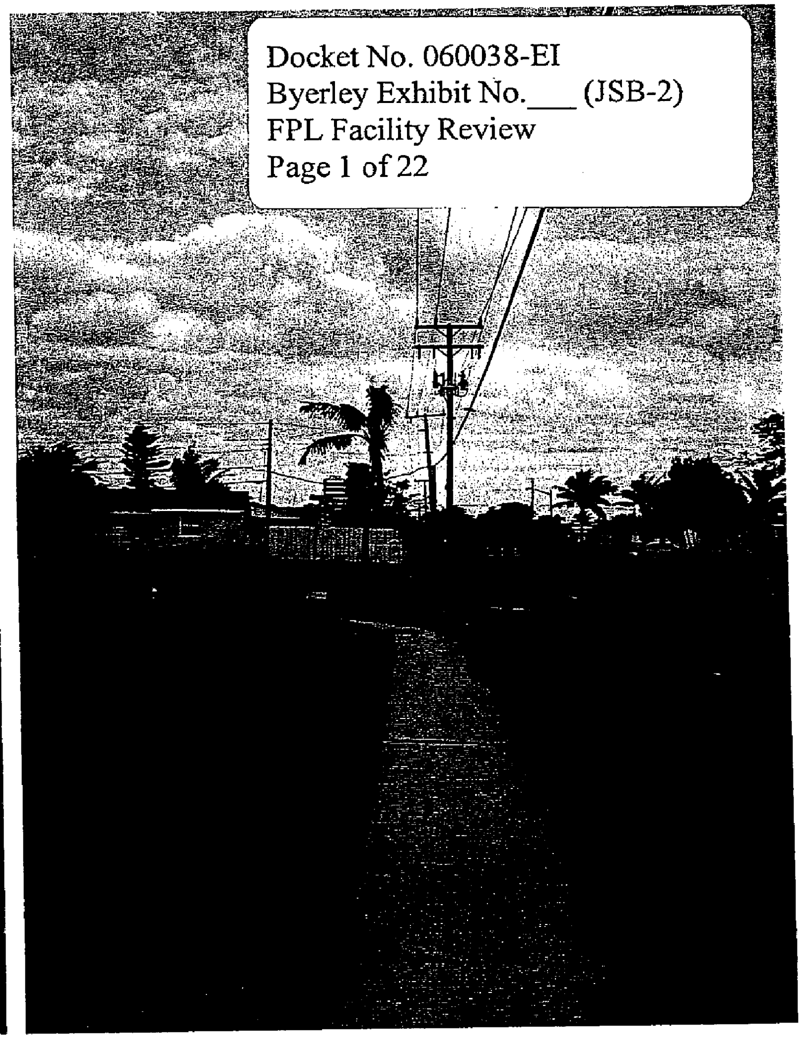
PHOTOS FROM INSPECTION TRIP

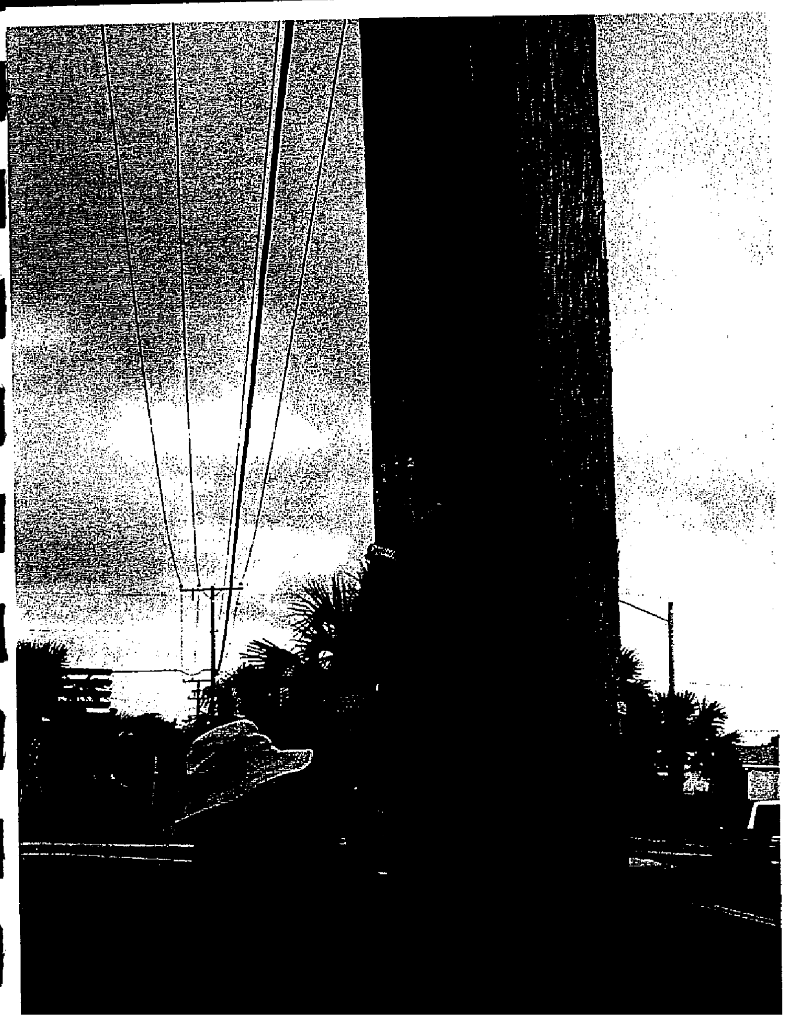
MARCH 13-15, 2006

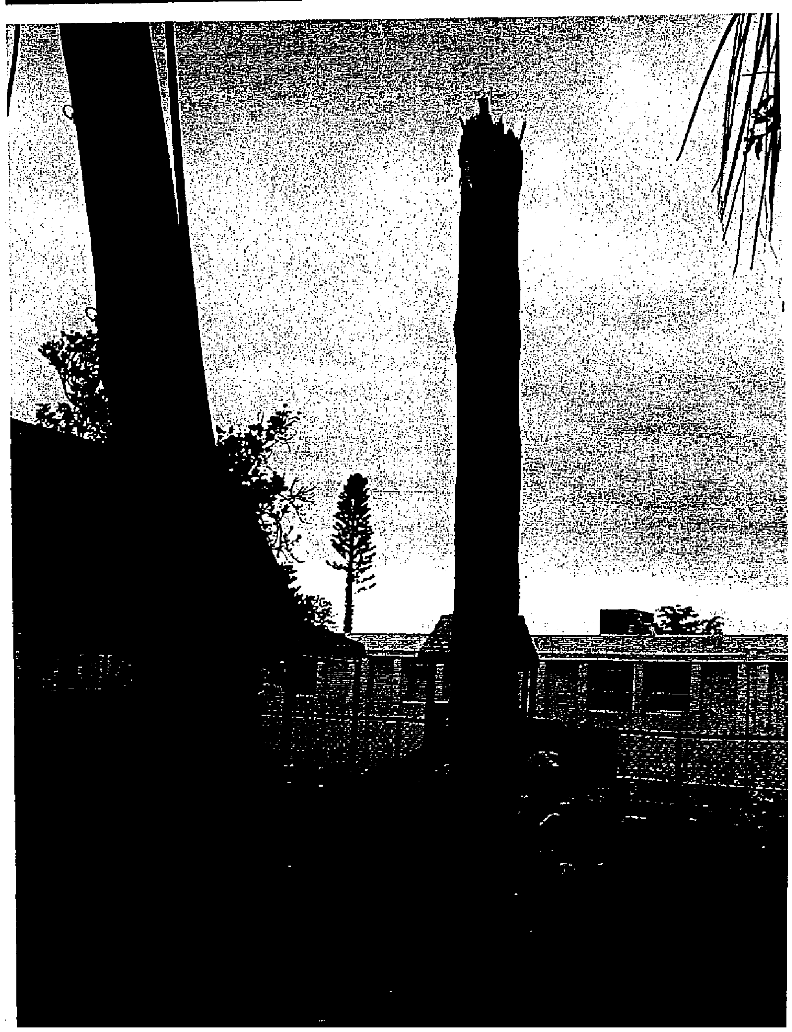
Item	Location	Comments
1	Congress Ave., S. of P. B. Lakes Blvd.	Vines covering pole
2	Near Congress Ave.	Leaning pole
3	Same spot	Pole appears set shallow, B.mark @ 9'
4	First Christian Church	Broken pole left adjacent to playground, new pole leaning
5	E. of Gale Place	Crack under bolt on top frame
6	500 Michigan Place	Vegetation on pole
7	Alley in W. P. B., behind Ridgewood Drive	Woodpecker hole
8	Same alley	Very rusty TX
9	Same alley	Pole deteriorated to 2' above ground
10	Same alley, next pole	Deteriorated pole
11	Georgia Ave. @ Avenida Alegre	Woodpecker hole close to arm
12	Same pole	Ground line decay
13	Next pole south	Pole deter. @ 4-6' above ground
14	Next pole south	Woodpecker holes around arm
15	Next pole south	Appears deter. @ 6' above ground, pole leaning badly
16	Same pole	Leaning badly
17	3624 Georgia Ave.	Pin pulling out of end of arm
18	Same pole	Big crack at base, pole deter.
19	Next pole south	Leaning pole
20	3729 Georgia Ave	Leaning pole
21	3729 Georgia Ave	Blackened TX
22	Lake Ave. @ Briggs St.	Deter. pole top, splintered at base
23	800 Briggs St.	Two woodpecker holes at top pin
24	4600 Lake Ave.	Pole appears to be set shallow
25	Valley Forge @ Parker	Broken pole, poor splint, set shallow?
26	top of same pole	Framing twisted badly
27	1st pole east of last photo	Supply to Muni. Water Plant. Leaning pole, no guys
28	12607 Hwy 441, west side	Leaning pole, big gap behind pole
29	Next pole south	Leaning pole, big gap behind pole
30	2nd pole south	Leaning pole, appears to be set shallow.
31	3rd pole south	Leaning pole, big gap behind pole
32	3th pole south, looking north	Last 3 poles, leaning
33	8th pole south of 12607 Hwy 441	Leaning pole, big gap behind pole
34	Hwy 27, about 5 mi. N of Sawgrass	500 kV line, broken X-brace, missing X-brace
No pic	Str. 16Z66 off Hwy 27	All four X-brace bolts loose. Seen with binoculars
35	Hwy 27 @ CR 827	Three-phase regulator bank falling off platform.
36	Hwy 27 @ CR 828	Three-phase regulator bank falling off platform.
37	Highway 27 @ S. Bay City limit (south)	leaning pole, ground line decay
38	Next pole north	Leaning pole, pole ground broken, gnd rod missing
39	South Bay, 4th Ave.	Ground line decay
40	South Bay, 4th Ave. @ Hwy 80	Pole in intersection leans badly
41	Same pole	Pole butt is 4" below dirt in bottom of hole

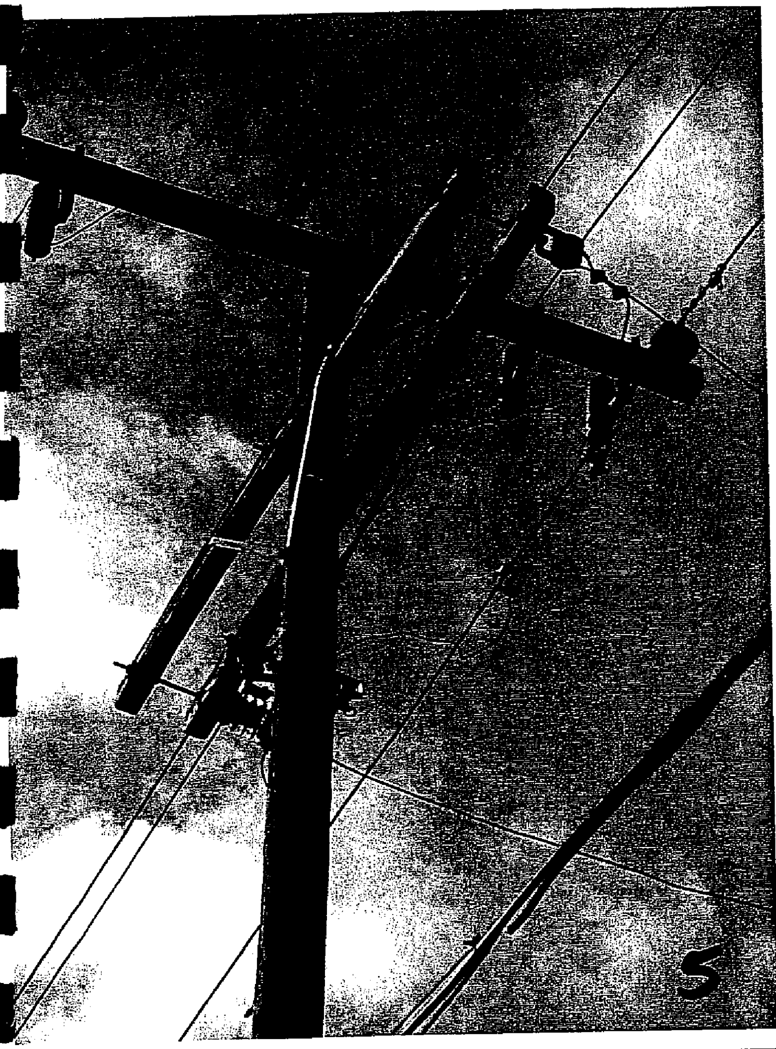
42	Same pole	birth mark on 40' pole, appears to be set very shallow
43	Hwy 880, FL Experimental Station	Pole leaning badly
44	same pole	Pole butt is 4" below dirt in bottom of hole
45	same pole	Pole appears to be set shallow, BM 9-10' above gnd.
46	28900 Hwy 880, King Ranch	230 kV line, all structures leaning in both directions
47	Same structure	230 kV line, all structures leaning in both directions
48	Same structure	Base of structure , showing gap behind pole
49	Same line looking west	Old Structures
50	Same line looking east	New structures
51	Hwy 880, Ross Nursery	Decayed pole, has been replaced
No pic	Structure 16Z213	New structure, X-brace bolts tight, no locknuts
52	Str. 16Z212	Defective foundation, failed in Wilma
53	Same Str.	Replacement structure
54	Str. A96V6, Alva-Corbett 230 kV line	Decayed pole broke, temp on two conc. Poles
55	Western Academy Charter School	Looking south, leaning pole
56	Western Academy Charter School	Looking north, leaning pole in distance
57	Western Academy Charter School	Pole with visible primary cable, guard taped on
58	5th pole north of school	Leaning pole, BM @ 9.5', appears set too shallow
59	3334 Broadway, Riviera Beach	Leaning pole, BM @ 9+', old pole not pulled
60	3500 block Broadway	Vegetation on pole
61	Cypress @ 4th St.	Leaning pole
62	All remaining photos at FPL disposal site	Decayed top
63		Decayed pole
64		Decayed pole @ top of photo
65		Decayed arm
66		Two deter. Poles
67		Deter. pole
68		Deter. Pole
69		Same pole, 20' above last photo
70		Deter. pole top, plant growing in it
71		Decayed pole w/conduit attached
72		view of pole disposal site
73		Deter. Pole, broke at hardware
74		Same pole
75		Hollow pole top
76		Two bad poles
77		Several deter. Poles
78		Deter.pole
79		Decayed pole on top, Splinted CCA pole
80		Numerous deter. poles
81		Same location from greater distance
82		Numerous deter. poles
83		Three deter. poles
84		Splinted pole but splint doesn't cover ground line decay
85		Several deter. poles







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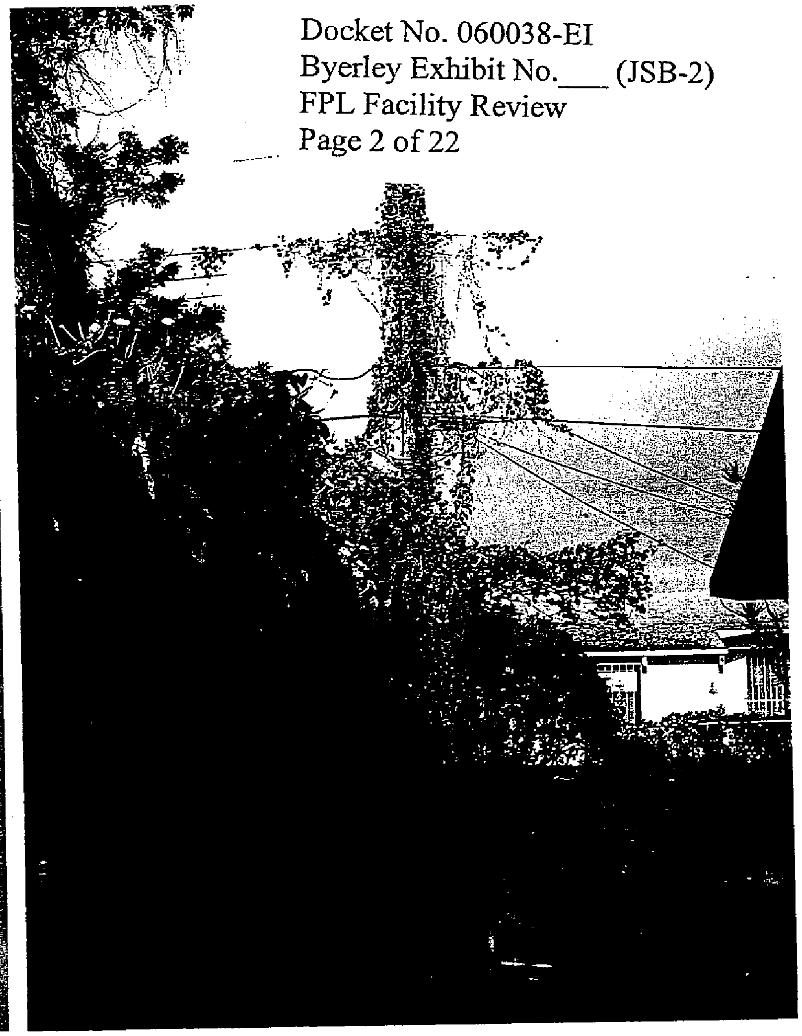

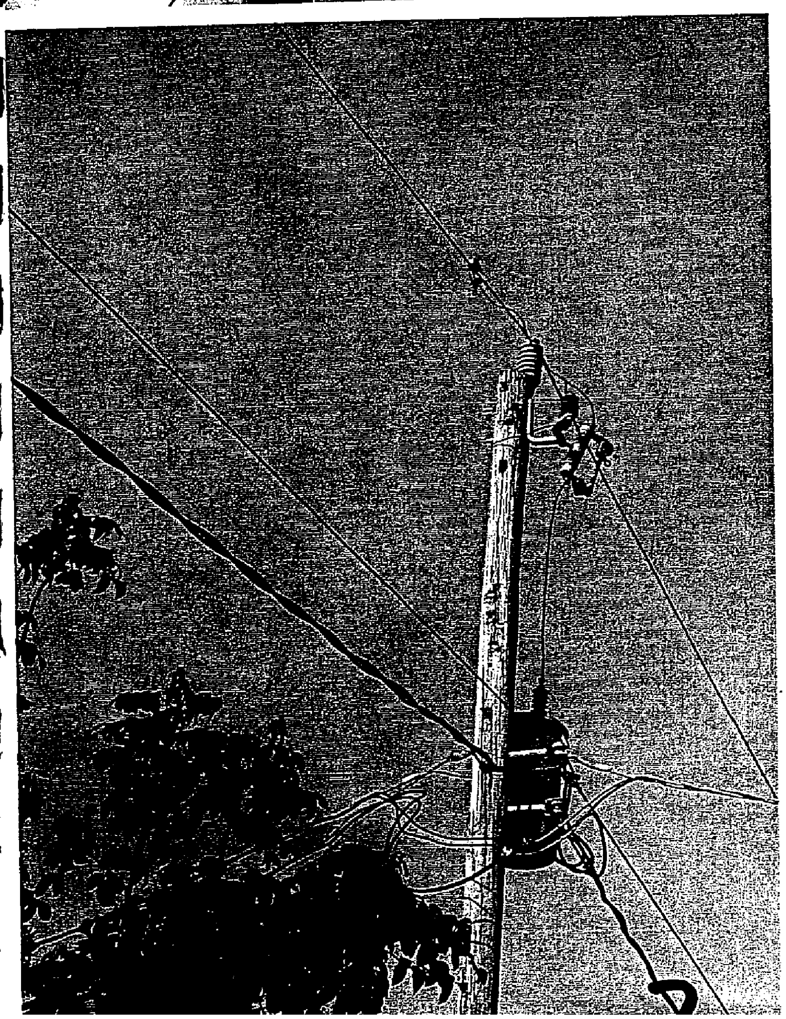
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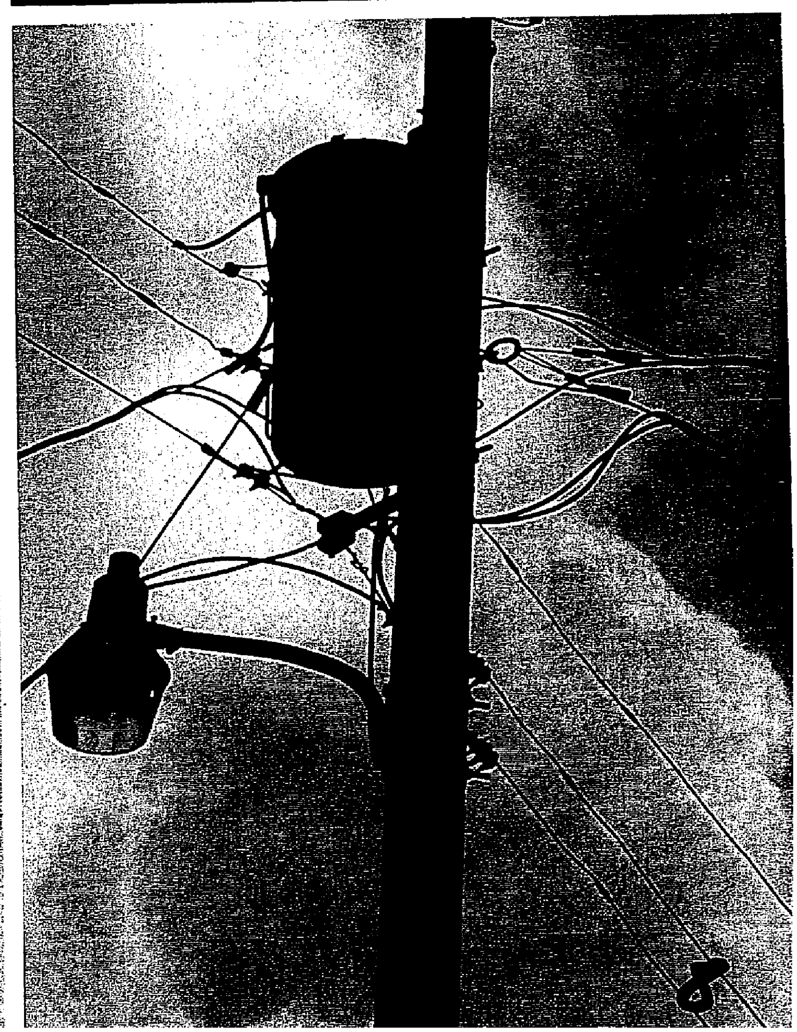
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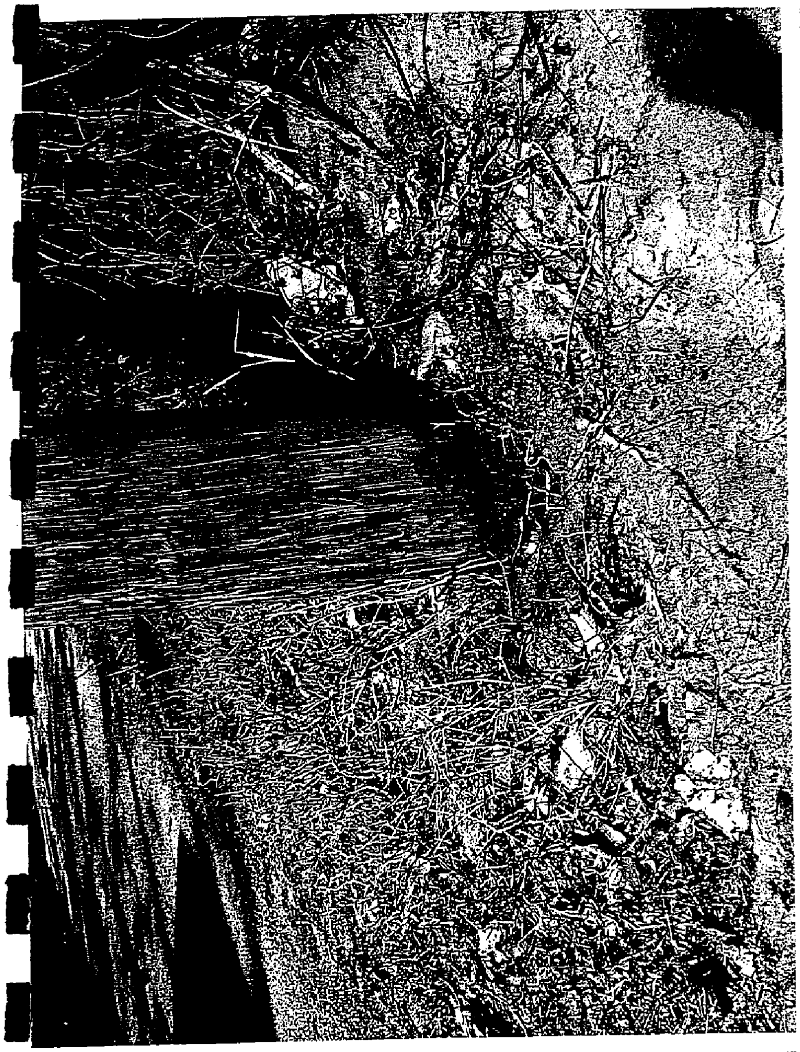

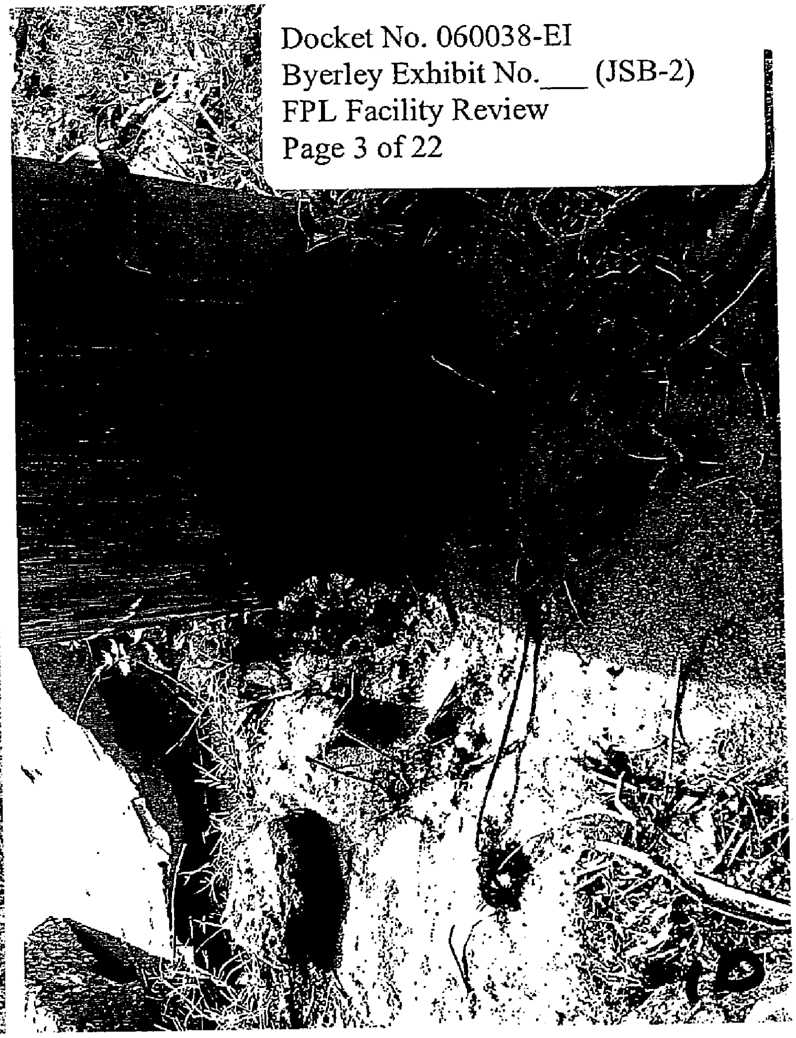

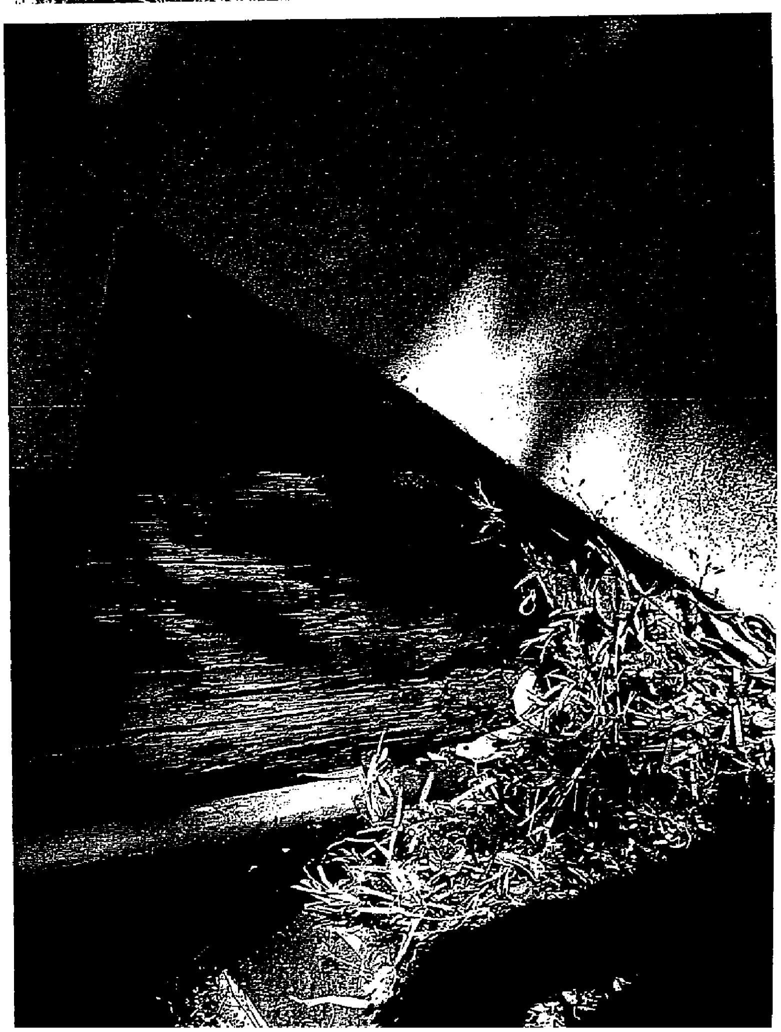

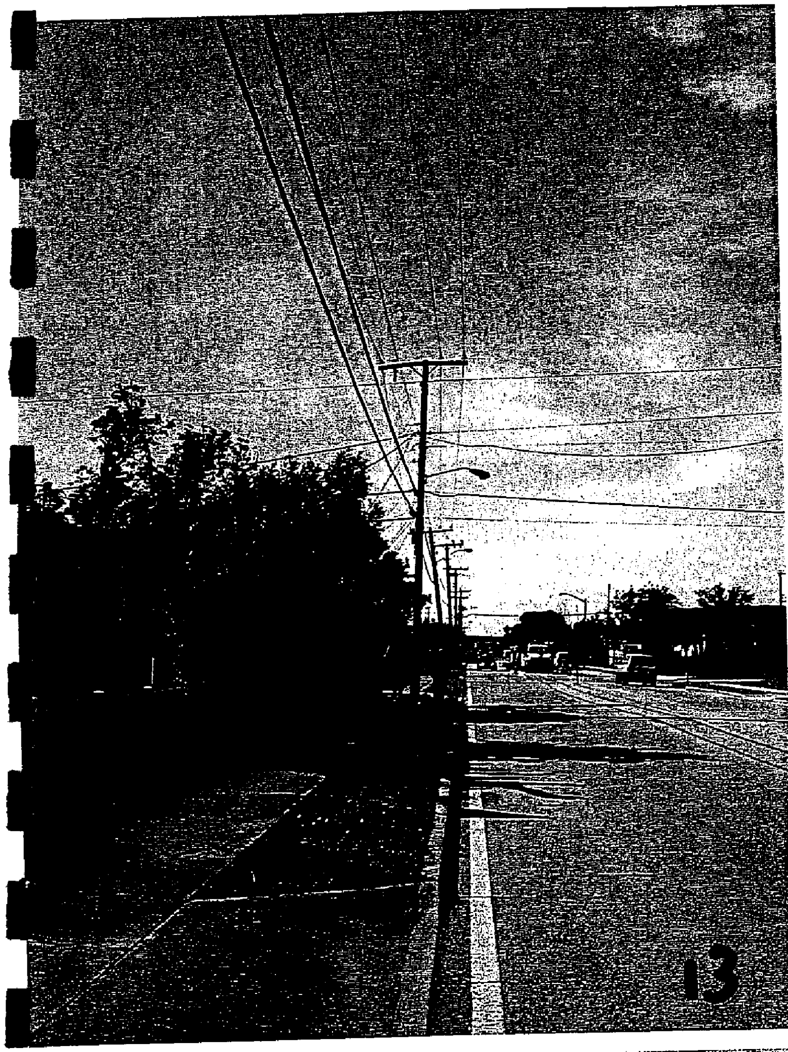
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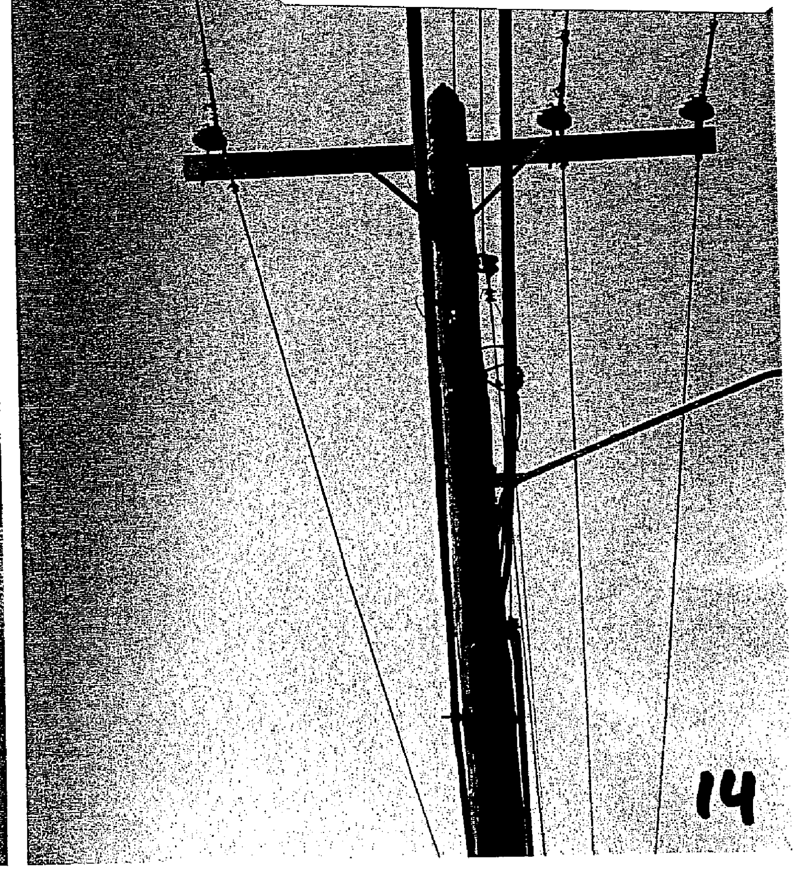
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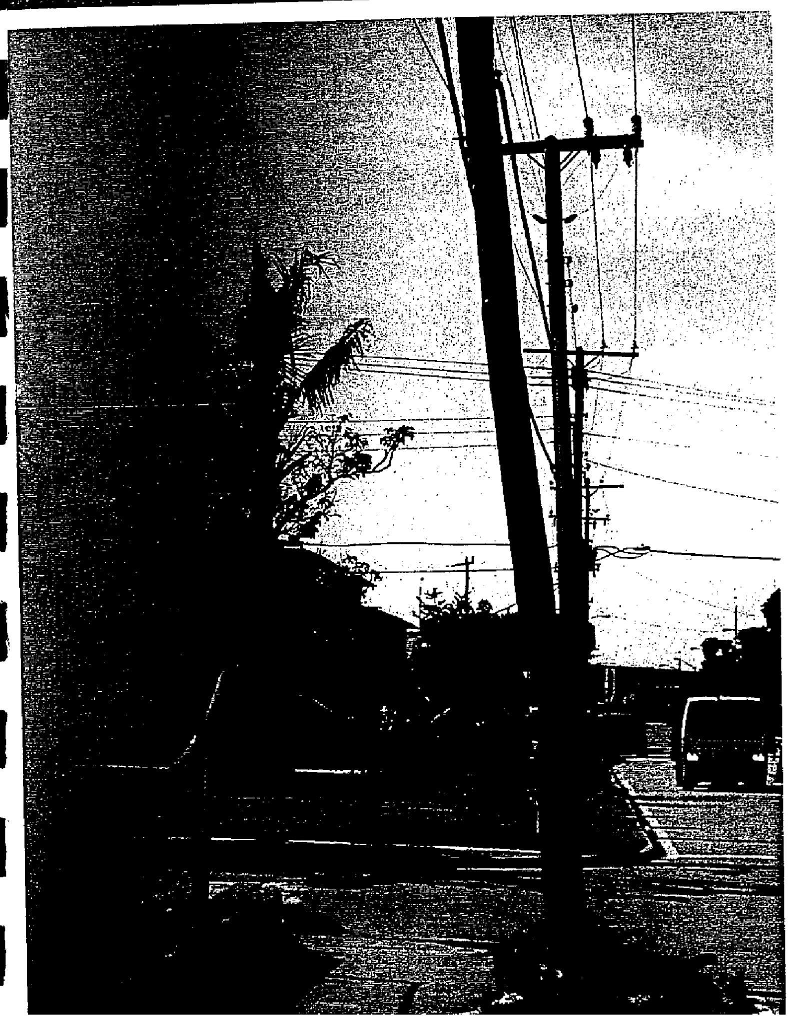

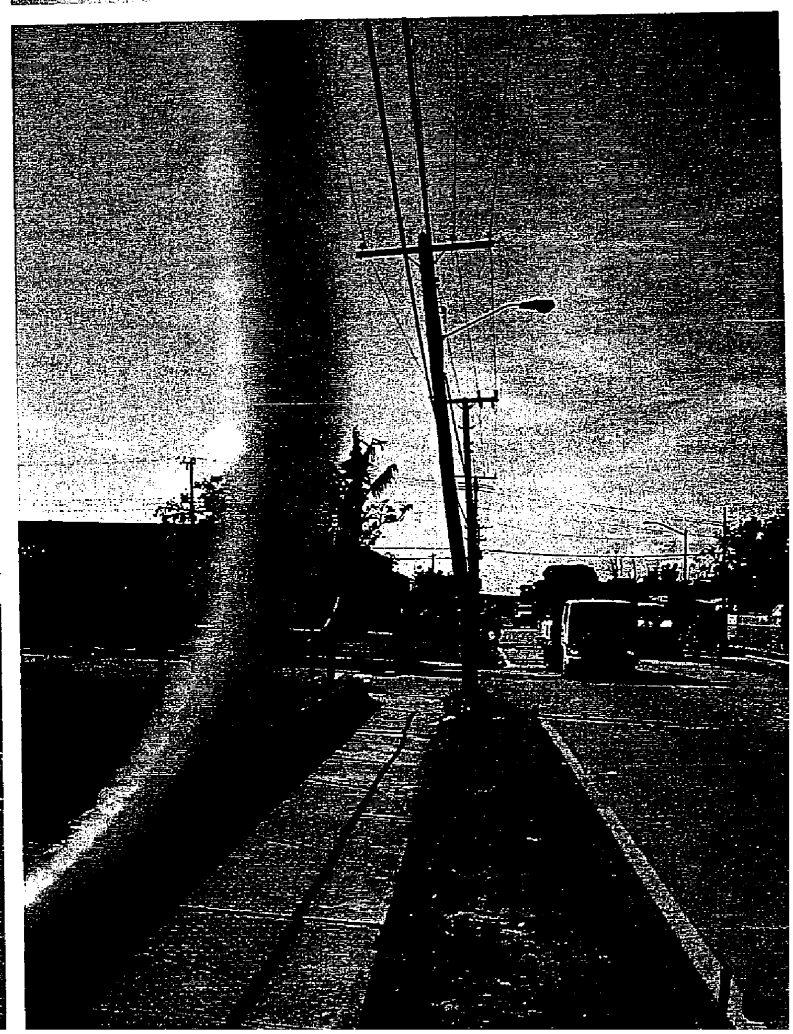

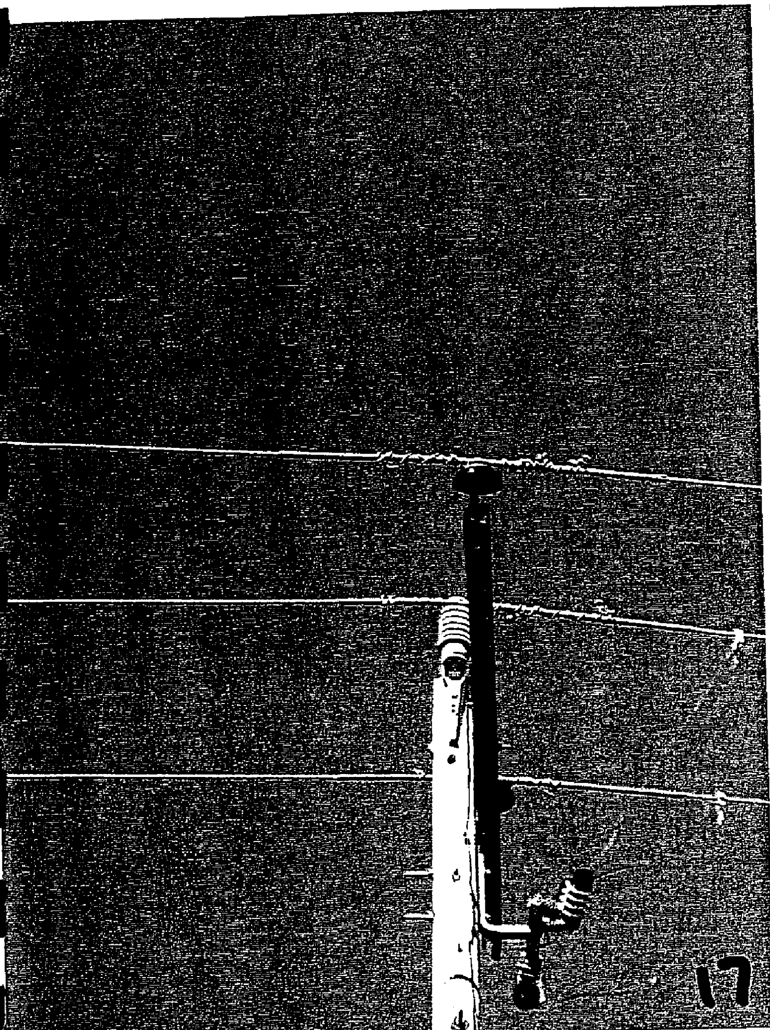
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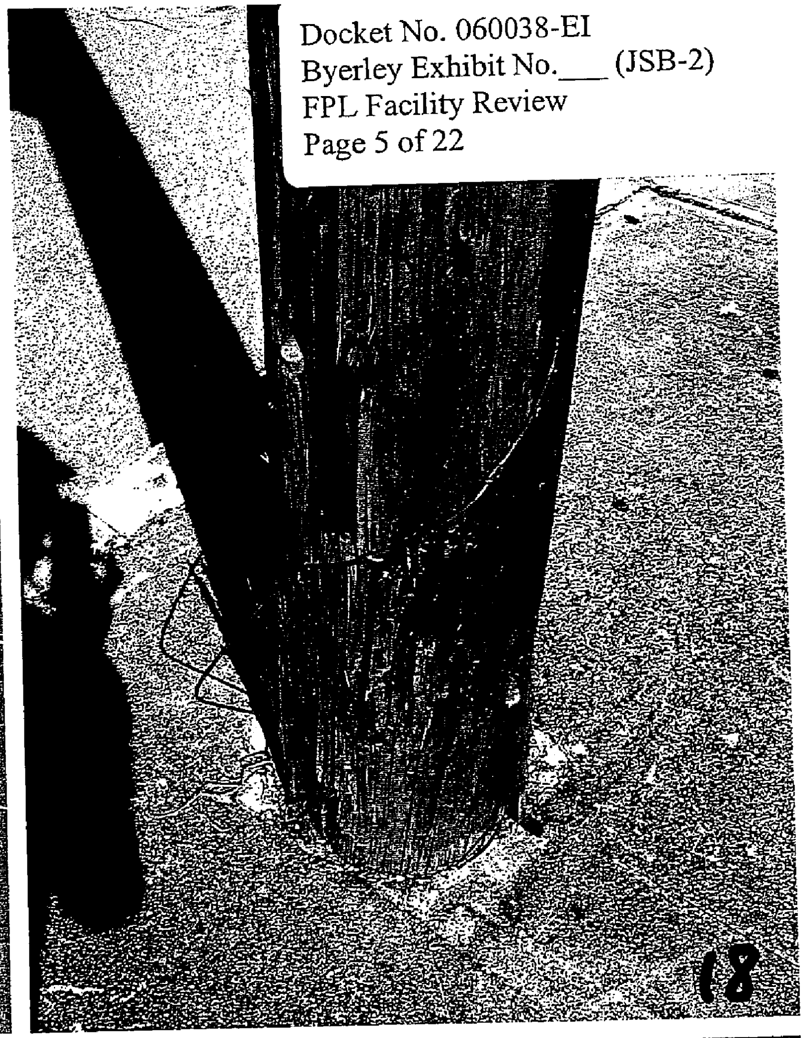
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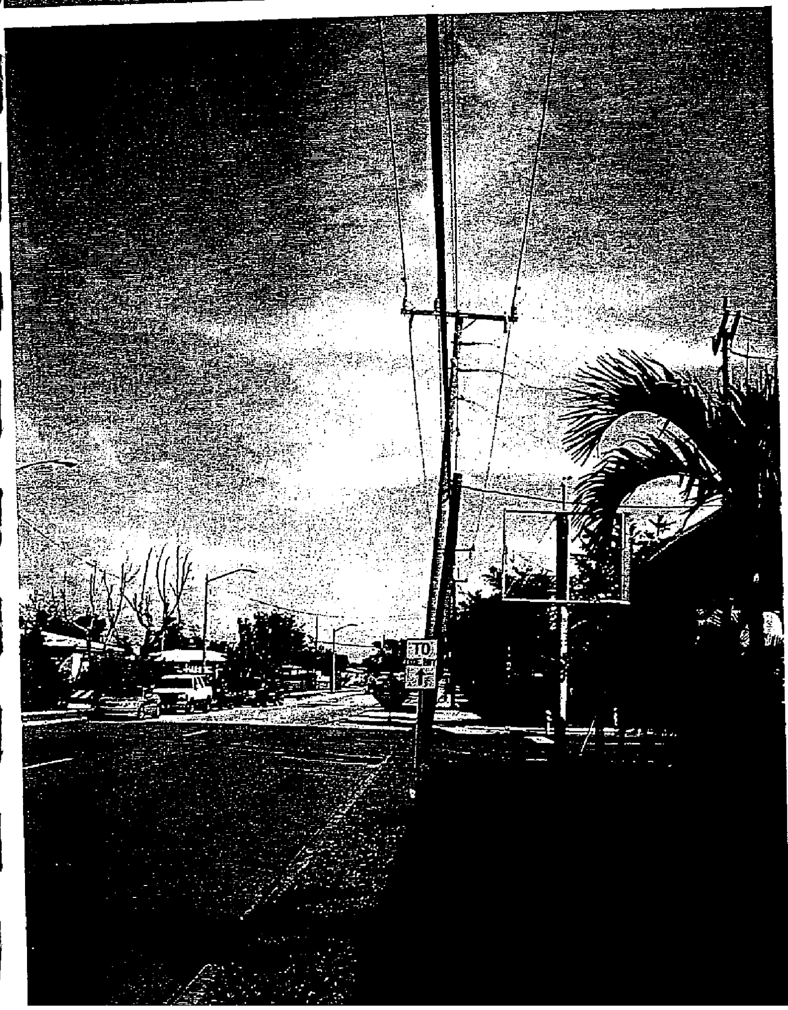

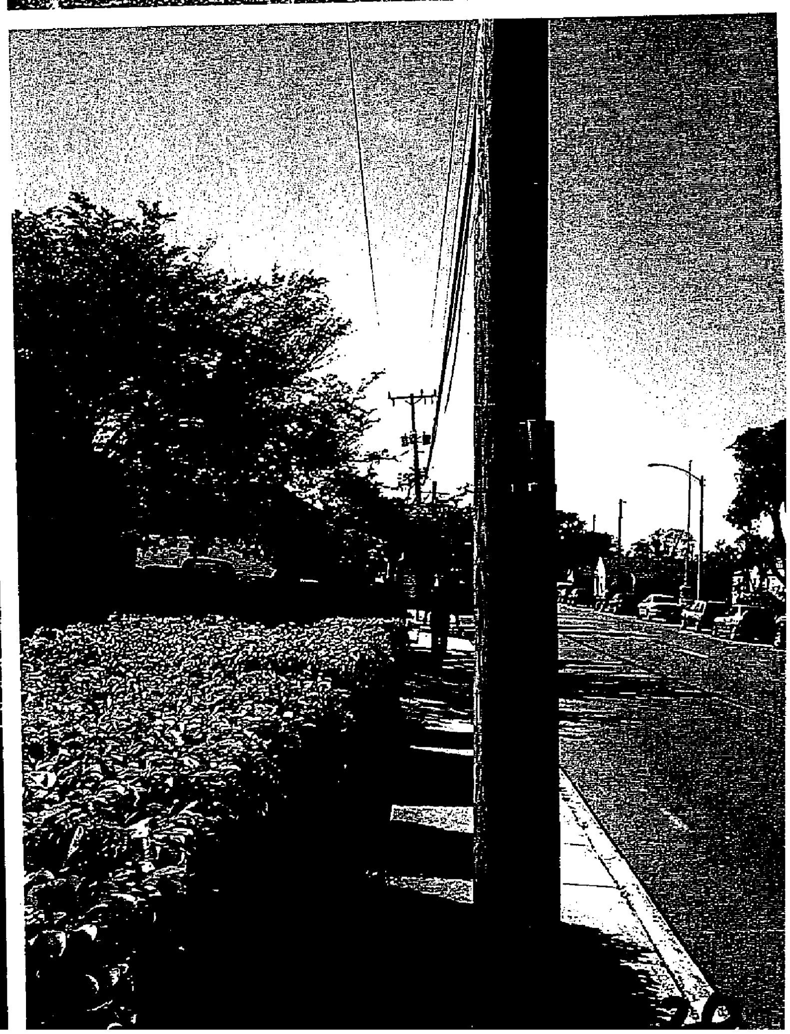

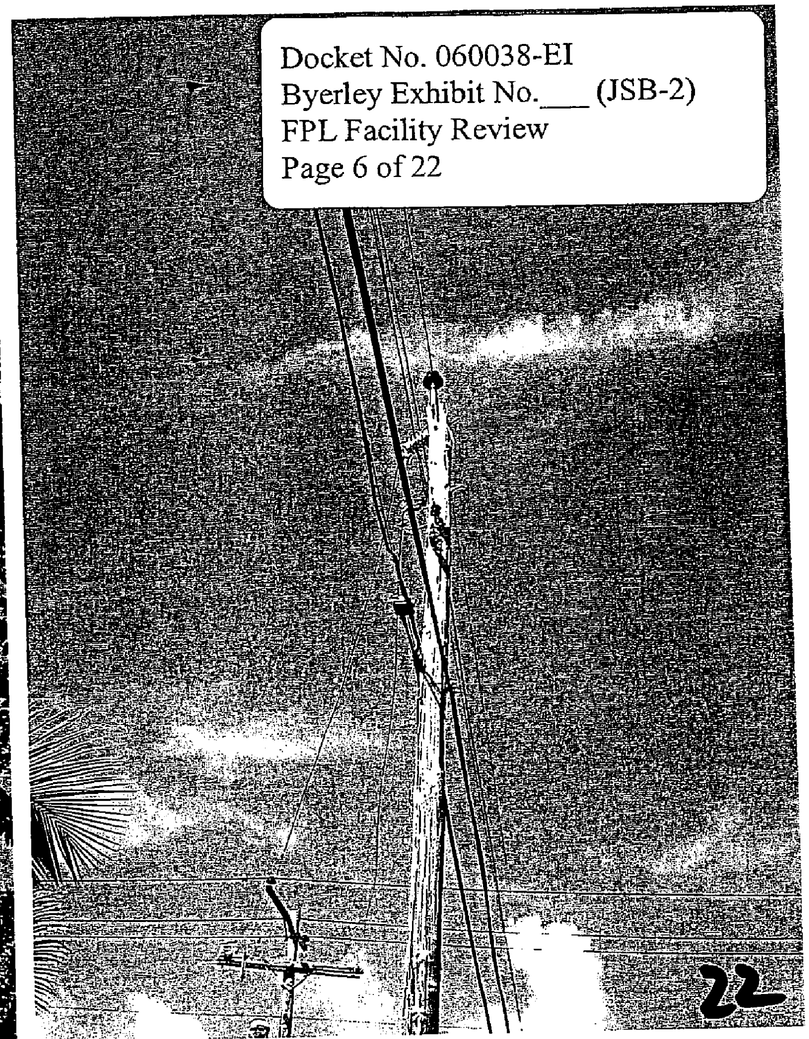
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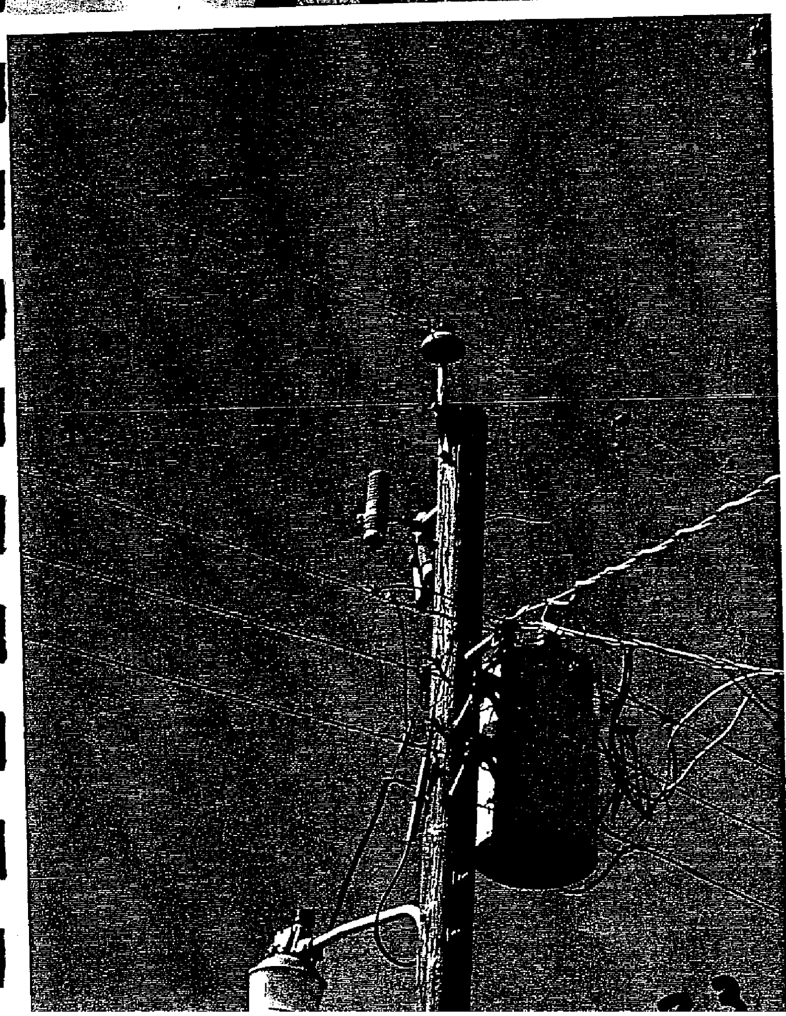

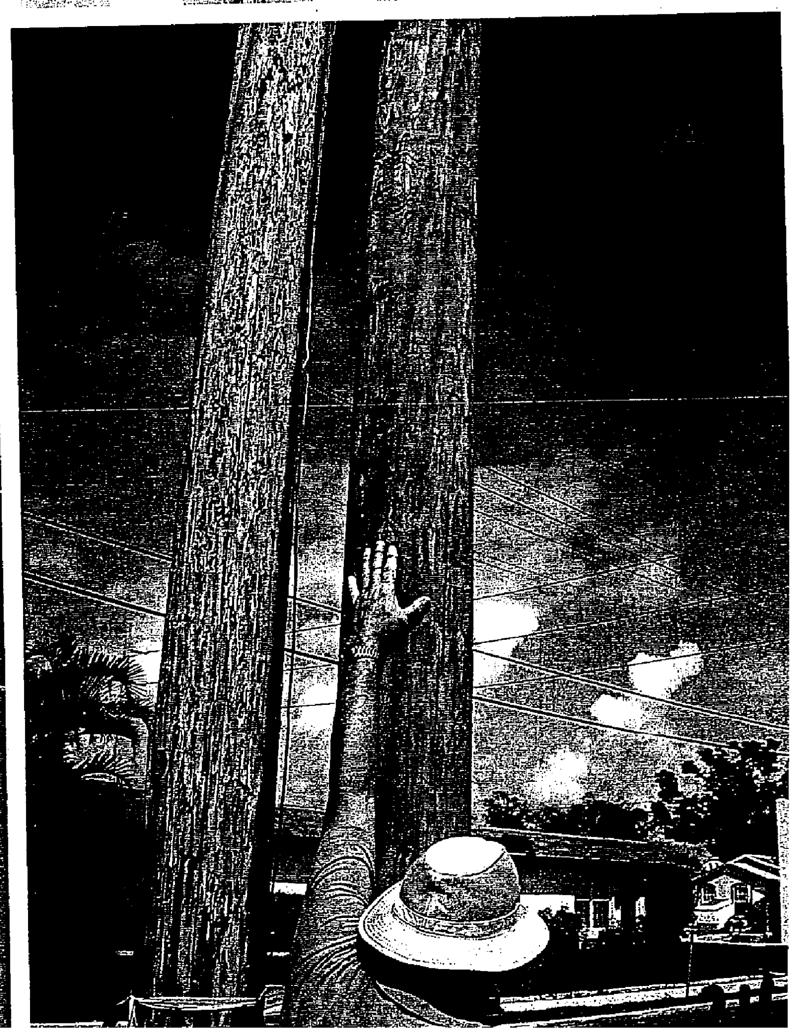

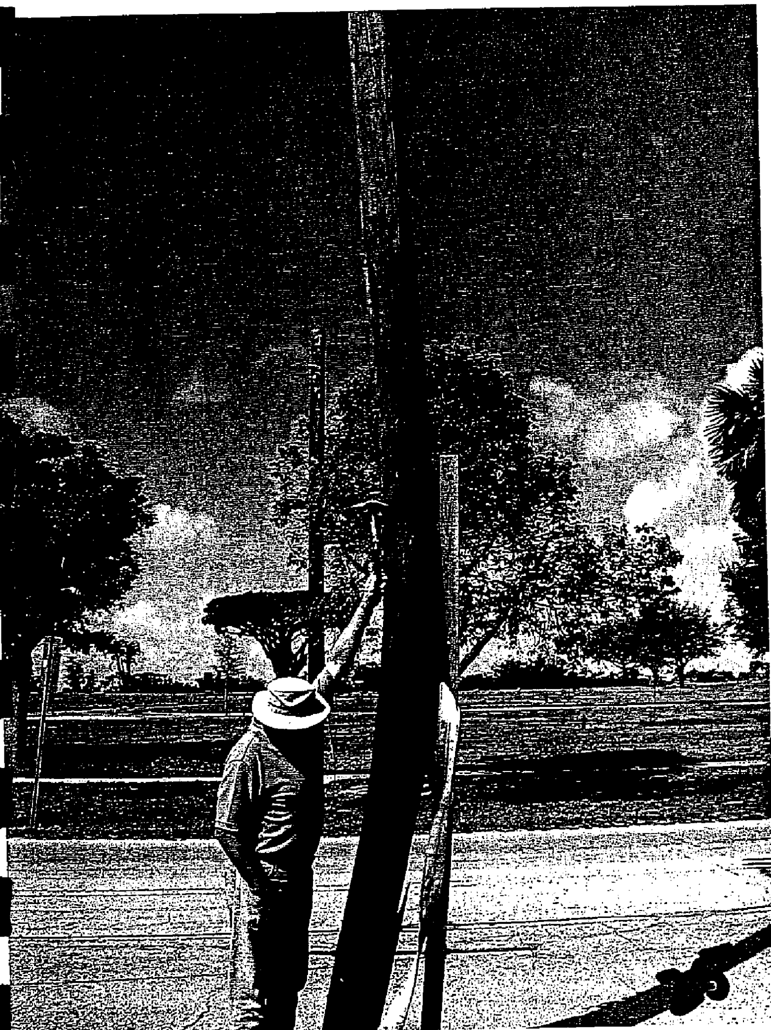

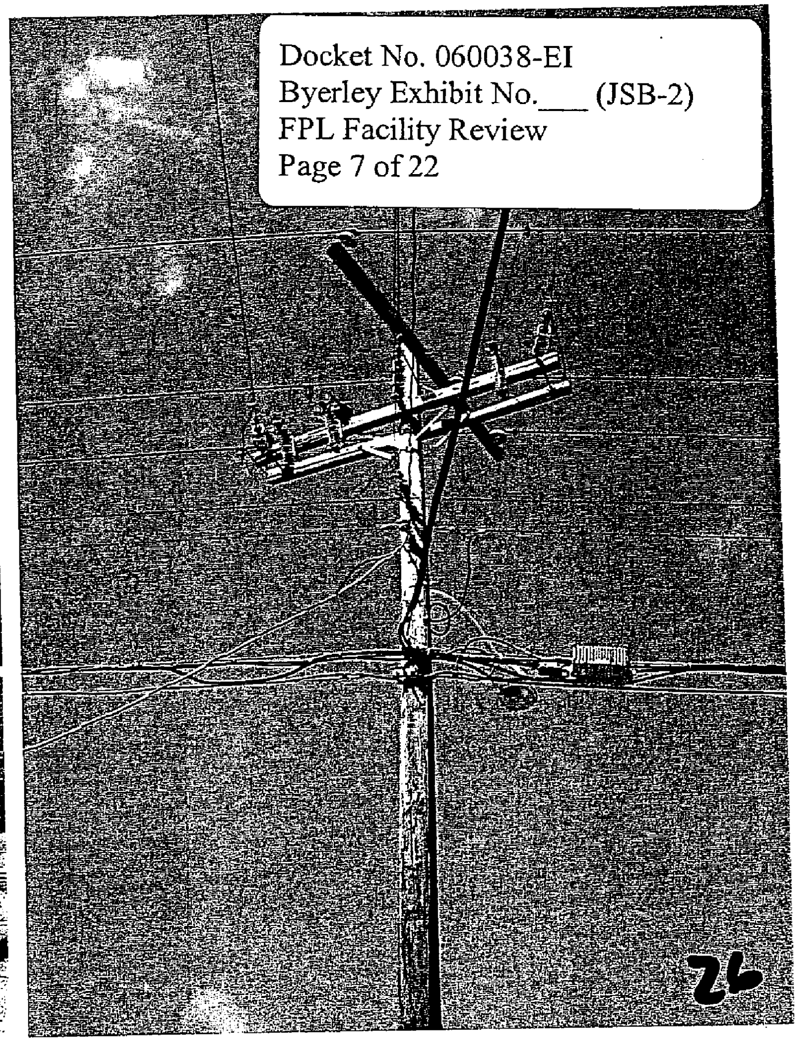

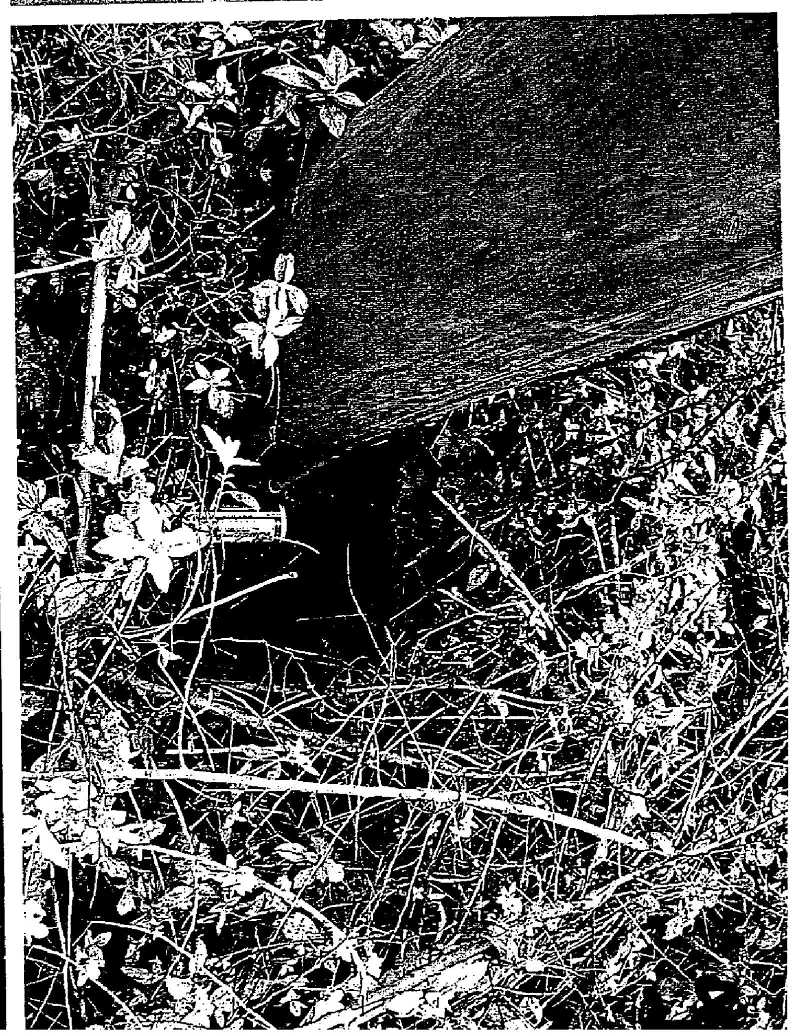

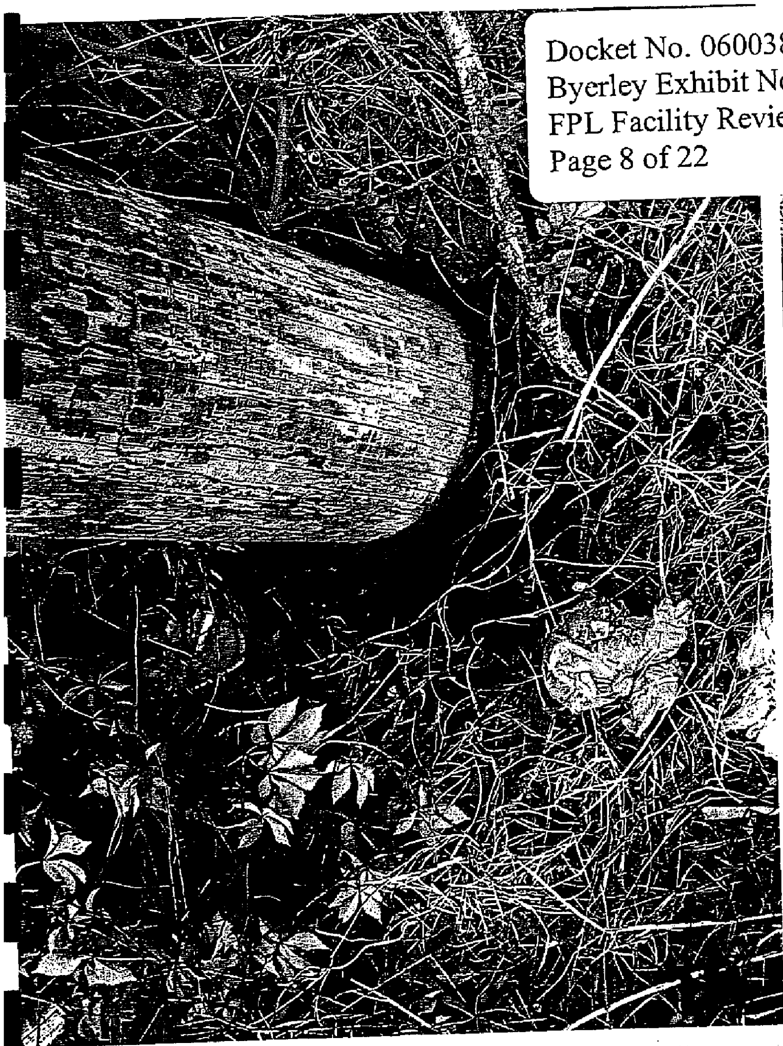


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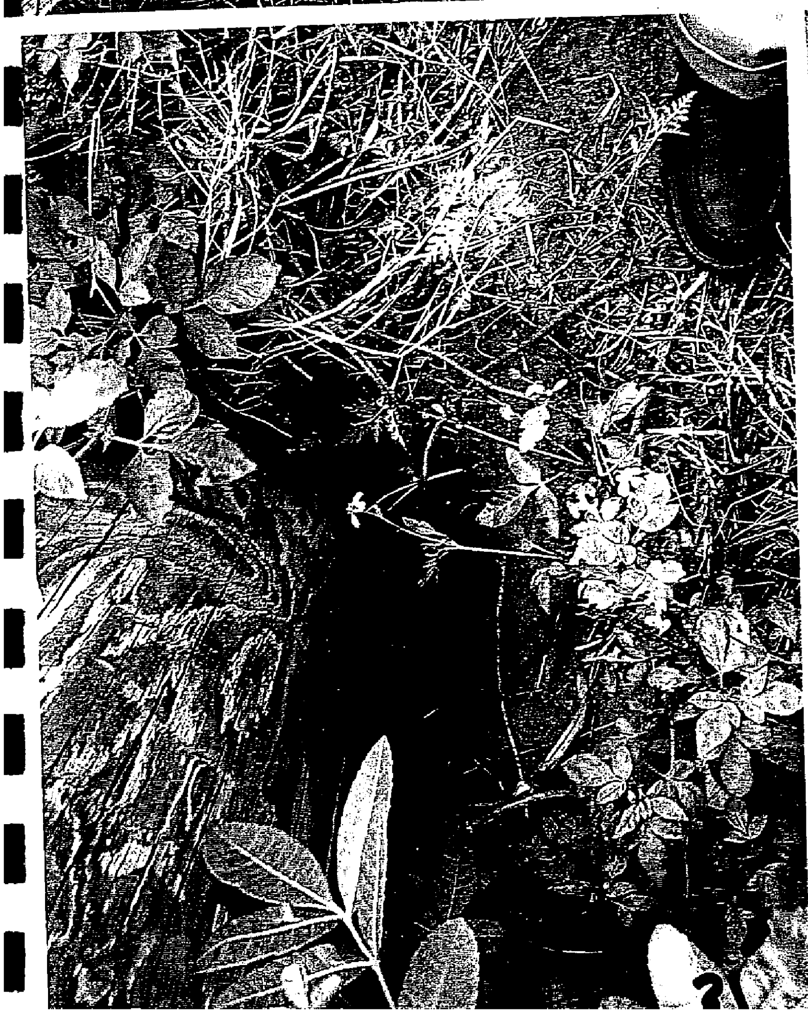

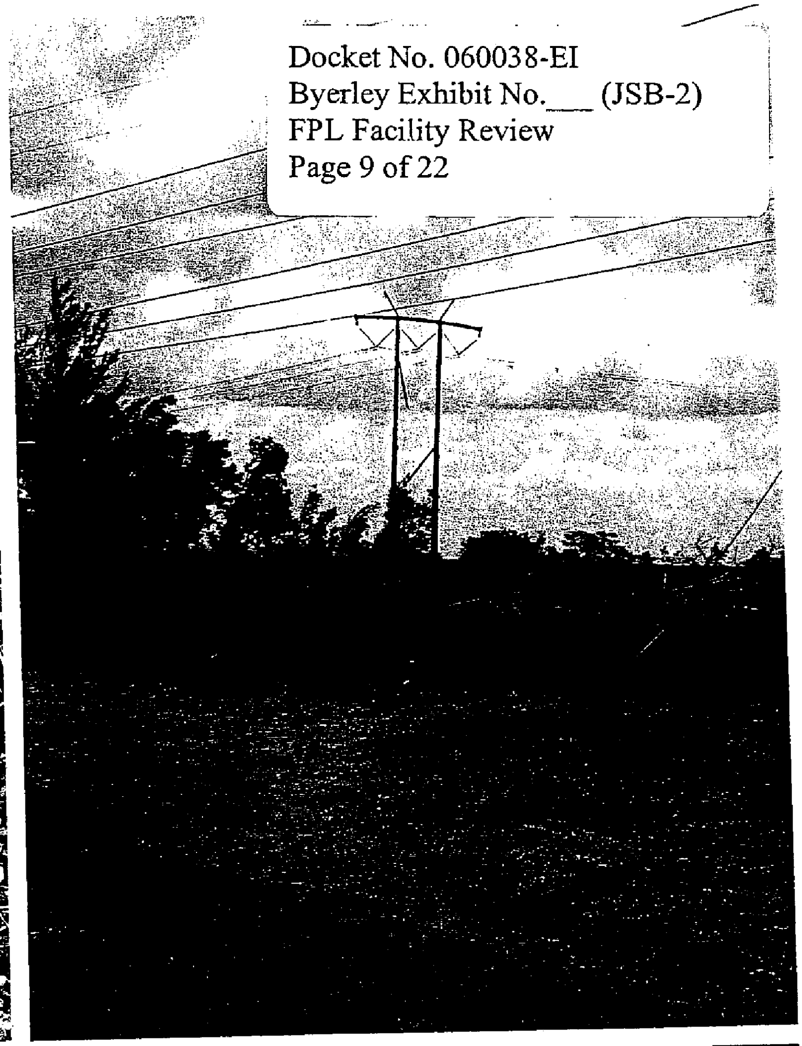

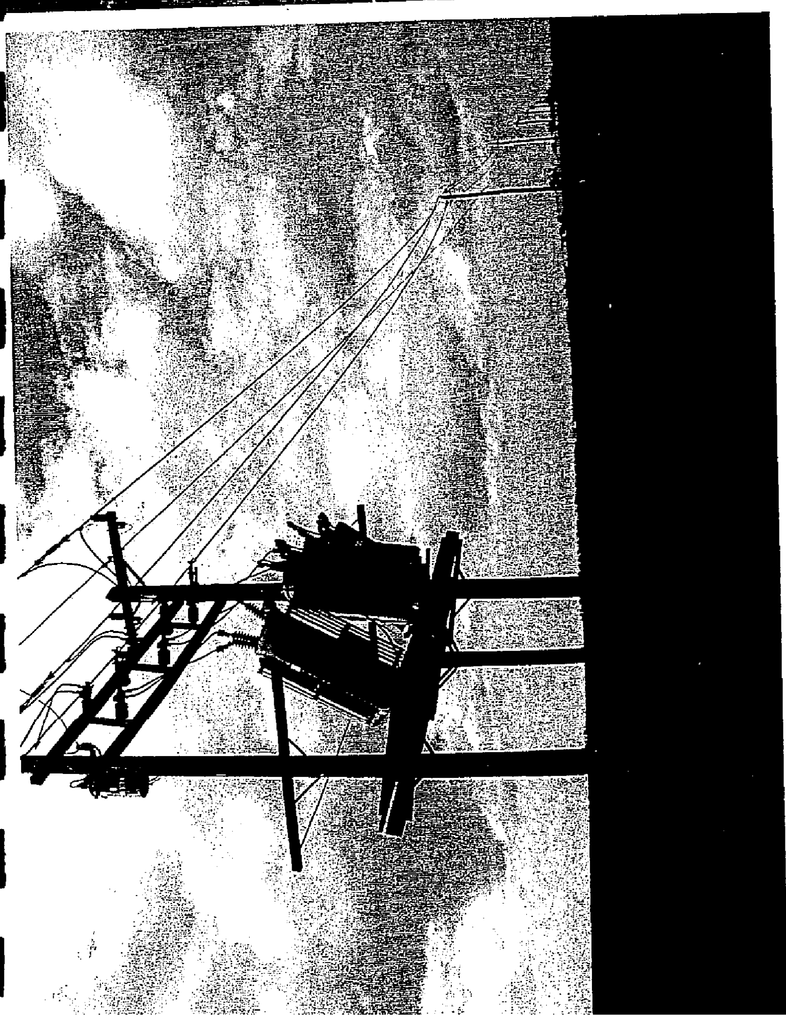

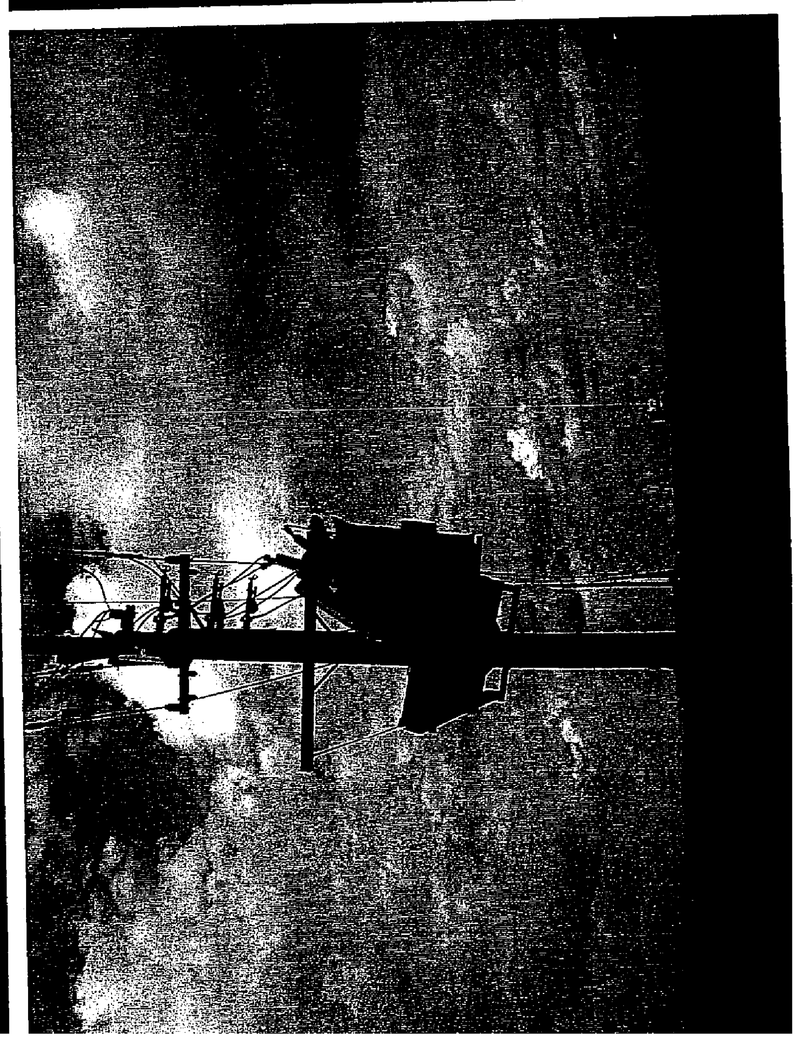

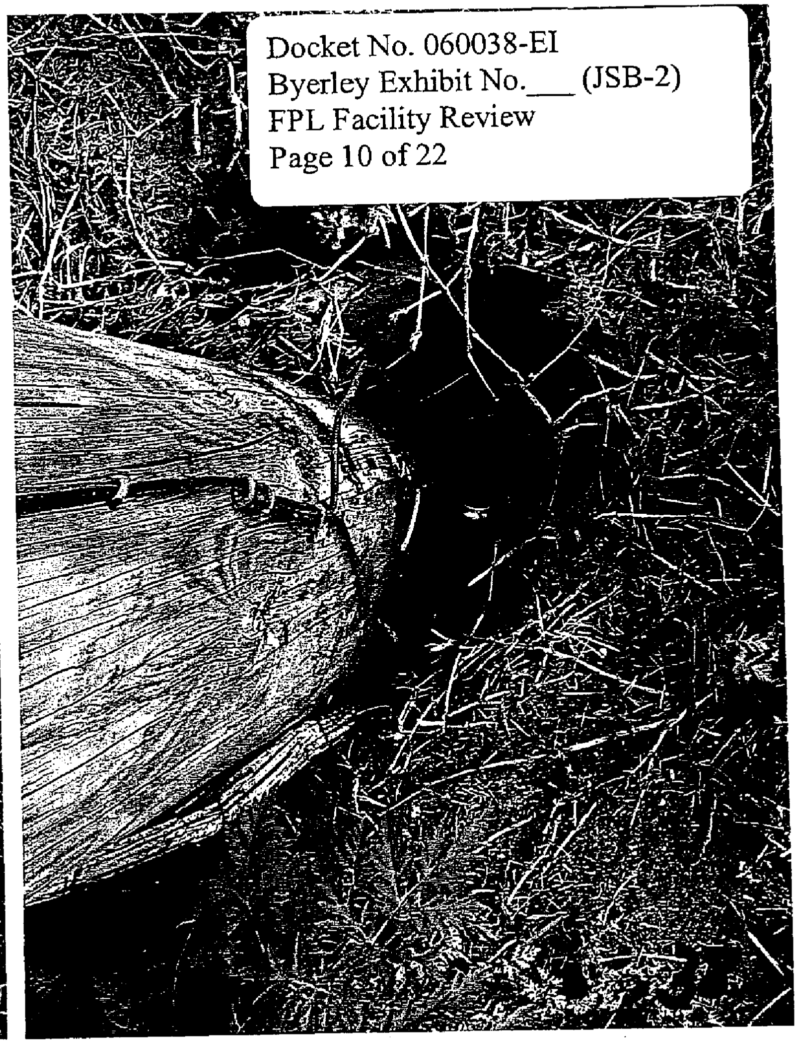

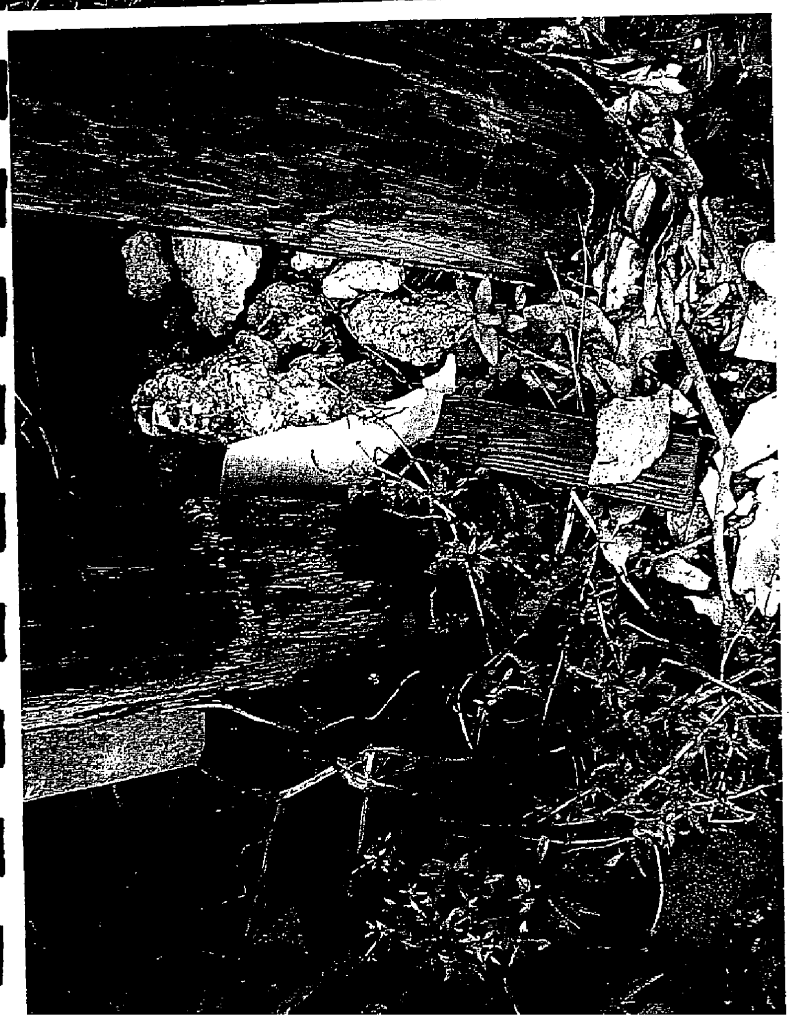

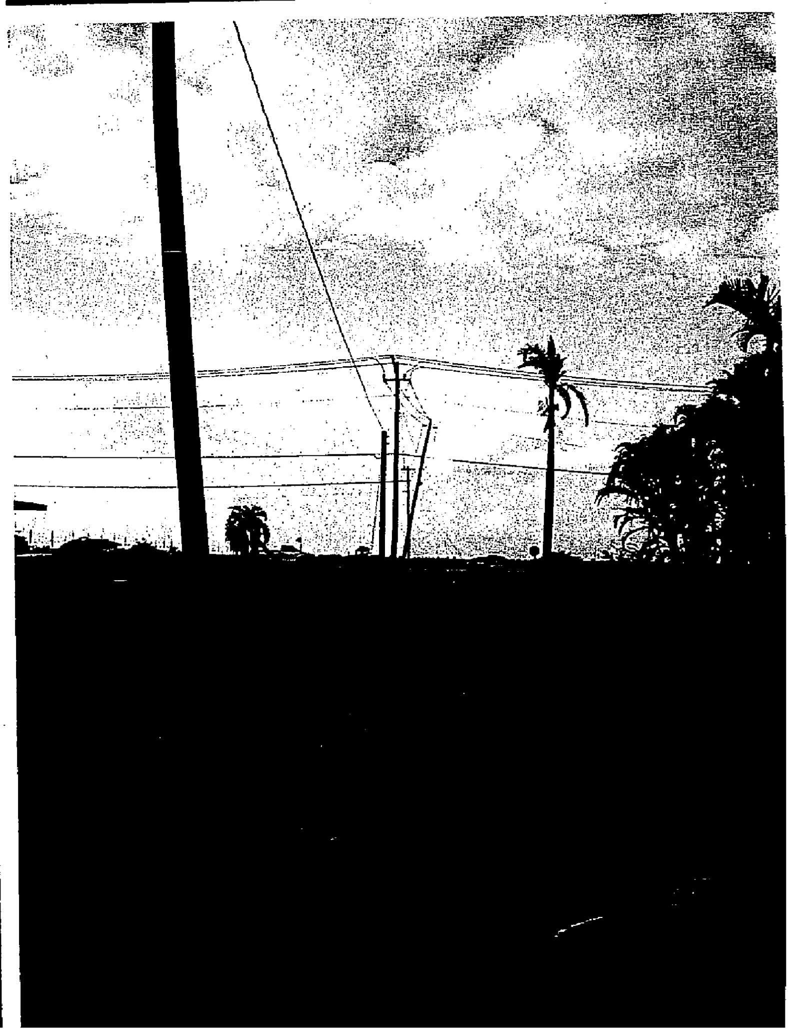

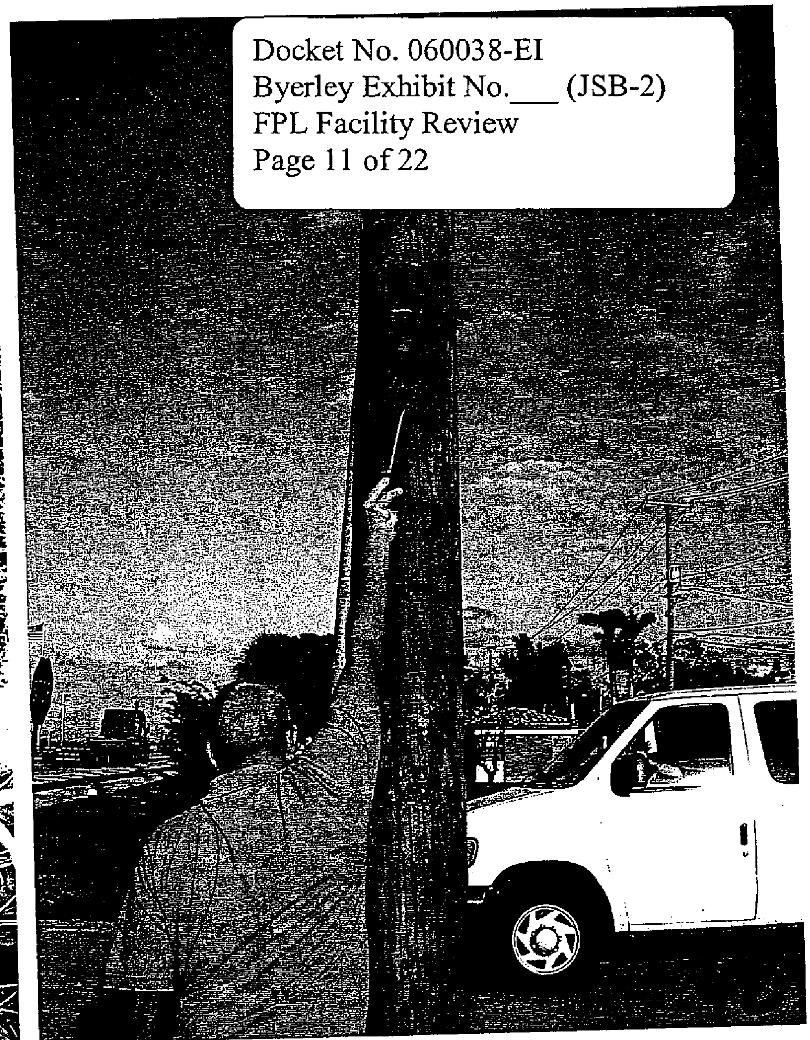

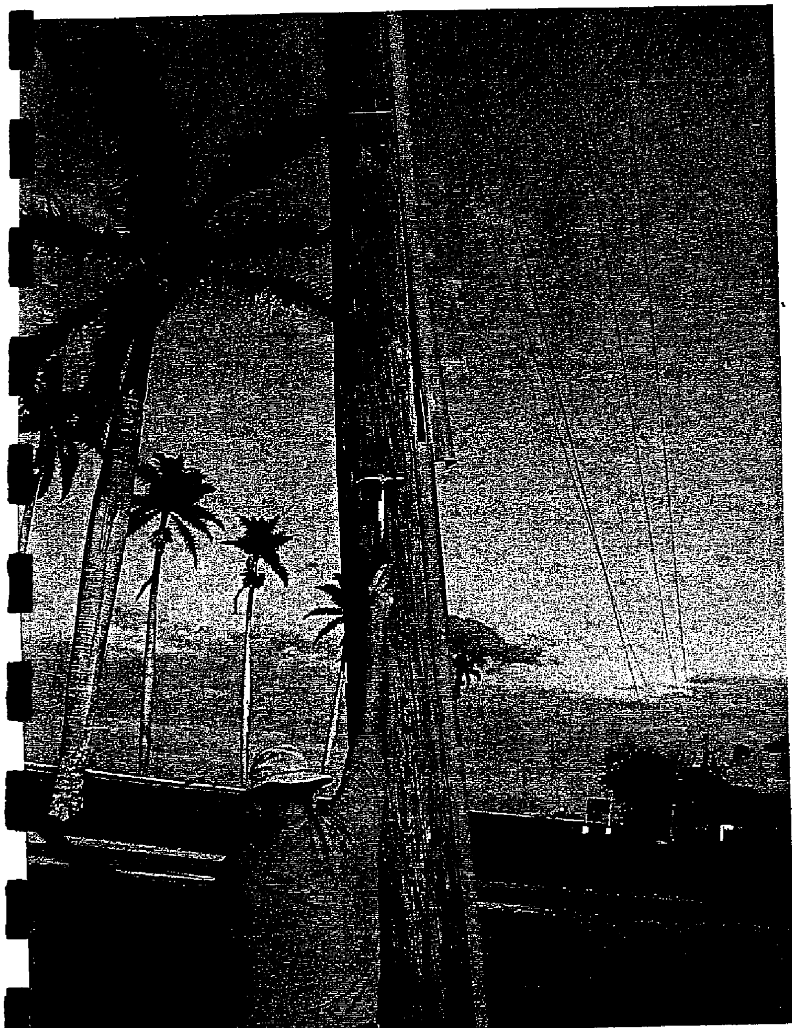

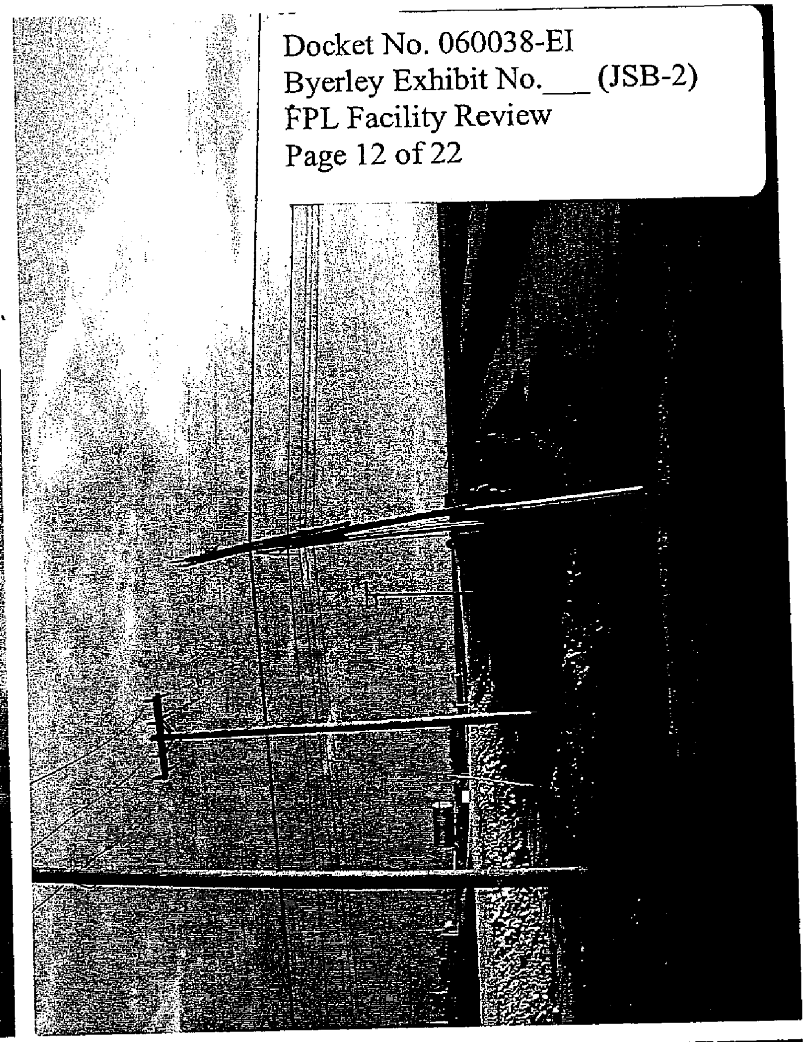

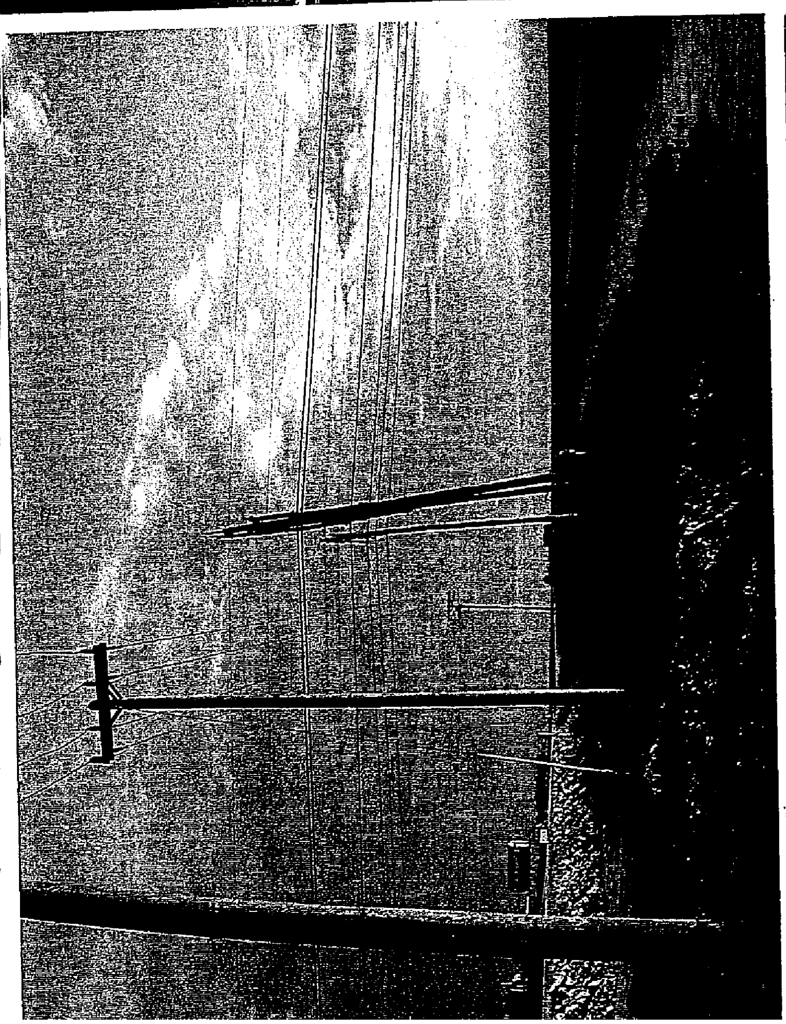

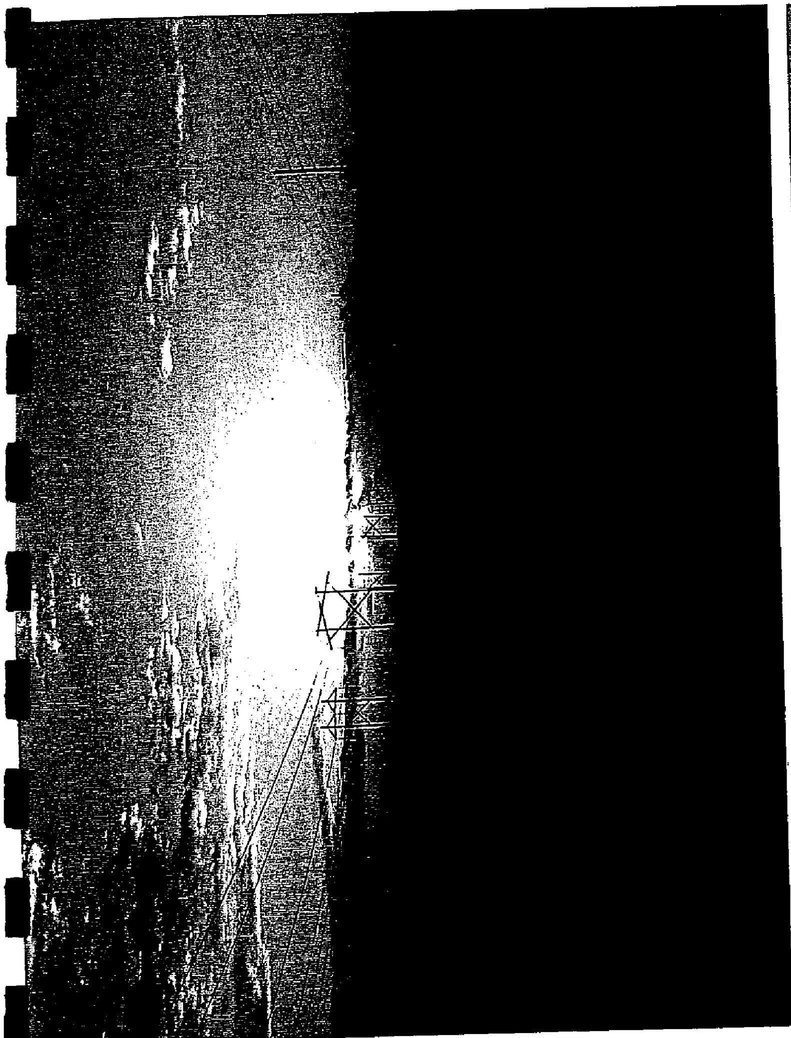

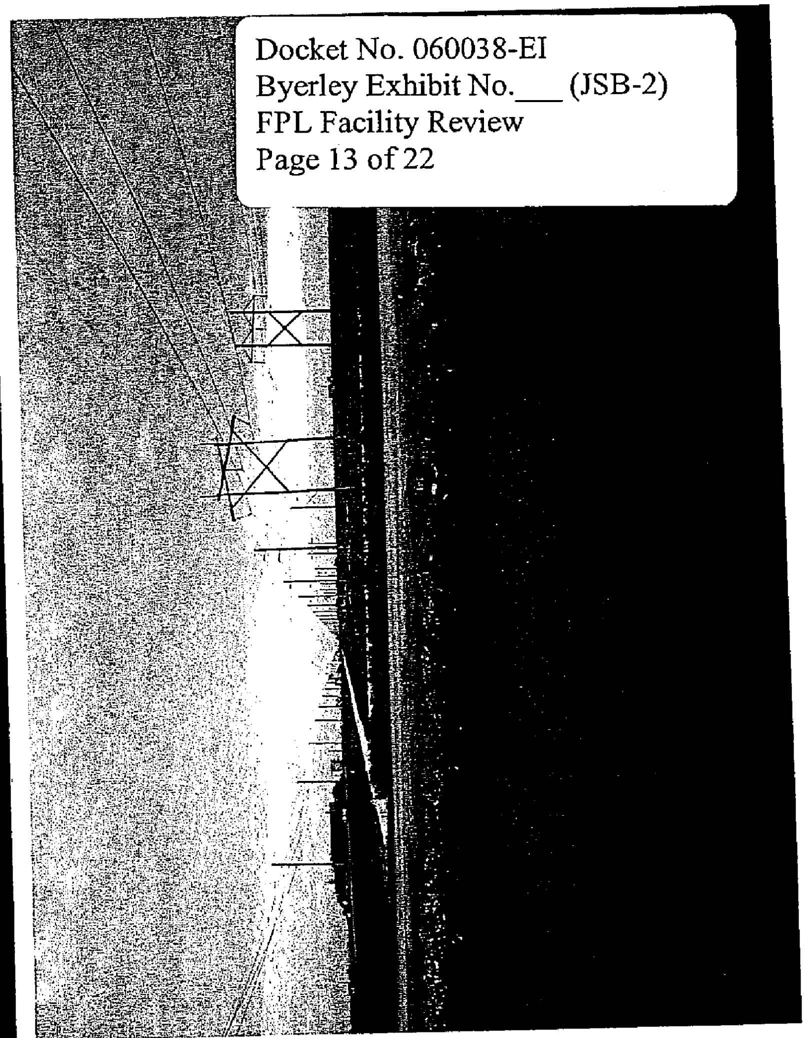

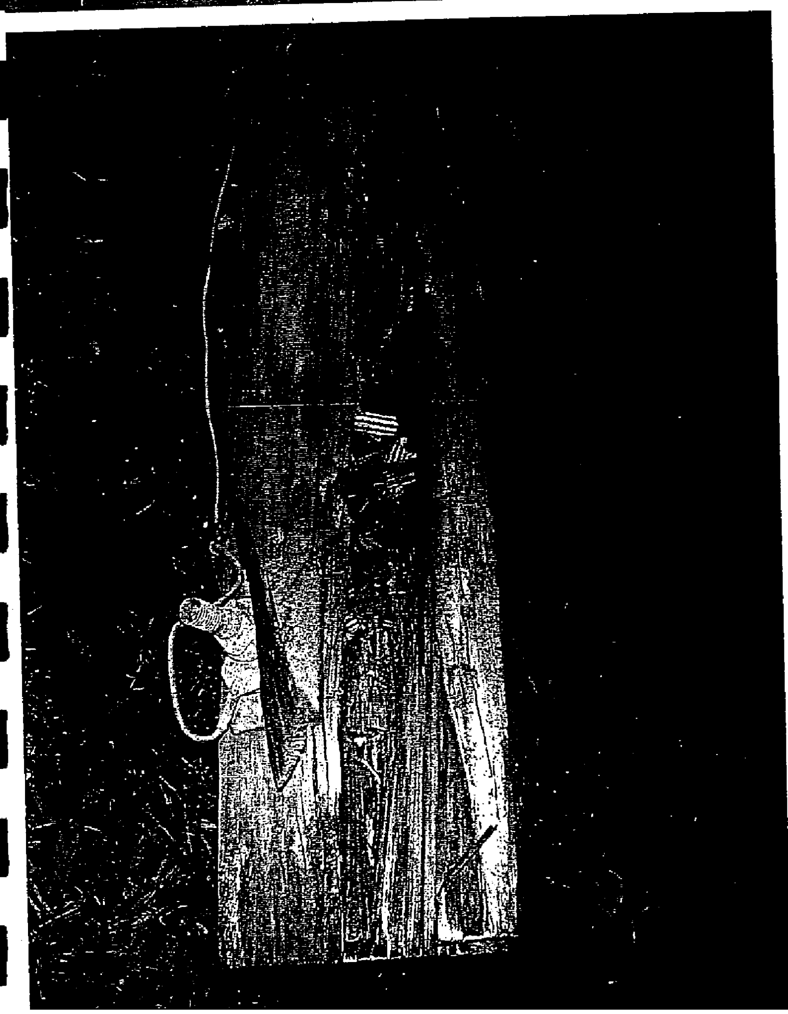

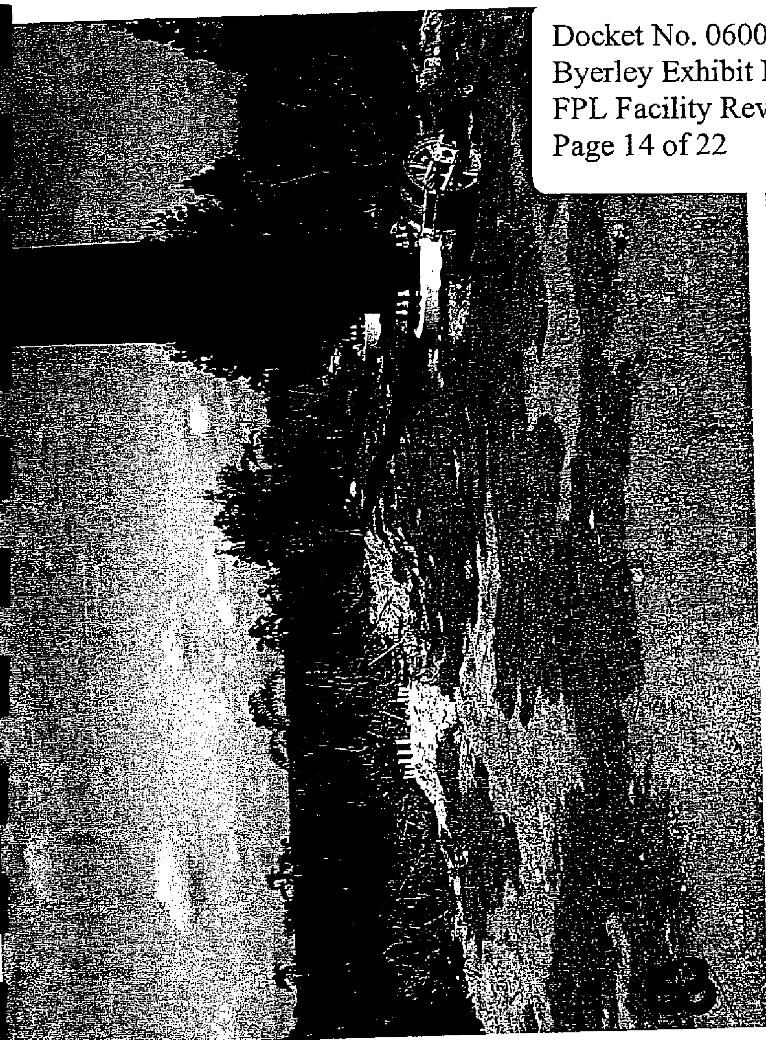

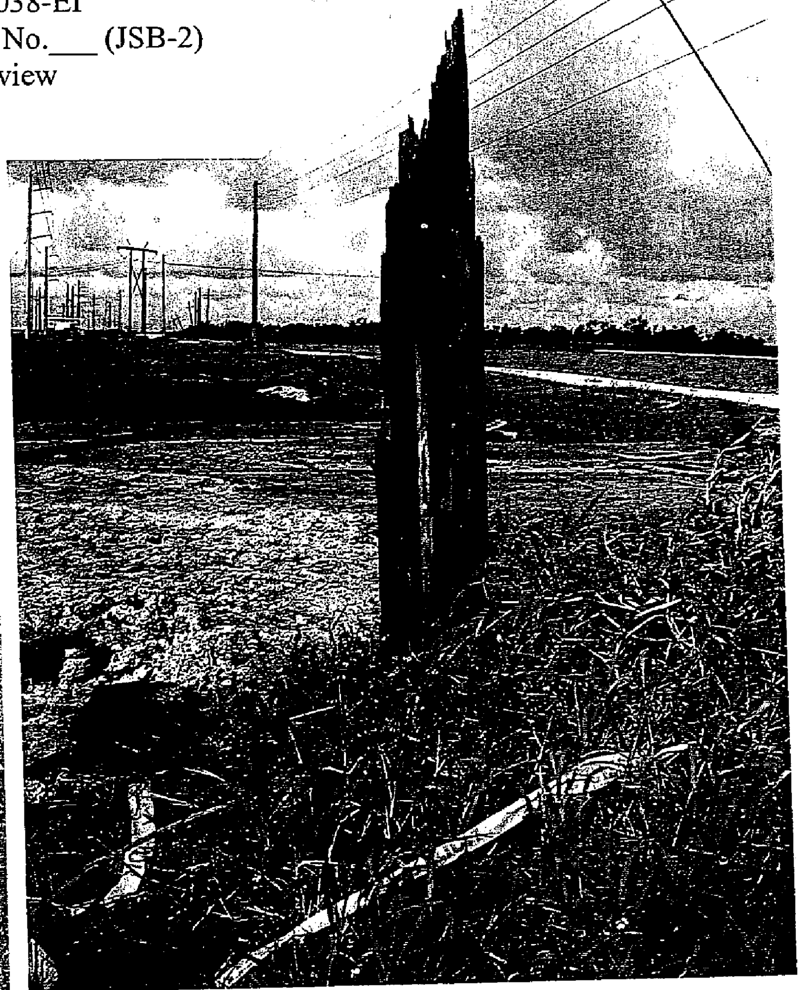

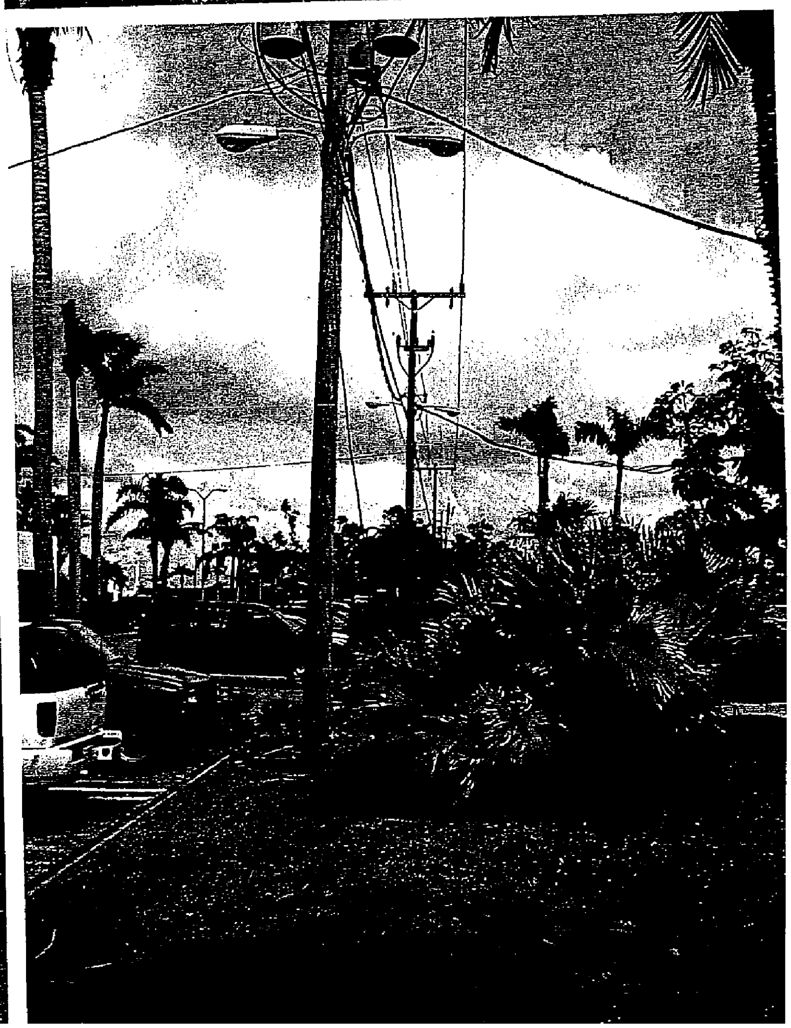

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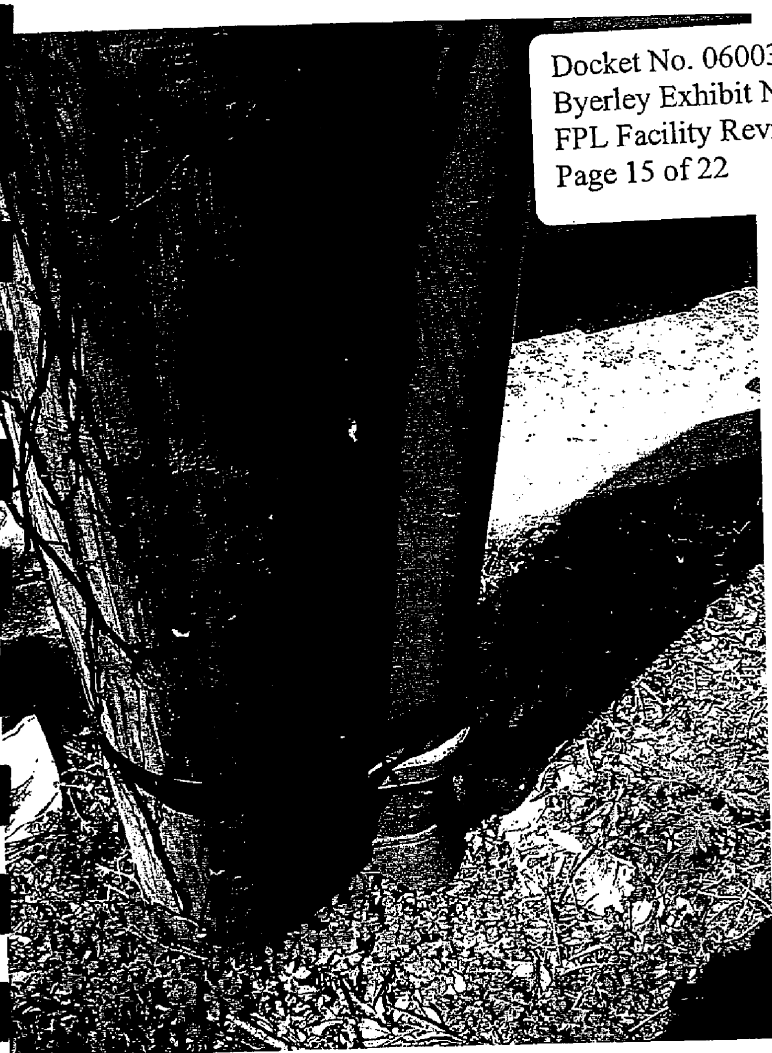

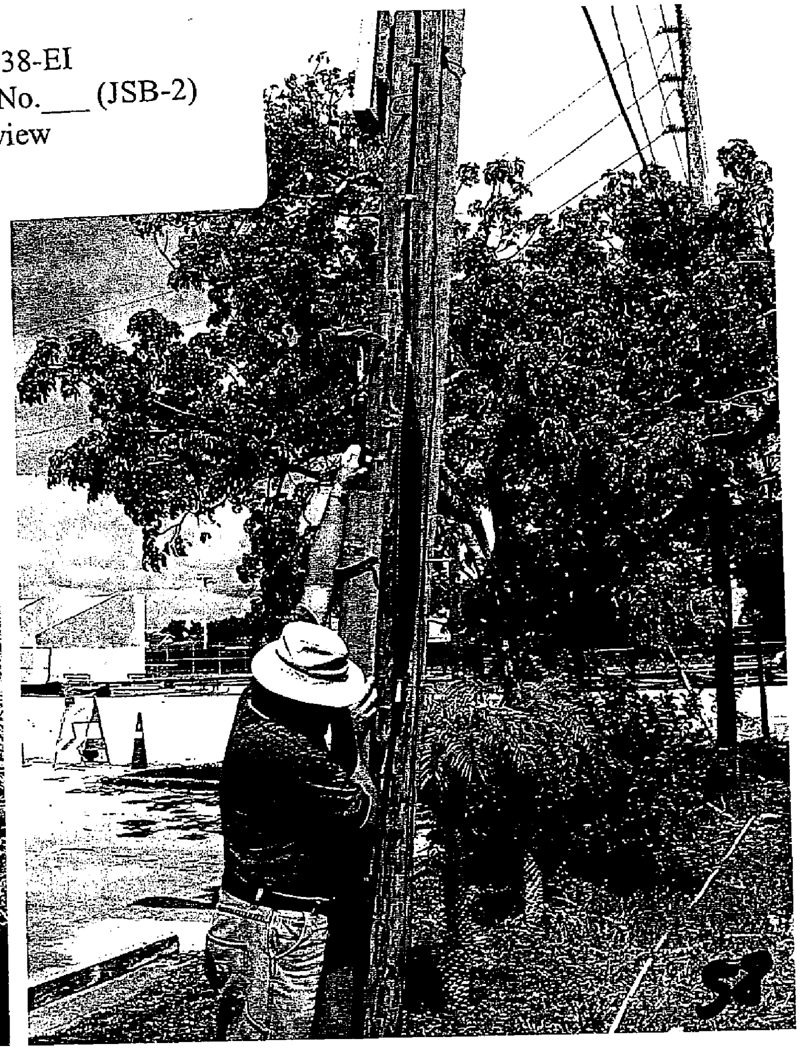

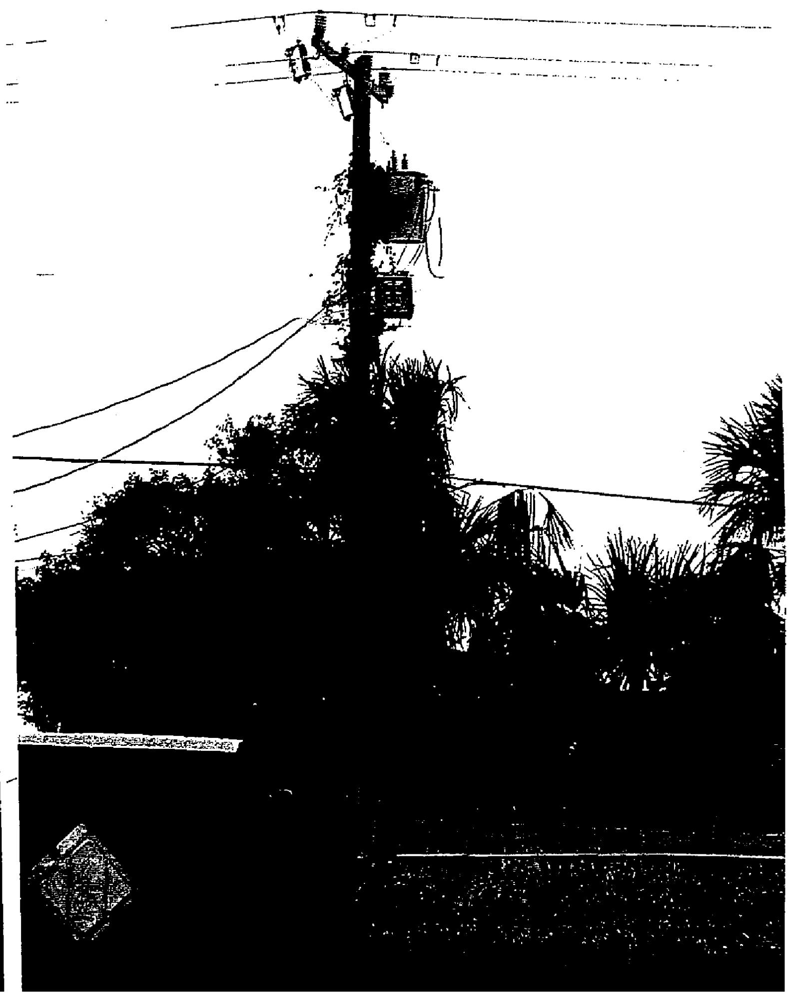

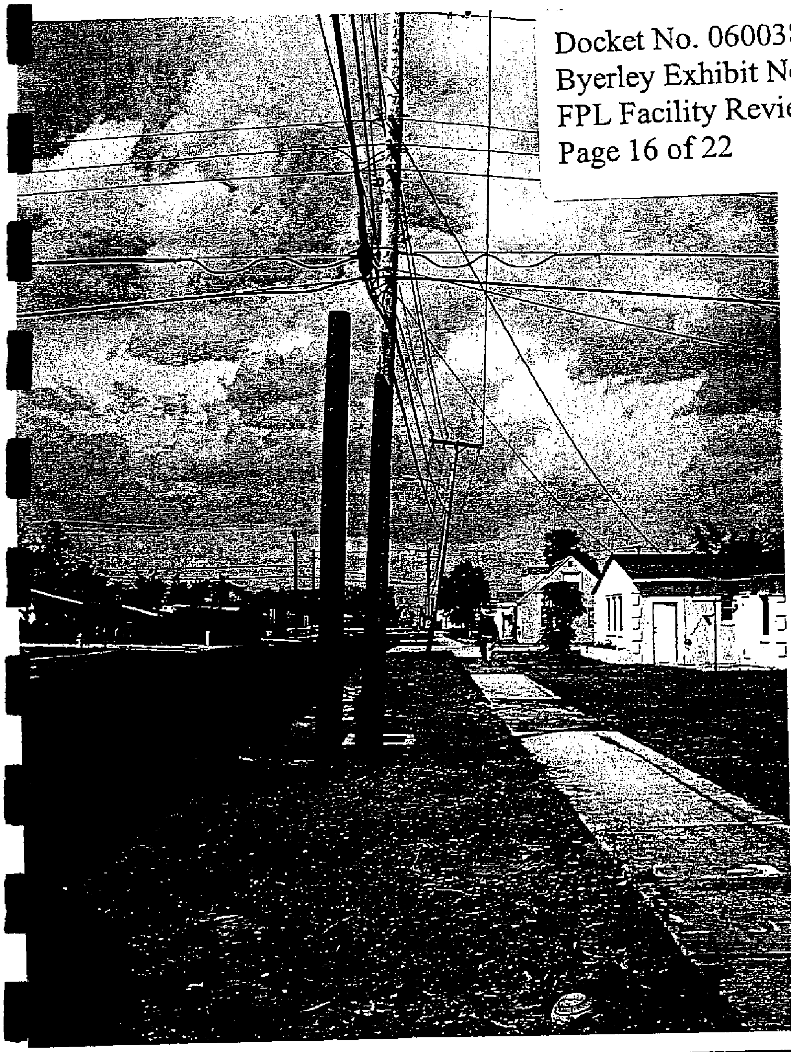

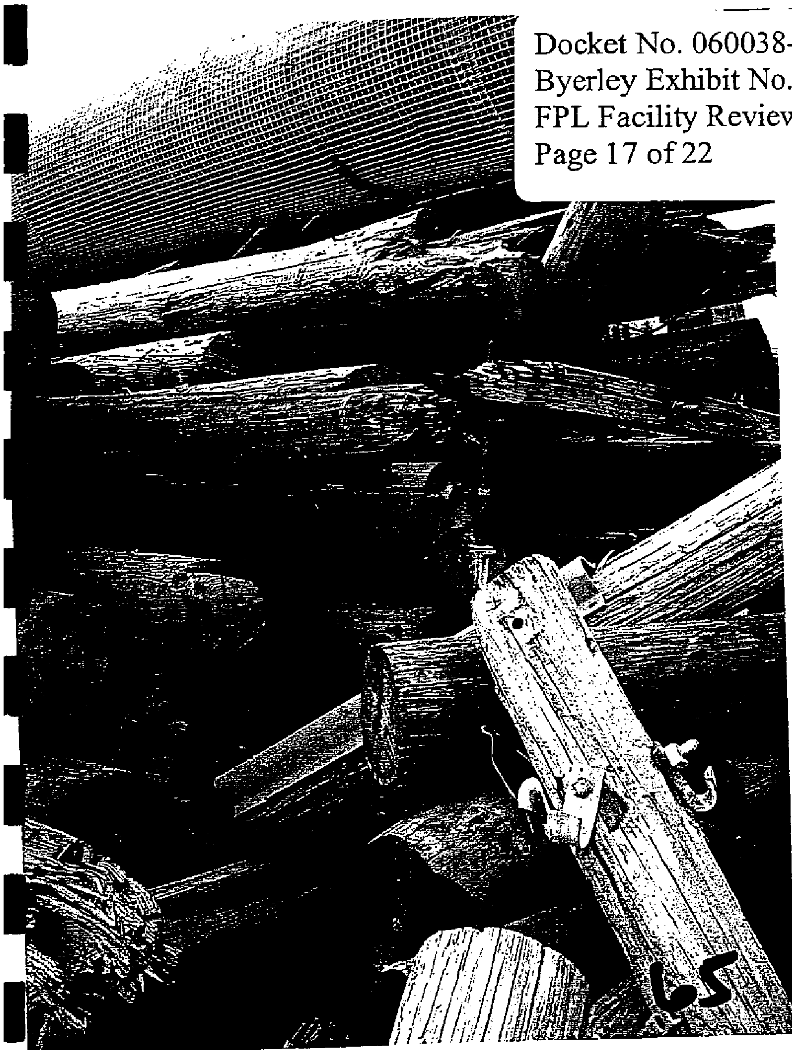
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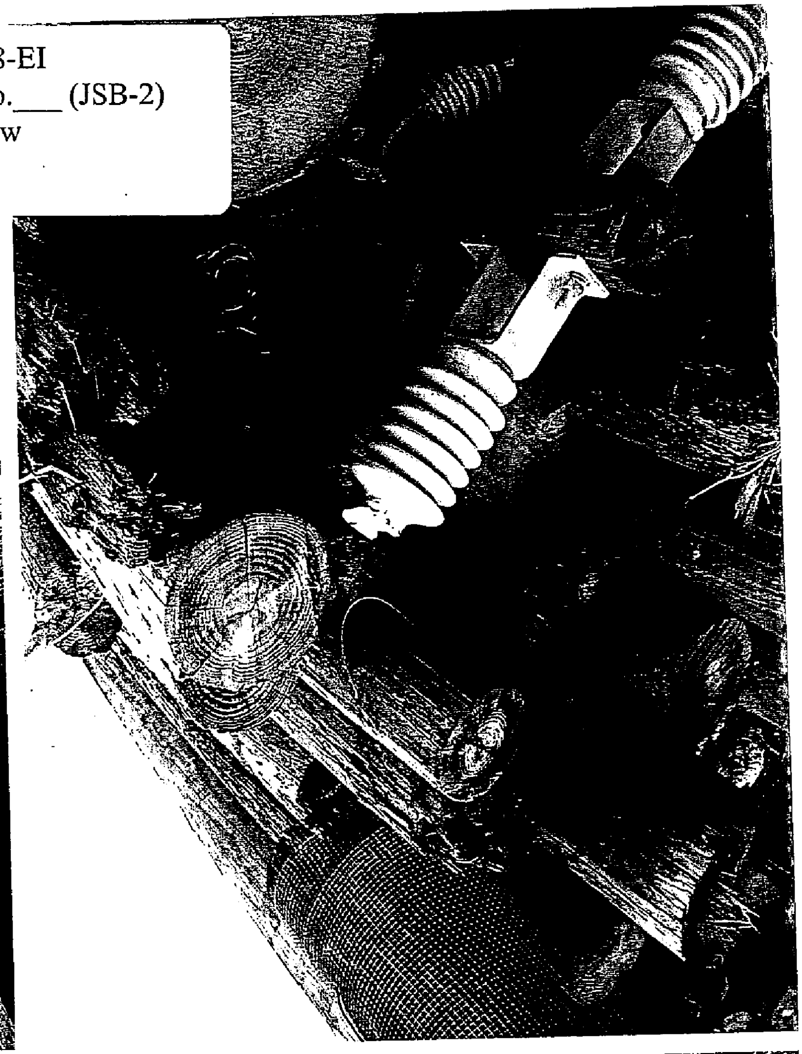

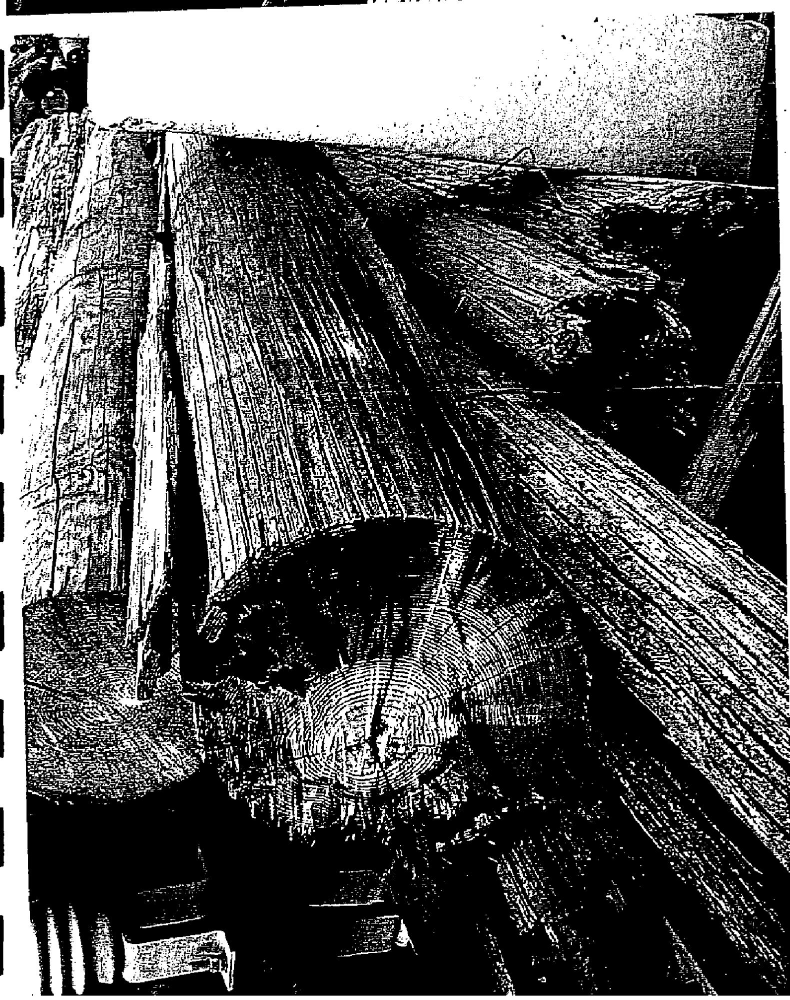

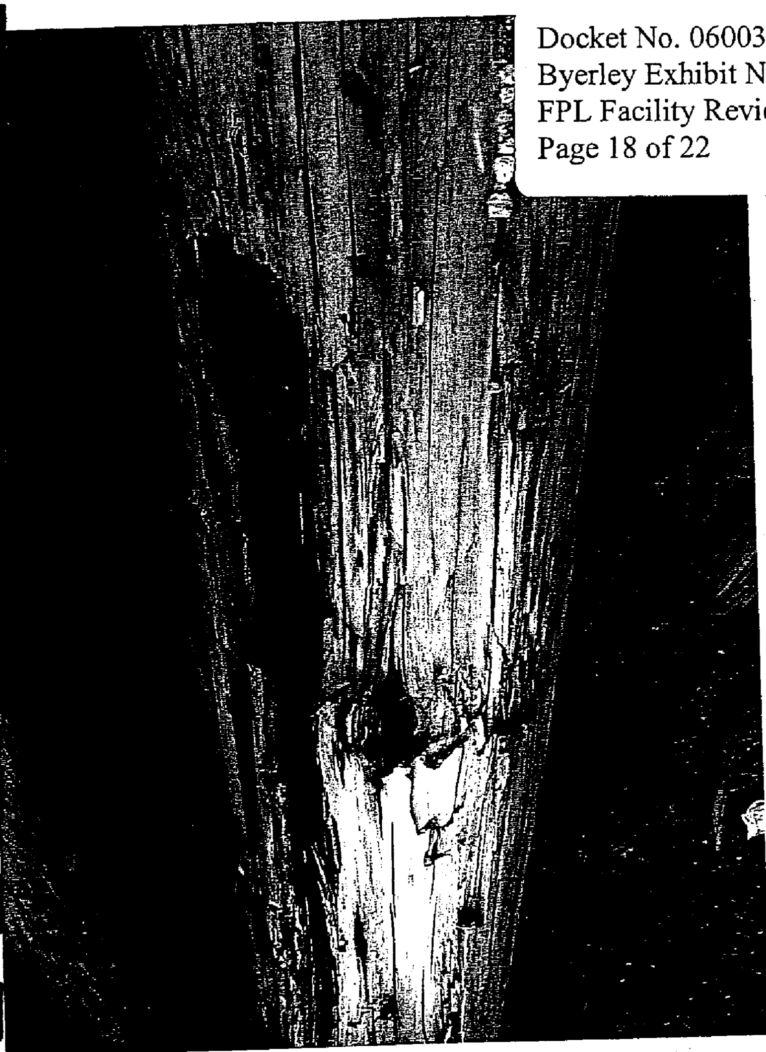

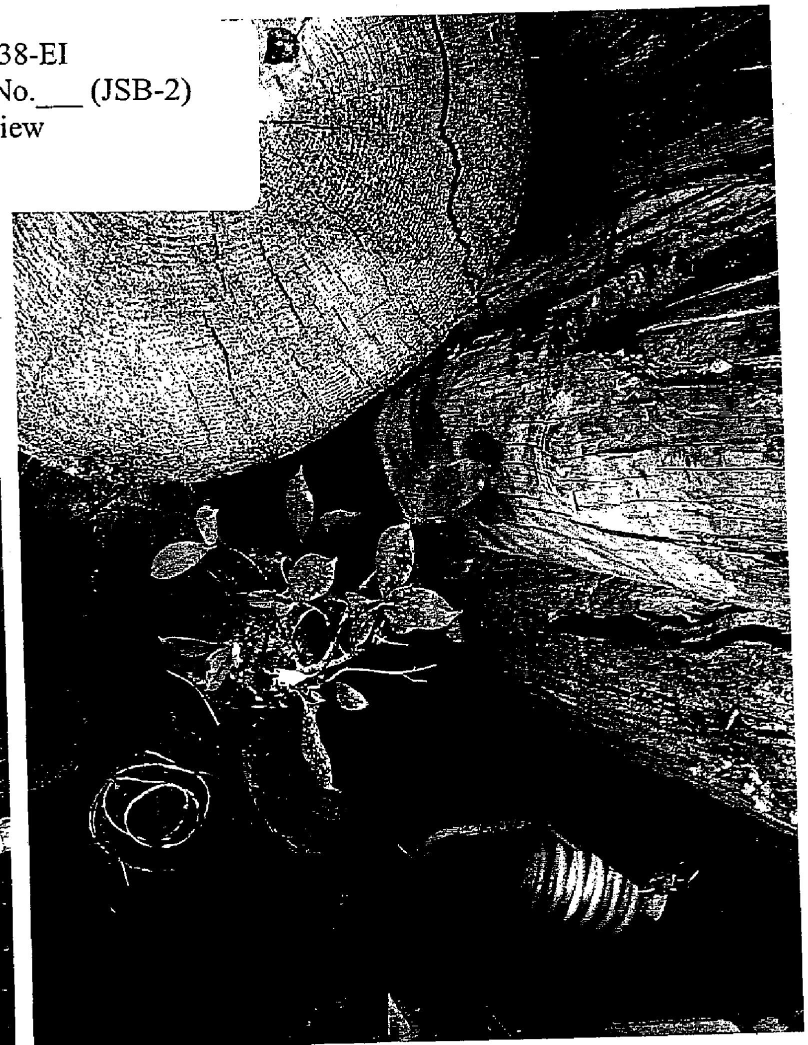

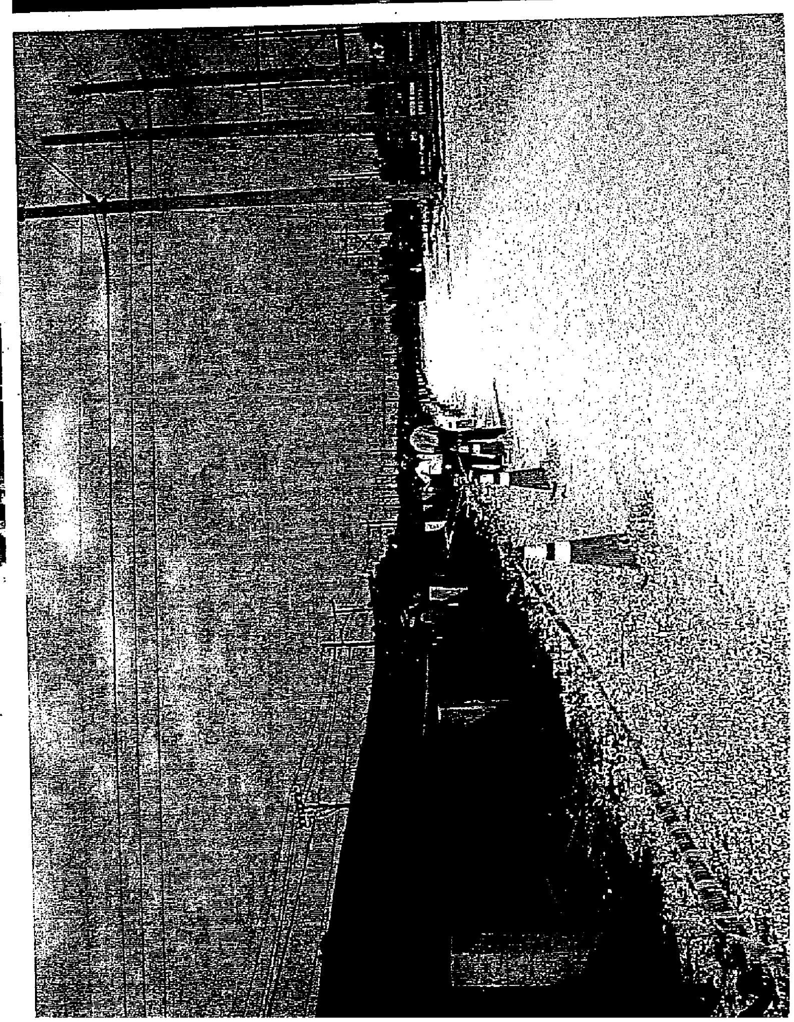

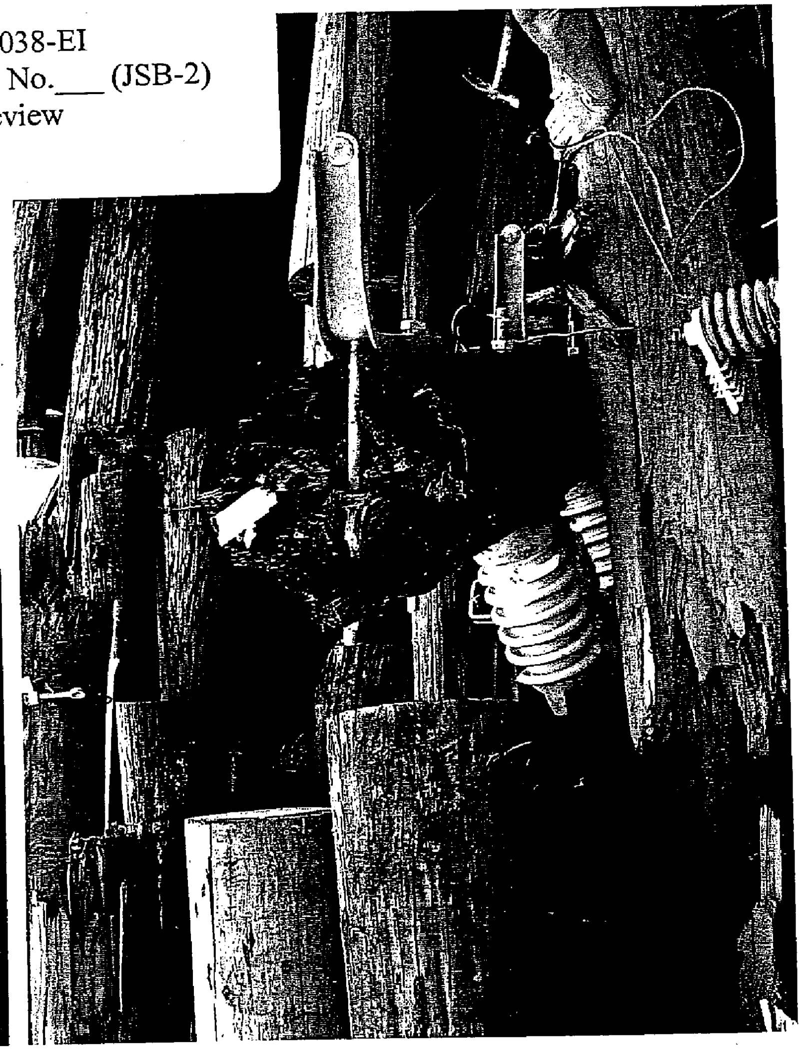

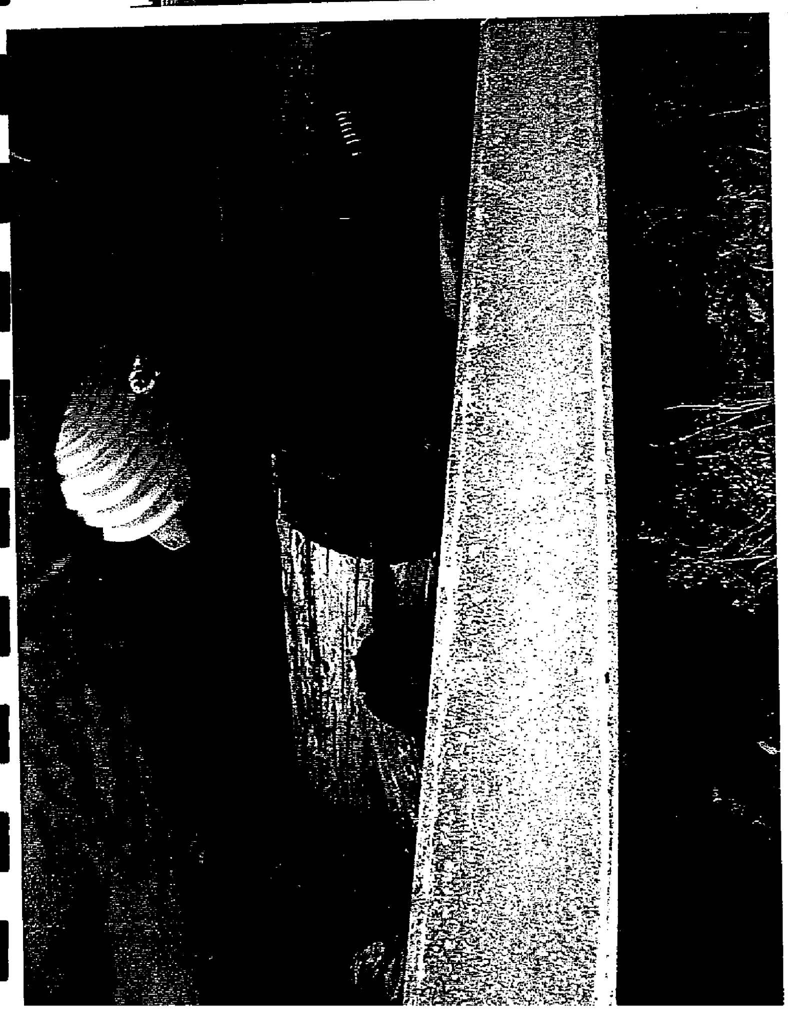

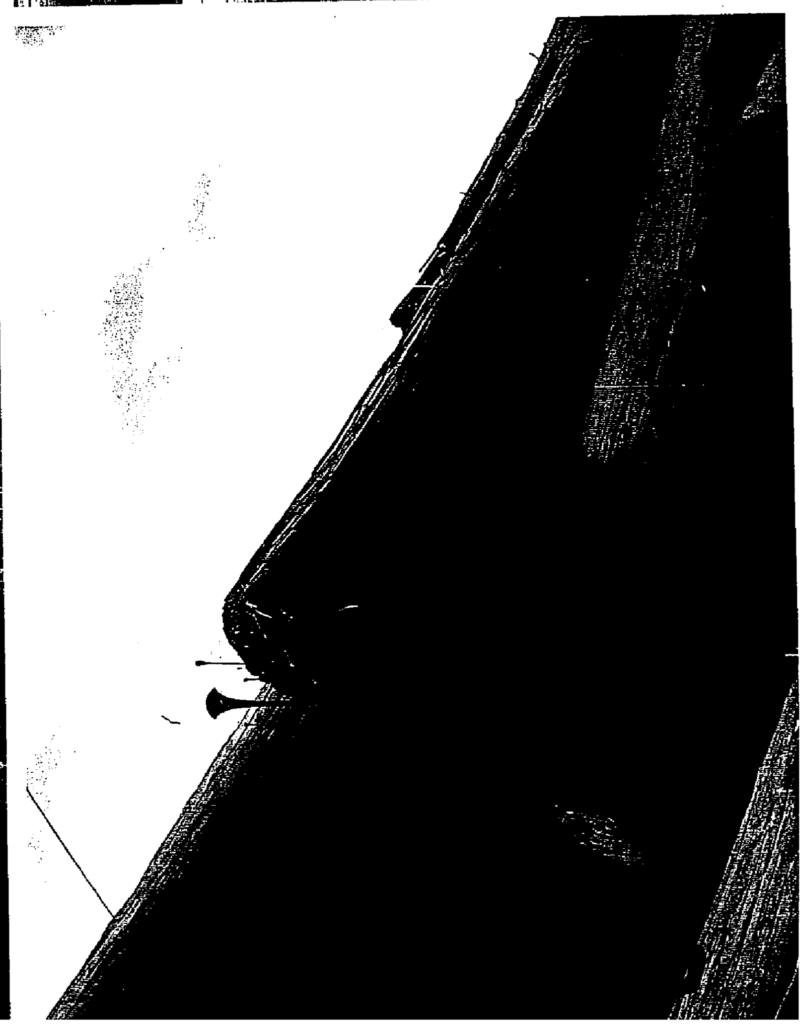

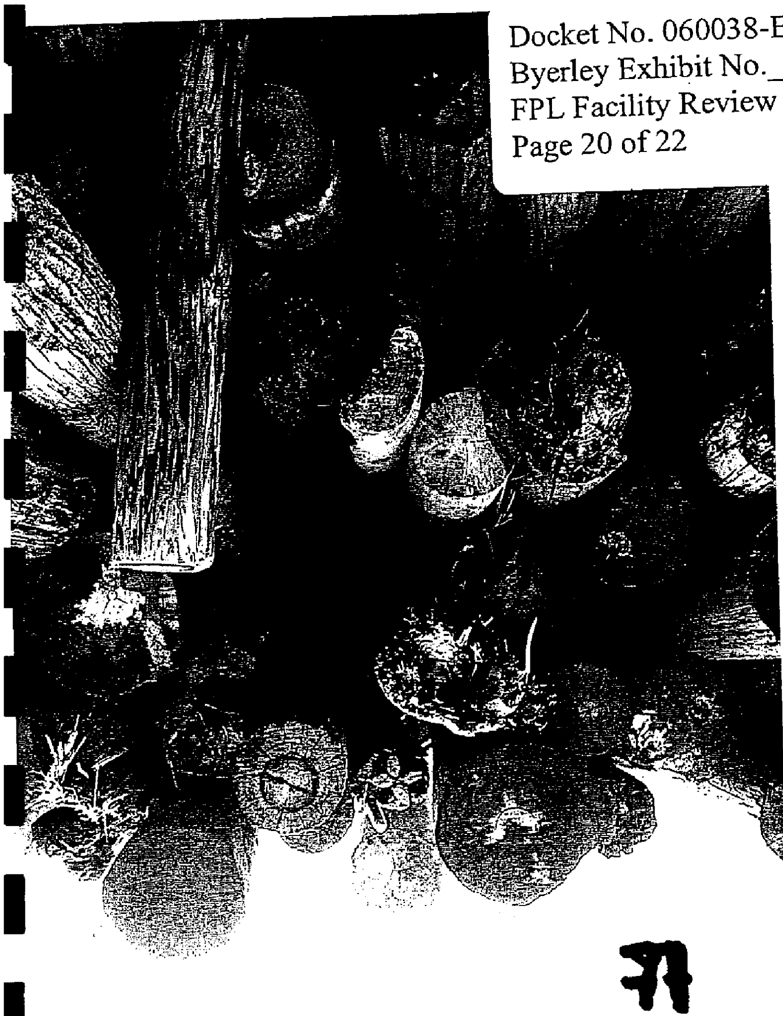
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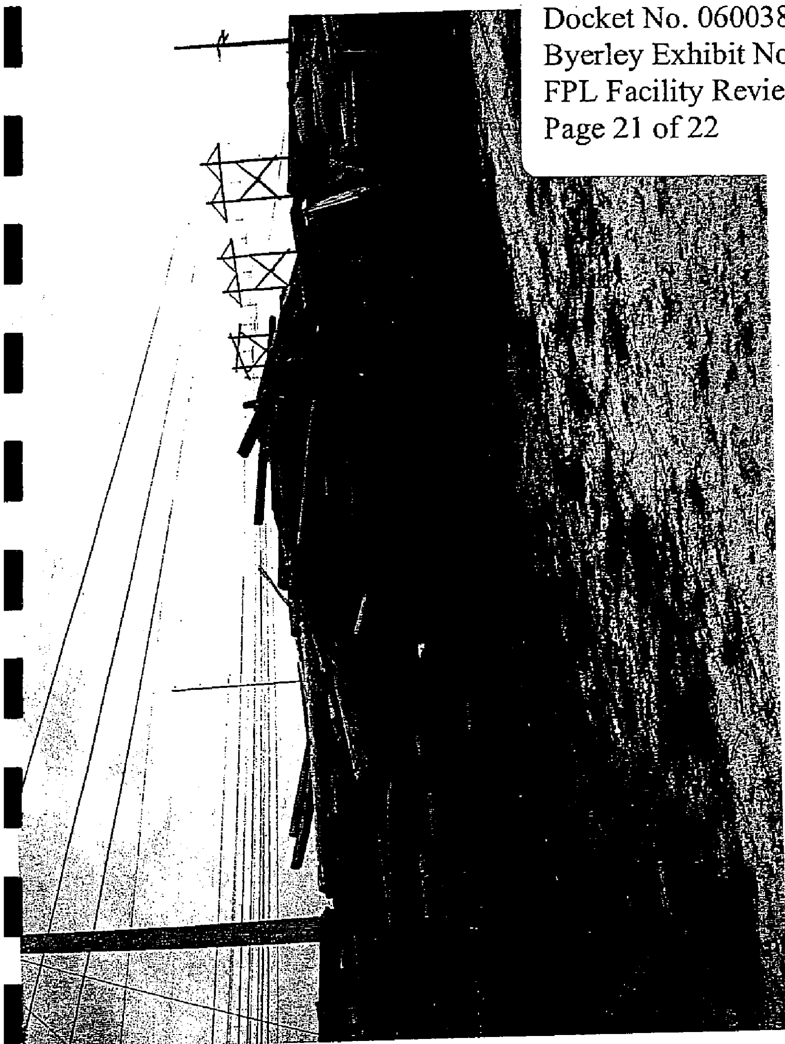

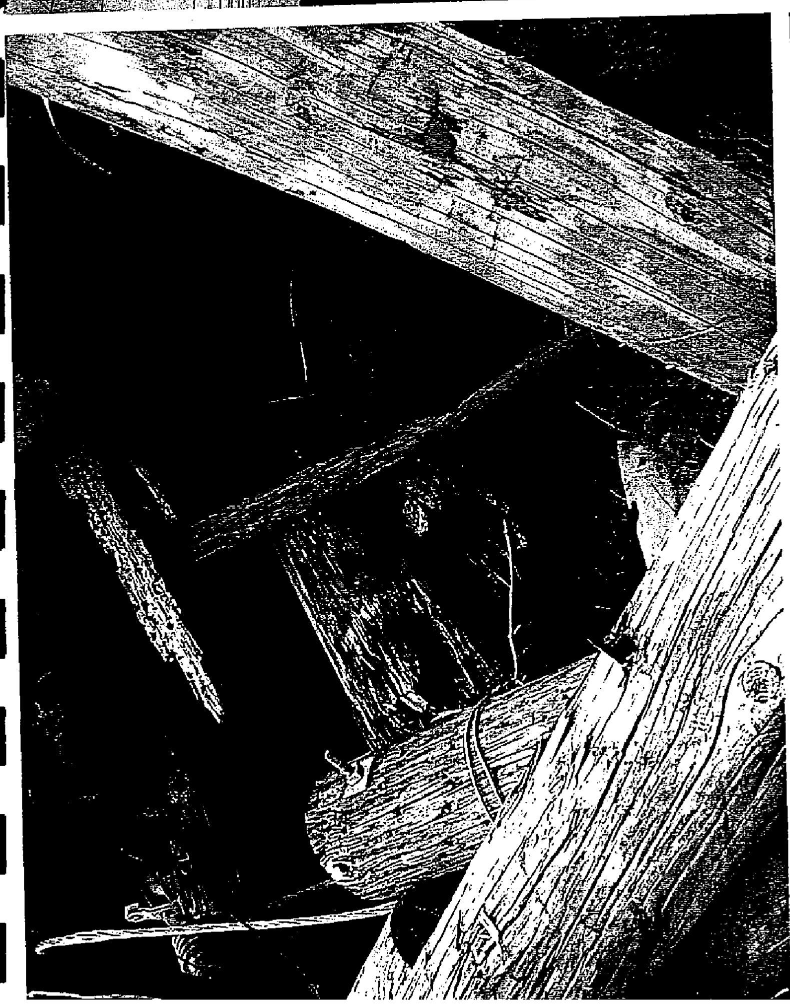

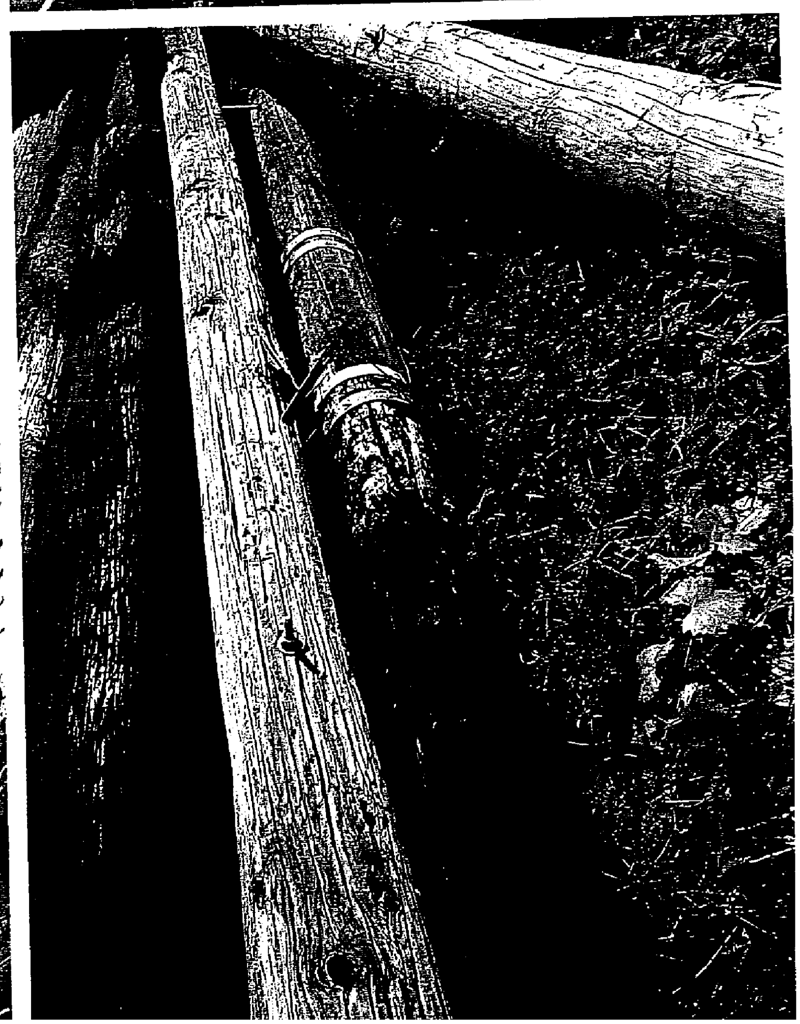


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EXHIBIT III

FPL POLE YARD INSPECTION—MARCH 15, 2006

STACK	TYPE POLES	NUMBER	DETERIORATED
STACK # 1	GREEN/CCA	75	0
	CREOSOTE	97	13
STACK # 5	GREEN/CCA	46	0
	CREOSOTE	51	8
STACK # 6	GREEN/CCA	67	0
	CREOSOTE	67	25
TOTAL	GREEN/CCA	188	0
	CREOSOTE	215	46
CREOSOTE PERCENT		53%	21.4%
TOTAL ALL POLES		403	46
GREEN/CCA/CREOSOTE %		100%	11.4%

Q.

The following interrogatories relate to page 7, lines 2-7 of Mr. Brown's testimony, in which he states: "Only one 500-kV transmission line experienced damages during Wilma. This particular line had 30 tower failures. The major contributing factor for these tower failures was the installation guidelines for manual tightening of crossbrace bolts, per industry standard practice, which is insufficient and led to the loosening of crossbrace bolts in several locations."

The following statement appears on page 43, Section 5.6.4, of the KEMA report: "In 1998, some crossbrace bolts were found to be loose or missing". In the next paragraph, on page 44, the following statement appears: "There is no record that it is known before the 2005 storms that bolts were loose or missing". Clarify these statements, or correct and resolve the inconsistency in them.

A.

In January 1998, FPL observed vibration on the Conservation-Corbett 500 kV transmission line while performing an outage investigation. FPL did a subsequent inspection and noted bolts that had loosened. FPL believed the root cause to be wire vibration. In 1998, FPL added additional vibration dampers to the line and addressed the bolt issues.

The 1998 inspection was not recorded in FPL's asset management system used for scheduling and tracking inspections. Additionally, no loose or missing bolts were recorded in FPL's system during inspections performed between 1998 and 2005.

To clarify the statement made on page 44 of the KEMA report, the statement should read "There is no record within FPL's asset management system that it is known before the 2005 storms that bolts were loose or missing."

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FAILURE INVESTIGATION OF CONSERVATION – CORBETT 500 kV LINE

C. J. WONG, Ph.D., P.E.
NOVEMBER 14, 2005

BACKGROUND

The Conservation – Corbett 500 kV line extends 57-mile in the western parts of Palm Beach County and Broward County; with 221 weathering steel H-frame type structures. This 500 kV line was designed per requirements as specified by National Electrical Safety Code (NESC), 1993 edition. The construction of this line was completed in 1996.

During Hurricane Wilma, approximately 7.5 miles of this line failed. In addition, several other structures were also damaged or destroyed.

At this time, FPL has identified three potential initiating events that could have led to these failures -

1. Loosened bolted connections, potentially by wind induced vibration
2. Improper installation of the foundation
3. Broken conductors.

GENERAL DISCUSSIONS OF FAILURE EVENTS –

In total, thirty (30) H-frame structures have been damaged that need complete structural replacement. Two (2) other structures have broken X-brace and cross-arm components that also need to be replaced. At these damaged structure locations, six (6) sets of caisson foundations have cracks that can be repaired. Additionally, one set of new caissons will need to be re-installed.

Figure 2 New Style Structure

Out of the thirty (30) structures that failed, twenty (20) are the "new" style structure (1995 design, straight leg, lighter weight, Figure 2); the other ten (10) are "older" style (more aesthetically pleasant but heavier, Figure 3). All designs met or exceeded the requirements of NESC to withstand the loads generated by a 105 mph wind storm (fastest-mile wind, basic wind speed) for structures located in Palm Beach county and 110 mph in Broward County.

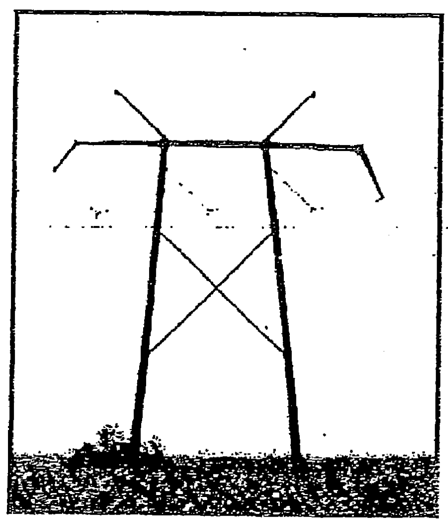

Figure 3 Older Style Structure

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Structural Failures and Partially Collapsed Mechanisms

The outage database indicates that the first relay on this 500 kV line occurred at 10:35:33 in the morning of 10/24/2005 (T/C/T [B phase]). Estimated fault location is around 43-mile south of the Corbett Substation. The damaged structure is located at the east side of Highway 27 about 3-mile north of Highway 84. **Structure #16Z51** is partially collapsed (Figure 4). All wires are still in the air, but the line cannot be energized without a structure replacement.

Structure #16Z51 is the tallest structure in the vicinity. The west leg buckled below the X-brace and the cross-arm folded (Figure 5). There are other secondary damages in the east leg and on the cross-arm. However, the X-brace tension member displays less damage (Figure 5) while the top bolt on the compression brace was apparently missing (Figure 6) before the storm hit. This connection does not appear to have been stressed before the separation.

Figure 4 Structure #16Z51
Looking North

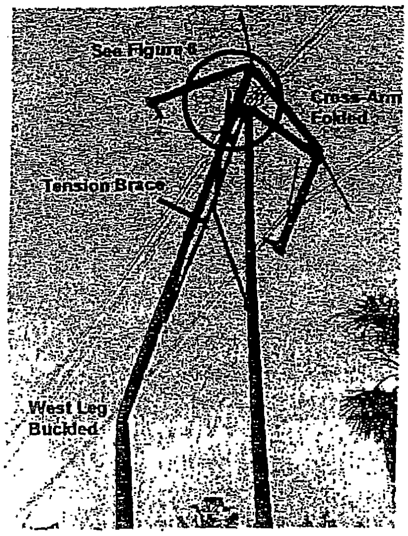

Figure 5 Structure #16Z51
Overall Damage

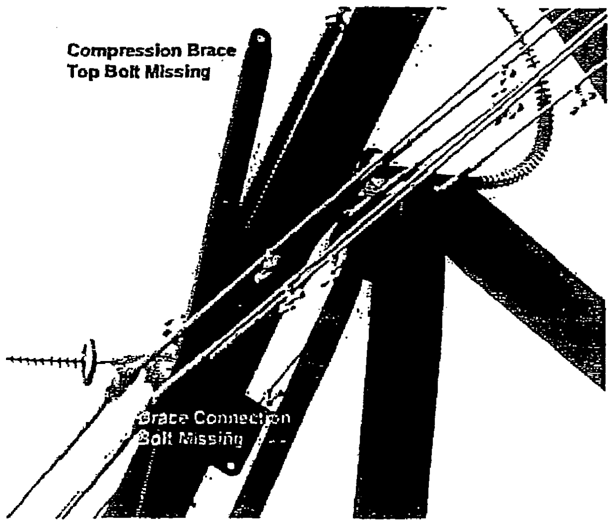

Figure 6 Structure #16Z51
Missing Bolt

Many spacer-dampers in the vicinity are broken, but the adjacent structures are intact. No visible problem can be found on the caisson foundations and they can be reused.

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There are two (2) other structures at Broward County that also experienced problems.

One bolt on the X-brace tension member is missing at **Structure #16Z5** (Figure 7). This is one of the three tallest structures in this 500 kV line, and it is near a populated area. A follow up helicopter inspection revealed that the cross-arm is also damaged at this location and needs to be replaced.

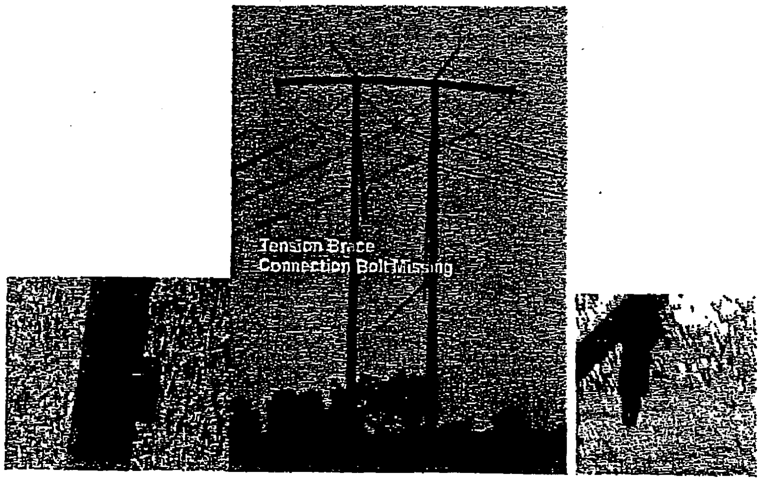

Figure 7 Structure #16Z5
Looking South

The X-brace member buckled at **Structure #16Z59**, (Figure 8). Due to accessibility problems near the surrounding area, the root cause of the failure can not be identified at this time. From visual inspection, no bolt is missing from this structure.

At both locations, the X-brace member failure did not propagate into a structural failure or a cascade event.

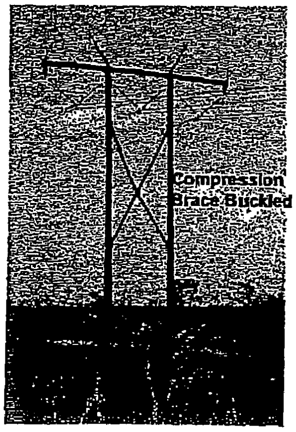

Figure 8 Structure #16Z59
Looking West

The H-frame failed transversely toward the southeast at **Structure #16Z139** (Figure 9). Both legs buckled below the X-brace and are currently supported only by a broken cross-arm and an X-brace component. A missing bolt was found at the base of the southeast (compression) leg. Its nut is laying about 15' away toward the northeast (in-line direction). Both components were on the ground, apparently for a long duration, prior to the wind storm. Again, the connection does not appear to be stressed before separation.

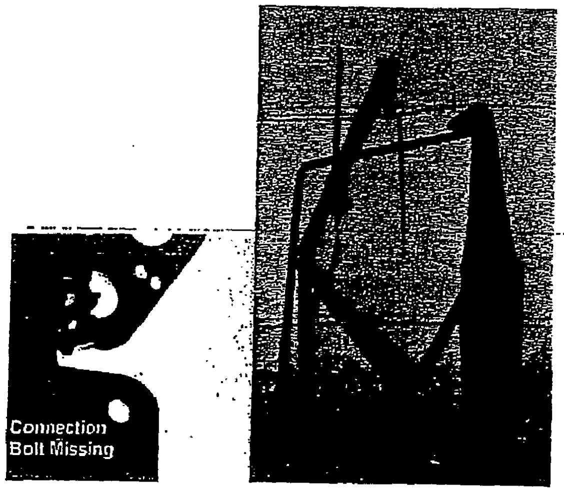

Figure 9 Structure #16Z139
Looking East

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Conductors (in particular, the west phase) were badly damaged (Figure 10) as this structure came down. This phenomenon - conductors rubbing against failed structural components - might have caused many other broken conductors, as displayed throughout this line. Both adjacent structures (Structure #16Z138 and #16Z140) are leaning slightly toward the collapsed Structure #16Z139.

Figure 10 Structure #16Z139
Conductor Damages

Moving north, twenty-eight (28, from **Structure #16Z186** to **Structure #16Z213**) of the failed structures are near the Corbett Substation, south of Highway 80 (Figure 11). These structural failures were initiated by at least three (3) different events and then cascades in between. Both longitudinal and transverse cascade phenomena have been observed in this 7.5-mile long section. From meteorological data available to date, the eye of Hurricane Wilma passed through this area (Figure 12).

Figure 11 Cascades near Corbett Substation
Structure #16Z186 to #16Z213

Figure 12 Hurricane Wilma Storm Track

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From the layout of all failed structures, two (2) or maybe three (3) of the cascade events were initiated near locations where several adjacent structures had missing connection bolts (between X-brace member and H-frame leg). It is also important to point out that broken wires can easily be found near these locations.

When installed correctly, weathering steel bolts should not be loosened (Figure 13) or totally disengaged (Figure 14). If there is a noticeable vibration problem, bolts will get loosened or missing. Structures then become more flexible and sway unpredictably. Structures could fail under this condition since the load path will not be the same as originally designed. As a result, stress distribution will be altered and stress concentration can develop into a level much higher than the material can handle.

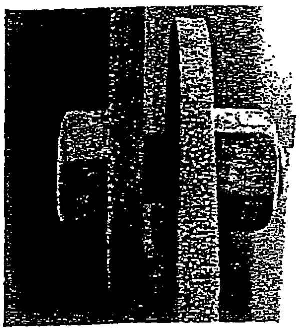

Figure 13 Loosened Bolted Connection

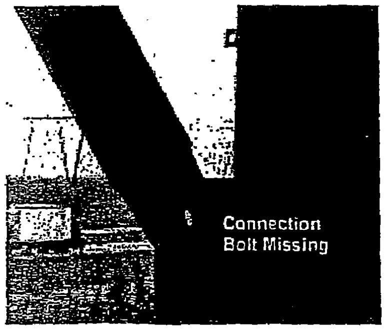

Figure 14 Missing Bolt

The line system can accommodate some flexibility as the adjacent structures attempted to share the load that had been imposed to the whole system. However, when several structures were not functioning properly in a series, the structural movements became much more aggressive and violent. Wires started to overstretch since structures do not typically move in unison. Thus, breakage of individual strands or of a complete wire system became more likely to happen (Figure 15).

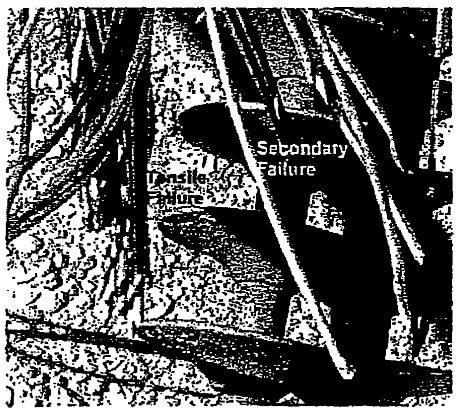

Figure 15 Broken Conductor

Both overhead ground wires (OHGW) and conductors broke in this line section. Some wires were broken in many places, and several locations have multiple broken wires (Figure 16). Most of the broken wires are secondary failures caused by structural collapse. However, in at least one location, a sub-conductor was broken by high tension.

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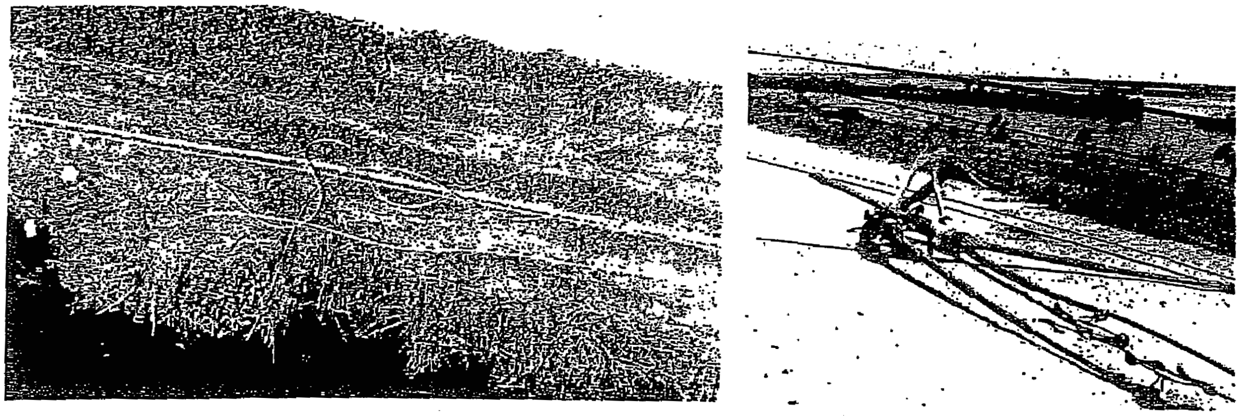

Figure 16 Broken Conductor Phase

The failure elements in this area are all mangled together, which makes it very difficult to identify the precise sequence (Figure 17). The interactions between the wire system and the structural support were highly influential with each other and rather dynamic. Root causes cannot be clearly identified without assumptions. However, from the evidence presented, the duration of the initial destruction and follow up cascade must be reasonably short, within minutes. In addition, the evidence supports that missing bolts at the critical connection is, no doubt, a major contributor to the failure of these structures and generated the cascade events.

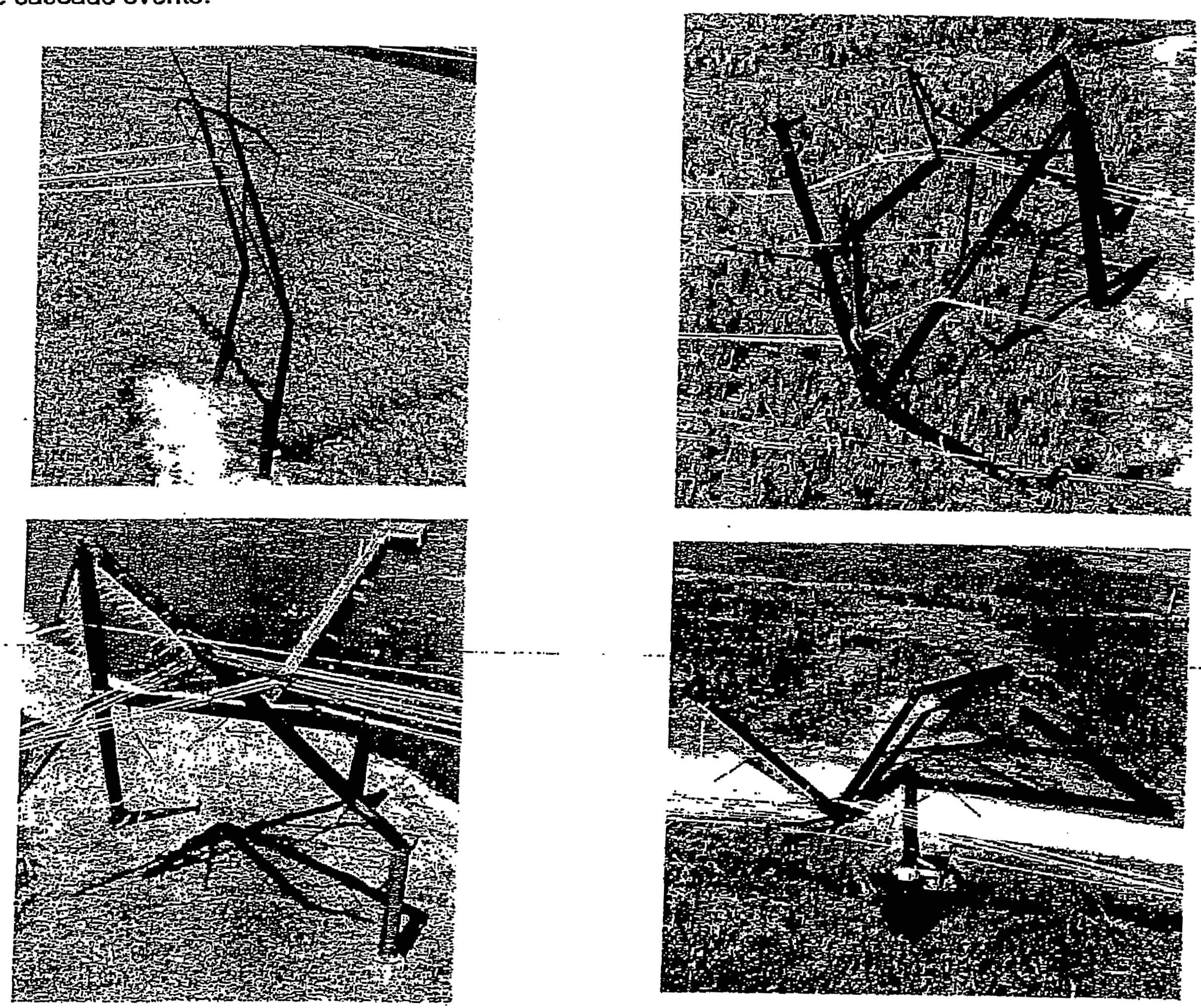

Figure 17 Structural Cascade Failures

In the North end, another cascade failure was initiated at **Structure #16Z212**. The caisson foundation of this structure was installed incorrectly which weakened the overall structural capacity. Caisson foundations consist of –

- An underground cast-in-place concrete shaft that interacts with the native soil to provide structural stability.
- A reinforcing bar cage to provide the overturning resistance.
- An anchor bolt cage to provide a connection between H-frame and the foundation.

To ensure adequate load-transferring strength, high quality sound concrete is needed to provide enough bonding between the reinforcing cage (which provides interaction from foundation to surrounding soil) and the anchor bolt cages (which connect to the H-frame structure). Any miscellaneous material that was not part of the concrete mix and trapped in the hole, including muddy water, will lead to voids or soil inclusions in the concrete. Thus, proper installation technique requires that concrete to be pumped and pressured from the bottom of the excavated shaft, and "push" the construction spoil materials, such as loose sand or ground water, out of the hole.

From Figure 18, bond strength was never developed between the anchor bolt cage and the reinforcing cage. The exposed reinforcing bars are so clean that there is hardly any trace to show that concrete has ever been adhered to them. There are also indications of soil inclusions (Figure 19) and cold joint lamination (construction delays of any kind that cause previously poured concrete to reach initial set, Figure 18).

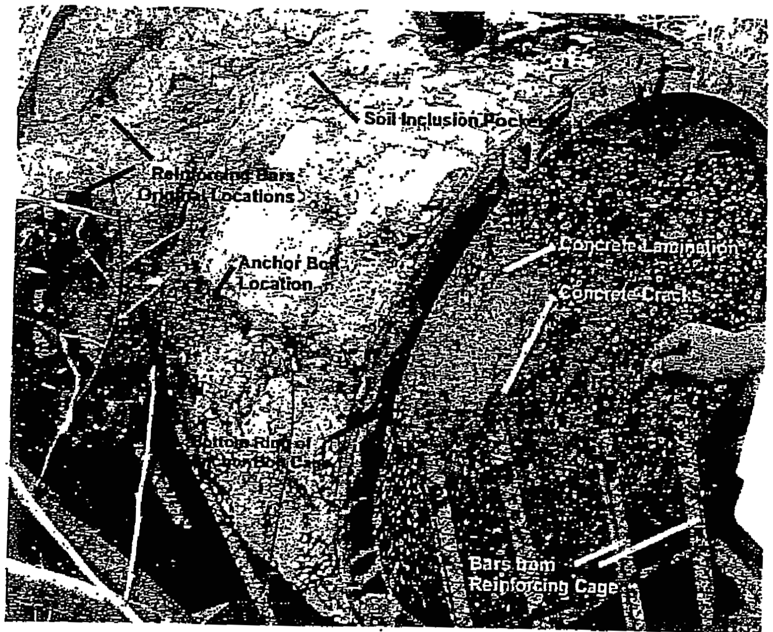

Figure 18 Caisson Foundation Separation
Structure #16Z212

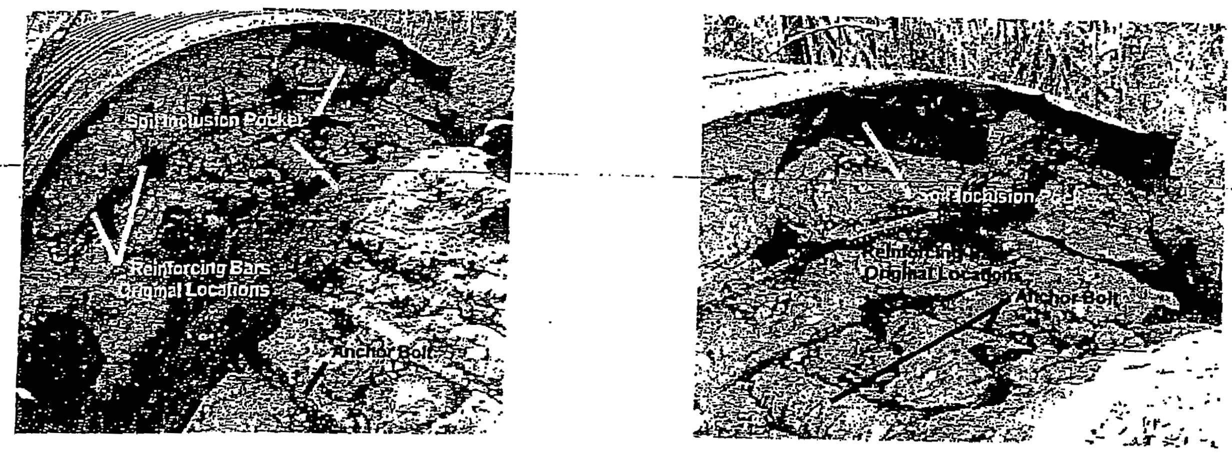

Figure 19 Soil Inclusion

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Without a high quality concrete placement to provide a solid connection between the cages, effective foundation size is basically the same as the size of anchor bolt cage (6'-9" into ground on a 47" bolt circle diameter). This significantly smaller size foundation cannot and did not survive the storm. In essence, the northwest (tension) leg of this structure was pulled out of the ground due to the lack of solid concrete bond. The fail of this foundation triggered a series of transverse cascade events.

ANALYSIS -

The 500 kV line structural failure is the result of two (2) mutually exclusive root causes.

1. Missing Connection Bolts probably caused by Conductor Vibration:

   The conductor is the most flexible component in a transmission line structural system. The first mode of free vibration for a conductor tends to be under low speed laminar winds (about 2 to 3 mph), a very common weather condition in Florida. Conductor tension strongly influences the vibration phenomenon. The higher the tension, the more a conductor is susceptible to vibration damages.

   As the conductor vibrates, other parts of the structure, including insulators and hardware components, will react and try to counterbalance the vibration motions. If the natural frequency of the system, as a whole or in part, is comparable enough to produce a harmonic motion or if the damping mechanism of the supporting structure is insufficient to counteract the free vibration, external damping devices must be provided. Otherwise, as vibration is out of control even for a relatively short duration, bolted structural connections can start loosening up and components can be damaged. Eventually, structures can no longer function as originally designed.

   The conductor in this line was strung at a higher tension limit than typical FPL standard practice. The "tension-over-mass" ratio for this line is much higher than other 500 kV lines (by 25% to 30%). "Tension-over-mass" ratio is an industrial standard practice to detect wire vibration concerns. It is not intended to be a clear cut "Go or No Go" type limit that provides absolute boundary for vibration damage. However, it is a useful tool that provides indications of potential problems. The "tension-over-mass" ratio for the conductor in this line is beyond the threshold established by international standard (IEC 60826).

   A new type of spacer-damper was selected as the main vibration mitigation device for this line during the design stage.

   Earlier studies (started from 4/98, around two years after this line was energized) concluded that this original spacer-damper recommendation was insufficient and ineffective. These dampers failed to control the conductor motion. As a result, conductor fatigue was observed, and at least one broken insulator, as well as many missing or loosened bolts, was found.

   - The report indicated that 45% of the conductor samples taken have broken strands. Wires were repaired and actions were also taken to mitigate the vibration problems which, according to field reports from line patrol personnel, seemed to be effective.

   - Insulators were inspected and replaced as required. Insulator damages were also found in May of 2003 as well as April of 2004, only a few years after the vibration retrofit activity. One insulator appears to have been damaged during installation. There is no evidence that the other failure is related to the vibration problem.

- Many missing bolts were replaced. However, there is no evidence that the loosened bolts were re-tightened during the retrofit construction. Bolts and connections are an integral part of the structure. Missing/loosened bolts alter structure responses under load and change structural behaviors. The fact that these structures have bolts missing might explain why this line failed the way it did.

A follow up inspection (10/31/2005) after the storm revealed that three (3) more locations in this line have missing bolts (no structural damage observed). In addition, twenty-eight (28) locations have loose bolts.

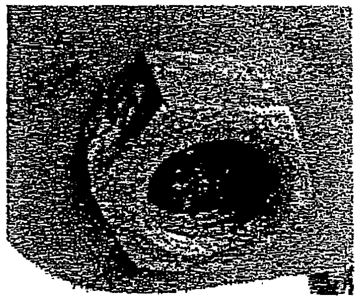

Figure 20 Loosened Connection

Close resemblances were found when comparing this inspection report (together with findings from the failed structure) with one of the earlier lists collected on missing bolts. A majority of the structures (91%) show up on both lists.

It is possible that a misfit part exists at some of the structure assemblies which make bolts somehow crooked. Since these bolts will always be under tension, vibration may accelerate the prying action and compromised the connection capacity. Misfit parts can be generated by poor manufacturing, excessive construction tolerance, or improper workmanship.

2. Foundation Construction:

Caisson foundation is commonly used in the bridge, port facility, and transmission line construction industries. Placing concrete in a freshly augured hole below water table is challenging; however, methods to prevent void, soil inclusion, and lamination are all well established. This unfortunate event could have easily been avoided.

A structure can only be as strong as the weakest link. As this foundation (Structure #16Z212) was being pulled out of the ground, there was not enough strength to resist or enough weight to overcome the uplift. Once this foundation gave, the structure tilted over and triggered a cascade event which brought down several adjacent structures (one structure from the north and up to three or four from the south).

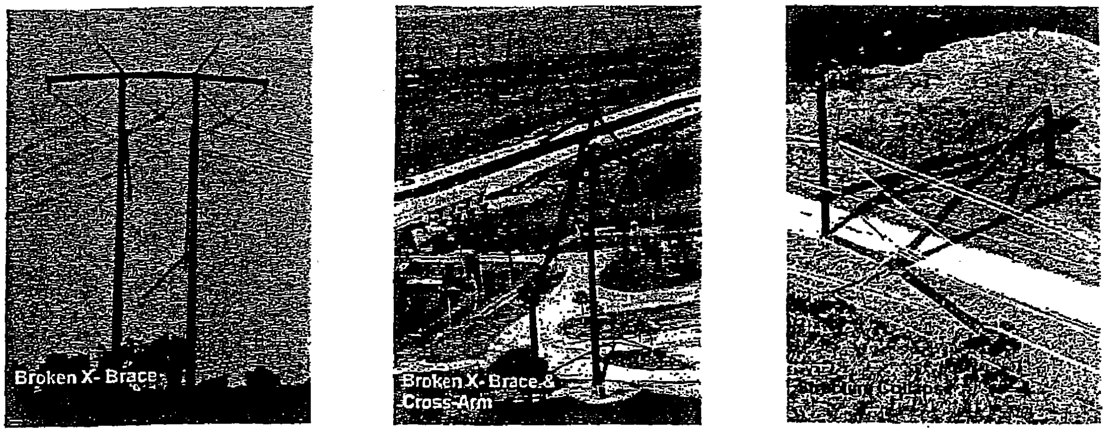

Figure 21 Failure Mechanism

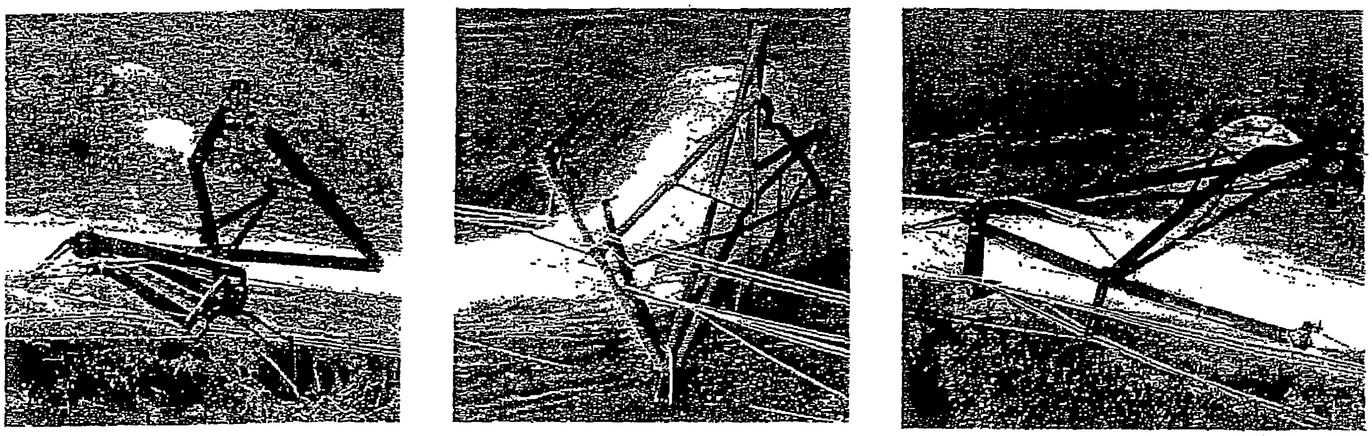

Figure 22 Structures Subject to Severe Torsional Stress

There is also evidence of welding failure at the area of circumferential joints, longitudinal seams, and even at full-penetration connections. Due to large movements created by the structural collapse, it is difficult to determine the causes. However, it is suspected that these weld damages are the results of secondary failure modes that happened after structural collapse.

COUNTERMEASURES AND RECOMMENDATIONS -

Most structures failed as a result of line cascades (both transverse cascade and longitudinal cascade) triggered by different events; missing critical connection bolts at many locations and a foundation failure.

Visual inspections were performed for Conservation - Corbett and other 500 kV transmission lines to identify storm damages and additional missing bolts (10/31/2005 – 11/9/2005). All bolts should be included in the normal line inspection and maintenance program. All loosened bolts will be re-tightened or replaced.

Locking devices should be used to prevent bolts from missing or loosening. However, the vibration phenomena of conductor on this line also need to be studied, in detail, to provide mitigation to the main source of vibration activities. It is likely that the loosened bolt conditions may occur again if the conductor vibration issue is not effectively addressed.

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An effective damping system need to be developed and implemented for the entire transmission line. It is estimated that 75% of the original spacer-dampers were damaged during this storm. The damper replacement program should not be restricted only at the damage locations. Observations or measurements should be made, in regular intervals, to ensure the adequacy of these damping devices.

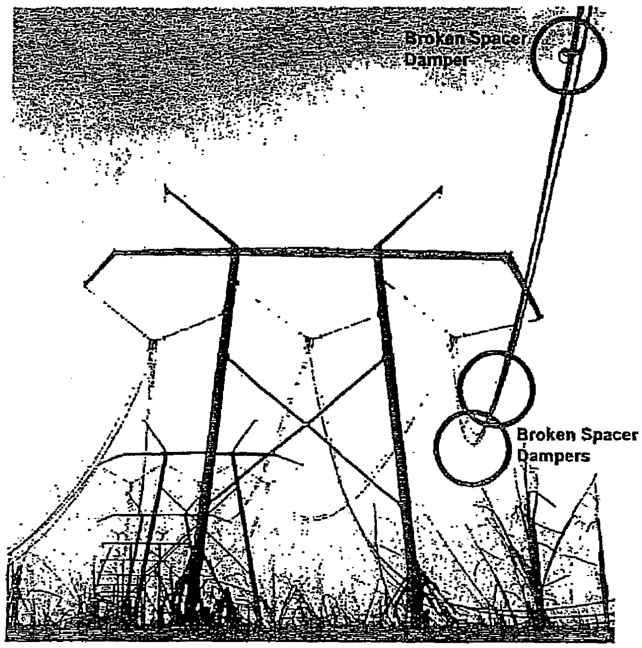

Figure 23 Spacer-Damper Damages

Construction specification for caisson foundation installation was not executed. Following Transmission Projects' "Phoenix Program" objectives, a solution should be developed to ensure proper construction procedures and techniques that can be applied to this type of construction activities. The solutions should start with some basic items such as contractor qualifications. Adequate resources should also be allocated to oversee the construction activities.

Random sampling will be taken, in next few weeks, to investigate the quality of concrete in this line section.

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1998 ANALYTICAL TECHNIQUES

500KV STRUCTURE FASTENER PROBLEM

[redacted]

BACKGROUND

- An insulator failure on the 2 year old Conservation-Corbett 500kV line created speculation that the structure was the source of the vibration.
- Missing structure fasteners (bolts) and loose nuts added to the concern about structure vibration
- Crews had witnessed structure vibration

BACKGROUND (Cont.)

- Subsequent tests and inspections of insulators and conductor have revealed conductor aeolian vibration is the cause of insulator damage
- Loosening of structure fasteners is an independent problem

BACKGROUND (cont.)

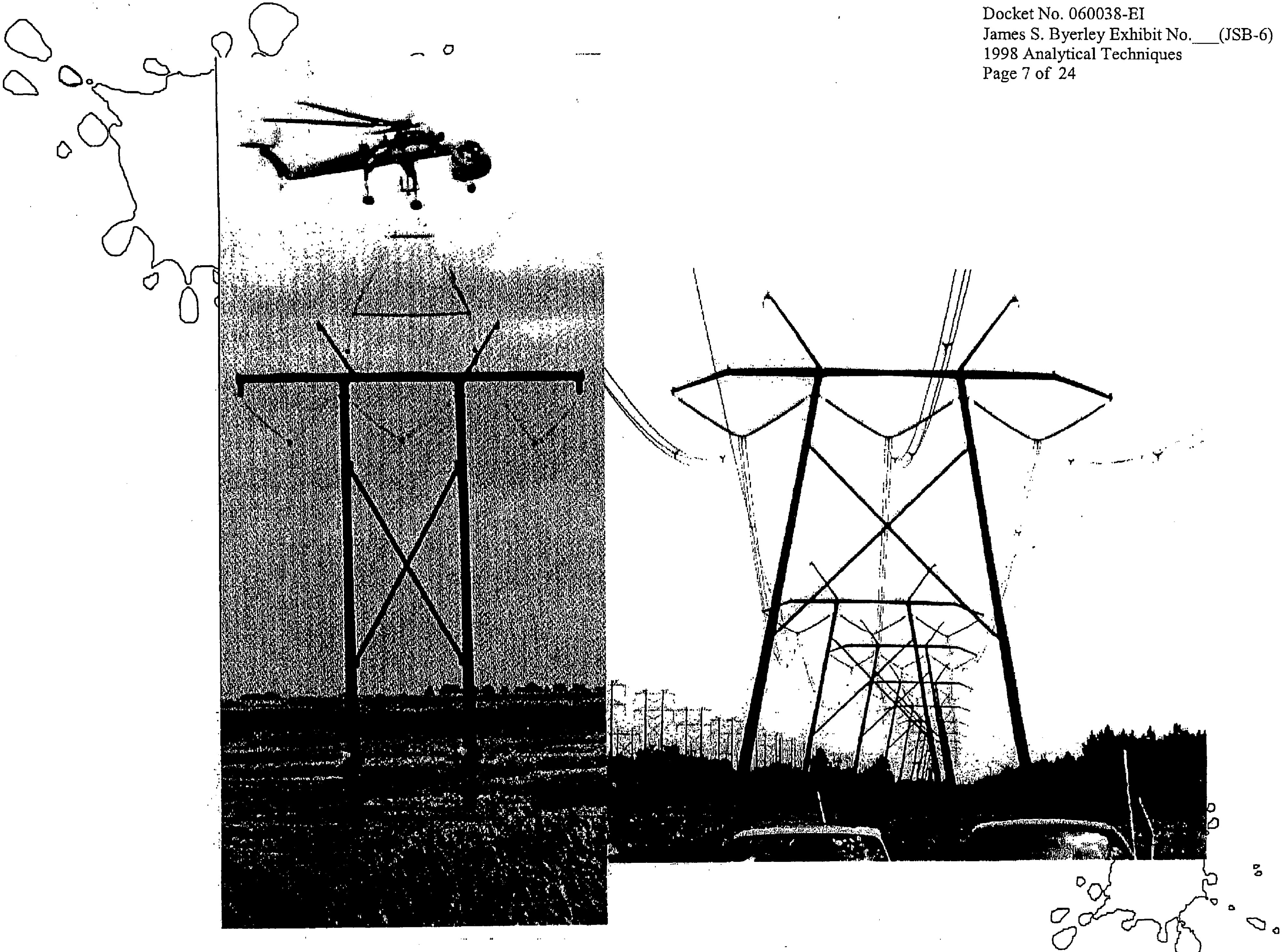
- Dr. Wong, structural engineer, designed the new structure for the line---although visually different, it has the same fundamental frequency as old structures
  - Have the same vibration characteristics
- Problems experienced on the new structures should be the same as on existing lines

SURPLUS STRUCTURES

- The Conservation-Corbett line utilized 14 structures removed from service in 1993
- In addition, 13 structures of the FPL traditional design had been supplied prior to the line being redesigned.
- In total, 27 "Surplus" or "Old" structures were utilized in this line section.

ASSUMPTIONS

- We assumed that the problems would be the same for structures of the old and new designs
- We assumed that the same installation techniques were used on both types, since they were installed in the same line section at the same time.



CURRENT SITUATION

- We need to know the proportion of loose fasteners, what is causing them to become loose, and identify countermeasures to prevent further fastener problems from occurring
- We will compare the proportions on old structures to those on new structures.

AT PROJECT DESCRIPTION

- Check all foundation nuts, brace fasteners and arm fasteners for "looseness" on a random sample of new structures and all of the old structures in Palm Beach County
- Compare statistics for clusters to determine the extent of the problems, whether they are common to the old and new structures, and if they occur in the same frequency for old and new structures.

DEFINITIONS

- For foundation nuts, if there is more than a .004 inch gap between the nut and baseplate, then the nut is loose
  - .004 inch gap is not significant structurally
  - Can be measured with standard feeler gauge
- For brace fasteners, if there is more than 1/2 nut gap, then nut is loose.
  - 1/2 nut gap can be seen through binoculars

Sampling Technique

- Cluster Sampling
  - We are checking the groups of fasteners
  - The number of foundation nuts varies for different structure types
  - There are 4 brace bolts for each structure

RESULTS OF SAMPLE--FOUNDATION

- NEW STRUCTURES
  - 34 SAMPLED
  - Various cluster sizes
  - N_n 87
  - n_n 34
  - $mbar_n$ 16.470588
  - M_n 1432
  - $Mbar_n$ 16.45977
  - $ybar_n$ .061 var_n .00018
  - $.0336 < u_n < .0878$

- OLD STRUCTURES
  - 24 sampled out of 26
  - Various cluster sizes
  - N_o 26
  - n_o 24
  - $mbar_o$ 19.666667
  - M_o 520
  - $Mbar_o$ 20
  - $ybar_o$ .036 var_o 1.29E-5
  - $.0288 < u_o < .0432$

EXPLANATION OF VARIABLES

- N — population total (# in Palm Bch County)
- n — quantity in sample
- mbar — average number of bolts in cluster for sample
- M — total number of bolts in population
- Mbar — average number of bolts in cluster for population
- ybar — proportion of loose bolts in sample
- var — Sample variance
- u — The estimate of the proportion of loose bolts in the population, with bound on error of estimation

HYPOTHESIS TEST

- Null Hypothesis: The population proportion of loose foundation nuts is the same for the old and new structures
- Alternative Hypothesis: The population proportion of loose foundation nuts is different for the old and new structures
- We choose the t test because we assume the sample means are normally distributed, unknown population variance.
- Significance level alpha = .05 (2 tailed test)

Test statistic

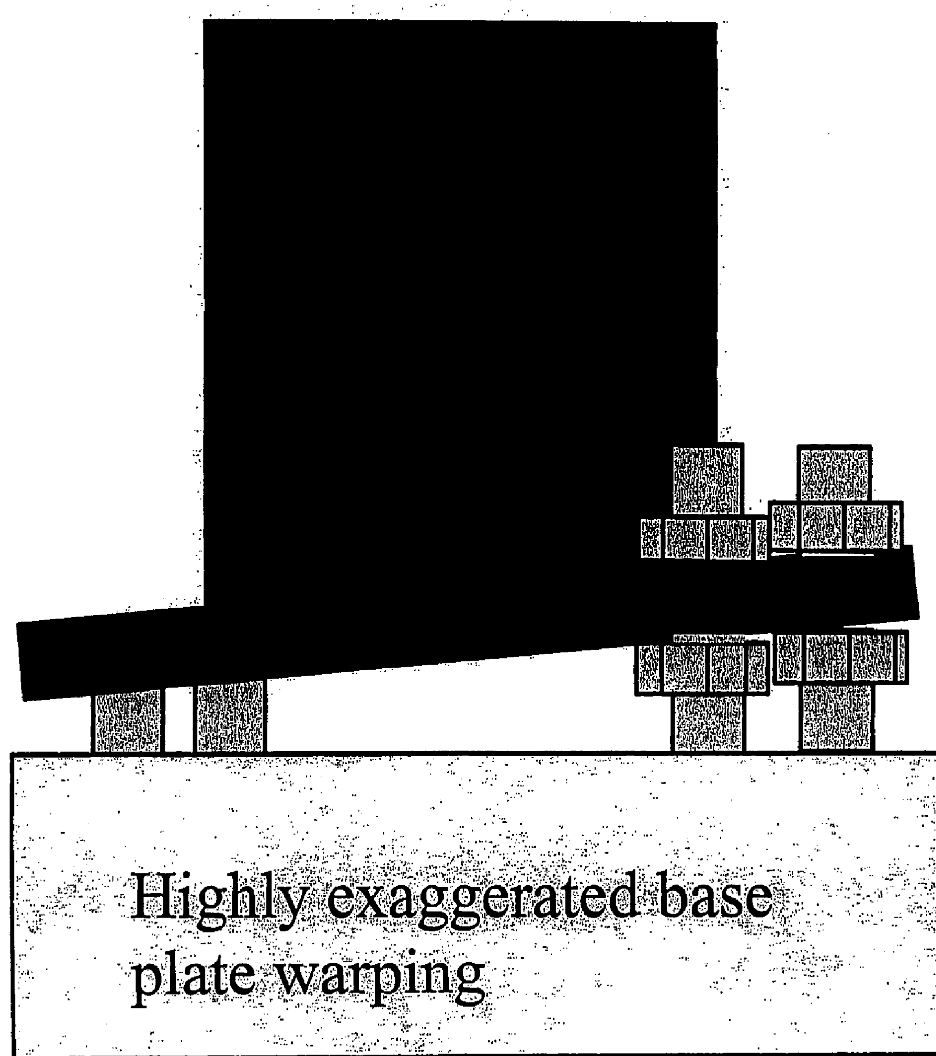
- We will reject the null hypothesis if the test statistic is greater than tprime.
  - We use tprime because we have no reason to think that the population variances are equal.
- tn=2.0345; to=2.0687,tprime=2.0376, test statistic=10.1455
- We reject the null hypothesis. The new structure foundation nuts have a higher proportion of loose nuts.

FOUNDATION NUT PROBLEM

Foundation nuts are "loose" because baseplates are not square.

Assume structure settles as stress is redistributed underneath baseplate.

Old structures may have been worn down previously



Analyze a Non-Problem

- Dr. Wong, Structural engineer examined the foundation nut problem.
  - The small gap is a minor structural problem
  - No need to go back to structures as long as the nut is not missing.
  - Problem with warp of baseplate cannot be fixed on existing structures
  - Problem is present on Andytown-Martin Lines also (spot check).

STANDARDS FOR BASEPLATES

- Dr. Wong will discuss baseplate tolerance with manufactures to improve flatness
  - We still use baseplates on special crossing structures

RESULTS OF SAMPLE--BRACES (loose nuts)

- NEW STRUCTURES
  - 34 SAMPLED
  - Various cluster sizes
  - N 87
  - n 34
  - mbar 4
  - M 348
  - Mbar 4
  - ybar .044 var .00017
  - .0182<u<.0700
- OLD STRUCTURES
  - 25 sampled out of 26
  - Various cluster sizes
  - N 26
  - n 25
  - mbar 4
  - M 104
  - Mbar 4
  - ybar .030 var 1.06E-5
  - .0235<u<.0365

HYPOTHESIS TEST

- Null Hypothesis: The population proportion of loose brace nuts is the same for the old and new structures
- Alternative Hypothesis: The population proportion of loose brace nuts is different for the old and new structures
- We choose the t test because we assume the sample means are normally distributed, unknown population variance.
- Significance level alpha = .05 (2 tailed test)

Test statistic

- We will reject the null hypothesis if the test statistic is greater than tprime.
  - We use tprime because we have no reason to think that the population variances are equal.
- tn=2.034; to=2.064,tprime=2.037, test statistic=6.101
- We reject the null hypothesis. The new structure brace nuts have a higher proportion of loose nuts.

Brace Nut Problem

- According to Dr. Wong, we expect more vibration on the braces of the new structure than on the old structure (but both will vibrate)
  - Braces are longer and steeper on new strs
  - Vibration is not harmful to the structure nor to the insulators and conductor
  - Nuts probably loosened from vibration soon after erection, but arrested after the bolt and nut began to rust

Brace Nuts

- All structures will be inspected for loose or missing nuts.
- Loose nuts and missing bolts can be a significant problem under wind load.
  - Try to tighten with wrench--if nut is frozen, then leave as is.
  - If missing, replace bolt and nut--peen nut.
    - Replacement bolts and nuts were ordered and are available in stores.

STANDARDIZATION--Brace Bolts

- Revise "D" Specification for construction of overhead transmission lines.
  - Require Brace, arm and OHGW mast bolts to have peened threads after nut is tightened.

Conservation Corbett 500 kv Line

16z196- did not climb, o.k.
16z197- did not climb, foundation bolts loose, x-brace bolts loose.
16z198- did not climb, x-brace bolts loose
16z199- replaced #2,#4, insulator and both rings, turned #1,#3,#6. 8" rings up, conductor and insulators vibrate excessively.
16z200- foundation bolts loose, x-brace bolt loose, x- arm bolt almost all the way out of arm ,pitcure, turned all 8" rings up.
16z201- foundation bolts loose, x-brace bolt loose, x-arm bolts loose, replaced #3,#4,#5,#6, insulator and both rings , good, gave to test lab.
16z202- foundation bolts loose, x-brace bolts loose, turned all 8', rings up.
16z203- did not climb, foundation bolts loose, x-brace bolts loose.
16z204- 110 ft. to conduct. could not reach, x-brace bolt missing, top west, #4 insulator needs to be replaced, need crane and man-basket.
16z205- did not climb, foundation bolts loose.
16z206- foundation bolts loose, x-brace bolts loose, turned all 8" rings up, replaced #4, 18" ring.
16z207- turned all 8" rings up, replaced #1, 18" ring, missing.
16z208- all 18" rings loose, 18 of them, foundation bolts loose, x-brace has no u-bolt holding braces together.
16z209- tightened all 18" rings
16z210- did not climb, foundation bolts loose.
16z211- did not climb, foundation bolts loose, x-brace bolt holding x-braces together in middle missing.
16z212- did not climb, foundation bolts loose.
16z213- did not climb, foundation bolts loose.
16z214- f. sturct. foundation bolts c. sturct. loose, e. tower lg. corona ring broken all the way off, west tower lg. corona ring broken.
16z215- did not climb, o.k.
16z216- did not climb, o.k.
16z217- did not climb, o.k.
16z218- did not climb ,foundation bolts loose.
16z219- k- struct. foundation bolts loose, center and west phase lg. corona ring broken.
16z220- did not climb, o.k.
16z221- foundation bolts c. phase tower loose, rest o.k.
AF-6 tower in corbett sub.did visual could not see anything wrong.

Conservation-Corbett 500KV
Structure Repairs

Structure Number	Structure Type	Structure	Foundation Bolts Loose	Crossbrace to Leg	Crossbrace Center	Leg to Crossarm	Other
16Z195	A80	A					
16Z196	A78	A					
16Z197	A78	A	Y	4			
16Z198	A73	A		4			
16Z199	C75 SURPLUS	C					
16Z200	A73	A	Y	4		1	
16Z201	A68	A	Y	4		4	
16Z202	A73	A	Y	4			
16Z203	C95 SURPLUS	C	Y	4			
16Z204	A110	A		4			
16Z205	B87 SURPLUS	B	Y				
16Z206	A68	A	Y	4			
16Z207	A73	A					
16Z208	C75 SURPLUS	C	Y		U		
16Z209	C75 SURPLUS	C					
16Z210	A100	A	Y				
16Z211	A110	A	Y		1		
16Z212	A100	A	Y				
16Z213	B88 SURPLUS	B	Y				
16Z214	F74	F	Y				Loose on C-Phase Leg
16Z215	A73	A					
16Z216	A75 SURPLUS	A					
16Z217	A75 SURPLUS	A					
16Z218	A78	A	Y				
16Z219	K72	K	Y				
16Z220	A73	A					
16Z221	K72	K	Y				Loose on C-Phase Leg
	AF6						
				124	1	17	
Bill of Material						Qty	
Crossbrace to Leg Connections							
	Type "A" Strs (non-surplus)					108	ConCor Meyer Parts 76411 / 72969 (Qty = 108 of each)
	Type C75 (surplus)					8	Meyer Job A97700 Parts 76326 / 70678 (Qty = 8+4+4 of each)
	Type C85 (surplus)					4	Meyer Job A97700 Parts 76326 / 70678
	Type C95 (surplus)					4	Meyer Job A97700 Parts 76326 / 70678
Crossbrace Center							
	Type "A" Strs (non-surplus)					1	ConCor Meyer Parts 75000 / 72940 (Qty = 1 of each)
	Type C75 (surplus)					1	Meyer Job A97700 Parts 1129 / 1130 / 72262 (Q = 1/1/2 of ea)
	Type C90 (surplus)					1	Meyer Job A97700 Parts 1129 / 1130 / 72262 (Q = 1/1/2 of ea)
Leg to Crossarm							
	Type "A" Strs (non-surplus)					17	ConCor Meyer Parts 78852 / 72969 (Qty = 16 / 17 of each)
	Type A75 (surplus)					1	M&S # 154-70500-1 (Qty = 1 of each)
OHGW Mast to Crossarm							
	Type "A" Strs (non-surplus)					1	ConCor Meyer Parts 74935 / 72940 (Qty = 1 of each)

CONCOR.XLS

Conservation-Corbett 500KV
Structure Repairs

Structure Number	Structure Type	Structure	Foundation Bolts Loose	Crossbrace to Leg	Crossbrace Center	Leg to Crossarm	Other
CONSERVATION-CORBETT 500KV LINE							
Structure Repairs from PBT Inspection							
Bill Of Material							
	Item					**Qty**	**Description**
	ConCor Meyer Part 76411					108	2" x 4-1/2" bolt
	ConCor Meyer Part 72969					125	2" nut
	A97700 Meyer Part 76326					16	1-1/2" x 4-1/2" bolt
	A97700 Meyer Part 70678					16	1-1/2" nut
	ConCor Meyer Part 75000					1	1" x 22-1/2" bolt
	ConCor Meyer Part 72940					2	1" nut
	A97700 Meyer Part 1129					2	U-bolt angle
	A97700 Meyer Part 1130					2	5/8" U-bolt
	A97700 Meyer Part 72262					4	5/8" nut
	ConCor Meyer Part 78852					16	2" x 32-1/2" bolt
	M&S# 154-70500-1					1	2-1/4" x 2'-11" bolt w/ nut
	ConCor Meyer Part 74935					1	1" x 14" bolt

FPL Phil S Givens 09/25/98 09:17 AM

[redacted]

To: Jeff Burnham@FPL
cc: Dean Busch@FPL, Jose Coto@FPL, Lee Weitzel@FPL, Tom Urspruch@FPL, Jerry Wong@FPL
Subject: Conservation-Corbett 500kv line fastener problem

Jeff,

The study I performed on the line in Palm Beach County revealed that we did not have a significant structural problem with the foundation nuts, but that we had a problem with brace fasteners. Because the base plates are not perfectly flat, the foundation nuts in many cases cannot be flush against the base plate. A slight gap between the nut and the base plate is not significant. Only 6% of the structures sampled had a gap of more than .004 inches between the nut and the base plate. Of these, the gap was not much greater than .004 inches.

There were 2 structures which did have a problem with the foundation nuts. At location 16Z147, which is a surplus structure, then nubs which were meant to secure the nut were not ground off. The washer is sitting on top of the nub, so the nut is not in a good position at this structure. At structure 16Z131, the guide cone is still on one of the foundation bolts. I think Jerry Wong needs to examine these two structures and make a recommendation for a fix.

Approximately 4.5% of the structures sampled had loose or missing hardware for the brace connection to the leg. I recommend that an inspection be performed on all structures to check for loose or missing brace hardware. Loose would be defined as more than 1/2 nut gap between the vang and the nut. If there is a gap less than 1/2 nut, the crew should try to tighten the nut. If the nut is frozen, leave that fastener alone. If there is more than 1/2 nut gap, the fastener should be removed, and a new one installed. In this case, the threads should be peened after installation to keep the nut from backing off. If the crew finds that nuts are not frozen on the brace bolts, then we need to consider peening all brace bolts.

If brace bolts are missing, they need to be replaced. Dean or Tony has a list of the material required. It has already been ordered and is in stores.

This inspection can be performed from the ground with good optics.

At some structures, there was not a full nut on the bolts which pin the arm to the leg. I have spoken to Jerry Wong about this. A full nut is not required. It may be worthwhile to do a close inspection of some of these structures from a bucket, to make sure the nut is snug, and that there is enough of the nut on the bolt for structural purposes.

Phil

Docket No. 060038-EI
James Byerley Exhibit No.__(JSB-9)
Comparison of 1999 and 2005
Bolt Inspections
Cc Page 1 of 1 ns

RAC
12/14/05

Structure	Loose X Brace Bolts 1998	In 1998 List?	Loose X Brace Bolts-2005		In 2005 List?	Both Lists?
103	>1	Y	1	BE	Y	Y
107	1	Y				
110	1	Y	1	BE	Y	Y
112	1	Y	1	BE	Y	Y
123	1	Y	1	TE	Y	Y
128	1	Y				
130	1	Y	1	BW	Y	Y
133	1	Y	1	BE	Y	Y
139	>1	Y		SE	Y	Y
140	1	Y	1	TW	Y	Y
142	1	Y				
153	>1	Y				
159	BOTH TOP	Y				
163	1	Y	1	TN	Y	Y
171	1	Y				
176	>1	Y				
177	>1	Y				
185	>1	Y				
188	>1	Y				
191	>1	Y				
193	>1	Y	1	TN	Y	Y
194	>1	Y	1	BN-MISSING	Y	Y
197	>1	Y				
198	>1	Y				
200	1	Y				
201	1	Y				
202	>1	Y				
203	>1	Y	1	SHEARED OFF	Y	Y
204	TOP WEST	Y	1	TS-MISSING	Y	Y
206	>1	Y	1	TS-MISSING	Y	Y

Number of Structures with loose bolts	
1998	30
2005	22
Both Years	14

Florida Power & Light Company
Docket No. 060038-EI
OPC's Seventh Set of Interrogatories
Interrogatory No. 125
Page 1 of 1

Q.

The following interrogatories relate to page 7, lines 2-7 of Mr. Brown's testimony, in which he states: "Only one 500-kV transmission line experienced damages during Wilma. This particular line had 30 tower failures. The major contributing factor for these tower failures was the installation guidelines for manual tightening of crossbrace bolts, per industry standard practice, which is insufficient and led to the loosening of crossbrace bolts in several locations."

Prior to Hurricane Wilma, were the nuts in this particular hardware secured to the bolts? If so, were they secured with lock washers, lock nuts, damaged threads or some other method? How are they secured post- Wilma?

A.

Just prior to Hurricane Wilma, FPL does not have records indicating cross-brace bolts were missing. Cross-brace bolts were found missing during post storm investigation. The development of the patina associated with weathering steel properties is sufficient to provide a locking mechanism under normal conditions. Post-Wilma, FPL is damaging the threads of the cross-brace bolts to provide additional security.

RELIABILTY 2000
1999 DEPLOYMENT PLAN

PROGRAM NAME: Pole Inspection and Treatment **DATE:** 11/2/98

PROGRAM OWNER: **I. Ares/D. Dominguez** **Telephone 305-485-6517**
305-552-3058
Pager # 6137/3318

PROGRAM DESCRIPTION

This program will address two critical areas North Florida and West Palm Beach. These areas where selected due to the Customer Impact Initiatives and for their critical population of creosote poles.

The program will consist of inspecting and treating approximately 17,670 poles and bracing 1,391 poles by the end of 1999.

PURPOSE & NECESSITY:

A pole inspection and maintenance program had begun in the early 1980s as a way to proactively maintain our decaying wood pole population. The program was discontinued in 1991 due to cost reduction. By inspecting and proactively bracing and treating creosote wood poles which are not beyond repair, we can cost-effectively extend the life of a large percentage of the population.

PROJECT SCHEDULE

Secure Contractor: January 1 thru 31, 1999
Perform Inspection/Treatment and Bracing: February – December 31, 1999

1999 Deployment Plan – Assumptions

PROGRAM NAME: Pole Inspection and Treatment

1. **Deployment Selection Criteria:**
   The two areas selected (NF and WB) were selected due to their critical populations of creosote wood poles. These areas have previously submitted initiatives for pole inspection.

2. **Budget Assumptions:**
   The following budget assumptions were used to calculate program costs.
   These costs are based on verbal quotes from pole inspection contractors.

   Average cost of pole inspection => $8.62 / pole
   Average cost of pole bracing => $250 / pole

   22% of inspected poles will fail inspection
   75% of failed poles will need bracing

3. **Cost Tracking:**

4. **Performance Tracking:**
   The primary performance indicator for this project is the number of poles inspected / treated and braced.

Sc poles

SC 11/17/98

1999 DEPLOYMENT PLAN

Program Name: Pole Inspection and Treatment

Program Description: Implement Pole Inspection Program in West Palm Beach and North Florida

Program Owner: I. Ares / D. Dominguez

Funding Level: O&M $500,000

Capital -------

Schedule: Start 01/01/99

End 12/31/99

Area	SD	CE	ND	GS	WG	PM	BR	WB	TC	BV	CF	NF	GC	TB	MS
Number of Poles to be Inspected / Treated								8,835				8,835			
Number of Poles to be Braced								695				696			
O&M Total								250,000				250,000			
Cap Total															
CMH - FPL															
CMH - Cont															
CMI Savings															

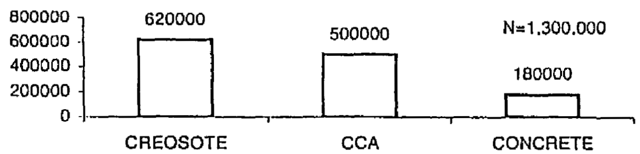
IA\99dp

EXTEND THE LIFE OR REPLACE CREOSOTE WOOD POLES

CREOSOTE WOOD POLE INSPECTION AND MAINTENANCE PROGRAM

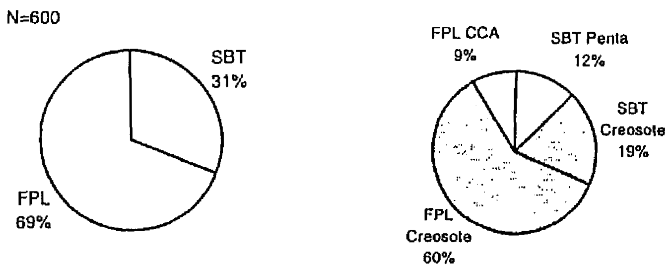
A pole inspection and maintenance program was begun in the early 1980s as a way to proactively maintain our decaying wood pole population. The program was discontinued in 1991 due to cost reduction.

DISTRIBUTION POLE POPULATION

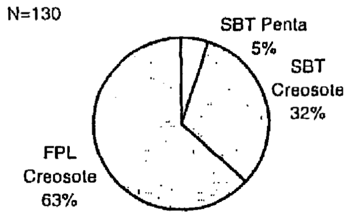


This year a statistically valid sample of 600 wood poles was inspected in South Florida. This inspection concluded that 22% of the wood poles fail to meet Standards. More specifically, 26% of the creosote wood pole population failed to meet standards and therefore, need either bracing and treatment, or replacement (results match those of independent program in the North area).

SAMPLE POPULATION



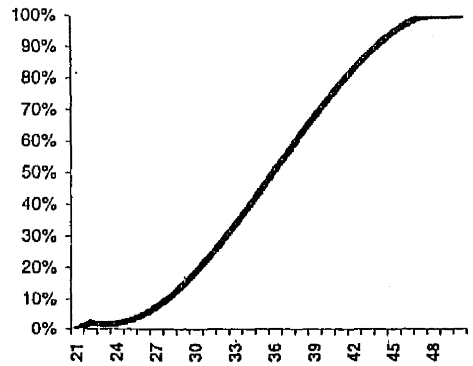
FAILED POPULATION



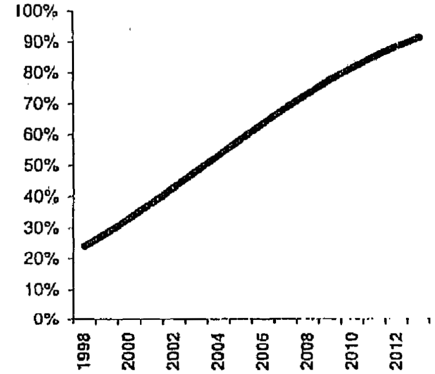
If no action is taken the creosote wood population will continue to deterlorate (see graphs below)

CREOSOTE WOOD POLES

FAILURE RATE vs POLE AGE



POPULATION FAILURE RATE



PROBLEM STATEMENT

In 1998, 26% of the creosote wood pole population failed to meet Standards and therefore, need either bracing and treatment, or replacement. This problem will only deteriorate as the creosote wood pole population ages.

BENEFIT

By inspecting and proactively bracing and treating creosote wood poles which are not beyond repair, we can cost-effectively extend the life of a large percentage of the population. By replacing the remaining creosote wood poles we can avoid an increase in CMI associated with creosote wood pole failures in the near future.

FPL 004453

Docket No. 060038-EI
James Byerley Exhibit No.__(JSB-11)
Reliability 2000 Deployment Plan
Page 4 of 17

RELIABILITY 2000 DEPLOYMENT PLAN

PROGRAM NAME: Pole Inspection Maintenance & Replacement

PROJECT OWNER: *Debra Dominquez* **Date :** *14-Oct-99*

PROGRAM DESCRIPTION:

This program will continue to address the two critical areas being North Florida and West Palm Beach.

This program will consist of inspecting and treating approximately 28,199 poles and bracing 2,219 poles by the end of the year 2000. This program will also consist of replacing the 1999 poles rejected from North Florida and West Palm Beach.

PURPOSE & NECESSITY:

A pole inspection and maintenance program had begun in the early 1980s as a way to proactively maintain our decaying wood pole population. The program was discontinued in 1991 due to cost reduction. By inspecting and proactively bracing and treating creosote wood poles which are not beyond repair, we can cost-effectively extend the life of a large percentage of the population.

PROGRAM SCHEDULE:

Secure Contract: January 1 thru January 31, 2000

Perform Inspection/Treatment, bracing and replacement: February - December 31, 2000

RELIABILITY 2000

DEPLOYMENT PLAN - ASSUMPTIONS

PROGRAM NAME: Pole Inspection Maintenance & Replacement

PROJECT OWNER: Debra Dominquez Date : 14-Oct-99

1. Deployment Selection Criteria:

This project will be centralized.

2. Budget Assumptions:

The following budget assumptions were used to calculate program costs. These costs are based on verbal quotes from pole inspection contractors.

Average cost of pole inspection = $9.42/pole

Average cost of pole bracing = $250/pole

Average cost of pole replacement = $1,200/pole

22% of inspected poles will fail inspection

75% of failed poles will need bracing

3. Cost Tracking:

PRA

4. Performance Tracking:

The primary performance indicator for this project is the number of poles inspected/treated, braced and replaced.

5. CI or CMI improvement methodology

N/A

2000 DEPLOYMENT PLAN

Program Manager: Pepe Diaz
Program Owner: Debra Dominguez
Date: 14-Oct-99

Program Name: Pole Inspection Maintenance & Replacement

Program Description: This program consists of inspecting and treating approx 28,199 poles and bracing 2,219 poles by the end of the year 2000. Also, the program provides for the replacement of the 1999 rejected poles in North Fla and West Palm

DRIVERS	FPL	NF	CF	BV	TC	MS	TB	GC	WB	BR	PM	WG	GS	ND	NEO	WDO	CD	SD
Inspections	28,199	14,100							14,099									
Bracing	2,219	1,110							1,109									
Replacements	686	412							274									
TOTAL $	$1,666,357																	
O&M $	$ 966,000																	
CAP $	$ 699,357																	
CMH - FPL	0																	
CMH - Cont	0																	
KCI Savings	N/A																	

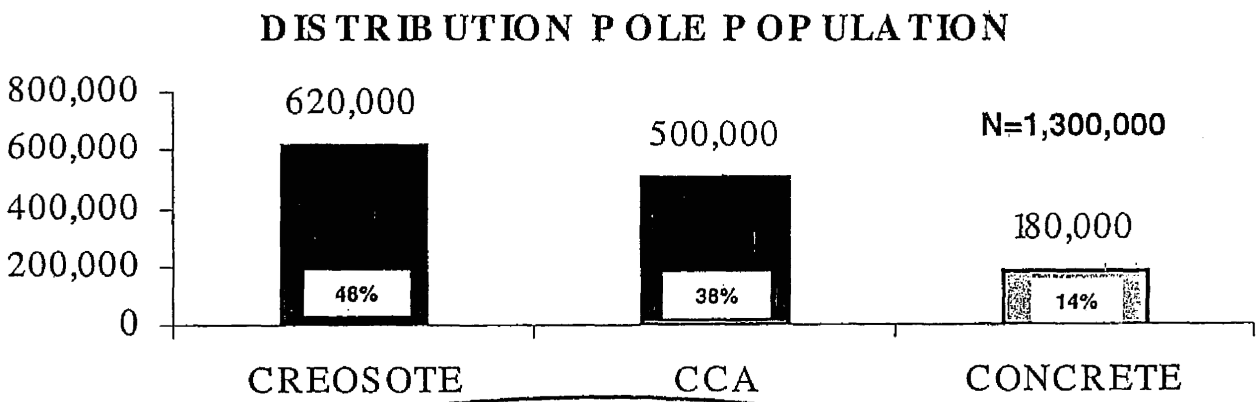
Docket No. 060038-EI
James Byerley Exhibit No.__(JSB-11)
Reliability 2000 Deployment Plan
Page 7 of 17

Pole Maintenance Program

2001 Reliability Performance Initiatives

1. Why was the program originally done?

- A pole inspection and maintenance program was performed in the early 1980s as a way to proactively maintain our decaying wood pole population. **The program was discontinued in 1991.**
- A '98 pole study showed that **26% of the creosote wood pole population had failed to meet Standards and therefore, needed either bracing, treatment, or replacement.** (Results matched those of an independent program performed for the North area).
- The program was restarted in '99 to extend the life or replace non-restorable poles out of the current pole population (**Est. 48% creosote poles**) and since the failure rate is projected to worsen as the current creosote pole population continues to age.



Note: Manufacturer's Life expectancy for a creosote pole is 27 years. FPL stopped purchase of creosote in 1976, so youngest creosote pole is 24 years old and a majority are already above 27 years old.

2001 Reliability Performance Initiatives

2. What were the original yearly projections for budget & indicators?

1999

DRIVERS	FPL	NE	WB
Inspections	17,670	8,835	8,835
Bracing	1,391	696	695
TOTAL $	$ 500,000	$ 250,000	$250,000
O&M $	$ 500,000	$ 250,000	$250,000
CAP $	$ -		
CMH - FPL	0		
CMH - Cont	0		
KCI Savings	N/A		

- Budget Assumptions were as follows;
  - Pole inspection@ **$8.62 / Pole** & Avg cost of Pole Bracing@ **$250 /Pole**

2000

DRIVERS	FPL	NE	WB
Inspections	28,199	14,100	14,099
Bracing	2,219	1,110	1,109
Replacements	686	412	274
TOTAL $	$1,665,357	$ 915,822	$ 749,953
O&M $	$ 966,000	$ 495,582	$ 470,473
CAP $	$ 699,357	$ 420,240	$ 279,480
CMH - FPL	6860	4120	2740
CMH - Cont	0		
KCI Savings	N/A		

- Budget Assumptions were as follows;
  - Pole inspection@ **$9.42 / Pole** & Avg cost of Pole Bracing@ **$260 /Pole** & Pole Replacement @ **$1200** (85% Cap Split) with 10avg mhrs per pole

2001 Reliability Performance Initiatives

3. Accomplishments & Results for past 2 years:

- 1999 was first year of restarted program with results below:

As of 12/31/99

1999

AREA	INSPECTIONS Target	INSPECTIONS Actual	INSPECTIONS FAILED Inspection	BRACING Budget	BRACING Actual Braced	REPLACEMENT '99 Identified	REPLACEMENT Actual Replaced	COST Target	COST Actual
NF (Live Oak)	8,835	12,102	1,043	696	586	457	0		
WB (Belle Glade)	8,835	14,591	894	695	342	552	0		
Total	17,670	26,693	1,937	1,391	928	1,009	0	$500,000	$504,375
% of Plan/Target		151%			67%		0%		101%
Note: No replacements in 1999, only identify poles for replacement following year									

Note: 51% more poles were inspected due to a larger amount of cca poles in the inspection area than forecasted.

- (YTD June 2000) 2000 Program results shown below:

As of 6/30/00

2000

AREA	INSPECTIONS Target	INSPECTIONS Actual	INSPECTIONS FAILED Inspection	BRACING Budget	BRACING Actual Braced	REPLACEMENT Target	REPLACEMENT Actual Replaced	YTD COST Jun-00 Target	YTD COST Jun-00 Actual
NF (Live Oak)	14,100	18,197	565	1,110	222	412	108		
WB (Belle Glade)	14,099	9,644	699	1,109	136	274	0		
Total	28,199	27,841	1,264	2,219	358	686	108	$833,110	$478,575
% of Plan/Target		99%			16%		▼		57%
				YTD replacements target		343	31%		

Note: 80% of the 686 targeted replacement poles are projected to be complete by end of year. WB received list late and estimates will complete half by end of year 2000.

2001 Reliability Performance Initiatives

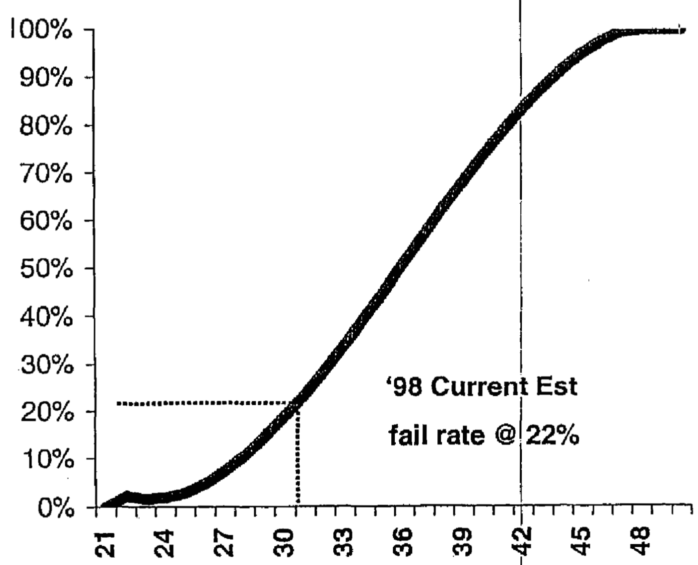
4. Why should we continue the program?

- Through inspections to proactively brace and treat many of the aging creosote wood poles which are not beyond repair, we can cost-effectively extend the life for a large percentage of the population. With the current inspection rate (est 28,000 per year), maintenance cycle would be 46 years.

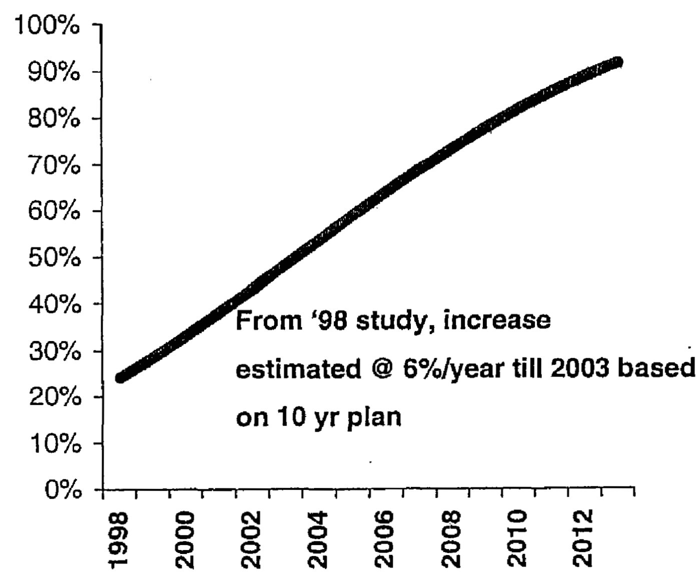
If no action is taken the creosote wood population will continue to deteriorate (see graphs below)

CREOSOTE WOOD POLES

FAILURE RATE vs POLE AGE

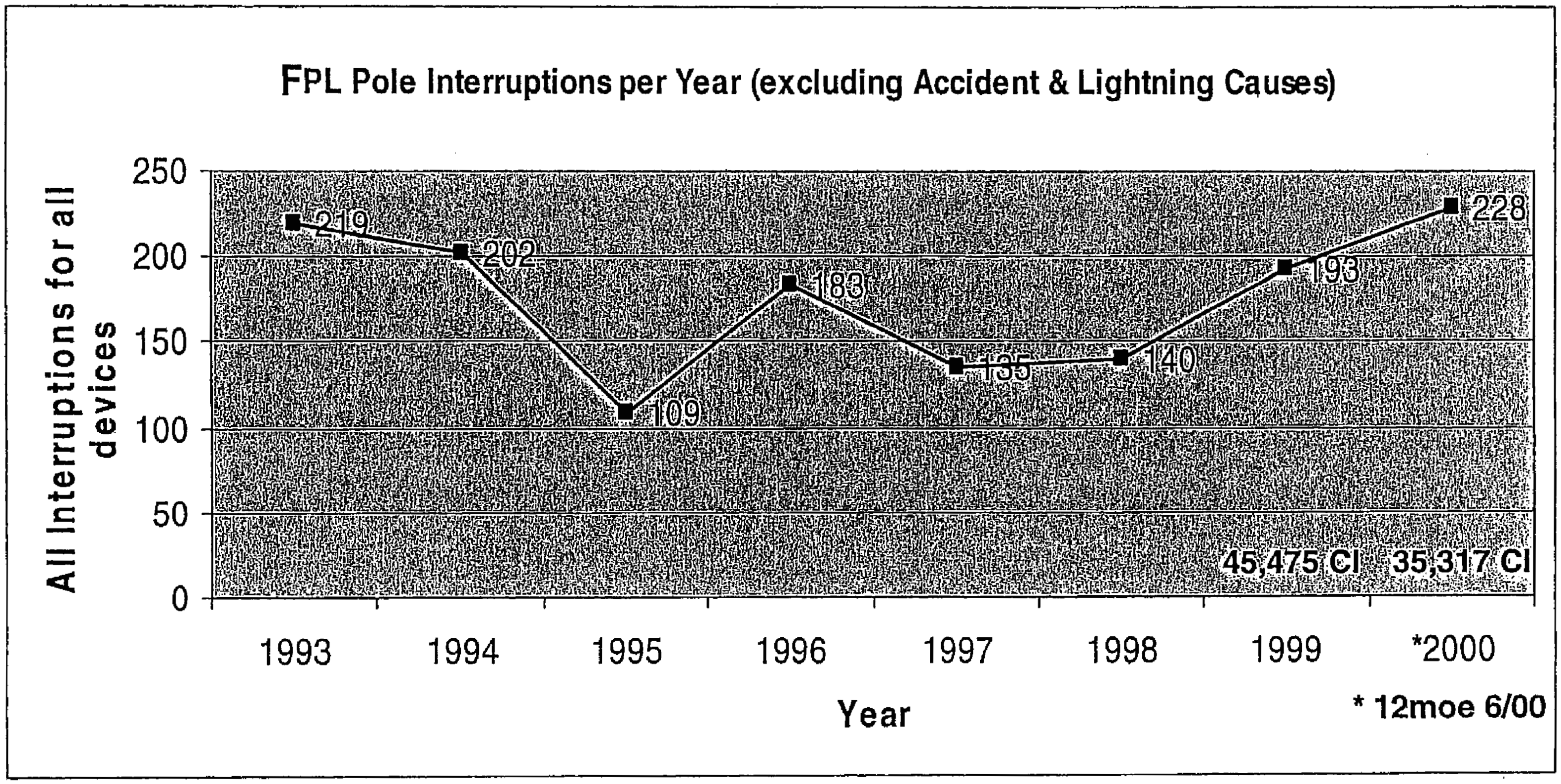


POPULATION FAILURE RATE



4. Why should we continue the program? (continued)

- By effectively bracing, treating and replacing the remaining creosote wood poles we can also avoid an increase in failures & CI associated with creosote wood pole failures in the near future. See graph below:



NOTE: No yearly CI Savings or CI Avoidance are being attributed from this program.

5. 2001-2003 Alternatives

The Alt #1 plan is the same as Alt #3 plan since there were no CI Savings contribution to SAIFI 1 plan.

Alt #1

(Addresses SAIFI = 1.00 Plan)	2001-2003 Budget	Inspection/ Treatment		Bracing		[redacted]
PLAN- # of Poles			28200		2219	
TOTAL	$ 1,719,928	$	319,788	$	576,940	
O&M	$ 1,020,208	$	319,788	$	576,940	
CAPITAL	$ 699,720	$	-	$	-	
Total CAP % Split	41%		0%		0%	
$ per budget assumptions		$	11	$	260	
Workload/CMH impact	6860		0		0	
CI Savings	n/a	n/a		n/a		

Alt #2

(Spending level same or less than 2000)	2001-2003 Budget	Inspection/ Treatment		Bracing		[redacted]
PLAN- # of Poles			27000		2060	
TOTAL	$ 1,664,980	$	306,180	$	-	
O&M	$ 965,260	$	306,180	$	535,600	
CAPITAL	$ 699,720	$	-	$	-	
Total CAP % Split	0%		0%		0%	
$ per budget assumptions			11.34		260	
Workload/CMH impact	6860		0		0	
CI Savings	n/a	n/a		n/a		

ALT #3

(Same service level as 2000)	2001-2003 Budget	Inspection/ Treatment		Bracing		[redacted]
PLAN- # of Poles			28200		2219	
TOTAL	$ 1,719,928	$	319,788	$	576,940	
O&M	$ 1,020,208	$	319,788	$	576,940	
CAPITAL	$ 699,720	$	-	$	-	
Total CAP % Split	41%		0%		0%	
$ per budget assumptions			11.34		260	
Workload/CMH impact	6860		0		0	
CI Savings	n/a	n/a		n/a		

FPL 004463

Docket No. 060038-EI
James Byerley Exhibit No. __ (JSB-11)
Reliability 2000 Deployment Plan
Page 14 of 17

Pole Inspections (Contact: Debra Dominguez)

Implementation	1999 Actual	Target	Var		Budget	Actual	Var
Poles inspected	26,693	17,640	34%		$500,000	$504,375	1%

As of 12/31/99, Osmose has completed a total of 26,693 inspections in both NF & WB.
NF has completed inspection on approx. 12,102 poles from which 1,043 poles have failed inspection. Of the 1,043: A total of 586 poles were identified for bracing - FPL braced 529 and SBT pick up the cost for 57. The remaining 457 poles are identified for replacement.
In WB, approx. 14,591 poles were inspected, of which 894 failed inspection with a total of 342 identified for bracing (FPL braced 233, SBT braced 109). The remaining 552 are identified for replacement.

As of 12/31/99	Poles Inspected	Failed Inspection	Total Braced	Completed Bracing (FPL)	Completed Bracing (SBT)	Identified for Replacement
NF (Live Oak)	12,102	1043	586	529	57	457
WB (Belle Glade)	14,591	894	342	233	109	552
Total	**26,693**	**1,937**	**928**	**762**	**166**	**1009**

Vault Inspections (Contact: Jerry Jones)

Implementation

Vaults Inspected	Critical Vaults Target	Critical Vaults Actual	Non-Critical Vaults Target	Non-Critical Vaults Actual	All Vaults Target	All Vaults Actual
FPL	2492	2492	2508	4128	5000	6620
Suburban	425	425	0	321	425	746
NF	20	20	0	116	20	136
CF	105	105	0	0	105	105
BV	56	56	0	205	56	261
TC	29	29	0	0	29	29
MS	90	90	0	0	90	90
TB	9	9	0	0	9	9
GC	116	116	0	0	116	116
Urban	2067	2067	2508	3807	4575	5874
WB	115	115	0	0	115	115
BR	57	57	0	287	57	344
PM	139	139	0	0	139	139
WG	190	190	0	0	190	190
GS	167	167	0	0	167	167
ND	428	428	624	1636	1052	2064
CD	854	854	1884	1884	2738	2738
SD	117	117	0	0	117	117

Budget:

Budget	Actual	Var
$1,178,500	$1,294,383	10%

20 critical (annual) vaults were completed in December for year end total of 2,492.
This completed all scheduled vaults for the year.

745 non-critical (five year) inspections were completed in December for a year end total of 4,128.

A new, more accessible database was developed and was implemented in March.
This database gives the areas easy access to vault inspection progress as well as vault inspection information.

Budget variance caused by greater number of repairs for throwover systems than expected and added costs for inspecting and repairing equipment in vaults with OFC's.

Program: Pole Inspection Program **Date:** 07/16/04 **REV:** 1 **Program Owner:** Luis F. Gutierrez

Program Description:

Contractor to inspect distribution poles and treat or brace any restorable poles.

This program will continue to address the most critical areas requiring pole inspections and replacements.

Purpose & Necessity:

A pole inspection and maintenance program began in the early 1980's as way to maintain our decaying wood pole population.
By proactively bracing and treating the creosote wood poles upon inspection, we can effectively extend the life for the majority of the wood population.

Base Minus Plan	O&M	CAPITAL	TOTAL	Cap/ Total % Split	Driver	Driver Quantity	$ per Driver	CI Avoided	CI Saved	Total CI Reduced	$ / CI Reduced	OH FPL CMH	OH Cont CMH	UG FPL CMH	UG Cont CMH	Total CMH	Total $'s per CMH
2002 Budget	$400,916	$597,330	$998,246	60%													
2003 Budget	$384,801	$135,881	$520,682	26%	Poles	11,986	$43										
2004 Budget	$191,995	$329,868	$521,863	63%	Poles							2,856				2,856	$150
Inspection & Treat	$71,623	$0	$71,623	0%	Poles	5,625	$13										
Bracing	$21,840	$0	$21,840	0%	Poles	80	$273										
Replacement	$98,532	$329,868	$428,400	77%	Poles	238											
2005 Budget	$187,414	$324,012	$511,426	63%	Poles							3,269				3,269	$142
Inspection & Treat	$31,467	$0	$31,467	0%	Poles	1,960	$16										
Bracing	$17,085	$0	$17,085	0%	Poles	59	$291										
Replacement	$138,862	$324,012	$462,874	70%	Poles	272	$1,700										
2006 Budget	$191,912	$331,788	$523,700	63%													
2007 Budget	$196,902	$340,414	$537,316	63%													
2008 Budget	$202,218	$349,605	$551,824	63%													
2009 Budget	$207,880	$359,394	$567,275	63%													

Deployment Selection Criteria:

Boca Raton was selected as the area for inpections because they have the most CI due to pole failures since 2000. Carryover pole replacements will still be in NF and WB.

Budget Assumptions:

Price to inspect and treat poles have been inflated by 5%. Price has been constant for the last two years.
Average price for pole replacement was calculated from completed WR's for the end of 2003 and beg of 2004.
Contractor will be used for inspections, treatment and bracing. Electrical contractors or FPL crews will be used for pole replacements.
Estimated 12 CMH per pole

Cost Tracking:

Pole inspections and bracing are tracked and accumulated on a monthly basis through a centralized work order 5365-92-035.
Pole replacement Work Requests are charged to Job Type 85J & monitored through the FMIP system.

Performance Tracking:

Poles inspected, braced and replaced.

CI Savings and Avoidance Methodology:

NO CI Savings in this program. This is a maintenance program.

Schedules & Due Dates:

All inspections and bracing done by 6/30/05. Pole replacements done by 12/31/05.

Program: Pole Inspection Program **Date:** 07/16/04 **REV:** 1 **Program Owner:** Luis F. Gutierrez

Program Description:
Contractor to inspect distribution poles and treat or brace any restorable poles. Rejected pole locations are submitted to areas for replacement.
This program will continue to address the most critical areas requiring pole inspections.

Purpose & Necessity:
A pole inspection and maintenance program began in the early 1980's as way to maintain our decaying wood pole population.
By proactively bracing and treating the creosote wood poles upon inspection, we can effectively extend the life for the majority of the wood population.

Base Plan	O&M	CAPITAL	TOTAL	Cap/ Total % Split	Driver	Driver Quantity	$ per Driver	CI Avoided	CI Saved	Total CI Reduced	$ / CI Reduced	OH FPL CMH	OH Cont CMH	UG FPL CMH	UG Cont CMH	Total CMH	Total $'s per CMH
2002 Budget	$400,916	$597,330	$998,246	60%													
2003 Budget	$384,801	$135,881	$520,682	26%	Poles	11,986	$43										
2004 Budget	$191,995	$329,868	$521,863	63%	Poles							2,856				2,856	$150
Inspection & Treat	$71,623	$0	$71,623	0%	Poles	5,625	$13										
Bracing	$21,840	$0	$21,840	0%	Poles	80	$273										
Replacement	$98,532	$329,868	$428,400	77%	Poles	238	$1,800										
2005 Budget	$191,239	$330,624	$521,863	63%	Poles							3,336				3,336	$142
Inspection & Treat	$32,109	$0	$32,109	0%	Poles	2,000	$16										
Bracing	$17,434	$0	$17,434	0%	Poles	60	$291										
Replacement	$141,696	$330,624	$472,320	70%	Poles	278	$1,700										
2006 Budget	$195,829	$338,559	$534,388	63%													
2007 Budget	$200,920	$347,362	$548,282	63%													
2008 Budget	$206,345	$356,740	$563,085	63%													
2009 Budget	$212,123	$366,729	$578,852	63%													

Deployment Selection Criteria:
Boca Raton was selected as the area for inpections because they have the most CI due to pole failures since 2000. Carryover pole replacements will still be in NF and WB.

Budget Assumptions:
Price to inspect and treat poles have been inflated by 5%. Price has been constant for the last two years.
Average price for pole replacement was calculated from completed WR's for the end of 2003 and beg of 2004.
Contractor will be used for inspections, treatment and bracing. Electrical contractors or FPL crews will be used for pole replacements.
Estimated 12 CMH per pole

Cost Tracking:
Pole inspections and bracing are tracked and accumulated on a monthly basis through a centralized work order 5365-92-035.
Pole replacement Work Requests are charged to Job Type 85J & monitored through the FMIP system.

Performance Tracking:
Poles inspected, braced and replaced.

CI Savings and Avoidance Methodology:
NO CI Savings in this program. This is a maintenance program.

Schedules & Due Dates:
All inspections and bracing done by 6/30/05. Pole replacements done by 12/31/05.

IX

Program: Creosote Pole Insp

Date: 30-Jun-98

Revised: 25-Aug-98

Program Manager: Pepe Diaz

Program Owner: I. Ares

Program Type (X):

	Regulatory Compliance/Commitment	X	Customer Impact
	High CMI/SU Impact program		Momentary Interruptions Reduction
X	Other, Please describe: Infrastructure Improvement		

Program Description: Inspect distribution poles and treat, brace or replace as necessary
It is expected that 22% of the creosote pole population will be rejected after inspection.
75% of the poles will be braced and 25% will be replaced.

Alternative Description	1998 Revised Budget	1998 YE	1999			2000	
Alternative #1 4 year program Inspect 325,000 poles per year			O&M $ $ 7,080,000 total =	Capital $ $ 10,620,000 $ 17,700,000	CMI Sav n/a	O&M $ $ 7,080,000 total =	Capital $ $ 10,620,000 $ 17,700,000
	Driver Desc: See below # in 1998 Actual Cost per Hist Cap %		# in 1999 Cost per Cap %	60%			
Alternative #2 7 year program Inspect 185,714 poles per year			O&M $ $ 6,060,000 total =	Capital $ $ 4,040,000 $ 10,100,000	CMI Sav n/a	O&M $ $ 6,060,000 total =	Capital $ $ 4,040,000 $ 10,100,000
Alternative #3(Pref) 10 year program Inspect 130,000 poles per year	N/A New Program	Forecast Not Avail New Program	O&M $ $ 5,041,500 total =	Capital $ $ 2,046,000 $ 7,087,500	CMI Sav n/a	O&M $ $ 5,041,500 total =	Capital $ $ 2,046,000 $ 7,087,500
Alternative #3a 10 year program Inspect 130,000 poles per year (With no year 1 replacements)	N/A New Program		O&M $ $ 3,677,500 $ 1,120,000 $2,557,500 total =	Capital $ $0 = Inspections = Bracing $ 3,677,500	CMI Sav n/a	O&M $ $ 5,041,500 total =	Capital $ $ 2,046,000 $ 7,087,500

Recommendation: Alternative #1 — Alternative #2 — X Alternative #3

Preferred Plan	$ Total	O&M $	Capital $	CMI Savings	CMH'S	Remarks
Carryover amount	none	none	none	none	none	New Project

All new 1999 created work

AREA IMPLEMENTATION

	NF	CF	BV	TC	MS	TB	GC	WB	BR	PM	WG	GS	ND	CE	SD
CAP $'s	10%	10%	10%	7%	7%	7%	8%	8%	8%	4%	4%	4%	5%	4%	4%

Budgetary assumptions (N, Lbar, CMI or other target methodology):
Failure Rates: 22%; Overall = 10.5%
For Creosote: 25% replace, 75% brace
List Drivers: Inspection $8.62/pole; Bracing $250/pole; Replacement $1,000/pole CMH = 10/pole replaced
mplementation Plan and schedule: Start inspection & replacement program: 1/99

Approvals:	John Easterling	Renee Mcvety	Denise Fagan
	Reliability Performance	Cost & Performance	SC Support

FPL 004449

EXHIBIT II

Random Review of FPL Thermovision Inspection Reports

(from Bates 001225)

File	Report #	Feeder	Date	# Reported Locations	Deterior. Pole	Deterior. arms	Vegetation	Comments
04 BR	7704	6867	12/17/2004	19			2	
04 BR	11604	4232	1/20/2004	13			2	
04 BR	50604	3232	7/12/2004	19		3	6	
04 GC	8404	3564	3/15/2004	18		1	4	
04 GC	23004	2166	3/8/2004				2	
04 GC	42004	3861	5/17/2004	22		1	5	
04 PM	13304	6863	2/2/2004	16	1			
04 PM	30804	2631	4/12/2004	13			5	
04 PM	59704	1131	7/30/2004	14			5	
04 PM SR	151	4463	2/13/2004	11				Woodpecker hole @ Loc. 11 not noted
04 PM SR	582	5862	8/13/2004	30	1		16	
04 WB	19104	8662	2/19/2004	16			1	
04 WB	19604	7664	2/16/2004	43				
04 WB	49804	4433	7/12/2004	29	2	3	8	Missed Deterior. Arm at Loc.8
Subtotal				263	4	8	56	
% of Subtotal					1.52	3.04	21.29	

Docket No. 060038-EI
James Byerley Exhibit No.__(JSB-13)
Random review of FPL Thermovision Inspection Reports

page 2

Random Review of FPL Thermovision Inspection Reports

(from Bates 001227)

File	Report #	Feeder	Date	# Reported Locations	Deterior. Pole	Deterior. arms	Vegetation	Comments
CF	1001	204632	5/20/2005	24			11	
	10788	102033	1/13/2005	28				Missed woodpecker hole at location 1
	30705	1464	4/13/2005	39			6	
ND	10088	802531	5/31/2005	37	1	1	3	Missed split pole top at loc. 23
	10271	801436	8/9/2005	23			9	
	44488	806331	7/6/2005	15		5		
SD	10071	802032	8/9/2005	15			8	
	11066	811362	9/6/2005	18	1		1	Leaning pole at loc. 18 noted
	40205	3232	3/29/2005	16	1			Missed badly twisted arm at loc. 1
WD	10388	808164	5/31/2005	23	1	2		Missed apparent det. pole top and arm @ loc. 17
	47905	810434	6/27/2005	18			1	
	48205	805536	6/22/2005	32			2	
Subtotal				288	4	8	41	
% of Subtotal					1.39	2.78	14.24	
Total				551	8	16	97	
% of total					1.45	2.90	17.60	

C:\Documents and Settings\poucher.earl\Local Settings\Temporary Internet Files\OLKAF\Exhibit II thermo survey
3/30/2006 Jbyerley

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Utilities Service

BULLETIN 1730B-121

SUBJECT: **Pole Inspection and Maintenance**

TO: All Electric Borrowers

EFFECTIVE DATE: Date of Approval

EXPIRATION DATE: Seven years from effective date

OFFICE OF PRIMARY INTEREST: Transmission Branch, Electric Staff Division

FILING INSTRUCTIONS: This bulletin replaces REA Bulletin 161-4, "Pole Inspection and Maintenance," dated October 17, 1974. File with 7 CFR Part 1730.

PURPOSE: To provide RUS borrowers with information and guidance for establishing or sustaining a continuing program of pole maintenance.

[signature]
Administrator

4/15/96
Date

3. PLANNED INSPECTION AND MAINTENANCE PROGRAM: The purpose of a planned inspection program is to reveal and remove danger poles and to identify poles which are in early stages of decay so that corrective action can be taken. The end result of the inspection program is the establishment of a continuing maintenance program for extending the average service life of all poles on the system. The steps in developing a planned pole inspection and maintenance program are outlined below:

3.1 Spot Checking: Spot checking is the initial step in developing a planned pole inspection and maintenance program. Spot checking is a method of sampling representative groups of poles on a system to determine the extent of pole decay and to establish priority candidates for the pole maintenance measures of the program. A general recommendation is to inspect a 1,000-pole sample, made up of continuous pole line groupings of 50 to 100 poles in several areas of the system. The sample should be representative of the poles in place. For instance, all the poles on a line circuit or a map section should be inspected as a unit and not just the poles of a certain age group. The inspection of the sample should be complete, consisting of hammer sounding, boring, and excavation as described in Section 4. Field data should be collected on the sample as to age, supplier, extent of decay, etc.

The data should be analyzed to determine the areas having the most severe decay conditions and to establish priorities for a pole-by-pole inspection of the entire system. It may be desirable to take additional samples on other portions or areas of the system to determine if the severity of decay is significantly different to warrant the establishment of an accelerated pole inspection and maintenance program for that portion of the system. The results of the spot check will aid in scheduling a continuous pole inspection and maintenance program at a rate commensurate with the incidence of decay.

3.2 Scheduling the Inspection and Maintenance Program: If an ongoing maintenance program is not in place, the suggested timing for initial pole-by-pole inspection and subsequent reinspection is shown in Table 3-1. Supplementary treatment is performed where necessary after the initial inspection.

Decay Zone	Initial Inspection	Subsequent Reinspection	Percent of Total Poles Inspected Each Year
1	12 - 15 Yrs	12 Yrs	8.3%
2 & 3	10 - 12 Yrs	10 Yrs	10.0%
4 & 5	8 - 10 Yrs	8 Yrs	12.5%

Table 3-1 - Recommended Pole Inspection Schedules

The vulnerability of poles to decay is generally proportionate to the decay zone in which they are installed. As a general recommendation, the initial pole-by-pole inspection program should be inaugurated at a yearly rate of 10 percent of the poles on the entire system when the average age of the poles reaches 10 years. If a spot check indicates that decay is advanced in 1 percent of the pole sample, the inspection and maintenance program should be accelerated so that a higher percentage of poles are inspected and treated sooner than the figures shown in Table 3-1. If the decay rate is low for a particular decay zone or area of the system, the pole-by-pole inspection can be adjusted accordingly. Historical inspection data indicates that the ratio between the decaying/serviceable poles to reject poles in the 10-15 year age group is about six or more to one. In a 30-year age group, the ratio was down to about one to one or less. In the latter group, the survivors have more than sufficient residual preservative to protect them indefinitely. The poorly treated poles in the 30-year old group usually have already decayed and been replaced.

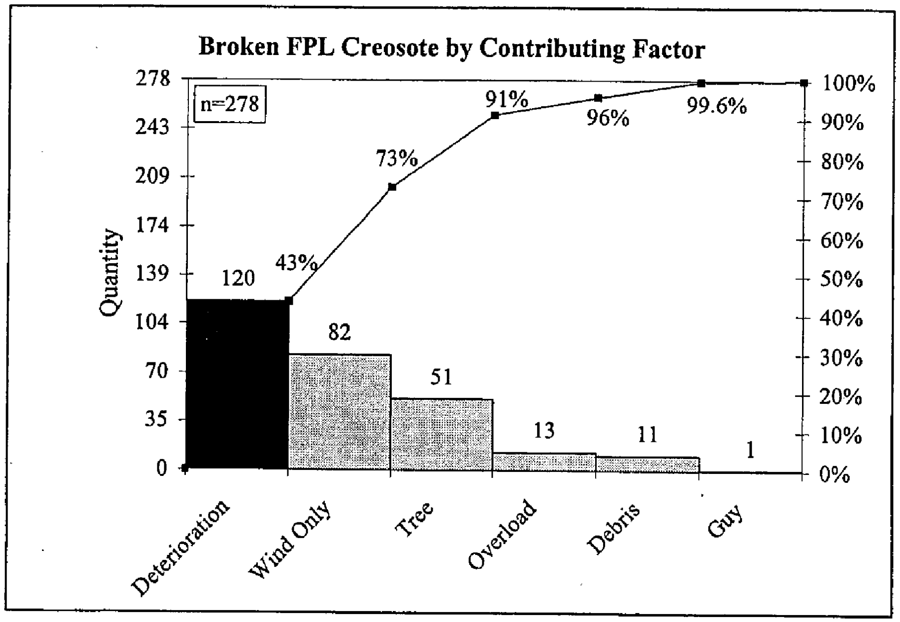
The greatest economic benefit from regular inspection is in locating the decaying/serviceable group. Treatment of poles in this group can extend pole life, thereby avoiding the cost of emergency replacement. Inspection and proper maintenance can more than pay dividends by extending the serviceable life of the poles. With the costs of replacing poles rising, the economics of extending the service life become more favorable.

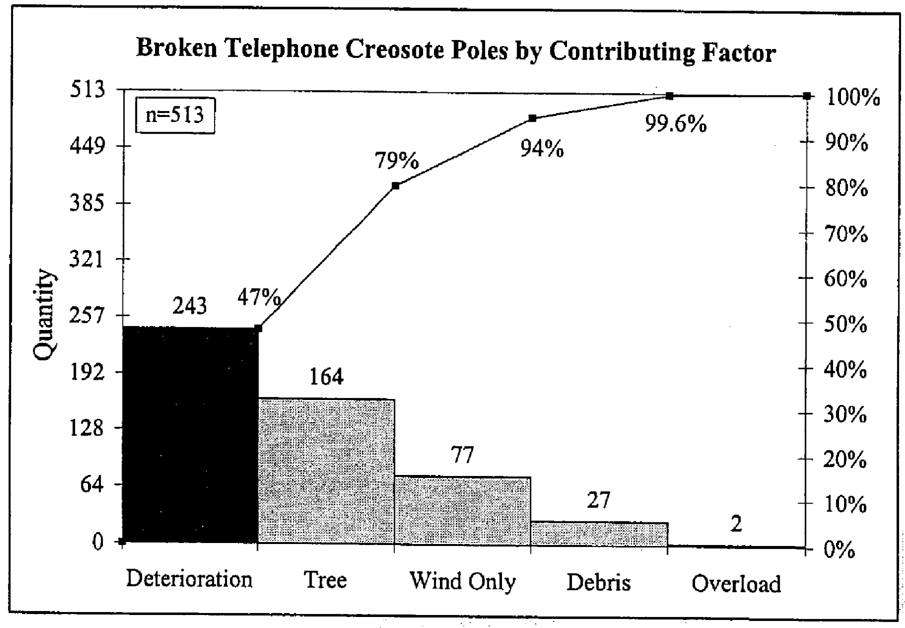
3.3 <u>Setting Up the Program</u>: The pole-by-pole inspection and maintenance work may be done by system employees or by contracting with an organization specializing in this type of work. The choice should be made on the basis of the amount of work to be done, availability, depth of trained people on staff, and a comparison of the costs. Developing the necessary skills in the system's own crews may require considerable time and be contingent upon the availability of an experienced inspector to train system employees. Therefore, qualified contract crews may be preferable for this work in many instances. To be considered qualified, the individual should have inspected, at a minimum, 5,000 poles under a qualified inspector and another 5,000 poles independently, but under close supervision. When the inspection program is underway, the work of the person chosen to inspect should be checked every week or two by the system's representative and the inspector's supervisor. The best way to check an inspector's work is to select at random about 10 poles inspected in the last few weeks, and perform a complete reinspection of the 10 poles. The reinspection should include: re-excavating, removal of paper and treatment, testing for hollow sounds, taking a boring, checking soft surface wood, remeasuring the pole, rechecking the calculations, then retreating and backfilling. If any serious first inspection errors are discovered, all work performed by the inspector between these spot checks should be reinspected.

Percent Broken versus Percent of Population

Pole Type	Broken	Population	Difference
CCA	35%	40%	-5%
Concrete	6%	9%	-3%
Creosote	45%	34%	12%
Penta	14%	18%	-3%

Broken Creosote Poles





Hardening of the Infrastructure: A Five Point Plan

Poles

Objective/Strategy Assess FPL's pole population

Current Situation

POLE POPULATION			
	FPL	SBT	TOTAL
CCA	699,039	-	699,039
Creosote	323,034	72,283	395,317
Penta	-	156,421	156,421
Total Wood	1,022,073	228,704	1,250,777
Concrete	65,403	-	65,403
Total Poles	1,087,476	228,704	1,316,180

- Last Creosote installed in FPL 1978
- Pole inspection program discontinued in 1991, re started in 1999. Average number of poles inspected per year since 1999 is 11,877 (1.1% of population).
- No deterioration has ever been reported in CCA or concrete poles.
- Hurricane Results – 76% in Katrina and 46% in Wilma of Creosote poles non-tree related damaged was due to deterioration.
- In Wilma, Creosote poles failed at a higher rate than CCA or Penta poles.

Summary of Plan

- Accelerate our current pole inspection program to a 5 year plan to inspect all creosote poles and a statically valid sample of CCA poles. Cost per year.

FPL - 5 yr	O&M	CAPITAL	TOTAL	Driver Quantity	$ per Driver
Total	$ 4,245,660	$ 3,997,869	$ 8,243,529		
Inspection & Treat	$ 1,445,900		$ 1,445,900	64,607	$ 22
Bracing	$ 1,086,387		$ 1,086,387	3,683	$ 295
Replacement	$ 1,713,372	$ 3,997,869	$ 5,711,241	3,360	$ 1,700

- Replace Creosote poles in conjunction with Small Wire program anticipate x poles a year over x years. See Conductor review.

Impact (expected results/improvement)

- Extend life of creosote poles that have exceeded manufacturer's expected life.
- Reduce creosote pole failures by 22% during storm events.

Obstacles

- FPL is attached to 72,283 SBT creosote poles. Need to negotiate with SBT to inspect, treat and replace if necessary this population.
- Resources to replace poles found during inspections. A 5 year inspection plan will identify about 3,360 poles to be replaced. This equates to 40,315 construction mhrs.

Future Plans

- KEMA Consulting review due mid January
    - o Review and analyze forensic data of poles from hurricane Katrina & Wilma to determine cause of pole failures
    - o Review pole standards (wind load, axial load, foundation and pole setting depths)
    - o Review pole specifications and manufacture's quality assurance process
    - o Review historic and current practices including frequency of inspections, testing methods, program specifications, use of reinforcement, and effectiveness of treating.

	North Florida Area			West Palm Area			Boca Raton Area		
	Inspected	Identified for Bracing	Identified to Replace	Inspected	Identified for Bracing	Identified to Replace	Inspected	Identified for Bracing	Identified to Replace
1999	12,102	529	457	14,591	233	552			
2000	18,197	258	307	11,156	501	298			
2001	2,438	92	98	2,486	122	56			
2002	1,829	23	43	1,830	97	20			
2003	5,625	80	42	5,180	277	266			
2004	5,697	63	150		-				
2005							2,013	218	117

	TOTAL						
	Inspected FPL & SBT	Identified for Bracing	Identified to Replace	Total Reject	Reject	% Brace	% Replace
1999	26,693	762	1,009	1,771	6.6%	2.9%	3.8%
2000	29,353	759	605	1,364	4.6%	2.6%	2.1%
2001	4,924	214	154	368	7.5%	4.3%	3.1%
2002	3,659	120	63	183	5.0%	3.3%	1.7%
2003	10,805	357	308	665	6.2%	3.3%	2.9%
2004	5,697	63	150	213	3.7%	1.1%	2.6%
2005	2,013	218	117	335	16.6%	10.8%	5.8%
	83,144	2,493	2,406	4,899	5.9%	3.0%	2.9%
	11,878						

	North Florida Area			West Palm Area			Boca Raton Area		
	Inspected	**Identified for Bracing**	**Identified to Replace**	**Inspected**	**Identified for Bracing**	**Identified to Replace**	**Inspected**	**Identified for Bracing**	**Identified to Replace**
1999	12,102	529	457	14,591	233	552			
2000	18,197	258	307	11,156	501	298			
2001	2,438	92	98	2,486	122	56			
2002	1,829	23	43	1,830	97	20			
2003	5,625	80	42	5,180	277	266			
2004	5,697	63	150		-				
2005							2,013	218	117

	TOTAL						
	Inspected FPL & SBT	**Identified for Bracing**	**Identified to Replace**	**Total Reject**	**Reject**	**% Brace**	**% Replace**
1999	26,693	762	1,009	1,771	6.6%	2.9%	3.8%
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2001	4,924	214	154	368	7.5%	4.3%	3.1%
2002	3,659	120	63	183	5.0%	3.3%	1.7%
2003	10,805	357	308	665	6.2%	3.3%	2.9%
2004	5,697	63	150	213	3.7%	1.1%	2.6%
2005	2,013	218	117	335	16.6%	10.8%	5.8%
	83,144	2,493	2,406	4,899	5.9%	3.0%	2.9%

R2K PROJECT SUMMARY REPORT

December 2000 Reliability Update — Pole Inspections (Contact: Charlie McQueen 552-2277)

Monthly Status Report:

As of 12/31/00 by Osmose Contractor, 18,197 poles have been inspected in the NF area (Lake City) from which 565 poles have failed inspection. Of the 565 poles, 258 are possible candidates for Bracing and the remaining 307 have been identified for replacement in the year 2001.

The WB area has had 11,156 poles inspected from which 799 poles failed inspection, 501 are possible candidates for Bracing and the remaining 298 have been identified for replacement in the year 2001.

Area	INSPECTIONS Target	INSPECTIONS Actual	INSPECTIONS FAILED Inspection	BRACING '00 Candidates	BRACING Actual Braced	REPLACEMENT '99 Identified	REPLACEMENT Actual Replaced
NF	14,100	18,197	565	258	222	412	412
WB	14,099	11,156	799	501	351	274	123
FPL	28,199	29,353	1,364	759	573	686	535
% completed		104%			75%		78%

	YE BUDGET O&M $	YE BUDGET Cap $	YE BUDGET Total $	YTD ACTUAL O&M $	YTD ACTUAL Cap $	YTD ACTUAL Total $
NF	$74,160	$419,741	$493,901	$116,152	$249,402	$365,554
WB	$49,320	$279,616	$328,936	$53,719	$141,876	$195,595
Centralized	$842,520	$0	$842,520	$505,302	$0	$505,302
FPL	$966,000	$699,357	$1,665,357	$675,174	$391,277	$1,066,451

FPL var YTD - YE Budget	O&M $	Cap $	Total $
	-30%	-44%	-36%

December 2001 R-1 Update - Pole Inspections (Contact: Jessica D'Agostini 552-2830)

Urban | Suburban | FPL | CAUTION | PROBLEM

	YE BUDGET			YTD BUDGET			YTD ACTUAL			YTD Variances		
	O&M $	Cap $	Total $	O&M $	Cap $	Total $	O&M $	Cap $	Total $	Var O&M	Var Cap	Var Total
NF	$52,920	$299,880	$352,800	$52,920	$299,879	$352,799	$71,074	$152,182	$223,256	34%	-49%	-37%
WB	$49,860	$282,540	$332,400	$49,860	$282,539	$332,399	$135,214	$219,522	$354,736	171%	-22%	7%
Centralized	$413,056	$0	$413,056	$413,056	$0	$413,056	$164,344	$0	$164,344	-60%		-60%
FPL	$515,836	$582,420	$1,098,256	$515,836	$582,418	$1,098,254	$370,692	$371,704	$742,396	-28%	-36%	-32%
						delta FMIP to Area total	-$60		-$60			

YTD	INSPECTIONS				BRACING		REPLACEMENT							2000 Data	
Area	Target	Actual	Failed Insp'	% Comp	01 Identified	Actual Braced	00 Identified	01 Identified	YTD Actual Replaced	Total Existing Backlog	Revised Plan *	% of Revised Plan YTD Completed	2001 YTD Cost per Pole Replaced	2000 YE Cost per Pole Replaced	Poles Replaced
NF	2,458	2,438	190	99%	92	81	307	98	191	214	392	49%	$1,169	$887	412
WB	2,458	2,486	178	101%	122	103	315	56	284	87	201	141%	$1,249	$1,590	123
FPL	4,916	4,924	368	100%	214	184	622	154	475	301	593	80%	$1,217	$1,049	535

* Estimated maximum # of poles to be replaced based on Budget

Monthly Status Report:

As of 12/31/01, Osmose finished all the planned inspections for 2001.
Poles to be braced by Osmose have been completed 100 %.
The **WB** area replaced **212** poles carried over from 2000, and has replaced **72** out of 103 inspected in 2000 to replace in 2001.
The **NF** area replaced **191** poles which were identified for replacement in the 2000 inspections.

WB YTD Actual is **7%** over theYTD Budget. **WB** replaced **83** more poles than the YE estimate (See Revised Plan).
NF completed **49%** of the poles targeted for replacement in 2001. The remaining poles were not replaced due to O&M budgeted contraints in the Area.

Docket No. 060038-EI
James Byerley Exhibit No.__(JSB-16)
Hardening of the Infrastructure
A Five Point Plan

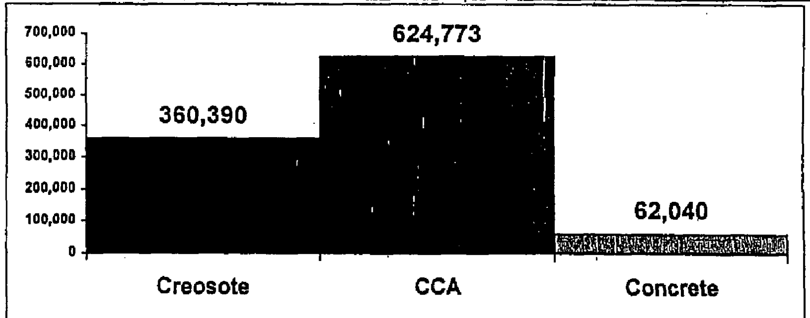
Dec 2002 R-1 Update - Pole Inspections RS85G-85702 (Contact: Jorge A. Rodriguez 305 552-2048)

	NF				WB				Centralized			FPL				
Budget	Total	O&M	Capital	% Cap Split	Total	O&M	Capital	% Cap Split	Total	O&M	Capital	Total				
Original YE Budget	$580,450	$197,353	$383,097	66%	$323,917	$109,684	$214,233	66%	$93,879	$93,879	$0	$998,246	$400,916	$597,330	60%	
Rev 6/02 YE Budget	$484,035	$100,938	$383,097	79%	$270,332	$56,099	$214,233	79%	$93,879	$93,879	$0	$848,246	$250,916	$597,330	70%	
YTD Budget	$484,035	$100,938	$383,097	79%	$36,722	$16,194	$20,528	56%	$327,489	$133,784	$193,705	$848,246	$250,916	$597,330	70%	
YTD Actual	$128,564	$50,706	$77,858	61%	$37,413	$16,508	$20,905	56%	$299,922	$102,929	$196,992	$465,899	$170,143	$295,756	63%	
YTD % Var	-73%	-50%	-80%		2%	2%	2%		-8%	-23%		-45%	-32%	-50%		
% of YTD Act to YE Bud	27%	50%	20%		14%	29%	10%		319%	110%		55%	68%	50%		
YE Estimated																

Quality Indicator (All Pole Customer Int's due to Corrosion/Decay)

	1998	1999	2000	2001	YTD 2001	YTD 2002	YTD Gap 2002 - 2001	% Gap
FPL	5,413	16,384	12,355	16,897	19,870	28,100	8,230	29%
NF	72	1,604	340	46	46	53	7	13%
WB	2,401	141	79	5,099	5,101	777	-4,324	-556%

2002 Estimated Pole Population by Type



Implementation

YTD	INSPECTIONS				BRACING		REPLACEMENT							2002 COST/Pole		Referance 2001	
Area	Target	Actual	Failed Insp'	% Comp	02 Identified	Actual Braced	Total YTD Poles to be Replaced based on previous YR Inspections	02 Osmose Identified	YTD Actual Replaced	Remaining Poles YTD	% YTD Replaced	Deployment Plan *	Cost per Pole Replaced	Poles Replaced	Cost per Pole Replaced	Poles Replaced
NF	1,830	1,829	66	100%	23	23	135	43	135	0	100%	361	$952	135	$1,169	191
WB	1,830	1,830	117	100%	97	97	213	20	30	183	14%	280	$1,247	30	$1,249	284
FPL	3,660	3,659	183	100%	120	120	348	63	165	183	47%	641	$1,006	165	$1,181	475

* Estimated maximum # of poles to be replaced based on Original Budget

Monthly Status Report:

The WB funds $ 233,610 (193,705 Cap & 39,905 O&M) for Osmose Pole replacemnts were used to replace 83 Interstate Highway X-ings poles.
The 2002 YE Actual Charges to Location 036 are $ 206,042 ($ 196,992CAP & 9,050 O&M).
2 Interstate Highway X-ings poles have been replaced. The remaining 11 are in construction.
The Osmose pole inspections began on May & July 2002 in WB & NF.The inspections were completed on June 28 & Aug 14, 2002 for WB & NF, respectively.
The bracing of the 120 poles were completed by October 25, 2002.
There was an accrual of $31,000 towards the "Centralized budget",due to the Osmose inspections of the Interstate Highway X-ings back in 2001.
Inspections BUCS 925365; $ 50,591 budget and $ 43,471 Actual: Bracing $ 43,288 budget and $ 36,787 Actual).
Osmose Contact David "Buck" Braswell 904-509-5179 Cell ; Supervisor Doug Hagled office 813-684-7338; Cell 813-299-5176

ON | PROBLEM

December 2003 R-1 Update - Pole Inspections & Replacement - (Contact: Karina Perez 305-552-3607)

Implementation

	YTD Actual	YTD Target	REV YTD Target	YE Target	REV YE Target
Poles Inspected	10,805	11,856	10,805	11,856	10,805
Poles Replaced	30	121	30	129	30

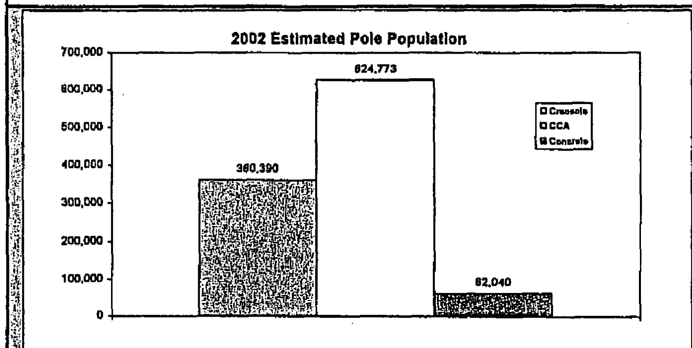
Quality Indicator: (Good = +)

Year	NF CI	WB CI	This Program CI
YE 2002 & Target	153	804	957
This 12 moe	404	5,032	5,436
GAP 03 - 02	-251	-4,228	-4,479
% Under Target	-164%	-526%	-468%

Quality Indicator: All FPL CI due to Major Cause Code Cor/Decay + Equip. Failure (187) & Equip. code = Poles (81)

FPL

Budget	Total	O&M	Capital
YE Budget	$520,682	$384,801	$135,881
Rev Budget	$520,682	$384,801	$135,881
YTD Budget	$520,682	$384,801	$135,881
YTD Actual	$446,337	$281,116	$165,221
YTD % Var	-14%	-27%	22%
% of YTD Act to YE Bud	86%	73%	122%



Operations Support

Budget	Total	O&M	Capital
YE Budget	$315,038	$315,038	0
Rev Budget	$315,038	$315,038	0
YTD Budget	$315,038	$315,038	$0
YTD Actual	$357,157	$247,077	$110,081
YTD % Var	13%	-22%	0%
% of YTD Act to YE Bud	113%	78%	0%

AREA

Budget	Total	O&M	Capital
YE Budget	$205,644	$69,763	$135,881
Rev Budget	$205,644	$69,763	$135,881
YTD Budget	$205,644	$69,763	$135,881
YTD Actual	$89,180	$34,039	$55,140
YTD % Var	-57%	-51%	-59%
% of YTD Act to YE Bud	43%	49%	41%

	Inspections					Bracing			Replacement					
Area	Target	Revised Target	Actual	Failed Inspection	% Complete	Target	YTD Need Bracing (Rev Target)	YTD Actual Braced	Carry over from 2002	Osmose 2003 Survey	Total Carry over & Osmose Survey	2003 Target	2003 Revised YE Target	YTD Actual
NF	5,928	5,625	5,625	122	100%	120	77	77	30	42	72	88	30	30
WB	5,928	5,180	5,180	543	100%	513	208	208	183	266	449	41	0	0
FPL	11,856	10,805	10,805	665	91%	633	285	285	183	308	521	129	30	30

Program Description:

This is a pole inspection and maintenance program designed to maintain the decaying wood pole population. Osmose is the contractor that was selected to inspect and treat 11,856 poles equally divided between North Florida and West Palm. Poles that have been rejected and can be replaced or will be braced. The rejected pole locations are sent to the areas for replacement.

Monthly Status Report:

Budget Variance: There are approximately 17 WR's along major interstate highway crossings that carried over from 2002 into 2003 that account for $132,605 of the YE dollars spent under the Operations Support budget. In addition, there are approximately $18,000 of the cost of 2002 inspections that were paid to the contractor in 2003. These dollars were applied to the Operations Support Budget.

Inspections: Pole inspections were completed in NF and WB.
Find Rate: A total of 665 poles failed inspection. Of those, 357 needed bracing and 308 needed replacement.
Bracing: The Osmose contractor completed bracing all 77 poles in NF and 208 poles in WB.
Replacements: NF had 5 WR's to replace 30 poles from the 2002 survey. The WR #'s are: 458335,479623,509616,516762,339185. All of these WR's were completed in construction for a total of 30 poles replaced in NF. WB replacements have all been deferred to 2004.

The budgeted dollars shown are from the December 03 R-1_Sum.

Dec 2004 R-1 Update - Pole Inspections & Replacement (85J) (Contact: Luis F Gutierrez 305-552-2063)

CAUTION PROBLEM

Implementation

	YTD Actual	YTD Target	REV YTD Target	YE Target	REV YE Target
Poles Inspected	9,723	5,625	7,697	7,625	9,697
Poles Replaced	216	238	238	238	238

Quality Indicator: (Good = +)

Year	NF CI	WB CI	This Program CI
YE 2003 & Target	404	2,130	2,534
This 12 moe	573	1,977	2,550
GAP 04 - 03	-169	153	-16
% Under Target	-42%	7%	-1%

Quality Indicator: All FPL CI due to Major Cause Code Cor/Decay + Equip. Failure (187) & Equip. code = Poles (81)

FPL

Budget	Total	O&M	Capital
YE Budget	$521,863	$191,995	$329,868
Rev Budget	$521,863	$191,995	$329,868
YTD Budget	$521,863	$191,995	$329,868
YTD Actual	$532,123	$300,092	$232,031
YTD % Var	2%	56%	-30%
% of YTD Act to YE Bud	102%	156%	70%
YE Est			

Monthly Status Report:

Budget Variance: Osmose has completed all inspection and bracing work, this work was 10K over budget. The actual 0&M-Capital split for the pole replacements was 32% 0&M and 68% Capital. The budgeted split was 23% 0&M and 77% Capital.

The inspections and bracing budgeted for 2005 were accelerated in Dec of 2004. The actual cost for this work was $ 88,286 0&M and it is reflected in the YTD Dec dollars. This dollars were not budgeted in the program. A total of 2013 poles were inspected, 218 were braced and 117 were identified for replacement.

Inspections & Bracing: Pole inspections and bracing are 100% complete in NF.

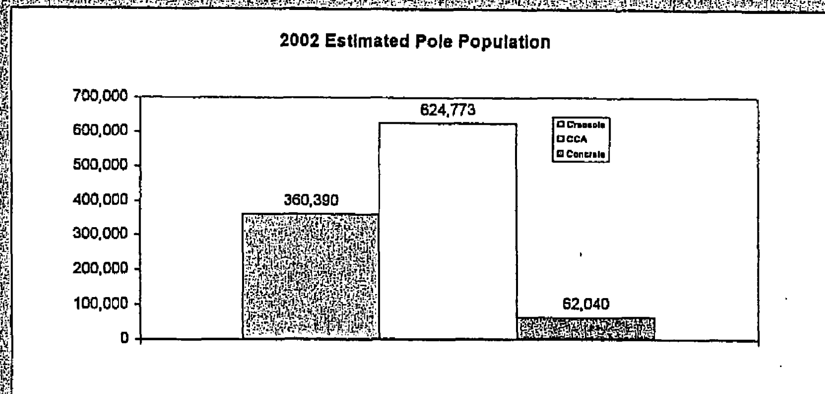
Find Rate: A total of 213 poles failed inspection. Of those, 63 needed bracing and 150 needed replacement.

Replacements: WB completed 134 pole replacements while NFcompleted 82. WB exceeded their budget for pole replacement in 0&M due to their 0&M split being higher than budgeted.

	Inspections					Bracing			Replacement					
Area	Target	Revised Target	Actual	Failed Inspection	% Complete	Target	YTD Need Bracing (Rev Target)	YTD Actual Braced	Carry over from previous	Osmose 2004 Survey	Total Carry over & Osmose Survey	2004 Target	2004 Revised YE Target	YTD Actual
NF	5,625	5,697	5,697	213	100%	80	63	60	42	150	192	84	84	82
WB	0	0	0	0	N/A	0	0	0	449	0	449	154	154	134
BR	2,000	2,000	2,013	117			218	218		117	117			0
FPL	7,625	7,697	7,710	330	100%	80	281	60	491	267	758	238	238	216

Program Description:

This is a pole inspection and maintenance program designed to maintain the decaying wood pole population. Osmose is the contractor that was selected to inspect and treat 5,625 poles in North Florida. Poles that have been rejected can be replaced or will be braced. The rejected pole locations are sent to the areas for replacement.



Deployment Plan

* Total # of poles to be inspected:	0
YTD Target:	0
YTD Actual:	4,344 *
Total # of poles to be replaced:	284
YTD Target:	284
YTD Actual:	284

Quality Indicator

	YTD Actual	YTD % Gap
YE 2004	2,673	
12 MOE	5,210	95%
CI Savings	-2,537	

All FPL CI due to cause code 187 & equipment code 081

Budget

		CAP	O&M	TOTAL
YE	Original Budget	$324,000	$187,416	$511,416
	Revised Budget	$324,000	$138,516	$462,516
	Estimate	$350,851	$194,765	$545,615
YTD	Budget	$324,000	$138,416	$462,416
	Actual	$345,851	$190,765	$536,615
	% Var	7%	38%	16%

Monthly Status Report

* All 2005 inspections (2,013) and bracing (218) were completed in Dec. 2004 in the BR Area. During these inspections 117 poles were identified for replacement.

Budget Variance: We have about 12K 0&M and 27K in capital from 2004 replacements. Budgeted for 272 replacements, actual replacements 284.
* Accelerated 4,344 inspections in BV from 2006 plan. Part of the cost of this went to the Pole inspection acccount, $ 49,277 and it is reflected in the numbers above. Remaining portion of these additional inspections, $48,894, were charged to account 1891-92-035 in error and is not reflected in the numbers above.

Execution by Area

Area	Plan				Execution						Exception	
	YE Target Inspection	YE Target Bracing	YE Target Replacement	YTD Target Replacement	Total WR's	Total Poles	YTD Completed in Design (50-60)		YTD Completed in Cnst. (70-90)		# WR not comp. by due date	# poles not comp. by due date
							WR's	# of Poles	WR's	# of Poles		
BR	compl in 04	compl in 04	117	117	6	117			6	117	0	0
BV												
CE												
CF												
GC												
GS												
MS												
ND												
NF			51	51	5	51			5	51	0	0
PM												
SD												
TB												
TC												
WB			116	116	15	116			15	116	0	0
WD												
WG												
FPL			284	284	26	284	0	0	26	284	0	0

Docket No. 060038-EI
James Byerley Exhibit No.__(JSB-16)
Hardening of the Infrastructure
A Five Point Plan
Page 10 of 10

FPL 102792

Hardening Distribution's Infrastructure

Plan to mitigate damage caused by Tropical Storms and Hurricanes

Executive Summary
November 2005

FPL

Objective

Develop multi-year plan to "harden" distribution's infrastructure to mitigate damage caused by a tropical storm or hurricane

- Reduce the number of interruptions caused by a tropical storm or hurricane, reducing the total restoration time and cost

FPL

Tropical Storm & Hurricane Probability

All named Tropical Storms and Hurricanes

1931 - 1959	---	10.1 per year
1960 - 1994	---	8.1 per year
1995 - 2005	**---**	**14.5 per year**

Source: National Hurricane Center website

According to the Max Mayfield, Director of National Hurricane Center, during his testimony to the U.S. Senate Subcommittee on Disaster Prevention and Prediction:

"We have entered a period of heightened hurricane activity......tropical cyclone activity in the Atlantic is cyclical, with a time period of multiple decades."

"Since the mid-1990's, activity increased sharply and this period of heightened activity could last another 10 – 20 years."

Tropical Storm & Hurricane Probability

Tropical Storms and Hurricanes striking the United States

State	# of total Hurricane Strikes	# of Major Hurricane Strikes
Florida	**110**	**35**
Texas	59	19
Louisiana	49	18
North Carolina	46	12

Source: National Hurricane Center website * From 1851 - 2004

- Florida has had 86% more hurricane strikes than the next highest State since 1851

Tropical Storm & Hurricane Probability – HAZUS Model

The risk of hurricanes varies around the state

	Dade		Volusia		Sarasota		Palm Beach	
Wind Speed	Inland	Coastal	Inland	Coastal	Inland	Coastal	Inland	Coastal
55	0.170	0.162	0.144	0.135	0.147	0.142	0.176	0.157
65	0.110	0.106	0.078	0.078	0.089	0.089	0.105	0.100
75	0.071	0.070	0.042	0.045	0.054	0.056	0.063	0.063
85	0.046	0.046	0.023	0.026	0.033	0.035	0.037	0.040
95	0.029	0.030	0.012	0.015	0.020	0.022	0.022	0.026
105	0.019	0.020	0.007	0.009	0.012	0.014	0.013	0.016
115	0.012	0.013	0.004	0.005	0.007	0.009	0.008	0.010
125	0.008	0.009	0.002	0.003	0.004	0.005	0.005	0.007
135	0.005	0.006	0.001	0.002	0.003	0.003	0.003	0.004
145	0.003	0.004	0.0006	0.0009	0.002	0.002	0.002	0.003
155	0.002	0.002	0.0003	0.0005	0.001	0.001	0.001	0.002
165	0.001	0.002	0.0002	0.0003	0.0006	0.0008	0.0006	0.001
175	0.0009	0.0011	0.00009	0.0002	0.0004	0.0005	0.0004	0.0007
185	0.0006	0.0007	0.00005	0.00010	0.0002	0.0003	0.0002	0.0004
195	0.0004	0.0005	0.00003	0.00006	0.0001	0.0002	0.0001	0.0003

This model is provided by the HAZUS system developed by the Federal Emergency Management Agency (FEMA)

- The costal southeast has 2X the probability each year of experiencing hurricane winds (>75mph) than the costal north region; **20.4% vs 10.6%**

Tropical Storm & Hurricane Costs

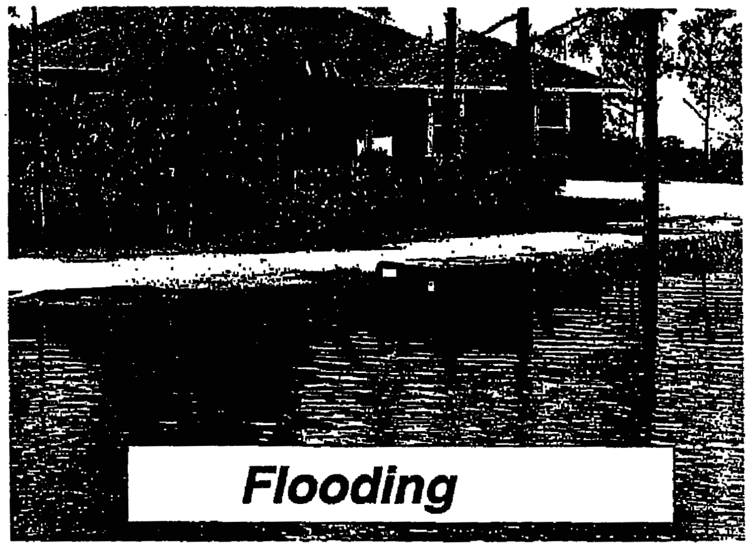
	Hurricane Rita	Hurricane Katrina	Hurricane Dennis	Hurricane Jeanne	Hurricane Frances	Hurricane Charley	Tropical Storm Gabrielle
	Sep-05 Est	Aug-05 Est	Jul-05	Sep-04	Sep-04	Aug-04	Sep-01
Customer Counts, Time & Cost							
Total Customers Affected	140,000	1,453,000	508,800	1,737,400	2,786,300	874,000	660,000
Restoration Days	2	8	3	8	12	13	4
T&D Cost	*14*	*153*	*9*	254	238	202	25

	Hurricane Irene	Tropical Storm Harvey	Hurricane Floyd	Hurricane Georges	Groundhog Day Storm	Hurricane Erin	Storm of the Century	Hurricane Andrew
	Oct-99	Sep-99	Sep-99	Sep-98	Feb-98	Sep-95	Mar-93	Aug-92
Customer Counts, Time & Cost								
Total Customers Affected	1,690,000	33,000	585,000	300,000	600,000	250,000	430,000	1,400,000
Restoration Days	4	0.3	3.5	1.5	6	5	6	35
T&D Cost	55	3	19	13	13	6	11	261

- We have had major restoration events in 8 of the last 14 years

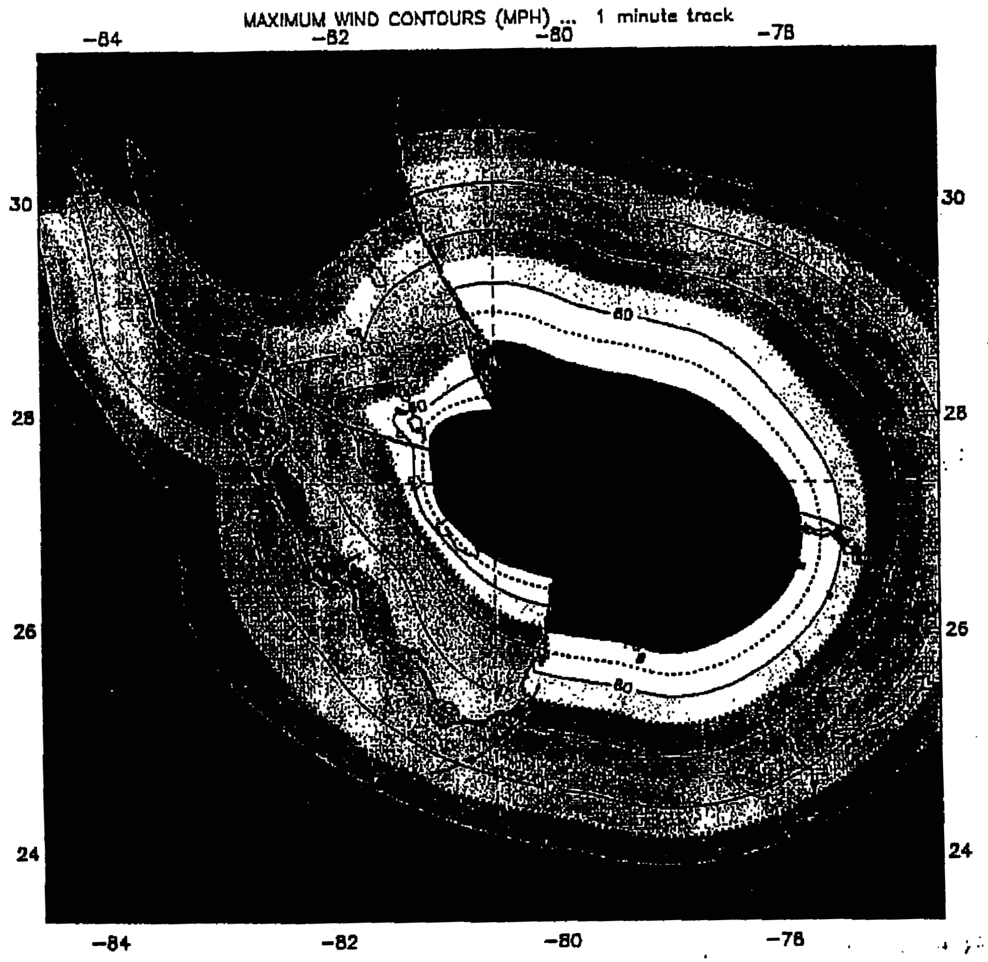
- **In the past 14 hurricane seasons, the average T & D expenditures on hurricane restoration has been $97M per year**

Damage to the distribution infrastructure occurs from:



Wind Damage – Infrastructure Performance

The following findings are based on the analysis of the observations by the forensic team on the damage caused by Hurricane Katrina



- Katrina hit sections of Dade and Broward Counties as a category 1 with maximum sustained winds of 81 mph and wind gusts of 92 mph.

- Forensic team analysis is based on observations in Miami-Dade and Broward only

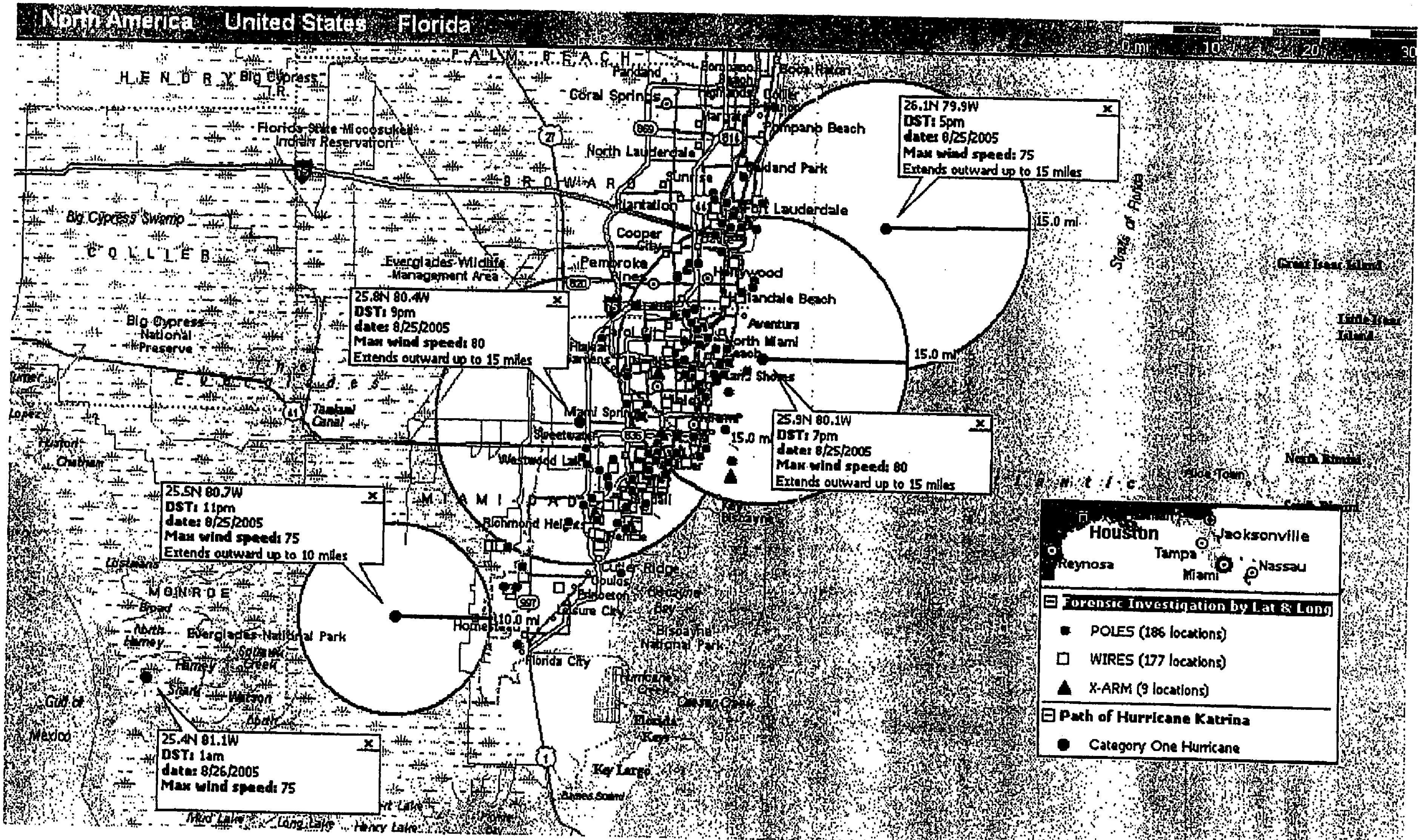
Tropical Storm & Hurricane Damage

Storm Category*	Wind Speed (mph)	Max Wind Gusts (mph) - up to 50% greater	Storm Surge (ft)	Damage Description
Tropical Storm/Gale	39 to 46	69	n/a	Tree limbs begin breaking
Tropical Storm/Severe Gale	47 to 54	81	n/a	Slight structural damage
Tropical Storm	55 to 63	95	n/a	Some structural damage; smaller trees uprooted
Tropical Storm/Violent Storm	64 to 72	108	n/a	Wide-spread shrubbery and tree damage; shallow rooted trees topple
Hurricane Category 1	74 to 95	143	4 to 5	Minimal structural damage; considerable damage to shrubbery and trees
Hurricane Category 2	96 to 110	165	6 to 8	Moderate damage to structures
Hurricane Category 3	111 to 130	195	9 to 12	Extensive damage to structures; large trees blown down
Hurricane Category 4	131 to 155	232	13 to 18	Extreme damage to roofs, doors and windows; many trees down
Hurricane Category 5	> 155	> 232	> 18	Catastrophic; complete roof and building failures

* Beaufort and Saffir-Simpson Scale

- Wind-caused damage begins at wind speeds of 39 mph and progressively worsens as the sustained wind speed and wind gusts increase; FPL's facilities are not designed to withstand winds greater than 118.6 mph

Observations by forensic team immediately after Hurricane Katrina

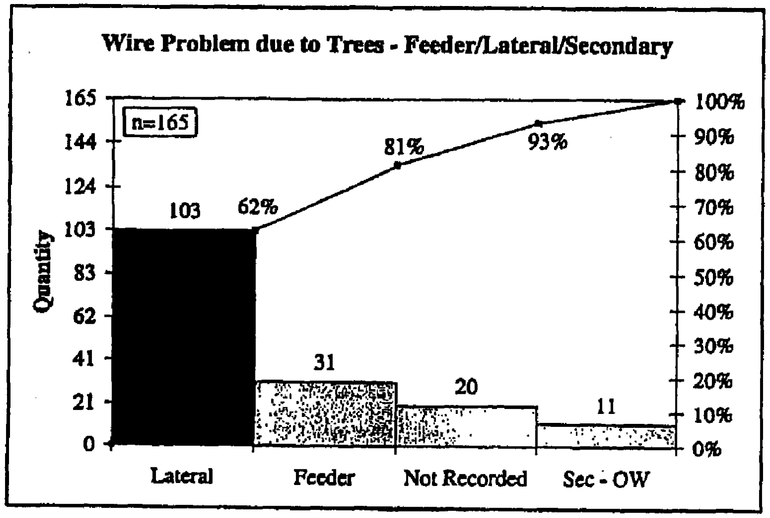


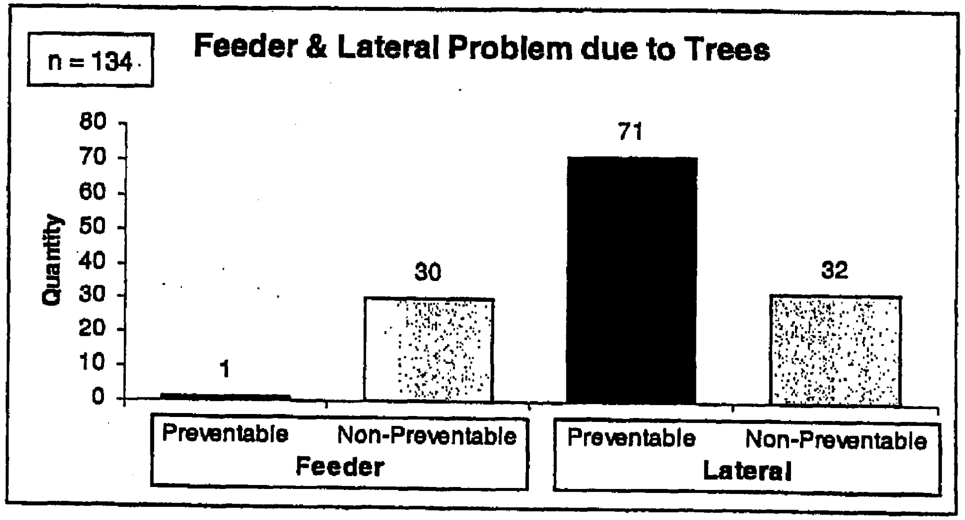
Prepared at the request of counsel, and intended to be protected by the attorney client privilege and work product protection

Wind Damage - Conductors

Conductor Damage due to wind:

- 93% of conductor damage observed was caused by **trees**





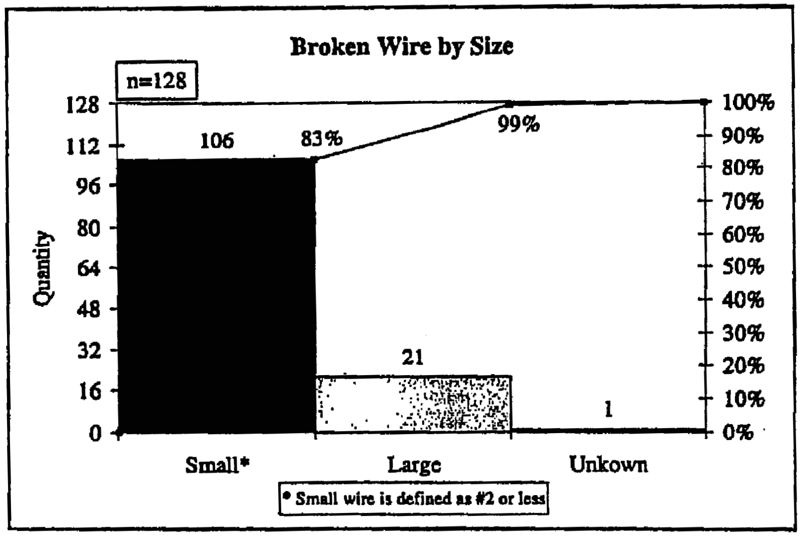
- **62% of the conductor damage caused by trees were on laterals**
- Only 3% of the feeder tree-related conductor damage was preventable
- **69% of the lateral tree-related conductor damage was preventable**

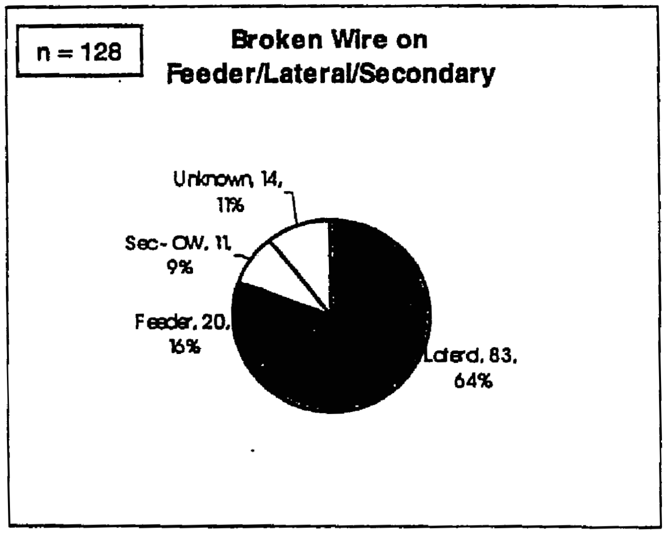
Trees and tree branches in the lateral lines was a significant cause of preventable interruptions and conductor damage

Wind Damage - Conductors

Conductor Damage due to wind:

- 83% of the conductor damaged observed was small wire (#2T or smaller)
- 77% of splices issued in 2004 hurricane season were for #2T or smaller





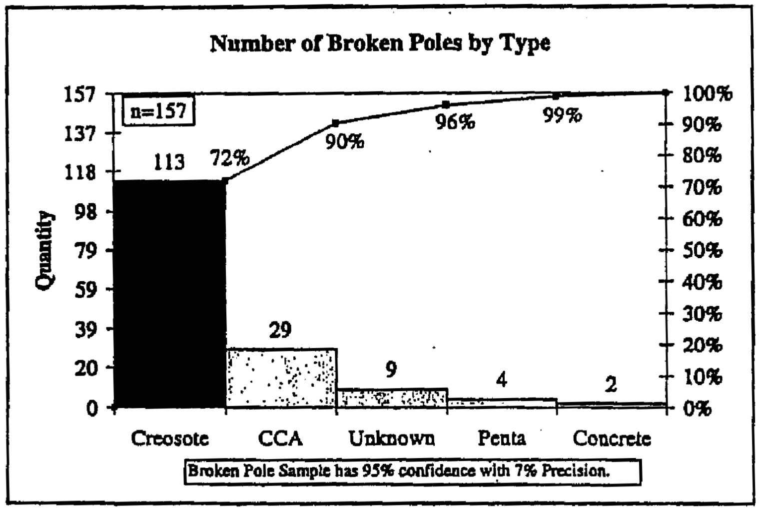
- 64% of the damaged small wire conductor was lateral conductor
- 16% of the damaged small wire conductor was feeder conductor

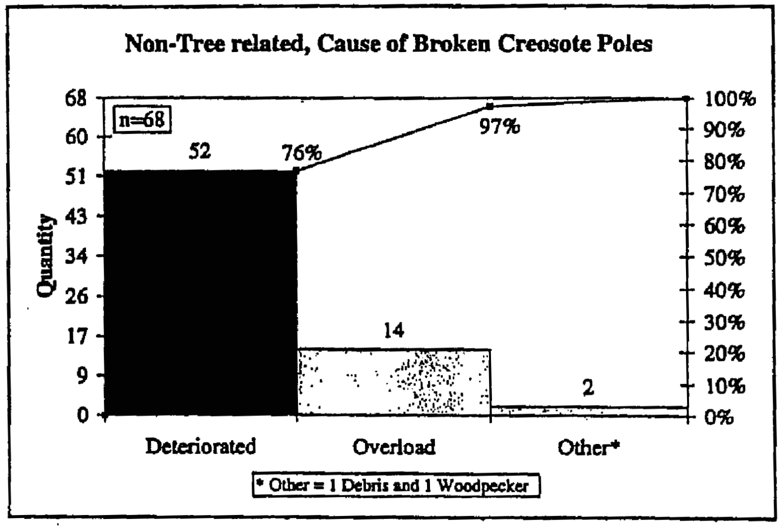
Lateral small wire was a significant factor in the interruptions and conductor damage

Wind Damage - Poles

In Dade and Broward County only 1035 out of 343,233 poles (.3%) were replaced during the restoration from Hurricane Katrina

- 50% of damage to distribution poles was tree related
- **72% of damaged poles were the creosote poles**





- 76% of the non-tree related damaged creosote poles is due to deterioration
- 58% of the damaged deteriorated creosote poles were on laterals

Aged creosote poles were a significant factor in the poles that were damaged during the hurricane

FPL Distribution Design Criteria

FPL designs comply to the National Electrical Safety Code (NESC)

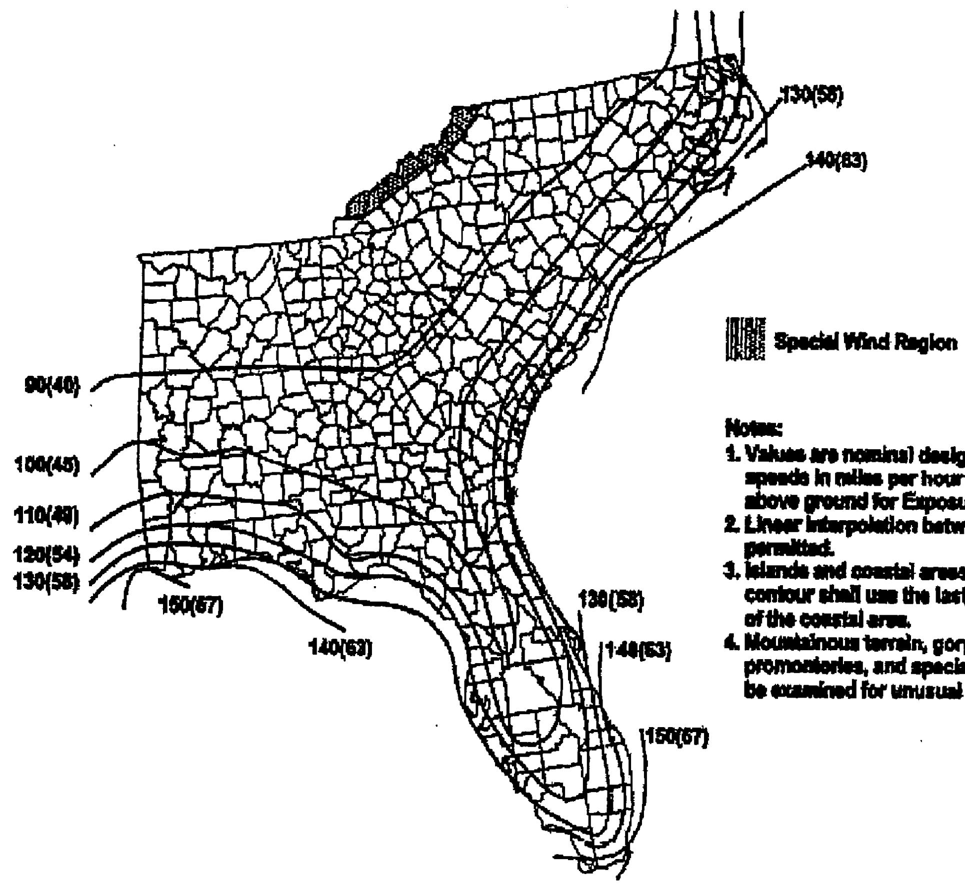
The NESC requires consideration of two weather Loading Conditions:

1. **Combined Ice & Wind Loading**
   FPL is in the "Light Loading District"- Design for 0" of ice and a 9 lb/sq. ft. horizontal wind Pressure (approximately 118.6 mph wind velocity).
2. **Extreme Wind Loading** – this rule applies to those facilities that are 60 ft. above grade. Most distribution facilities are below this height and this rule does not apply.

Once the Load is determined from above, FPL applies the NESC Grade B Overload Factors to determine the pole size needed.
- 4.0 overload factor when installed
- The overload factor is allowed to decrease to 2.67 before replacement

What is the impact if FPL designed for extreme wind loading?

NESC Extreme Wind Velocities



Extreme Wind Speeds Range from 100mph to 150 mph in FPL Territory

Notes:
1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10 m) above ground for Exposure C category.
2. Linear interpolation between wind contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

Fig 250-2(d)
Eastern Gulf of Mexico and Southeastern US Hurricane Coastline*

FPL Current Design vs. Extreme Wind Loading Design

Feeder framed Modified Vertical: 3 - 568.3 kCMIL ACAR with 1#3/0 AAAC Neut; CATV and Telephone
45'/3 Wood Pole has a maximum intial span length of 150 feet.

	FPL Current Design NESC Combined Ice & Wind Loading (0" Ice 9Lb/sq ft wind load)	NESC Extreme Wind Loading Wind Velocity			
		118.6 mph	120 mph	140 mph	150mph
Span Length allowable with 45'/3	150'	128'	124'	80'	64'
Pole Class Required for 150'	3	2	2	H1	H2
Cost of Pole	$217	$249	$249	$375	$425
% Increase In cost per Pole		114.75%	114.75%	172.81%	195.85%

Note: Class "H" Wood Poles are less available than smaller class poles.

Single Phase Lateral: 1 #1/0 AAAC with 1#1/0 AAAC Neut; 1-25kVA Tx; CATV and Telephone
40'/5 Wood Pole has a maximum initial span length of 224 but limit to 150 ft.

	FPL Current Design NESC Combined Ice & Wind Loading (0" Ice 9Lb/sq ft wind load)	NESC Extreme Wind Loading Wind Velocity			
		118.6 mph	120 mph	140 mph	150mph
Span Length allowable with 40'/5	150'	198	191	126'	97'
Pole Class Required for 150'	5	5	5	3	3
Cost of Pole	$134	$134	$134	$217	$217
% Increase In cost per Pole		100.00%	100.00%	161.94%	161.94%

Feeder increase in cost of poles = $480,000
Lateral Increase in cost of poles = $ 33,000
Total Annual Cost = $513,000

Impact of Attachments

Maximum Span Lengths using Wind loading for NESC Grade B Construction

	Maximum Span Lengths for Grade B Construction			
	FPL Only	FPL & CATV	FPL & TEL	FPL/CATV/TEL
FPL Feeder & Neutral Only	**268**	222	173	153
FPL Feeder/Neutral/TX	251	208	162	**143**

FPL:		CATV:	Telephone:
Modified Vertical Framing		Trunk	600 Pair
45'/3 Wood Pole	Diameter	.75"	2.08"
3 - 568.3 ACAR Feeder			
1- 3/0 AAAC Neutral			
50 kVA Transformer			

For a typical new FPL Feeder a 45'/3 wood pole, the strength of this pole will accommodate a range of spans lengths from:

- 268 feet for FPL Primary and Neutral Only
- 143 feet for FPL Primary, Neutral and 50 kVA Transformer with CATV Trunk line and a Telephone 600 pair cable.

Impact of Joint Users on Distribution Poles

Total FPL Distribution Poles*	Total FPL Distribution Poles with Attachments*	Bell South Poles – FPL Attached	Other Pole Owners – FPL Attached
1,108,011	678,616	228,704	2,713

•Does not include Street Light or Transmission poles

- **Joint Use with Bell South**
  - **Agreement calls for Strength Requirements of NESC Grade B Construction for all FPL/BST joint use poles.**
  - **Do not know what BST requires of other attachees.**
- **Joint Use with other pole owners**
  - **FPL designs for Grade B and would require the appropriate pole for its attachments.**
- **Joint use with non-pole owners (CATV & Telecom)**
  - **All requests to attach to FPL poles are processed through FPL's designated contractor. These requests include wind loading calculations and are verified. Post checks are performed on all jobs after notification that the work has been completed.**
  - **Audit performed in 2000 revealed that the installations met FPL's Criteria.**
  - **Annual survey of attachments indicate that the attachees are accounted for.**

FPL's Joint Use Agreements and Processes support compliance by Joint Users to meet present FPL & NESC pole loading criteria.

Summary of Wind Damage

The three top causes of interruptions and damage to our infrastructure during a category one hurricane:

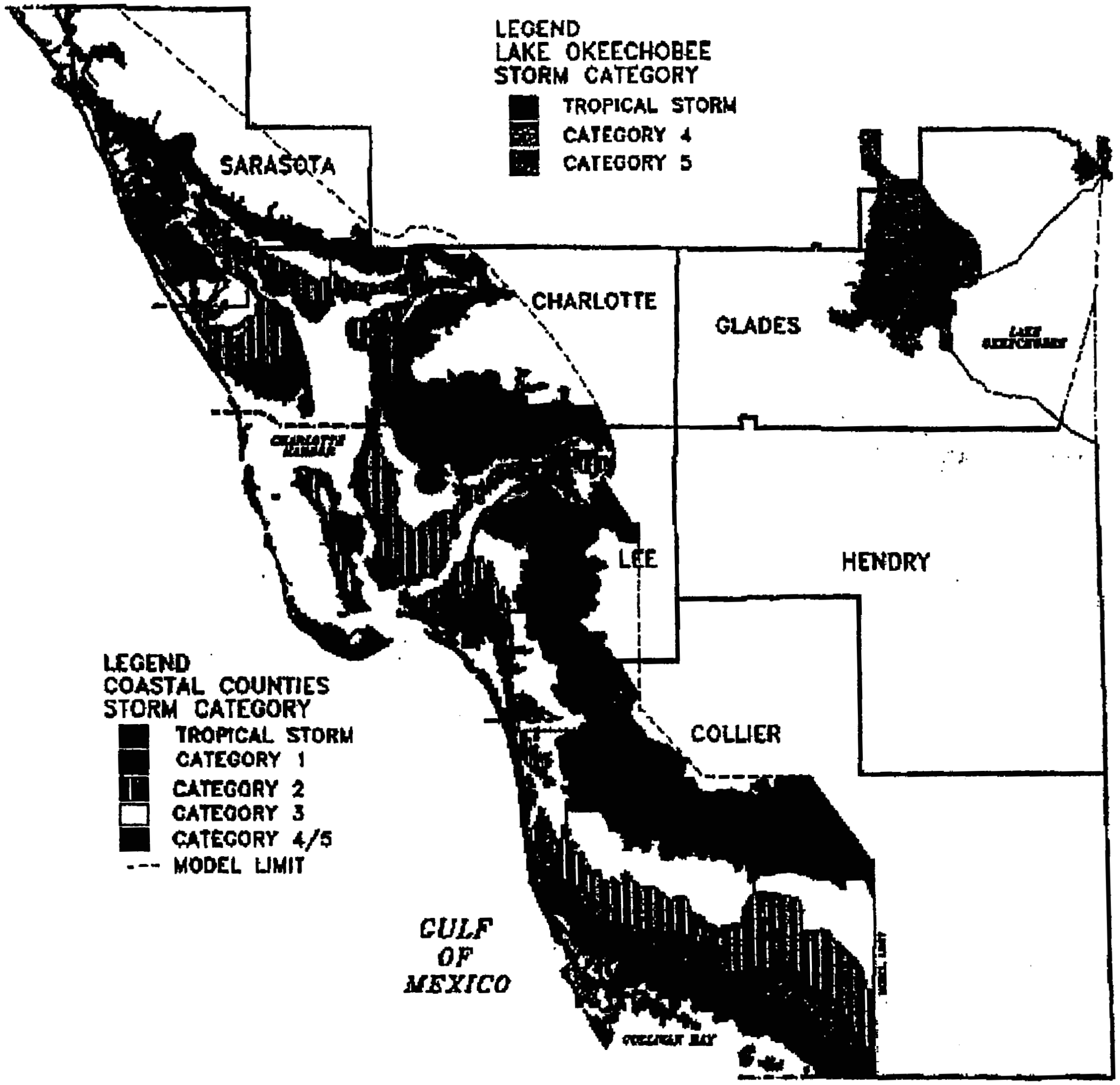
- **Vegetation in the lateral conductors**
- **Small wire conductors on the laterals**
- **Deteriorated creosote poles**

Reduction of interruptions due to tropical storm winds and category one hurricanes requires a focus on the laterals

- 92% of FPL customers are served from the lateral system
- 75 – 80% of the restoration time is spent repairing laterals, transformers, and services

Storm Surge & Flood Damage

Storm Surge Damage



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Storm Surge impacts in two ways:

- Physical damage by the wave action right on the coast
- Flood damage by the quickly rising water miles inland from the coast

Areas at Risk

- Coastal Areas
- Lake Okeechobee Areas: storm surge & levee breaches

FPL Storm Surge History

Highest surge on West coast – 14' (1848, 25-Sep)

2 Levee Breaches in Lake Okeechobee (1926, 18-Sep; 1928, 6-Sep)

Highest surge in the North – 12' (1964, Dora)

Highest surge recorded in FPL's territory – 17' (1992, Andrew)

Year	Storm Category	Name	Surge Height*	Comments
1848		25-Sep	14'	Sarasota
1848		12-Oct	9'	Sarasota
1873		5-Oct	5' - 6'	Ft Myers
1876		18-Oct	8' - 10'	Ft Myers
1910		11-Oct	4' - 6'	Ft Myers
1921		24-Oct	7'	Sarasota
1926		6-Jul		WPB: "a tremendous wave moved up the river"
1926		18-Sep	10' - 12'	levee breach - Moore Haven
			13'	Dade
1928		6-Sep	5 - 10'+	Tidal Wave: levee breach; Pahokee, South Bay, Belle Glade
			10'	WPB
1935		2-Sep	15'	Ft Myers
1935		30-Oct	8' - 9'	Broward
1944		13-Oct	8' - 9'	Naples
1945		12-Sep	10' - 14'	C Grove - Cutler
1946		7-Oct	4' - 5'	Naples
1947		11-Sep	10'	Broward, WPB
1948		19-Sep	5'	Dade - Titusville/Heavy flooding from rain in Dade
1948		4-Oct	5' - 6'	S Dade/Flooding from rain in Broward
1949		24-Aug	8'	WPB
1950	3	King	5'	Dade & Broward
1960	3	Donna	6' - 13'	Naples & Ft Myers
1964	2	Cleo	5'	Dade, Broward, & Naples
1964	2	Dora	10' - 12'	St Johns
1965	3	Betsy	nm	Dade, Broward, & Naples (all indirect)
1979	2	David	5'	WPB, TC, BV
1992	5	Andrew	17'	No padmount transformers dislodged
1995	1	Erin	nm	No disabling surge damage
1998	2	Georges	4'-6' (keys)	No disabling surge damage
1998	TS	Mitch	3'	No disabling surge damage
1999	TD	Floyd	none in FL	No disabling surge damage
1999	TS	Harvey	2' - 3'	No disabling surge damage
1999	1	Irene	nm	No disabling surge damage
2001	TS	Gabrielle	5'	No disabling surge damage
2004	4	Charlie	4' Ft Myers 6'-7' Sanibel	No disabling surge damage
2004	2	Frances	6' - 8'	No disabling surge damage
2004	3	Jeanne	4' - 6'	several Nettles Island padmount transformers dislodged^

*based on NHC/TPC reports

Note: Prior to 1950, only hurricanes with surge/flooding information are listed

Water Damage - UG Transformers

Initial Outage

Transformer\Lateral fuse will blow when water reaches exposed electrical components

Transformer\Lateral fuse will blow when water reaches exposed electrical components

- 17" for LS padmount transformer*
- 34" for RS & 3 phase padmount transformer*
- 48" for vault type transformer

* Note: Includes 4" pad height

Restoration

Fresh water: flooding

Transformer/Lateral can be re-energized with no additional work when water recedes

Salt water: Hurricane Storm Surge

Transformer/Lateral can be re-energized when water recedes, but should be washed with fresh water/ decontaminant spray

Water Damage - UG Switches

Initial Outage

Fuse will blow when water reaches electrical compartment

- 12" for padmount Switch Cabinet (including 4" pad)
- 8" from base for vault Switch Cabinet
  (typical installation height is 3' from the floor of the vault)

Restoration: For both flooding or storm surge

Padmount Switch Cabinet

- Unit must be removed and sent to ERC to be dried

Vault Switch Cabinet

- Switch barrel must be replaced

Countermeasures

Lateral Line Clearing Cycle

Study conducted to determine the cost effectiveness of a

- 3 year system-wide lateral cycle
- 6 year system-wide lateral cycle
- 3 year urban/ 6 year suburban lateral cycle

Incremental annual cost (2006-2012) compared to a "Same Performance" scenario

• 3 year system wide -	$90M
• 3 yr Urban only -	$23M
• 3 yr Urban, 6 yr Suburban -	$52M

2012 budget – scenarios (annual cost)

• 3 year system wide -	$73M
• 3 yr Urban only -	$62M
• 3 yr Urban, 6 yr Suburban -	$69M
• Same Performance -	$62M

Lateral Line Clearing Cycle –
Storm Restoration Cost Avoidance

3-yr ALL System

- $148M restoration savings over 12 years
- Reduced hurricane restoration costs outweighed additional trimming costs only for Pompano and Inland West-Dade

3-yr Urban, 6-yr-Suburban

- $122M hurricane restoration savings over 12 years
- Extending the lateral trim cycle in suburban to 6 years is cost effective for: ???

6-yr ALL System

- $95M hurricane restoration savings over 12 years
- Extending the lateral trim cycle to 6 years is cost effective for two additional areas: North Dade, and Coastal Treasure Coast

Lateral Line Clearing Cycle –
Storm Restoration Cost Avoidance

Expected annual hurricane damage necessary to justify shorter lateral trim cycles for the whole territory

• 3-yr ALL System:	$293M
• 3-yr Urban, 6-yr-Suburban:	$238M
• 6-yr ALL System:	$211M

Small Wire & Creosote Poles on Laterals

Countermeasure – Lateral Upgrade

Optimize effectiveness by upgrading all OH facilities on the laterals (small wire, creosote poles, open wire secondary) and line clear at the same time

Alternative Design Solutions

- **Replace OH facilities** – reconductor small wire, replace creosote poles and remove open wire secondary
- **Relocate OH facilities** – remove small wire, creosote poles and open wire secondary – install new OH facilities in accessible locations
- **Conversion of OH facilities to UG** – remove small wire, creosote poles and open wire secondary; install new UG facilities in accessible locations

Geographical Approach

The laterals will be grouped in geographical zones, field visited and evaluated to determine which of the three design solutions (replace, relocate or UG) are feasible and least costly.

Wind Damage – Lateral Upgrade

Alternative Solutions	Customer Sensitivity/Impact	High Density OH Residential subdivision (1.29 miles)	Low Density OH Residential subdivision (2.47 miles)
Replacement of OH Facilities (same location; assumes inaccessible)	Medium	$129,188/mile $24/ft 1027 cmh/mile	$164,291/mile $31/ft 1224 cmh/mile
Relocation of OH Facilities (inaccessible to accessible)	High	$78,130/mile $15/ft 620 cmh/mile	$85,264/mile $16/ft 636 cmh/mile
Conversion (OH to UG) Does not include any easement, restoration or meter conversion costs	High	$293,978/mile $56/ft 1147 cmh/mile	$304,309/mile $58/ft 1198 cmh/mile

- Costs include removal and replacement of all lateral small wire, creosote poles and open wire secondary
- Many customer and municipality issues regarding options 2 & 3
- Undergrounding costs twice as much as upgrading overhead (Option 3 costs do not include CIAC)

Wind Damage – Lateral Upgrade

Estimated Cost

Assuming alternative one (Replacement of OH Facilities) as the most common solution, below are the estimated costs to upgrade 10%, 25%, and 50% of the small wire laterals in the Urban Areas

Top 10% Substation Ranking within Tri-County Areas (24 Substations)					Lateral Reconductor Costs	
Area	Lateral Small Wire Miles	LAT Wiredown Ints (187-104) (1/02-9/05)	Sum of Oth LAT Ints (1/02-9/05)	Creosote Poles	Reconductor Cost ($24/FT)	Reconductor Cost ($31/FT)
Grand Total	949	132	2,662	23,162	$120,202,537	$155,261,610

Top 25% Substation Ranking within Tri-County Areas (61 Substations)					Lateral Reconductor Costs	
Area	Lateral Small Wire Miles	LAT Wiredown Ints (187-104) (1/02-9/05)	Sum of Oth LAT Ints (1/02-9/05)	Creosote Poles	Reconductor Cost ($24/FT)	Reconductor Cost ($31/FT)
Grand Total	1,942	225	5,545	47,062	$246,091,000	$317,867,542

Top 50% Substation Ranking within Tri-County Areas (121 Substations)					Lateral Reconductor Costs	
Area	Lateral Small Wire Miles	LAT Wiredown Ints (187-104) (1/02-9/05)	Sum of Oth LAT Ints (1/02-9/05)	Creosote Poles	Reconductor Cost ($24/FT)	Reconductor Cost ($31/FT)
Grand Total	2,746	307	7,893	68,028	$347,915,589	$449,390,969

* Breakdown of miles and cost by management areas in Appendix

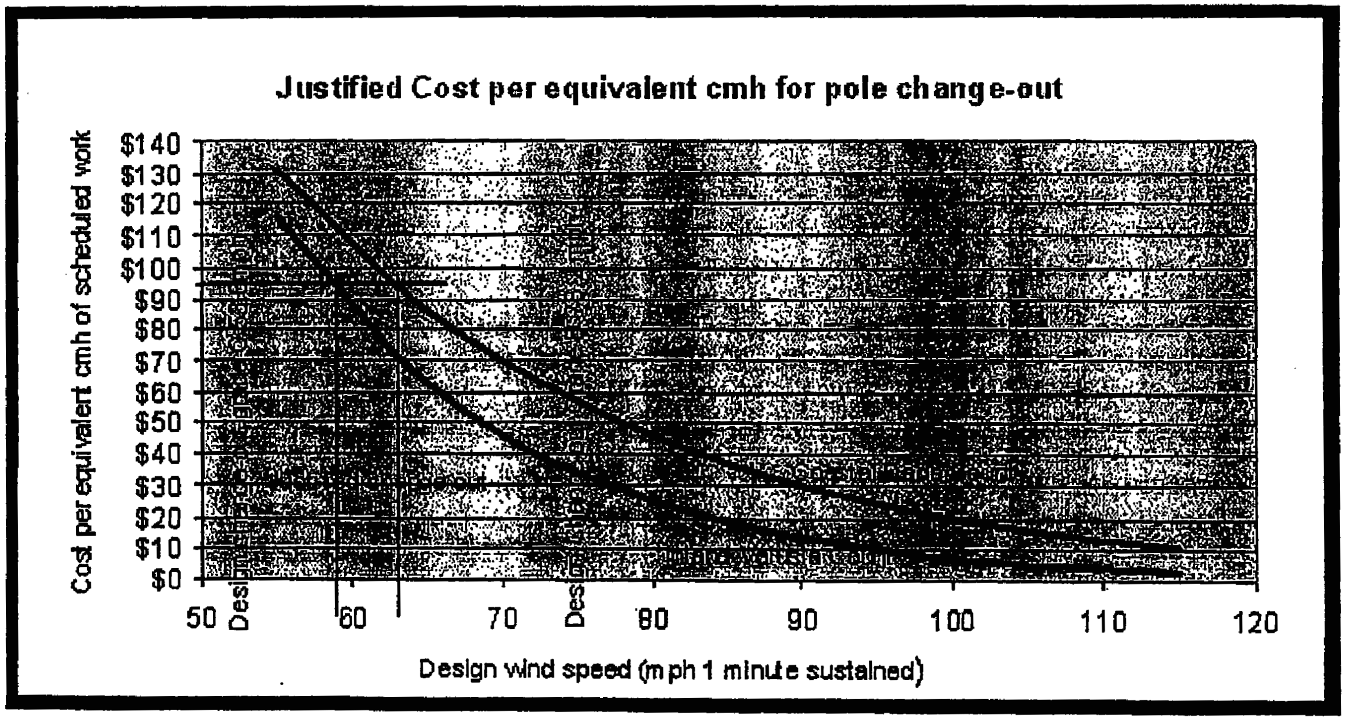
Lateral Upgrade - Reliability Benefits
(Non-Hurricane)

Reliability Impact of Small Wire Lateral Upgrade in Tri-County Areas					
Implementation Plan	CI	SAIFI	CAIDI	SAIDI	MAIFI
Existing Reliability (Sep 2005 12moe)	5,378,262	1.270	59.70	75.78	14.51
Addressing worst 10% Substations	7,854	0.002	0.14	0.26	0.05
Addressing worst 25% Substations	16,219	0.004	0.26	0.53	0.10
Addressing worst 50% Substations	23,049	0.005	0.36	0.75	0.15

- OH laterals without small wire have 31% less interruptions than laterals with small wire.
- OH laterals without small wire on average have a Duration that is 8 minutes less than laterals with small wire.
- Improvements in upgrading laterals with small wire improves the overall reliability performance which helps reduce momentaries on the feeder.

Pole Replacement Cost/Benefit Analysis

Study conducted to determine the costs and benefits of replacing deteriorated poles to mitigate hurricane restoration costs



When the remaining strength of a pole cannot withstand up to 65 mph, the cost to replace on scheduled work equals the cost to replace under storm restoration given the likelihood of failing

Water Damage – Countermeasures

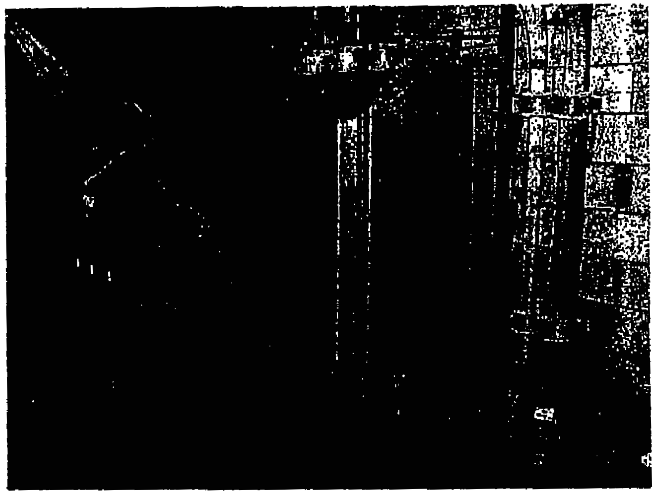
Criteria: If structures are habitable, power should be available

- **Identify facilities at risk**
  - TCMS trouble tickets referred to "Flood" screen
  - During PSIP (Padmounted Safety Inspection Program)
  - Based on County storm surge and flood maps*

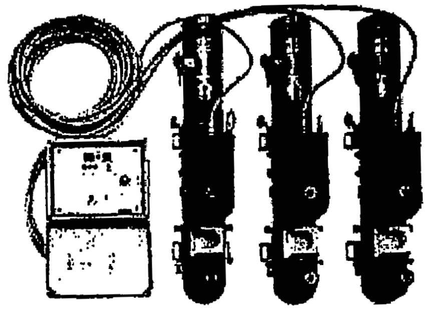
- **Raise Transformers and Switch Cabinets**
  - Raise transformer pad level by filling or installing tx chamber
  - Replace LS transformers with RS transformers (17" height gain)
  - Below grade vault transformer secondary should be capable of being submerged for brief periods of time without disabling damage or secondary should be located above flood/surge level

*FEMA is currently updating flood maps for the South Florida Water Management District.

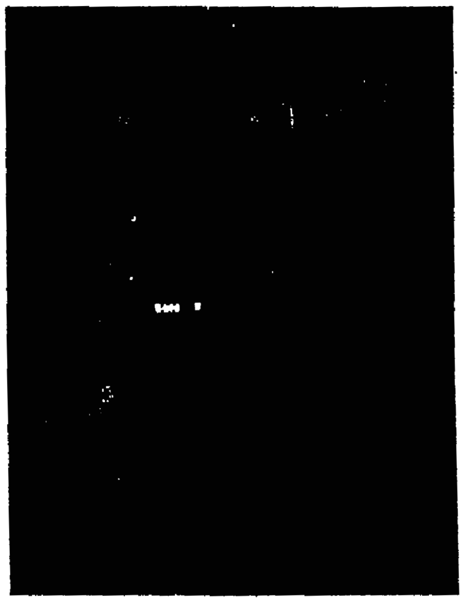
Water Damage – Below Grade Vaults



Molded Vacuum Interrupter

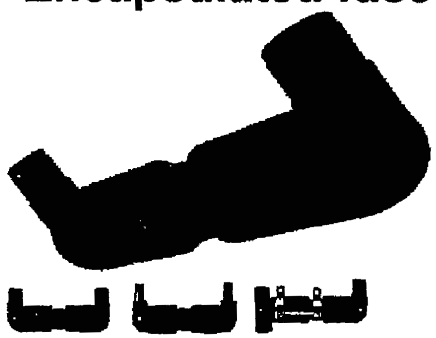


- Open and close operation done via external handle
- Deadfront design; No gaskets



- Bolts must be removed & re-installed to open or re-fuse
- Gaskets may get pinched, out of channel, or deteriorate
- Live parts exposed inside cabinet

Encapsulated fuse



- No exposed live parts
- Deadfront design

Storm Surge & Flood Damage – Countermeasures

Item	Recommendation	Population	Cost per unit	# upgraded per year	Annual Cost
Transformers	1-2 story residences: Raise or relocate pad; secondary spades to be 17" above floor level in flood-prone areas	TBD	$750	TBD*	TBD*
	Multi-story buildings: Raise or relocate pad; secondary spades to be at least 34" above floor level	TBD	$2,000	TBD*	TBD*
Switch Cabinets	Pad to be located 14" above crown of road	TBD	$5,000	TBD*	TBD*
Below Grade Vaults	Inspect cabinet gaskets & replace as necessary	250	$200	125	$25,000
	non-Throwover: Replace fusing with encapsulated fuses	66	$10,000	6-7^	$60,000 - $70,000
	Throwover: Replace cabinets/fusing with MVS switchs & encapsulated fuses	114	$60,000	11-12^	$660,000 - $720,000

*** to be budgeted after 2006 inspections** **^ based on 10 year program**

*UG vault equipment replacement to be coordinated and performed by ERC

Countermeasure Plan

Initiative	Plan	Duration	Annual Cost (Capital)	Annual Cost (O&M)	Annual Cost (Total)	Annual Savings (Capital)	Annual Savings (O&M)	Annual Savings (Total)	Annual Outlay (Capital)	Annual Outlay (O&M)	Annual Outlay (Total)
Lateral Line Clearing Cycle	3 yr urban/ 6 year suburban	On-going	$0	$52,000,000	$52,000,000	$0	?	?	$0	?	?
Upgrade of Laterals	Reconductor 25% of worst performing small wire/creosote poles/open wire secondary	10 years	$28,620,000	$3,180,000	$31,800,000	?	?	?	?	?	?
Upgrade submersible equipment in below grade vaults	Inspect cabinet gaskets and replace as necessary	2 years	$0	$25,000	$25,000	$0	$0	$0	$0	$25,000	$25,000
	Replace fusing with encapsulated fuses in non-throwover vaults	10 years	$62,300	$7,700	$70,000	$0	$0	$0	$62,300	$7,700	$70,000
	Replace switches and fusing with MVS switches and encapsulated fuses in throwover vaults	10 years	$640,800	$79,200	$720,000	$0	$0	$0	$640,800	$79,200	$720,000
Identify padmounted equipment at Risk	Identify padmounted switch cabinets and transformers below floor grade during PSIP inspection	5 years	$0	$0	$0	$0	$0	$0	$0	$0	$0
Totals			$29,323,100	$55,291,900	$84,615,000	$0	$0	$0	$29,323,100	$55,291,900	$84,615,000

Reliability Benefits

Initiative	Plan	Duration	Customer Interruptions Savings	SAIFI Improvement
Lateral Line Clearing Cycle	3 yr urban/ 6 year suburban	On-going	120,181	0.050
Upgrade of Laterals	Reconductor 25% of worst performing small wire/creosote poles/open wire secondary	10 years	16,219	0.004
Upgrade submersible equipment in below-grade vaults	Inspect cabinet gaskets and replace as necessary	2 years	0	0
	Replace fusing with encapsulated fuses in non-throwover vaults	10 years	0	0
	Replace switches and fusing with MVS switches and encapsulated fuses in throwover vaults	10 years	0	0
Identify padmounted equipment at Risk	Identify padmounted switch cabinets and transformers below floor grade during PSIP inspection	5 years	0	0
Totals			136,400	0.054

Appendix

Hurricane Wilma

Preliminary findings from forensic team: (Observations through 11/1)

1168 poles inspected

- 563 CCA poles broken (majority due to wind, debris, or loading, 95 due to trees)
- 334 creosote poles broken, 173 of which were BellSouth poles (majority due to wind/loading, 34 due to trees/debris)
- 174 penta poles broken (majority due to wind/loading, 53 due to trees)
- 97 concrete broken (56 due to wind/load, 41 due to debris)

Lateral Upgrade

Top 25% Substation Ranking within Tri-County Areas (61 Substations)					Lateral Reconductor Costs	
Area	Lateral Small Wire Miles	LAT Wiredown Ints (187-104) (1/02-9/05)	Sum of Oth LAT Ints (1/02-9/05)	Creosote Poles	Reconductor Cost ($24/FT)	Reconductor Cost ($31/FT)
WB	436	24	994	9,867	$55,306,817	$71,437,972
ND	335	48	1,055	6,727	$42,453,481	$54,835,746
SD	324	33	886	8,108	$41,106,701	$53,096,155
GS	184	31	597	5,441	$23,270,861	$30,058,195
CE	171	22	536	3,849	$21,664,051	$27,982,733
WG	157	25	419	5,023	$19,941,926	$25,758,322
PM	131	13	477	3,232	$16,552,040	$21,379,718
WD	116	20	304	1,982	$14,645,030	$18,916,498
BR	88	9	277	2,833	$11,150,093	$14,402,203
Grand Total	1,942	225	5,545	47,062	$246,091,000	$317,867,542

- Upgrade 1942 miles of small wire laterals in the urban areas
- Total cost of $246M to $318M (~ 2.2M CMH)
  - $24.6M to $31.8M per year over 10 years
  - 220,000 CMH per year over 10 years
- Reduces on average ? cmh and $? per year in hurricane restoration
- Estimated reduction of 16,219 CI's, .004 in SAIFI, .26 in CAIDI, and .1 in MAIFI
- Assumes lateral line clearing cycle on the laterals being upgraded

Lateral Upgrade - Organization

- Stand-alone organization staffed with
  - Designers (10 – 12)
  - Project Managers (3 - 4)
  - CCR's (3)
  - Customer Specialists/Negotiators (3 - 4)
  - Vegetation Management Liaison (1)

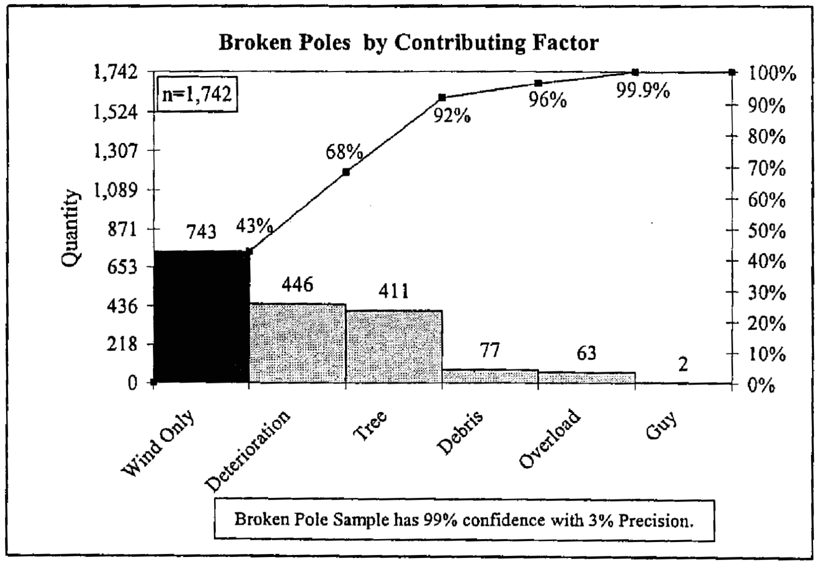
- 150 -160 OH contractor crew bodies required

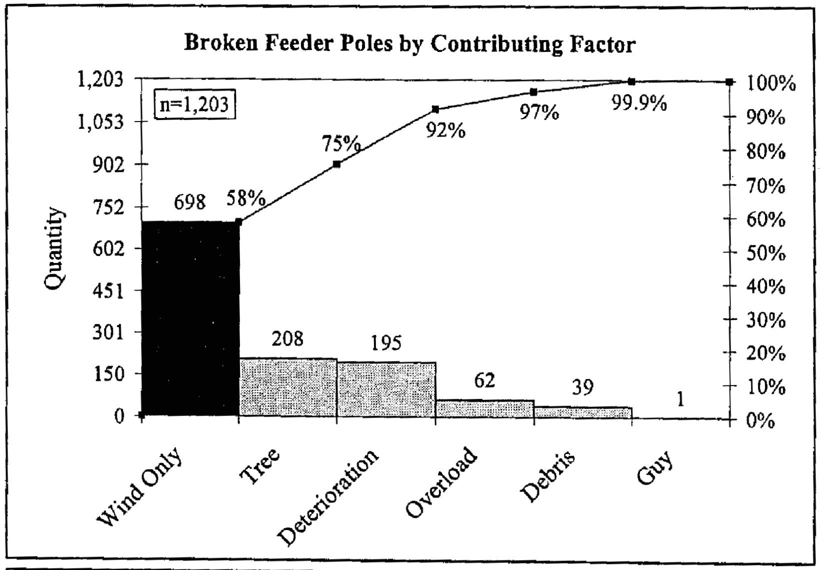
- Multi-year contract with several OH construction contractors guaranteeing a certain workload

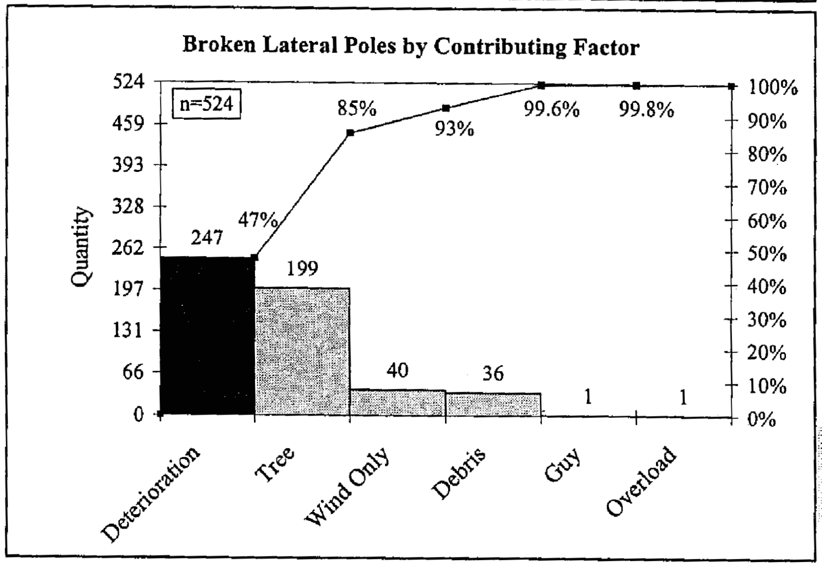
- First year will be needed to ramp-up and pilot several projects to develop best processes

- Administrative costs of the organization will be approximately $1.5M - $2M per year

Broken Poles by Contributing Factor







- **40 - 46% of broken poles were due to wind only** with 99% confidence.
- Observed 58% of broken feeder poles were due to wind only.
- Observed 47% of broken lateral poles had some degree of deterioration.