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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

PREPARED DIRECT TESTIMONY OF

JOHN E. ODOM, JR.

ON BEHALF OF FLORIDA POWER CORPORATION

DOCKET NO. 910578-EI

June 19, 1991

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Introduction and Qualifications

Q. Please state your name, business address and occupation.

A. My name is John E. Odom, Jr. and my business address is 3201 34th St. South, St. Petersburg, Florida 33711. I am a Senior Transmission & Distribution Planning Engineer in the System Planning Department at Florida Power Corporation.

Q. What are your duties and responsibilities in that position?

A. As a planning engineer, I am responsible for identifying the future transmission needs of FPC with adequate lead time to allow for the licensing, engineering and construction of new transmission or substation projects. I am currently the area planner responsible for evaluating the transmission system within FPC's

Mid-Florida Division, including interconnections with other divisions and utilities. In addition, I am involved in special projects on an as-needed basis.

Q. Please summarize your educational background.

A. I graduated from Lake-Sumter Community College with an Associate of Arts Degree in 1975, and from University of Central Florida with a Bachelor of Science in Engineering Degree in 1979.

Q. Please summarize your professional experience.

A. I have approximately five years of Design Engineering experience and seven and one-half years of System Planning experience, all with Florida Power Corporation.

Q. Are you a member of any professional organizations or industry groups?

A. Yes, I am a registered Professional Engineer in the State of Florida. In addition, I am a member of the Power Engineering Society of the IEEE. I am also a member of the Application of Probability Methods Subcommittee of that Society's Power System Engineering Committee.

Q. Have you previously testified before this Commission?

A. Yes. In August, 1987, I testified on substation and transmission issues in a territorial dispute between FPC and Suwannee Valley Electric Cooperative, Inc. (Docket No. 870096-EU).

**Purpose of Testimony**

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the technical aspects of the DeBary-Winter Springs 230 kV transmission line (the "Project") and to demonstrate FPC's need for the Project. I will explain FPC's transmission planning process, including our transmission reliability criteria. I will describe why additional 230 kV transmission is needed by the end of 1995 to maintain acceptable transmission reliability in the Greater Orlando Area and to enable FPC to reliably disperse power from future CTs that may be added at the DeBary Generating site. I will explain how FPC determined that the Project is the best alternative to meet these needs, and will describe other benefits that the Project provides. I will also explain the adverse consequences to FPC and

its customers if approval of the Project is delayed or denied.

Q. Are you sponsoring any exhibits as part of your testimony?

A. Yes. Exhibit ____ (JEO-1) is the report titled "Determination of Need for DeBary-Winter Springs 230 kV Transmission Project" that was filed in this docket on June 3, 1991. I have also prepared Exhibits ____ (JEO-2) to ____ (JEO-4), which are attached to this testimony.

**Planning Process**

Q. Please describe FPC's transmission planning process.

A. FPC conducts a comprehensive transmission study each year to identify future transmission improvements needed to maintain acceptable transmission reliability. In addition, we conduct special studies on an as-needed basis when significant changes occur that could impact the current plan. FPC uses the Multiple Contingency Load Flow (MCLF) program to identify areas of concern. This program models the outage of individual transmission lines or transformers at

various load levels to identify areas that need further review. Once an area of concern has been identified, a planning engineer conducts an in-depth analysis of the area. This analysis determines the extent of the problem, identifies and evaluates possible solutions, and selects a recommended alternative for inclusion in FPC's capital facilities plan.

Q. Please explain the reliability criteria used as the basis for planning FPC's transmission system.

A. FPC has developed various criteria, consistent with Florida Electric Power Coordinating Group (FCG) Planning Criteria, to ensure that the transmission system will perform in a reliable manner. FPC designs its transmission system so that, under normal conditions (i.e., with no transmission or transformer outages), the flow on any line or transformer will be below its normal rating. This criteria must be met for any reasonable generation dispatch, including situations where any single generating unit is out of service for scheduled maintenance. Therefore, a single generating unit outage is considered to be a normal condition.

In addition, the system is designed so that no lines or transformers will exceed their emergency ratings in the event of the loss of any single transmission line or transformer (a "single contingency"). FPC's criteria also provide that the voltages at any bus that serves residential or commercial customers should not drop below 95% of its nominal voltage under single contingency conditions.

Q. What other factors are used in assessing transmission reliability?

A. When FPC conducts a study of an area, the planner considers other factors that may be important to the specific area. These factors may include the likely duration of an outage, the remedial action that could be taken to react to an outage, the possibility that multiple contingencies could result from a single event, and the need to withstand events that could separate large load centers from the sources of generation.

Q. What analyses did you perform in investigating the need for the Project?

A. The analysis included an in-depth study of all single 230 kV line outages and any double circuit line outages in the study area as shown on the map attached as Exhibit ____ (JEO-2). This analysis was performed using the FCG and FPC 1990/1991 transmission data bases and our computerized load flow program.

The analysis concentrated on line outages that would cause other lines in the area to overload. The voltage at each bus was also examined; however, this was not a significant factor in the study, since low voltages were not identified as a problem under any single contingency. The study included an examination of how the generation dispatch affected power flows on the transmission system in the study area.

**Need for Project**

Q. What specific factors show a need for additional transmission in the study area by 1995?

A. The study identified two items of concern that indicate a need for transmission improvements by 1995. The first is a violation of single contingency criteria that occurs in 1995 when the

outage of the Sanford-North Longwood 230 kV line causes the Sanford-Sylvan-North Longwood line to overload and exceed its emergency rating (the "1995 single contingency"). Service to approximately 95,000 customers could be affected by this single contingency. This is the type of single contingency that FPC ordinarily designs its transmission system to withstand.

The second item of concern is that an outage of the Sanford-Altamonte and Sanford-North Longwood lines, which share common structures for approximately 12 miles, causes a severe overloading of the Sanford-Sylvan-North Longwood line. This double contingency could totally separate the generation at DeBary and at FPL's Sanford Plant from the Greater Orlando Area, and has the potential to impact service to approximately 500,000 customers as the result of a single event (i.e., the loss of a single transmission structure). This particular double circuit outage is a problem that FPC believes should be addressed from a reliability viewpoint, even though our criteria do not require the transmission system to be able to withstand every

double contingency. The double-circuit outage problem and the 1995 single contingency are referred to together as the "DeBary-North Longwood corridor violations."

**Q. Are there any other reliability problems in the area that must be addressed?**

A. Yes. By December, 1997, the outage of the North Longwood-Winter Springs line causes the Stanton-Rio Pinar line to reach its emergency rating (the "1997 single contingency" or the "Stanton-Rio Pinar violation"). Service to approximately 16,000 customers could be affected by this single contingency. Again, this is the type of single contingency that FPC's system is typically designed to withstand.

Finally, by December, 1997, the single contingency loss of the Rio Pinar-Stanton line will cause the North Longwood-Winter Springs line to exceed its normal rating, requiring corrective action that could affect service to approximately 8,000 customers.

**Q. How does the Project address these reliability problems?**

A. The Project strengthens the 230 kV system so that it can withstand either the 1995 or 1997 single contingency without causing any transmission line in the area to exceed its normal rating. The Project also addresses the double circuit outage situation by significantly reducing the overload on the Sanford-Sylvan-North Longwood line. While the overloading is not eliminated, the improvement will give FPC's system dispatchers more time to respond to such an outage in a controlled manner. The results of these studies, showing line loadings with and without the Project, are presented in the table attached as Exhibit ____ (JEO-3). Detailed load flow plots are contained in Appendices H and I of Exhibit ____ (JEO-1).

**Q. How was the possible need to add CT capacity at the DeBary Generating site included in your analysis?**

A. As Mr. Foley has testified, FPC needs the ability to add combustion turbine (CT) capacity to its system on short notice. The study therefore included an analysis of the impact of additional

generation at DeBary, beyond the 340 MW being added at the site in 1992. The analysis showed that by 1992 the DeBary site will be transmission-limited, such that the addition of as little as 150 MW of new generation at the site without transmission improvements would cause the system to violate single contingency criteria. By adding a third circuit from the site to the load area in the south, the Project enables up to 450 MW of generation to be added at the DeBary site without adverse transmission system consequences.

Mr. Foley discusses the various planning contingencies that could result in the need to locate additional combustion turbines at the DeBary site on short notice.

**Q. Does the Project provide any other benefits?**

A. Yes, in addition to (1) solving the 1995 single contingency, (2) addressing the double circuit outage problem, (3) preventing the 1997 single contingency violation, and (4) supporting 450 MW of additional CT capacity at the DeBary site, the Project provides two other benefits. First, the Project provides the ability to reliably transfer

more power from the electrical sources at DeBary and FPL's Sanford Plant into the Greater Orlando Area. Second, the Project makes the Winter Springs Substation a strong source that will support a 230 kV extension to the south and east to provide a new source for the underlying 69 kV network in the future.

**Alternatives**

**Q. Did FPC examine any alternatives to the Project?**

A. Yes.

**Q. Please summarize those alternatives.**

A. FPC identified transmission improvements that, singly or in combination, could meet all of the needs that are addressed by the Project. The alternatives fell into three groups:

Group A: Alternatives that address the DeBary-North Longwood corridor violations, the Stanton-Rio Pinar violation, and support additional generation at the DeBary site.

Group B: Alternatives that address the DeBary-North Longwood Corridor violations and support additional capacity at DeBary.

Group C: Alternatives that correct the Stanton-Rio Pinar violation.

Each alternative is shown on the table attached as Exhibit ____ (JEO-4). The alternatives in Group B and Group C do not address all of the needs the line is designed to address. The only options that address all of the needs are the Project and the DeBary-Winter Park East line (Group A), and combinations of one project from Group B and one project from Group C.

**Q. How did you conclude that the Project is the best of the available alternatives?**

A. Each alternative (or combination of alternatives) that meets all of the needs was evaluated based on cost and technical factors. The only single-line alternative that provided the same benefits is the DeBary-Winter Park East line. This alternative is essentially a longer and more expensive version of the Project. This alternative was rejected because the added cost did not provide any additional benefits. Each of the two-line alternatives was more expensive than the Project, and none of them were as desirable from a technical viewpoint. The Project was therefore

selected as the best solution from both a technical and cost perspective.

**Project Details**

Q. What is the FPC's timetable for licensing, design and construction of the Project?

A. FPC is presently evaluating corridors in anticipation of submitting an application under the Transmission Line Siting Act (TLSA) by December, 1991. The final action by the Siting Board is expected by October, 1992. Detailed design of the Project will begin as soon as a final corridor is approved. Construction is expected to begin in June, 1994 and to be completed by December, 1995. A licensing and construction timetable for the Project is contained in Appendix B of Exhibit ____ (JEO-1).

Q. What is the current status of corridor selection for the Project?

A. FPC's permitting team, in conjunction with its consultants, has examined a large number of possible corridors using a series of environmental, land use, cost, reliability, and other criteria. Although no final decision on the

preferred corridor or corridors has been made, the most promising candidate corridors make extensive use of existing transmission line rights-of-way.

Q. Please provide FPC's capital cost estimate for the Project and describe the assumptions on which the estimate is based.

A. The Project is estimated to cost approximately $14 million in 1995 dollars, although the cost could range from approximately $12 million to approximately $16 million depending on the final corridor approved under the TLSA. This estimate incorporates all costs, including transmission design and construction, right-of-way acquisition, terminations at DeBary Substation and the Winter Springs Substation, and the cost to convert the Lake Emma Substation from a 115/13 kV substation to a 230/13 kV substation. This conversion cost is included because several of the possible siting options use an existing 115 kV transmission line right-of-way for a portion of the Project. If one of these corridors is selected, the existing line would be removed and the Lake Emma Substation would need to be converted. Many of the options that do not include routing through the Lake Emma

Substation have other offsetting costs, and the estimated costs for the top ten routes are all within the $12 to $16 million range. This compares with an estimated cost of $17 million to $31 million for the alternatives discussed above and shown on Exhibit ____ (JEO-4).

Q. What assurance can FPC give that the actual cost of the Project will not exceed the current estimate?

A. FPC cannot give any absolute assurance as to the final installed cost of the line. While the estimate is the most accurate one possible at this time, the final route has not been selected and a number of factors beyond FPC's control can affect the final cost of the line. These include: the determination of the final length and routing of the line in further proceedings under the TLSA; any costs required to comply with unexpected conditions that may be imposed through the TLSA process; and unexpected changes in materials or labor costs.

**Consequences of Delay or Denial**

**Q. What would be the consequences to FPC and its customers if the approval of the Project was delayed?**

A. The consequences would depend in part on the length of the delay. Any delay of more than a few months in obtaining final approval by the Siting Board could delay the in-service date of the Project on a month-for-month basis. Any in-service delay would expose FPC's customers to the possibility of losing service in the event of the single contingency outage of the Sanford-North Longwood line beginning in winter 1995. In addition, such a delay would extend the period during which the double circuit outage could cause severe outages in the Greater Orlando Area, and would delay the date that CTs could be added at the DeBary site without violating single contingency criteria.

An in-service delay of two years or more would expose FPC's customers to the possibility of losing service in the event of the outage of the Stanton-Rio Pinar 230 kV line, in addition to all of the consequences of a shorter delay.

Q. What would be the impact if certification of the line was denied?

A. Because FPC will violate single contingency criteria by 1995 without the Project, doing nothing is not an alternative. If certification was denied, FPC would be required to address its customers' needs with a longer, more costly, less desirable alternative or combination of alternatives.

**Summary**

Q. Please summarize your testimony.

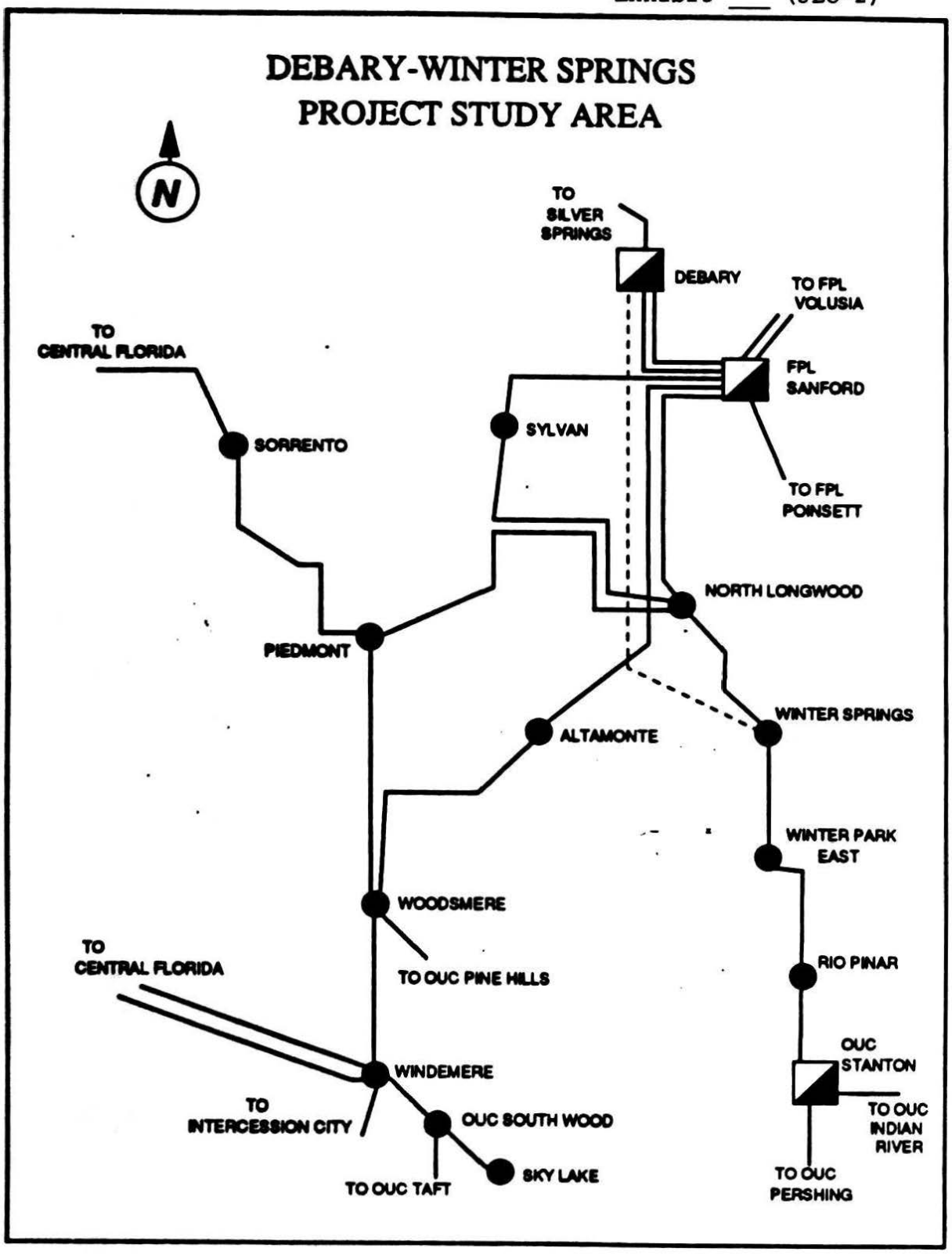
A. The DeBary-Winter Springs transmission line is needed for a variety of reasons. By December 1995, a single transmission line outage would cause a transmission line to overload. In addition, by December 1997, a different single transmission line outage would result in a second transmission line overload. The Project corrects both of these problems, as well as minimizing the effect of a double-circuit outage that would cause widespread outages. In addition, the Project will allow FPC a great deal of flexibility in how it meets the energy needs of its customers. This line provides that flexibility in two ways. The

first way is by eliminating the transmission limitation at the DeBary Generating Plant. This provides FPC with the option of installation of generation at DeBary on short notice if that is the most prudent, cost-effective thing to do. This Project also provides flexibility by providing a starting point for an extension of the 230 kV transmission system to the south and east that will provide needed support for the existing and future 69 kV system.

Q. Does that conclude your testimony?

A. Yes.

Florida Power Corporation
Docket No. 910578-EI
Witness: Cdom
Exhibit ___ (JEO-2)



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Docket No. 910578-EI
Witness: Odom
Exhibit ___ (JEO-3)

**LOAD FLOWS BEFORE AND AFTER DEBARY-WINTER SPRINGS PROJECT**

| CASE | OUTAGE | ADVERSELY AFFECTED LINE | % OF EMERGENCY RATING | | % OF NORMAL RATING | |
|---|---|---|---|---|---|---|
| | | | WITHOUT PROJECT | WITH PROJECT | WITHOUT PROJECT | WITH PROJECT |
| 1995 WINTER | Sanford-No.Longwood | Sanford-Sylvan-No.Longwood | 109% | 80% | 134% | 98% |
| | Sanford-Altamonte & Sanford-No.Longwood (Double-Circuit) | Sanford-Sylvan-No.Longwood | 169% | 117% | 207% | 144% |
| 1995 WINTER PLUS 150 MW | Sanford-No.Longwood | Sanford-Sylvan-No.Longwood | 115% | 83% | 140% | 102% |
| | DeBary-Sanford Circuit #1 | DeBary-Sanford Circuit #2 | 107% | 56% | 123% | 65% |
| | Sanford-Altamonte & Sanford-No.Longwood (Double-Circuit) | Sanford-Sylvan-No.Longwood | 177% | 123% | 217% | 150% |
| 1997 WINTER | No.Longwood-Winter Springs | Rio Pinar-OUC Stanton | 100% | 59% | 120% | 70% |
| | Rio Pinar-OUC Stanton | No.Longwood-Winter Springs | 93% | 44% | 107% | 51% |

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Docket No. 910578-EI
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Exhibit ___ (JEO-4)

## COMPARISON OF ALTERNATIVES

| Name<br>Length (Miles±) | Cost<br>(000,000) | DeBary-North Longwood Corridor Violations | | Support DeBary CTs | Rio Pinar-Stanton | Other Factors |
|---|---|---|---|---|---|---|
| | | Correct 1995 Single Contingency | Address Double Contingency | | Correct 1997 Single Contingency | |
| **GROUP A**<br>**THE PROJECT:**<br>**DeBary-Winter Springs (20)** | **$ 14** | **Yes** | **Yes** | **Yes** | **Yes** | **Option Selected** |
| DeBary-Winter Park E. (24) | $ 17 | Yes | Yes | Yes | Yes | Longer version of DeBary-Winter Springs |
| **GROUP B**<br>DeBary-North Longwood (15) | $ 12 | Yes | Yes | Partly | No | A segment of the Project; adds third source to N. Longwood |
| DeBary-Piedmont (24) | $ 21 | Yes | Yes | Partly | No | Site limited by adjacent development |
| DeBary-Sorrento (20) | $ 12 | Yes | Yes | Partly | No | |
| **GROUP C**<br>North Longwood-Winter Springs (5) | $ 5 | No | No | No | Yes | A segment of the Project |
| Altamonte-Winter Park East (8) | $ 7 | No | No | No | Yes | |
| OUC Stanton-Rio Pinar (11) | $ 10 | No | No | No | Yes | Does not enhance North to South flow of power |