ORIGINAL

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In Re: Petition for Determination of Need for an Electrical Power Plant in Lake County by Panda Leesburg Power Partners, L.P.	))))))	DOCKET NO. 000288-EU

DIRECT TESTIMONY OF

FRANCIS P. GAFFNEY

ON BEHALF OF

PANDA LEESBURG POWER PARTNERS, L. P.

April 24, 2000

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

**IN RE: PETITION FOR DETERMINATION OF NEED
FOR AN ELECTRICAL POWER PLANT IN LAKE COUNTY
BY PANDA LEESBURG POWER PARTNERS, L.P.
FPSC DOCKET NO. 000288-EU**

DIRECT TESTIMONY OF FRANCIS P. GAFFNEY

Q: Please state your name and business address.

A: My name is Francis P. Gaffney, and my business address is 800 North Magnolia Ave., Suite 300, Orlando, FL 32803-3274.

Q: What is your occupation?

A: I am employed by R. W. Beck, Inc. as a Principal Engineer in Transmission Planning and Analysis.

Q: Please describe your duties with R. W. Beck, Inc. as applicable to the subject of your testimony.

A: I am responsible for transmission planning and operations studies for clients of R. W. Beck. These studies include generation interconnection studies, and interface limit studies involving load flow, short circuit and stability analyses.

Q: Please summarize your educational background and experience.

A: I have a Bachelor of Science, Magna Cum Laude, from Northeastern University in Electrical Engineering with a specialization in Electric Power Engineering. I have a Master of Engineering from Rensselaer Polytechnic Institute in Electric Power Engineering. I have also completed all course work towards a Master of Science in

Management from Lesley College. I am a member of the Eta Kappa Nu (Electrical Engineering) and Tau Beta Pi (Engineering) National Honor Societies.

I have more than fourteen years of engineering work experience. I worked for more than ten years with Boston Edison Company. For five of those years I was assigned to the transmission planning organization, and for two years I managed the organization. For the past four years, I have worked for R. W. Beck and a subsidiary, TAVA/R. W. Beck, Inc., with continuing responsibilities in transmission planning. I have performed load flow studies, stability analyses, short circuit studies, electro-magnetic switching studies, harmonics studies, and other transmission related analyses, using varied software programs (e.g., PTI's PSS/E, GE's PSLF, EPRI's EMTP). These studies include generator interconnection studies, regional export/import studies, critical clearing time studies, rail electrification interconnection studies (harmonics), annual reliability assessment studies, short circuit mitigation studies, and others. Each of these studies examines the impact on the system or particular facilities. In addition to my extensive technical analysis experience, I was also a member of the New England Power Pool's Stability Task Force and several NEPOOL working groups.

For more information, my Curriculum Vitae is Exhibit FPG-1.

Q: **Have you previously testified before regulatory authorities and courts?**

A: Yes, I have testified at the Federal Energy Regulatory Commission ("FERC") on transmission related issues.

SUMMARY OF PURPOSE OF TESTIMONY

Q: What is the purpose of your testimony?

A: I am testifying on behalf of Panda Leesburg in support of Panda Leesburg's proposal to construct and operate the Panda Leesburg Generating Project ("Project"). My testimony demonstrates that the Project can be interconnected to the Florida Power Corporation ("FPC") system and deliver power to peninsular Florida utilities with no significant adverse impact on transmission reliability.

Q: Please summarize your testimony.

A: The Panda Leesburg Project is proposed to interconnect by looping the Central Florida to Camp Hill and the Central Florida to Clermont East 230 kV lines into a new 230 kV project substation, close to the Central Florida 500 kV and 230 kV substation of Florida Power Corporation. I will discuss the methodology and data used to conduct the study. I will also discuss the results of the study that show that the proposed Project, along with some transmission system upgrades, has no significant adverse impact on the reliability of the peninsular Florida transmission system.

Q: Are you sponsoring any exhibits?

A: Yes. I am sponsoring the following exhibits:

FPG-1. Qualifications of Francis P. Gaffney

FPG-2. FRCC Generation Interconnection Load Flow Study Report

Q: Please describe R. W. Beck, Inc. and its business.

A: R. W. Beck, Inc. is a corporation of engineers and consultants founded in 1942 for the purpose of rendering professional engineering and consulting services in planning, financing, operating and designing facilities for utilities and energy users. Exhibit PAA-1 provides information about the firm's experience and qualifications.

Q: **With what similar projects has R. W. Beck been involved, and in what capacity?**

A: R. W. Beck has performed numerous studies for generator interconnection, including merchant power plants. Our role has included: Fatal Flaw Studies, System Impact Studies, reviews of System Impact Studies, and testimony on behalf of our clients.

Q: **What are your responsibilities with respect to the Project that is the subject of these proceedings?**

A: R. W. Beck has been retained to perform load flow and stability studies to evaluate the impacts on the transmission system of the proposed Project as a merchant plant selling wholesale power to other utilities in peninsular Florida. I have the primary responsibility for conducting these studies and evaluating the impact on the transmission system.

TRANSMISSION INTERCONNECTION FOR THE PANDA LEESBURG POWER STATION

Q: **Please describe the transmission facilities by which the Panda Leesburg Plant will be connected to the Florida transmission grid.**

A: Panda Leesburg is proposed to have an eighteen breaker, breaker-and-a-half scheme Project 230 kV substation. The six turbines will be separately connected by their own Generator Step-up Units ("GSU's") to the Project 230 kV substation. The Central Florida to Camp Hill 230 kV line and the Central Florida to Clermont East 230 kV line will be looped in and out of the Project substation for a total of four lines emanating from the Project substation, two to the Central Florida substation, one to Camp Hill and another to Clermont East.

Also, as part of the Project's interconnection, it is proposed to reconductor the Enola to Umatilla 69 kV line, and to install a series reactor on the Villa Tap to Homsatp2 115 kV line. Other alternatives to these proposals will also be considered.

TRANSMISSION SYSTEM IMPACT STUDY DATA AND METHODOLOGY

Q: How did you evaluate the impact of the proposed Project on the transmission system?

A: We evaluated the transmission system impacts of the Project by conducting load flow studies (also known as power flow studies or thermal analyses) in which we simulated the incremental impact of the Project on the power system. We are also performing stability analyses and are calculating three phase fault currents at buses in close proximity to the Project.

LOAD FLOW ANALYSIS

Q: Please briefly explain the purpose of load flow analyses.

A. Electrical systems consist of physical equipment which is used to generate power, step-up power to a higher voltage and deliver power to customer loads through a series of lines and transformers. The characteristics of the transmission system's physical components can be modeled mathematically as impedances. When this impedance model is coupled with specific load levels, generation dispatch, voltage schedules, VAR inputs and area interchange schedules (for a multi-control area model), a load flow model of the system is defined for a single "snapshot" in time. When the load flow case is solved, the load flow program will use mathematical methods to simulate flows and voltages on the modeled system based on the impedance of the system and the load flow inputs.

When examining the impact on the transmission system of a new generator, the system is first evaluated without the proposed project, the Base Case, and then evaluated with the Project, the Alternate Case. Electric utilities compile information about their power systems in load flow models and file these models at FERC as part of the FERC 715 filing. This is typically a good starting point for creating a Base Case – a case that represents the condition of the system before the change to the system being studied. An Alternate Case is then created to represent the system change being studied (e.g., adding a generator) and results of the load flow analysis of the Alternate Case are compared to results from the Base Case to examine the incremental impact of the system change.

Q: **How did you conduct the load flow analysis?**

A: We created three Base Cases without the Project: 1) Peak Load or 100% load level, 2) "Shoulder" Load or 60% load level, and 3) Light Load or 40% load level. Three different load levels were evaluated to reflect the varied conditions on the transmission system. Peak load is used for planning purposes to demonstrate that the resource's ability to serve load at the time the resource is most needed. Light load can represent a "worst case" for the transmission system in the immediate vicinity of the project as loads are reduced in the area requiring more exports from the region. The light load snapshot is used only for planning purposes since it does not always reflect that many units will be off-line or close to their minimum load dispatch levels. It is the purpose of the market price study as discussed by Mr. Davis to determine when the resource will be dispatched on an economic basis. "Shoulder" load, or mid-load levels, can be the "worst case" for regions importing or exporting power. We evaluated the performance of the three Base Cases by testing a comprehensive set of contingencies to create a baseline performance for the existing power system.

We then modified the three Base Cases to include the Project and tested these three Alternate Cases using the same set of contingencies. The results of the Alternate Cases were compared with the Base Cases to evaluate the incremental impact of the Project on the performance of the power system.

This approach is common practice and is valuable because criteria violations in the existing system (if any) can be identified and any new criteria violations caused by the incremental impact of the project can be separately identified.

Q: **How did you develop the peak load Base Case?**

A: We obtained the 2004 FERC 715 filed summer peak load flow case from the FERC's web-site. We reviewed the ten year site plans for each of the peninsular Florida utilities, the ten year site plan of the Florida Reliability Coordinating Council ("FRCC"), and the Florida Public Service Commission's ("FPSC") review of the ten year site plan. From these site plans, we included the generating projects and transmission reinforcements scheduled to be in service by 2004. We also included other Merchant Generator Projects that were publicly announced and have petitioned for a Certificate of Need (e.g., Duke New Smyrna and PG&E Okeechobee). After adding the new generation resources, we made adjustments to other generating plants within peninsular Florida (generally turning off peaking units based on FERC Form 1 data on capacity factor, heat rate and operating costs) to maintain the same level of Florida Import as in the filed FERC 715 load flow case (approximately 2,350 MW).

Q: How did you develop the shoulder load and light load Base Cases?

A: Using the peak load case above, we scaled the load down within peninsular Florida to the 60% and 40% load levels. We maintained the 2,350 MW Florida Import level at the 60% load level and reduced Florida Import to about 1,000 MW at the 40% load level. We then adjusted generation within Florida to match load and losses, subtracting out the Florida Import. We adjusted the generation using the following guidelines:

1. Generation was turned off and reduced in the following order: (i) gas turbines and diesels, (ii) oil and gas fired steam units, (iii) repowered and green-field combined cycle plants, and (iv) coal plants. We did not turn off any nuclear units, large coal units, or cogeneration facilities except as noted below.
2. When deciding among generators with the same technology guideline, we considered FERC Form 1 data for capacity factor, heat rate and costs (or forecasted heat rate and cost information for new units),
3. A general preference was given to keeping plants in close proximity to the Project in service. This results in a conservative study by increasing area export conditions and stressing the transmission system. In converse, plants far away from the Project will have little effect on the regional impacts of the Project.
4. A general preference was given to turning off generation in south Florida to enhance north to south flow through Florida.

At the 40% load level, we assumed that one nuclear unit would be out of service for maintenance and/or refueling because 40% load level would likely be a fall or spring minimum load. For conservatism, we chose Turkey Point because it is distant from the proposed plant site, and, by taking this south of Miami unit out of service, it increases north to south flows.

Q: How were the Alternate Cases created?

A: Each of the three Base Cases was modified by including the Project at peak output (projected to be 1,040 MW) and adjusting generation within peninsular Florida using the same factors as previously mentioned.

Q: In the load flow analysis, did you study the combined effects of Panda Leesburg and Panda Midway?

A: Yes. The Base Cases excluded the Panda Leesburg and Panda Midway projects (defined collectively as the "Projects"), and the Alternate Cases included the Projects. Because of the distance between the Projects, the impacts of each are easily separated and identifiable from each other.

Q: Did you evaluate the Project's capability to deliver power outside of Florida?

A: No. I understand from Panda Leesburg that their intent is to sell wholesale power within peninsular Florida, and accordingly R. W. Beck was not asked to evaluate sales outside of peninsular Florida.

Q: What steady state voltage and rating criteria were used in your study?

A: The transmission planning criteria used in the study are in accordance with "*FRCC Planning Principles and Guides*", and in accordance with FPC Planning Criteria as published with FPC's FERC 715 filing. The FRCC guides are not specific regarding quantitative criteria. The guides define probable contingencies as single contingencies (e.g., loss of any one element), and state that, "Transmission systems should be capable of delivering generator unit output to meet projected customer demands during normal and probable contingencies."

Because the FRCC guides are not specific, and because the project is proposed to connect to the FPC transmission system, we used FPC's planning criteria, which are:

- Voltage should be between 95% and 105% of nominal voltage for both normal conditions and contingencies.
- Loading on transmission lines and transformers should be under the Normal Rating (Rating 1 in the FERC 715 load flow case).
- Under contingency conditions, the loading should be under the Emergency Rating (Rating 2 in the FERC 715 load flow case).

Q: What areas were monitored in your analysis?

A: All of the peninsular Florida areas were monitored down to the 69 kV level.

Q: Please define contingency.

A: The Florida Reliability Coordinating Council defines a contingency as an "unexpected loss of a system element". Generally, a contingency is loss of any one transmission element, such as a transmission line, transformer or generator. The loss of the element could be due to any number of reasons such as lightning, birds, equipment failure, human error, etc. Although many failures are temporary and will be restored in less than fifteen seconds, for the purposes of the load flow study, the contingency is assumed to be long term (minutes to hours). The significance of a contingency is that while a transmission element is out of service, other transmission elements share in transmitting the power formerly being transmitted by the element that was lost, thereby increasing the non-outaged elements' loadings, potentially causing an overload situation or a voltage violation. In a load flow study, many different contingencies are tested.

Q: How did you select the contingencies used in your steady state analysis?

A: The "*FRCC Planning Principles and Guides*" define a "Probable Contingency" as "the loss of any single element (generating unit, transmission line or transformer." In accordance with these principles and guides, we tested, one at a time, every line and transformer from contingency 69 kV and up within the vicinity of the Project to assess the impact of the Project on the regional transmission system. We also tested, one at a time, every line and transformer contingency from 230 kV and up within peninsular Florida. In addition, we tested, one at a time, every generator contingency from 100 MW and up within peninsular Florida.

STABILITY ANALYSIS

Q: Were you able to complete your stability analysis?

A: No. The Florida Reliability Coordinating Council (FRCC) was asked to provide a stability case for the study, but, a case was not made available. The stability case is not available from the FERC 715 filing either. Therefore, the dynamic stability data were obtained from the Mid-Atlantic Area Council ("MAAC") System Dynamics Database Working Group ("SDDWG") database representing the entire eastern U.S. interconnection for the year 2003 summer peak. This data is publicly available from the MAAC web-site, which is accessible via the Pennsylvania - New Jersey - Maryland ("PJM") web-site (www.pjm.com). However, due to the complexity of this very large (over 30,000 bus) model, we are still in the process of performing the study. Results will be made available shortly.

Q: How are you conducting the stability analysis?

A: In a similar fashion to the load flow analysis, a base, peak load case was created and the performance of the power system will be benchmarked with this Base Case. Then, the new plant was added and generation adjusted to create an Alternate Case. The results of the Alternate Case will be compared with the results of the Base Case to assess the incremental impact of the Project.

Q: How will you develop the contingency list used for your stability analysis?

A: We will simulate three-phase faults at either end of all 500 kV lines within Florida, and partially into Georgia. We will also study faults on 230 kV lines in close proximity to the Project.

Q: In the stability analysis, will you study the combined effects of Panda Leesburg and Panda Midway?

A: Yes. The Base Cases excluded the Projects, and there are two Alternate Cases one that includes only Panda Leesburg and another that includes both Panda Leesburg and Panda Midway.

SYSTEM IMPACT STUDY RESULTS

Q: What were the results of the load flow study?

A: Exhibit FPG-3 shows the results of the load flow study. When analyzing the results we take several factors into consideration. These factors are:

1. Is the element overloaded in the Base Case? If the element is overloaded in the Base Case, then the overload is a Pre-Existing condition and it is likely that the Project would not be responsible for upgrades required to solve the overload

concern. This also holds true if the results of the study indicate the same element is overloaded for other contingencies.

2. Does the overload exceed the Emergency Rating for a contingency (Rating 2)? If the loading does not exceed the element's Emergency Rating (Rating 2), then the line is able to carry the loading under contingency conditions.

3. Does the overload exceed 15% of the Normal Rating if the Normal Rating (Rating 1) equals the Emergency Rating (Rating 2)? Frequently, in the FERC 715 filed case, Rating 2 is published as the same as Rating 1. This can be due to several reasons. The filing entity may not have calculated an Emergency Rating for that element and, therefore, published the Normal Rating as the Emergency Rating. Typically, an Emergency Rating of a line is about 15% greater than the Normal Rating. Tampa Electric Company ("TECO") uses this 115% of Normal Rating in their planning criteria (as published in their FERC 715 filing). The Normal and Emergency Ratings may also be equal due to other reasons, such as the line may be "sag" restricted, (e.g., restricted by clearance to ground of the conductor). Usually, this can be easily fixed by re-tensioning the line and possibly making minor modifications to some transmission structures. In addition, there might be minor equipment that limits the line, such as a disconnect switch.

4. Is the difference between the Base Case and the Alternate Case significant (e.g., greater than a 5% increase)? If the difference between the loading in the Base Case and the Alternate Case is insignificant, then the Project does not contribute significantly to the concern.

5. Is the location of the overloaded line distant from the Project? If the location of the overloaded element is distant from the project, then the cause of the overload is likely something other than the Project.

6. Is the overload insignificant? If the overload is very small (e.g., 101% to 103%), then the overload is within the error tolerances of the study, and/or it may be that the situation can be resolved through an operating measure, such as reducing the output of the Project, to eliminate the overload.

Q: **Are there any potential concerns for integrating the Project into the Florida transmission grid?**

A: There are concerns for two transmission corridors:

- There is a parallel 500 kV, 230 kV, 115 kV and 69 kV transmission corridor that runs from the Crystal River Plant to the Lake Tarpon Substation just north of Tampa. There are three potential concerns on this corridor:
    - The 115 kV portion of the corridor
    - The Lake Tarpon auto-transformers
    - The Dade City to Ft. King 69 kV line
- There is a parallel 230 kV and 69 kV transmission corridor from the Central Florida substation to Haines Creek, then to Sorrento and on to Piedmont that carries power from the Central Florida substation towards north suburban Orlando. There is concern for the Enola to Umatilla 69 kV line within this corridor.

Q: **Would you explain the potential concern for the 115 kV corridor from Crystal River to Lake Tarpon?**

A: There is a parallel 500 kV, 230 kV, 115 kV and 69 kV transmission corridor that runs from the Crystal River Plant to the Lake Tarpon Substation just north of Tampa. Because Crystal River is a large Plant, portions of the corridor from Crystal River to Tampa overload in the Base Case at the 60% load levels for loss of one of the 500 kV lines (particularly the Crystal River to Brookridge 500 kV line). The addition of the Project increases the flow towards Tampa, incrementally impacting this corridor. In particular, the 115 kV line from Brookridge to the Brk98 Tap and then to the Hammck Tap loading is increased from 112%-114% of Rating 1 in the Base Case without the Project to 132%-135% of Rating 1 with the Project. Note that, as published in the FERC 715 load flow database, Rating 1 equals Rating 2 (137 MVA) for this line. Other segments of this 115 kV corridor are also overloaded in the Base Case beyond 115% of Rating 1. These segments are from Villa Tap to Homsatp2 to TC Ranch to Hammck Tap. Note that these overloads do not appear in the peak load case, but only in the lighter load cases (60% in particular).

There are a few options for addressing the overloads of this 115 kV corridor:

- Upgrade / reconductor the Brookridge to Brk98 Tap to Hammck Tap lines (estimated cost of $2.5 to $3 million).
- Install a series reactor, possibly on the Villa Tap to Homsatp2 line to limit flow on this 115 kV corridor (estimated cost of about $500,000).
- Install a phase shifting transformer (phase shifter), possibly on the Villa tap to Homsatp2 line, to limit the flow along the 115 kV corridor (estimated cost of $1.5 to $2 million).

Preliminary analysis on the effectiveness of the phase shifter and the series reactor was performed. This preliminary analysis indicated that both alternative solutions effectively eliminate the overloads on this 115 kV corridor, including those overloads in the Base Case, while not causing adverse conditions to other parallel lines. The cost-effective solution appears to be a series reactor on the Villa Tap to Homsatp2 115 kV line with an estimated cost of $500,000.

My conclusion is that the overload on this corridor can be cost-effectively addressed by one of the three alternatives presented above, eliminating any significant adverse impact of the Project on this 115 kV transmission corridor.

Q: Would you explain the potential concern for the Lake Tarpon autotransformers?

A: At the end of the Crystal River to Lake Tarpon transmission corridor are two 500 kV to 230 kV autotransformers at the Lake Tarpon substation. At the 60% load level in the Base Case, the transformers are overloaded to 102% - 103% of Rating 1 without the Project on loss of the other autotransformer. Note that, as published in the FERC 715 loadflow database, Rating 1 equals Rating 2 (750 MVA) for this transformer. The Project does increase the flow towards Tampa, increasing the loading of the autotransformers to a contingency loading of 116% - 117% of Rating 1 on loss of the other transformer. This is of potential concern because it exceeds the 115% of Rating 1 that is typical of an Emergency Rating (see previous discussion). However, transformers, because they are oil filled, take longer to heat up than overhead transmission lines. Therefore, the Emergency Ratings of transformers are often greater than 115% of Rating 1, and, since the loading exceeds Rating 1 by only 116%-117%, it is likely that the overload would be within an Emergency Rating for the transformer.

For example, the American National Standards Institute ("ANSI") Standard C57.92-1981 lists a four hour Emergency Rating for a typical transformer (65 degrees Celsius rise, Forced-Air-Cooled Transformer rated over 133% of self-cooled rating with an equivalent load of 70% of maximum nameplate rating pre-contingency, 30 degrees Celsius ambient temperature) as 118% of Normal Rating with no loss of life. A one hour rating under the same conditions is 145% of Normal Rating. So, if the transformers comply with the ANSI standards, the transformers should be able to carry this contingency loading.

In addition, since the overload only happens at off-peak loads, a low-cost alternative is to back down the output of the Project post-contingency to reduce the loading on the remaining autotransformer.

My conclusion is that any significant adverse impact caused by the Project to these autotransformers can be eliminated through calculating an Emergency Rating and/or through operating measures to reduce the output of the Project post-contingency in the event that one of the Lake Tarpon autotransformers fails and the other becomes overloaded.

Q: **Would you explain the potential concern for the Dade City to Ft. King 69 kV line?**

A: The Dade City to Ft. King 69 kV line is part of a 69 kV transmission corridor that loops from the Brooksville substation (part of the Crystal River to Lake Tarpon corridor) west to the Zephyrhills North substation and Kathleen substation area (the other end of the 500 kV system) and then towards north Tampa and the Lake Tarpon area. At the 60% load level in the Base Case, the line is loaded to 99% of Rating 1 on loss of the Brookridge to Lake Tarpon 500 kV line. Note that, as published in the FERC 715 loadflow database, Rating 1 equals Rating 2 (63 MVA) for this line. The addition of the Project increases the loading on the line for the same contingency to 116% of Rating 1. If the Emergency Rating is as typical (115% of Rating 1), then this is a minor overload of 1% in excess of the estimated Emergency Rating. Since the overload only happens at off-peak loads, a low-cost alternative is to back down the output of the Project post-contingency to reduce the loading on the 69 kV line on loss of the 500 kV line.

My conclusion is that any significant adverse impact caused by the Project to this line can be eliminated through calculating Emergency Ratings and/or through operating measures to reduce the output of the Project post-contingency.

Q: Would you explain the potential concern for the Enola to Umatilla 69 kV Line?

A: The Enola to Umatilla line is part of a 230 kV and 69 kV transmission corridor that heads from the Central Florida substation to north suburban Orlando. The corridor has one 230 kV line, and if the Haines Creek to Sorrento portion of that 230 kV line is lost, it overloads the underlying 69 kV line, Enola to Umatilla, to 117% of its Emergency Rating with the Project.

Likely, the most cost-effective option is to reconductor the line for an estimated cost of $140,000.

My conclusion is that the overload on the Enola to Umatilla 69 kV line can be cost-effectively addressed through reconductoring, eliminating any significant adverse impact of the Project on this 69 kV line.

Q: Did you perform sensitivities to Florida Interface Import levels?

A: No. The location of the Panda Leesburg Project is sufficiently distant from the Florida Interface that the Project will have negligible impact from a load flow perspective on the capability to import power into Florida, and vice versa. The study was performed at a conservative level of a Florida Import near its maximum firm capability.

Q: Did you study voltage stability?

A: No. Generally, voltage instability (e.g., voltage collapse) is caused by transferring large amounts of power over large distances (e.g., from Georgia to South Florida) without sufficient active voltage regulation. The addition of Panda Leesburg will not adversely impact active voltage regulation, and, in fact, should improve the voltage stability of Georgia to South Florida transfers by providing mid-point active voltage regulation.

SHORT CIRCUIT AND STABILITY RESULTS

Q: Are you able to make any observations regarding the results of the stability analysis or short circuit calculations?

A: Theoretically, a large, active source in Central Florida should not have an adverse impact on stability limits from Georgia to Florida. I expect study results to confirm that the Project will have no significant adverse impact on the system from a stability perspective. I have no observations concerning short circuit calculations yet.

CONCLUSIONS

Q: What is the overall conclusion of your analysis?

A: Based on results to date, with the interconnection scheme, the proposed transmission upgrades and the operating schemes discussed, the Panda Leesburg project has no significant adverse impact on the peninsular Florida transmission system.

Q: Does this conclude your direct testimony?

A: Yes.

FRANCIS P. GAFFNEY

Rensselaer Polytechnic Inst.: Master of Engineering in Electric Power Engineering, GPA 4/4

Northeastern University: B.S. in Electrical Engineering, Power Systems, GPA 3.6 / 4

Since 1982, Mr. Gaffney has developed a diverse expertise in most aspects of the electric utility business, especially the electric power delivery business. During his career, he has been employed as:

- Transmission Planning Manager, expert in transmission planning studies and generator interconnection studies.
- National Director of Operations of a Y2k Consulting Firm, successfully operated $15M company.
- Manager of Delivery System Design, all aspects: transmission, substation, distribution and protective relaying.
- Power Quality / Technology Expert.
- Project / Program Manager for many, varying projects.
- Marketing and Sales Manager.
- Strategic Planning / Change Management.

Transmission Planning

Managed the Transmission Planning group of Boston Edison. Principal Engineer with R. W. beck specializing in transmission planning studies.

- Former member of several NEPOOL Committees, including the Stability Task Force, the Southeast Mass. and Rhode Island (SEMA/RI) export study, and the Hydro-Quebec Phase II export study.
- Performed numerous load-flow, stability, short circuit and electro-magnetic transient studies. Some major categories of studies are listed below:
    - Import Studies (e.g., Boston Import) (loadflow)
    - Major load interconnection studies (e.g., bulk substations, Amtrak rail electrification) (loadflow, short circuit)
    - Export Studies (e.g., SEMA/RI Export) (loadflow, stability)
    - Critical Clearing Time studies (stability)
    - Control System Contingency Studies (stability)
    - Capacitor switching studies (electro-magnetic transient)
    - Performed several interface limit studies, including Southeast Mass / Rhode Island Export, Hydro-Quebec Phase II export and involvement with the New York to New England interface and Maine to New Brunswick interface, both loadflow and stability analyses

- Performed numerous generator interconnection studies in various regions of the country, including NEPOOL, WSCC, SERC and FRCC (e.g., Fatal Flaw Studies, System Impact Studies, Facilities Studies, Minimum Interconnection Studies, etc.), load flow, short circuit and stability analyses.

- Due diligence expert review for several merchant generator interconnections.
- Testified at FERC and local courts on transmission related subjects.
- Experienced with several different programs, including GE PSLF, PTI PSS/E, and EPRI EMTP.

Delivery System Design

Managed Delivery System Design for R. W. Beck, all aspects, including: transmission design (overhead and underground), substation, distribution and protective relaying. Managed Distribution Design, Senior Substation and Protective Relay Engineer for Boston Edison. Prepared numerous specifications, drawings, etc. for complete design packages. Performed numerous protective relay coordination studies. Performed several due diligence asset evaluations.

Operations Management

National Director of Operations for a start-up, limited duration, Year 2000 consulting firm. Developed work processes, developed employee reference manuals, conducted training, developed project manager tools, successfully managed the company's first project, helping the company achieve in the black operations within 6 months of start-up. Developed work management tools, metrics, backlog report, operations forecast pro-forma and other operations management tools to successfully operate the $15M company. Developed Exit Plan to successfully manage overhead costs while meeting commitments to clients and breaking even during the last 4 months of operation.

With Boston Edison, major contributor in numerous projects to improve operations, including: work process redesign, core business system requirements / replacement, change management efforts, etc. Major contributor to a Customer Response Program - evaluated adequacy and integration alternatives of existing IT "back-office" infrastructure, including: customer care system, work management system, materials management system, energy management system and AM/FM GIS System. Facilitated a culture change program (Pacific Institute's Investment in Excellence).

With R. W. Beck, performed several management audits of utility operations.

Power Quality / Technology

Power Quality expert. While at Boston Edison, consulted to numerous commercial and industrial customers. Helped develop a profitable Power Quality consulting business by developing work processes, standard cost estimates, marketing material and training the sales team. Proposed and participated in market research of residential, commercial and industrial customers of many sizes for power quality services. Taught seminars on power quality. Initiated a project to install power quality meters throughout the distribution system to measure the quality of power being delivered to customers. Power quality / reliability metrics expert.

With Boston Edison, company's expert on new technologies such as fuel cells, power electronics, superconducting, renewable energy sources, flywheels, etc. Performed cost benefit analyses, due diligence on start-up firms. Conducted training.

Project / Program Management

Managed several Y2k Remediation Programs successfully – on schedule, under budget. High quality delivery, such that clients expanded the scope to triple and quadruple the size of the projects. High client satisfaction, thank you letters received for a job well done. Design projects managed on schedule on budget.

Strategic Planning / Change Management

With Boston Edison. Managed a project studying the convergence of delivery utilities (e.g., electric, communications, water, gas). Principle contributor for entrepreneurial project to develop a power system for a high bandwidth communication system for a Regional Bell Operating Company. Project Manger for a Distribution Business Pilot, a program to isolate a section of the distribution system, treat it as its own P&L center, and evaluate modifications in technology and operations on P&L. Facilitated a culture change program (Pacific Institute's Investment in Excellence). Developed a business plan to transition the engineering group into an engineering consulting group.

With R. W. Beck. Major contributor to develop a business plan for a schedule coordinator business. Major contributor to develop a model for the revenue cycle services marketplace that would allow revenue cycle services to be open to competition. Major contributor to develop a business plan for non-utility entities to enter the energy services business sector.

Honors

- Honorable Mention, Young Outstanding Electrical Engineer from the Eta Kappa Nu National Honor Society, 1991.
- Member of the Tau Beta Pi National Honor Society for Engineers
- Eta Kappa Nu National Honor Society for Electrical Engineers

Memberships and Continuing Education

- Completed course work for BS in Management, Lesley College, Cambridge, MA, 1995, GPA 3.8/4
- Leadership Development Program, University of Maryland & Center for Creative Leadership, 1995.
- Industrial Power System Engineering, Power Technologies, Inc., Schenectady, NY (2.7 C.E.U's)
- Member for the Institute of Electrical and Electronics Engineers (IEEE)

**FRCC GENERATION INTERCONNECTION
LOAD FLOW AND STABILITY STUDY
VOLUME 1: LOAD FLOW STUDY**

LEESBURG SITE

PANDA LEESBURG POWER PARTNERS, L.P.

APRIL 24, 2000

GENERATION INTERCONNECTION
LOAD FLOW AND STABILITY STUDY

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INTRODUCTION

In accordance with your request, this report summarizes the results of our load flow and stability study to examine the technical aspects of interconnecting a proposed 1000 MW plant addition to the Florida transmission grid.

THE PROPOSED "PROJECT"

The Proposed Project is two, two-on-one F-Series 500 MW combined cycle units. The proposed Project site is in central Florida, near Leesburg, just south of Central Florida substation. The proposed plant will be referred to as the Project throughout the remainder of the report. The output of the proposed plant would be sold within Florida.

The proposed interconnection for the project will be to loop the Central Florida to Camp Hill 230 kV line and the Central Florida to Clermont East 230 kV line in and out of the proposed Project's 15 breaker 230 kV switchyard.

LOAD FLOW STUDY METHODOLOGY

The goal of the Load Flow Analysis is to perform an evaluation of the incremental impact of the Project on the loading of the regional transmission system. To achieve this goal, R. W. Beck uses the following process:

1. A Base Case is developed to establish a baseline performance of the system before the Project.
2. Alternative Case(s) are then developed which include the Project.
3. Single contingency analysis is then performed on all of the cases.
4. Results from the Alternative Case(s) are compared to the results from the Base Case to evaluate the incremental impact of the Project on the loading of the transmission system.
5. The results are analyzed and presented.

R. W. Beck uses General Electric's PSLF program to run the load flow cases.

The purpose of the technical evaluation is to determine if upgrades to the existing transmission system are likely to be required to integrate the Project to the transmission grid. This study does not determine when and if the proposed Project would be dispatched. It instead evaluates the impact of the proposed generation on the planned transmission system, i.e., the Base Case configuration. The transmission loadings are evaluated against the applicable line or transformer capability ratings to determine whether it is likely that particular system components will require upgrade, replacement or additional protection as a condition for interconnecting the proposed Project. This study is not purported to represent a comprehensive review or analysis of physical interconnection alternatives, operational conditions, right-of-way or permitting from a cost or technical standpoint.

When studying generation export conditions, worst case conditions are often at lighter load levels. Near minimum (approx. 40-50%) load levels sometimes result in worst case conditions on the transmission system in close proximity to the Project, and "shoulder" load levels (approx. 60-70%) sometimes result in worst case conditions for multiple generating plants exporting from a region. Therefore, analysis was also performed at these lighter load levels.

MODELING / STUDY ASSUMPTIONS

As with all load flow analyses, the results of the study are driven by the assumptions used in developing the load flow models. To minimize the impact of these assumptions, R. W. Beck starts the process with a FERC 715 load flow case model, and then details the changes made to the model in evaluating the resource addition. The most significant assumptions impacting the identified necessary improvements include:

- The "Merchant" (or other planned) Generation added to the Base Case load flow model.
- The re-dispatch of existing units used to offset the new projects, including the Client's project.

This section discusses these assumptions, and others made in performing the study, such as contingencies evaluated and information monitored.

R. W. Beck reviewed the Ten-Year Site Plans for the FRCC and Florida utilities to determine what transmission system improvements and generator additions are planned to be added to the system, as well as other announced regional generation additions.

TABLE 1

NEW GENERATION IN REGION INCLUDED IN BASE CASE

Developer	Type	Plant / Location	MW	ISD	Comments
Florida Power Corp.	CT	Intercession City	329	2001	Planned
Florida Power Corp	CC	Hines Energy Complex	470	2000	Already in FERC 715 2004 Case
FPL	CC	Fort Myers Repowering	926	2002	Already in FERC 715 2004 Case
FPL	CC	Sanford Repowering	2,280	2003	Already in FERC 715 2004 Case
Gainesville	CC	Kelly Unit 8 Repowering	110	2001	Planned
JEA	CT	Brandy Branch	149	2001	Planned
JEA	CFB	Northside	276	2002	Planned
FMPA	CC	Cane Island	240	2001	Already in FERC 715 2004 Case
Lakeland	CC	MacIntosh 5	337	2002	Already in FERC 715 2004 Case
SECI	CC	Paynes Creek	488	2002	Already in FERC 715 2004 Case
TECO	CC	Gannon Repowering	1,475	2004	Planned
Reliant	CT	Holopaw	460	2002	Planned
Duke Energy Power	CC	New Smyrna Beach	460	2001	Planned
PG&E Generating	CC	Okeechobee Co.	560	2003	Planned
IPS/Avon Park	CT	Hardee Co.	460	2001	Planned
Panda Midway	CC	Midway	1,000	2003	Not included in Base Case, included in Alternate Case

CASE DEVELOPMENT

The 2004 summer peak load flow model filed at the Federal Energy Regulatory Commission ("FERC") by the FRCC was used as a starting point to create the cases for the study. The utilities in the State file load flow cases at FERC annually. The load flow cases submitted include projections for several different years. Each load flow case for a future year includes projected loads and the planned generation additions and dispatch, and transmission improvements to meet those loads. Each load flow case must have an equal amount of generation and load. R. W. Beck relies upon these load flow models but does not independently verify all of the data in the models.

The FERC 715 case is modified to incorporate the Announced Regional Generation (see Table 1) to create a 100% Base Case. The load was scaled to a 60% load level and a 40% load level and generation redispatched within peninsular Florida to create a 60% Base Case and a 40% Base Case, respectively. The method used to redispatch the generation is described in the following section: Dispatch Assumptions.

The Base Cases were then further modified to create the Alternate Cases by including the Project (and the Panda Midway project).

A total of six (6) cases were developed:

1. 100% Load Level Base Case
2. 60% Load Level Base Case

3. 40% Load Level Base Case
4. 100% Load Level Alternate Case
5. 60% Load Level Alternate Case
6. 40% Load Level Alternate Case

The essential difference between the Base Cases and the Alternate Cases is that the Base Case do not include Panda Leesburg nor Panda Midway, while the Alternate Cases do.

DISPATCH ASSUMPTIONS

As discussed in the previous section, generation is adjusted from the FERC 715 case to accommodate the Announced Regional Generation assumed in the study (see Table 1) to create the Base Cases. Generation is further adjusted to accommodate the proposed plant to create the Alternative Case(s). Generation is adjusted considering the following factors:

- Turned off and reduced generation in the following order: (i) gas turbines and diesels, (ii) oil and gas fired steam units, (iii) repowered and green-field combined cycle plants, (iv) coal plants.
- FERC Form 1 data for capacity factor, heat rate and costs (or forecasted heat rate and cost information for new units), when deciding among generators in the same technology.
- A general preference was given to keep plants in close proximity to the Project in service for a conservative study by increasing area export conditions and stressing the transmission system. And visa versa, plants far away from the Project will have little effect on the regional impacts of the Project.
- A general preference was given to enhance north to south flow through Florida (e.g., turning off generation in south Florida) further stressing the system.

At the 40% load level, we assumed that one nuclear unit would be out of service for maintenance and/or refueling because 40% load level would likely be a fall or spring minimum load. For conservatism, we chose Turkey Point because it is distant from the proposed Project, and, by taking this south of Miami unit out of service it increases north to south flows.

CONTINGENCIES

A single contingency analysis was performed, in other words, one line or transformer is taken out of service at a time. To perform the contingency analyses, R. W. Beck created a contingency list containing all 230 kV and above transmission lines and transformers within peninsular Florida, all 69 kV to 138 kV lines and transformers in the region of the Project, and all generators larger than 100 MW within peninsular Florida. Appendix B is a list of the contingencies studied.

MONITORED INFORMATION

For the Contingency analyses, R. W. Beck monitored voltages and flows on lines and transformers 69 kV and higher within peninsular Florida to assess any violations outside of the planning criteria described in the following sections.

EVALUATION CRITERIA

Criteria are necessary to evaluate the performance of the transmission system within this analysis. This section describes 1) the coordinating council reliability criteria, 2) the regional utilities' reliability criteria, and 3) the criteria used for evaluation in this analysis.

FRCC SPECIFIC CRITERIA

FRCC has established Planning Principal and Guides, including criteria for reliability in system planning. While the FRCC states that this reliability criteria is not mandated by the FRCC, its purpose is to promote coordination of planning, construction and utilization of generation and transmission facilities involved in interconnected operations. FRCC recognizes that the reliability of power supply in local areas is the responsibility of the individual FRCC members and each member has internal criteria for planning and reliability. The current FRCC Planning Principals and Guides, as posted at the FRCC Web site, were adopted on September 25, 1996.

FRCC lists several guidelines pertaining to transmission adequacy, security, coordination, and protection systems. The guidelines define probable contingencies as single contingencies (e.g., loss of any one element), and states that: "Transmission systems should be capable of delivering generator unit output to meet projected customer demands during normal and probable contingencies." In general, the guidelines reflect typical transmission planning criteria, but are rather broad and offer few specific parameters. For example, the FRCC guidelines include no numerical targets for line and transformer loading or voltage specifications for either normal (Rating 1) or contingency conditions (Rating 2).

R. W. Beck has assumed that the two ratings provided in the load flow models correspond to the normal and emergency ratings when the two ratings are different.

- Rating 1 – Normal Rating

- Rating 2 - Emergency Rating

REGIONAL UTILITIES' SPECIFIC CRITERIA

TECO SINGLE CONTINGENCY PLANNING CRITERIA

Excerpted from TECO's 1998 FERC 715 Filing, Part 4.

TRANSMISSION SYSTEM LOADING LIMITS	
Transmission System Conditions	Acceptable Loading Limit for Transmission Lines and Transformers
Single Contingency, pre-switching	115% or less
Single Contingency, after all switching	100% or less
Bus Outages, pre-switching	115% or less
Bus Outages, after all switching	100% or less

FLORIDA POWER CORPORATION PLANNING CRITERIA

The FPC Planning Criteria as published with FPC's FERC 715 filing is as follows:

- Voltage should be between 95% and 105% of nominal voltage for both normal conditions and contingencies.
- Loading on transmission lines and transformers should be under the Normal Rating under normal conditions.
- Under contingency conditions, the loading should be under the Emergency Rating.

CRITERIA USED FOR THIS STUDY

The transmission planning criteria used in the study are in accordance with "FRCC Planning Principles and Guides", and in accordance with FPC Planning Criteria as published with FPC's FERC 715 filing. Because the FRCC guides are not specific, and because the Project is proposed to connect to the FPC transmission system, we used FPC's planning criteria, which are:

- Voltage should be between 95% and 105% of nominal voltage for both normal conditions and contingencies.
- Loading on transmission lines and transformers should be under the Normal Rating (Rating 1) under normal conditions (Contingency 0).

- Under contingency conditions, the loading should be under the Emergency Rating (Rating 2).

The results of the contingency analyses for the Alternate Cases are compared with the Base Case loadings for the same contingency to determine if the new facilities were responsible for any new overloads. The Results section details the overloads in the Alternative Cases, both with and without contingencies. The overloads are compared to the Base Case results to make an assessment of the severity of the overload, specifically, the incremental impact on the overloaded facility of integration of the Project. The following table lists guidelines used by R. W. Beck to evaluate the incremental impact of the Project.

- Is the element overloaded in the Base Case? If the element is overloaded in the Base Case, then, the overload is a Pre-Existing condition and it is likely that the Project would not be responsible for any upgrades required to solve the overload concern. This also holds true if the results of the study indicate the same element is overloaded for other contingencies.
- Does the overload exceed the Emergency Rating for a contingency (Rating 2)? If the loading does not exceed the element's Emergency Rating (Rating 2), then, the line is able to carry the loading under contingency conditions.
- Does the overload exceed 15% of the Normal Rating if the Normal Rating (Rating 1) equals the Emergency Rating (Rating 2)? Frequently, in the FERC 715 filed case, Rating 2 is published as the same as Rating 1. This can be due to several reasons. The filing entity may not have calculated an emergency rating for that element and, therefore, published the Normal Rating as the Emergency Rating. The line may be "sag" restricted, e.g., restricted by clearance to ground of the conductor. Often, this can be easily fixed by re-tensioning the line and possibly minor modifications to some transmission structures. Or there may be minor equipment that limits the line, such as a disconnect switch. Typically, emergency ratings are about 15% greater than normal ratings (for example, TECO's planning criteria described above specifically mentions 15%). Therefore, for purposes of the analysis, if Rating 1 equals Rating 2, then the line is not reported as a new overload unless the overload exceed 115% of Rating 1. Note that if the line is sag limited, or otherwise limited, some corrective action may be necessary to achieve this emergency rating.
- Is the difference between the Base Case and the Alternate Case significant (e.g., greater than a 5% increase)? If the difference between the loading in the Base Case and the Alternate Case is insignificant, then the Project does not contribute significantly to the concern.
- Is the location of the overloaded line distant from the Project? If the location of the overloaded element is distant from the project, then, the cause of the overload is likely something other than the Project.

- Is the overload insignificant? If the overload is very small (e.g., 101% to 103%), then, the overload is within error tolerances of the study, and/or it may be that the situation can be resolved through an operating measure, such as reducing the output of the Project, to eliminate the overload.

RESULTS

Appendix A consists of a series of tables listing all of the cases where Rating 1 was exceeded for both normal conditions (Contingency Number 0) and contingency conditions (preceded by a contingency number). Each line loading is listed in MW, MVAR and MVA for both the Base Case and Alternate Case, for the same contingency at the same load level. The rating is also reported as Rating 1 / Rating 2, and the percentage of the rating is reported for both the Base Case and the Alternate Case for each load level.

The tables are organized by Load Level (e.g., 100% or Peak, 60% or Shoulder, and 40% or Light), and by the following categories (see discussion in the Evaluation Criteria section):

Potential Concerns	These are lines and transformers that are of potential concern to integrating the project into the transmission grid.
Overloaded for Another Contingency in the Base Case	These are lines that are overloaded for another contingency, and possibly another load level, in one of the base cases
Less that a 5% Increase from the Base Case	These are lines where the loading increased only marginally
Distant from the Project	These are overloads distant from the Project.
Minor Overload	The overload is minor (e.g., 101% to 103%).
Does not Exceed Rating 2 for a Contingency	These lines are actually not overloaded since Rating 2 is not exceeded
Does not Exceed 115% of Rating 1 for a Contingency if Rating 1 Equals Rating 2	115% of Rating 1 is a typical value for an emergency rating, but, the emergency rating is either not published, or, is limited by another factor, often a minor factor (e.g., sag limited)
Pre-Existing Violations	These are lines overloaded in the Base Case for the sme contingency.

Below is a table summarizing the results that are of potential concern to integrating the project into the interconnected peninsular Florida system. Note that the highest loading is shown in the table and the line may be overloaded for other load levels.

POTENTIAL CONCERNS

Load Level	Overload			Contingency		Base Case Ldg MVA	Alt. Case Ldg MVA	Rating MVA	Base Case % of Rtg2	Alt. Case % of Rtg2
100%	Line	Enola	Umatilla 69kv	Hainesck	Sorrento 230kv	122	161	126/ 138	88%	117%
60%	Line	Dade Cty	Ft King 69kv	Lk Tarpn	Brkridge 500kv	64	75	63/ 63	99%	116%
60%	Line	Brkridge	Brk98 Tp 115kv	Brkridge	Cryst Rv 500kv	155	185	137/ 137	112%	132%
60%	Line	Brk98 Tp	Hammcktp 115kv	Brkridge	Cryst Rv 500kv	159	188	137/ 137	114%	135%
60%	Xfmr	Lk Tarpn	Lkt-Dum2 230/500kv	Lkt-Dum1	Lk Tarpn 500/230kv	770	878	750/ 750	103%	117%
60%	Xfmr	Lk Tarpn	Lkt-Dum1 230/500kv	Lkt-Dum2	Lk Tarpn 500/230kv	762	870	750/ 750	102%	116%

ANALYSIS

The Results discussed in the previous section cause potential concerns for two transmission corridors:

1. The Crystal River to Lake Tarpon 500 kV, 230 kV, 115 kV, and 69 kV transmission corridor that carries power from Central Florida and Crystal River to Tampa.
2. The Central Florida to Haines Creek to Sorrento to Piedmont 230 kV and 69 kV corridor that carries power from Central Florida substation to north suburban Orlando.

CRYSTAL RIVER TO LAKE TARPON TRANSMISSION CORRIDOR

There is a parallel 500 kV, 230 kV, 115 kV and 69 kV transmission corridor that runs from the Crystal River Plant to the Lake Tarpon Substation just north of Tampa. Because Crystal River is a large Plant, portions of the corridor from Crystal River to Tampa overload in the Base Case at the 60% load levels for loss of one of the 500 kV lines (particularly the Crystal River to Brookridge 500 kV line).

115KV TRANSMISSION CORRIDOR

The addition of the Project increases the flow towards Tampa, incrementally impacting this corridor. In particular, the 115 kV line from Brookridge to the Brk98 Tap the Hammck Tap loading is increased from 112%-114% of Rating 1 in the Base case to 132%-135% of Rating 1 with the Project. Note that, as published in the FERC 715 loadflow database, Rating 1 equals Rating 2 (137 MVA) for this line.

Prior segments of this corridor are also overloaded in the Base Case beyond 115% of Rating 1, these segments are from Villa Tap to Homsatp2 to TC Ranch to Hammck Tap.

There are a few options for addressing the overloads of this 115 kV corridor.

1. Upgrade the Brookridge to Brk98 Tap to Hammmck Tap lines (estimated cost of $2.5 to $3M).
2. Install a series reactor, possibly on the Villa Tap and Homsatp2 line to limit flow on this line (estimated cost of about $500,000).
3. Install a phase shifting transformer (phase shifter), possibly on the Villa tap to Homsatp2 line, to limit the flow along the 115 kV corridor (estimated cost of $1.5 to $2 million).

Preliminary analysis on the effectiveness of the phase shifter was performed. This preliminary analysis indicated that the phase shifter effectively eliminates the overloads on this 115 kV corridor while not causing adverse conditions to other parallel lines. Cursory testing of the series reactor shows that a 150 MVA, 15% reactor ought to eliminate the overloads on the 115 kV corridor in a similar fashion as the phase shifter.

The cost-effective solution appears to be a series reactor on the Villa Tap to Homosatp2 115 kV line with an estimated cost of $500,000.

LAKE TARPON AUTOTRANSFORMERS

At the end of the Crystal River to Lake Tarpon transmission corridor are two 500 kV to 230 kV autotransformers at the Lake Tarpon substation. At the 60% load level in the Base Case, the transformers are already overloaded to 102-103% of Rating 1 on loss of the other autotransformer. Note that, as published in the FERC 715 loadflow database, Rating 1 equals Rating 2 of 750 MVA for this transformer.

The Project does increase the flow towards Tampa, increasing the loading of the autotransformers to a contingency loading of 116-117% of Rating 1 on loss of the other transformer. This is of potential concern because it does exceed the 115% of Rating 1 that is typical of an emergency rating. However, transformers, because they are oil filled, take longer to heat up than overhead transmission lines. Therefore, the emergency ratings of transformers are often greater than 115% of Rating 1, and, since the loading exceeds Rating 1 by only 116%-117%, it is likely that the overload is within an emergency rating for the transformer.

For example, the American National Standards Institute (ANSI) Standard C57.92-1981 lists an four (4) hour emergency rating for a typical transformer (65 degrees C rise, Forced-Air-Cooled Transformer rated over 133% of self-cooled rating with an equivalent load of 70% of maximum nameplate rating pre-contingency, 30 degrees C ambient temperature) as 118% of normal rating with no loss of life. An one (1) hour rating under the same conditions is 145% of normal rating. So, if the transformers comply with the ANSI standards, the transformers should be able to carry this contingency loading.

In addition, since the overload only happens at off-peak loads, a low-cost alternative is to back down the output of the Project post-contingency to reduce the loading on the remaining autotransformer.

The cost effective solution appears to be to calculate long term and short term emergency ratings for the transformers and to back down the Project output post-contingency to bring the transformer loading to within the appropriate rating.

DADE CITY TO FT. KING 69 KV LINE

The Dade City to Ft. King 69 kV line is part of a 69 kV transmission corridor that loops from the Brooksville substation (part of the Crystal River to Lake Tarpon corridor) west to the Zephyrhills North substation and Kathleen substation area (the other end of the 500 kV system) and then towards north Tampa and the Lake Tarpon area. At the 60% load level in the Base Case, the line is loaded to 99% of Rating 1 on loss of the Brookridge to Lake Tarpon 500 kV line. Note that, as published in the FERC 715 loadflow database, Rating 1 equals Rating 2 of 63 MVA for this line.

The addition of the Project increases the loading on the line for the same contingency to 116% of Rating 1. If the emergency rating is as typical (115% of Rating 1), then this is a minor overload of 1% in excess of the estimated emergency rating. Since the overload only happens at off-peak loads, a low-cost alternative is to back down the output of the Project post-contingency to reduce the loading on the 69 kV line on loss of the 500 kV line.

Other alternatives for addressing the overload of this 69 kV line are.

- Upgrade the line (estimated cost of about $630,000).
- Install a series reactor to limit flow on this line (estimated cost of about $400,000).

The cost effective solution appears to be to calculate long term and short term emergency ratings for the line and to back down the Project output post-contingency to bring the line loading to within the appropriate rating.

CENTRAL FLORIDA TO HAINES CREEK TO SORRENTO TO PIEDMONT 230 KV AND 69 KV CORRIDOR

ENOLA TO UMATILLA 69 KV LINE

The Enola to Umatilla line is part of a 230 kV and 69 kV transmission corridor that heads from the Central Florida substation to north suburban Orlando. The corridor has one 230 kV line that, if the Haines Creek to Sorrento portion of that 230 kV line is lost, it overloads the underlying 69 kV line, Enola to Umatilla, to 117% of its emergency rating.

Likely, the most cost-effective option is to reconductor the line for an estimated cost of $140,000.

APPENDIX A: LOAD FLOW RESULS

100% LOAD LEVEL

POTENTIAL CONCERNS

No.	Overload				Area	Outage			Base Case Ldg MW	MVar	MVA	Alt. Case Ldg MW	MVar	MVA	Rating MVA	Base Case Rtg1	Rtg2	Alt. Case Rtg1	Rtg2
143	Line	Enola	To	Umatilla 69kv	FPC	Halnesck	to	Sorrento 230kv	122	-9	122	161	-15	161	126/ 138	94%	88%	125%	117%

OVERLOADED FOR ANOTHER CONTINGENCY IN THE BASE CASE

No.	Overload				Area	Outage			Base Case Ldg MW	MVar	MVA	Alt. Case Ldg MW	MVar	MVA	Rating MVA	Base Case Rtg1	Rtg2	Alt. Case Rtg1	Rtg2
228	Line	Martin W	to	Reddick (1) 69kv	FPC	Archer	to	Pkrd 230kv	33	4	33	40	0	40	32/ 38	102%	88%	121%	104%
234	Line	Bell Tp	to	Trenton (2) 69kv	FPC	Ft Wht S	to	Newberry 230kv	-33	10	34	-41	13	43	32/ 38	107%	90%	136%	114%
234	Line	Martin W	to	Reddick (1) 69kv	FPC	Ft Wht S	to	Newberry 230kv	35	3	35	39	0	39	32/ 38	106%	92%	120%	103%
237	Line	Inglis	to	Lebanon (3) 69kv	FPC	Newberry	to	Wilcox 230kv	38	-2	38	40	-3	40	32/ 38	115%	99%	123%	106%
267	Line	Homsatp2	to	Villa Tp (4) 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-121	58	135	-131	61	145	137/ 137	98%	98%	105%	105%
267	Line	Martin W	to	Reddick (1) 69kv	FPC	Brkridge	to	Cryst Rv 500kv	35	3	35	39	1	39	32/ 38	106%	92%	118%	102%

(1) Loaded to 109% of Rating 2 in 100% Base Case for Contingency 227, Archer to Martin 230 kV
(2) Loaded to 101% of Rating 2 in 40% Base Case for Contingency 232, Ft White N to Ft White S 230 kV
(3) Loaded to 114% of Rating 2 in 100% Base Case for Contingency 238, Newberry to Crystal River Plant 230 kV
(4) Loaded to 125% of Rating 1 in 60% Base Case for Contingency 267, Brookridge to Crystal River 500 kV

LESS THAN A 5% INCREASE FROM THE BASE CASE

No.	Overload	Area	Outage	Base Case Ldg MW	Base Case Ldg MVar	Base Case Ldg MVA	Alt. Case Ldg MW	Alt. Case Ldg MVar	Alt. Case Ldg MVA	Rating MVA	Base Case Rtg1	Base Case Rtg2	Alt. Case Rtg1	Alt. Case Rtg2
62	Line Midway to Turnpike 230kv	FPL	Indn Twn to Bridge 230kv	636	190	664	652	191	679	647/647	99%	99%	101%	101%
181	Line Dade Cty to Dc Notap 69kv	TEC	Lk Tarpn to Brkridge 500kv	63	5	63	66	4	66	63/63	98%	98%	103%	103%
181	Line Dc Notap to Ft King 69kv	TEC	Lk Tarpn to Brkridge 500kv	63	5	63	66	4	66	63/63	98%	98%	103%	103%
181	Line Hudson to Hudsontp 115kv	FPC	Lk Tarpn to Brkridge 500kv	287	82	298	296	84	307	246/302	119%	99%	122%	102%

DISTANT FROM THE PROJECT

No.	Overload	Area	Outage	Base Case Ldg MW	Base Case Ldg MVar	Base Case Ldg MVA	Alt. Case Ldg MW	Alt. Case Ldg MVar	Alt. Case Ldg MVA	Rating MVA	Base Case Rtg1	Base Case Rtg2	Alt. Case Rtg1	Alt. Case Rtg2
4	Xfmr Hart-Fmp to Hartman 138/69kv	FTP	Emerson to Fv-Ctyln 138kv	41	9	42	61	7	61	50/50	84%	84%	122%	122%
4	Xfmr Hart-Fmp to Hartman 138/69kv #2	FTP	Emerson to Fv-Ctyln 138kv	41	9	41	60	7	60	50/50	83%	83%	120%	120%
90	Line Citrus to Hartman 138kv	FPL	Emerson to Emerson 138/230kv	236	25	238	359	46	362	272/272	87%	87%	133%	133%
90	Line Citrus to Midway 138kv	FPL	Emerson to Emerson 138/230kv	-236	-25	238	-359	-46	362	272/272	87%	87%	133%	133%

DOES NOT EXCEED RATING 2 FOR A CONTINGENCY

No.	Overload	Area	Outage	Base Case Ldg MW	Base Case Ldg MVar	Base Case Ldg MVA	Alt. Case Ldg MW	Alt. Case Ldg MVar	Alt. Case Ldg MVA	Rating MVA	Base Case Rtg1	Base Case Rtg2	Alt. Case Rtg1	Alt. Case Rtg2
6	Xfmr Emerson to Emerson 138/230kv	FPL	Citrus to Hartman 138kv	-276	-38	279	-412	-21	413	400/577	70%	49%	104%	72%
7	Xfmr Emerson to Emerson 138/230kv	FPL	Citrus to Midway 138kv	-276	-38	279	-412	-21	413	400/577	70%	49%	104%	72%
90	Xfmr Midway to Midway 138/230kv #2	FPL	Emerson to Emerson 138/230kv	-170	-11	170	-225	-29	226	224/286	77%	60%	103%	79%
144	Line Curry Fd to Stanton 230kv	FPC	Hainesck to Cent Fla 230kv	-404	0	404	-459	-25	460	444/553	88%	73%	100%	83%

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
144	Xfmr	Dallas	to	Dallas 69/230kv	FPC	Hainesck	to	Cent Fla 230kv	-140	-52	150	-145	-49	153	150/ 280	102%	53%	104%	55%
144	Line	Leesbg E	to	Leesburg 69kv	FPC	Hainesck	to	Cent Fla 230kv	-78	23	81	-136	34	141	126/ 143	63%	56%	109%	98%
155	Xfmr	Clmt Est	to	Clmt Est 69/230kv	FPC	Clmt Est	to	Winderme 230kv	-178	-22	179	-253	-17	254	250/ 280	73%	64%	103%	91%
170	Line	Hudson	to	Hudsontp 115kv	FPC	Lk Tarpn	to	Hudson 230kv	250	68	259	258	68	266	246/ 302	103%	86%	106%	88%
177	Line	Higgins	to	Griffin 115kv	FPC	Griffin	to	Kathleen 230kv	-137	59	149	-117	47	126	142/ 168	104%	89%	88%	75%
178	Line	Avon Pkn	to	Frostprf 69kv	FPC	Griffin	to	West 230kv	78	-4	78	76	-3	76	75/ 82	102%	95%	100%	93%
178	Line	Juneau-W	to	Gannon 138kv	TEC	Griffin	to	West 230kv	-305	-18	305	-294	-18	295	300/ 300	102%	102%	98%	98%
178	Line	So Gib	to	B Bend 230kv	TEC	Griffin	to	West 230kv	-656	-174	679	-613	-170	636	634/ 634	103%	103%	96%	96%
180	Line	Hudson	to	Hudsontp 115kv	FPC	Lk Tarpn	to	Lkt-Dum2 500kv	238	72	249	243	69	252	246/ 302	99%	83%	100%	84%
181	Line	Higgins	to	Griffin 115kv	FPC	Lk Tarpn	to	Brkridge 500kv	-156	51	164	-151	48	158	142/ 168	118%	98%	113%	94%
181	Line	Disston	to	N East B 115kv	FPC	Lk Tarpn	to	Brkridge 500kv	-124	-72	143	-124	-79	147	144/ 183	98%	79%	101%	80%
181	Xfmr	River-S	to	River-S 69/230kv	TEC	Lk Tarpn	to	Brkridge 500kv	-214	-42	218	-210	-43	214	224/ 232	100%	94%	98%	92%
181	Line	11th Ave	to	So Gib 230kv	TEC	Lk Tarpn	to	Brkridge 500kv	-599	-214	636	-577	-212	615	634/ 634	102%	102%	98%	98%
181	Xfmr	Hkrs Pt	to	Hkrspt-S 138/69kv	TEC	Lk Tarpn	to	Brkridge 500kv	175	50	182	174	50	181	168/ 187	108%	98%	108%	97%
189	Line	Curry Fd	to	Stanton 230kv	FPC	Deland W	to	Silvr Sp 230kv	-395	1	395	-465	-26	465	444/ 553	86%	71%	101%	84%
195	Line	Curry Fd	to	Stanton 230kv	FPC	N Longwd	to	Wtr Spgs 230kv	-401	-15	402	-459	-47	461	444/ 553	87%	72%	101%	83%
198	Xfmr	Stc East	to	Stc East 230/ 69kv	OUC	Taylr Ck	to	Holopaw 230kv	147	15	147	154	18	155	150/ 168	98%	88%	103%	92%
198	Line	Stc East	to	Stc Nth 69kv	OUC	Taylr Ck	to	Holopaw 230kv	127	-5	127	133	-4	134	116/ 144	109%	88%	115%	93%
199	Line	Curry Fd	to	Stanton 230kv	FPC	Wtr Pk E	to	Wtr Spgs 230kv	-490	-27	491	-495	-36	496	444/ 553	107%	89%	108%	90%
204	Line	Babspktp	to	Indlketp 69kv	FPC	Avon Pk	to	Ft Meade 230kv	-64	36	73	-59	34	68	75/ 82	101%	89%	94%	83%
204	Line	Frostprf	to	Indlketp 69kv	FPC	Avon Pk	to	Ft Meade 230kv	66	-31	73	61	-29	67	75/ 82	101%	89%	94%	82%
207	Line	Avon Pkn	to	Frostprf 69kv	FPC	Barcola	to	West 230kv	77	-4	77	76	-3	76	75/ 82	102%	94%	101%	93%
216	Line	Union Hl	to	Dadect T 69kv	FPC	Kathleen	to	Zephyr N 230kv	125	29	128	128	28	131	126/ 150	99%	85%	102%	87%
216	Xfmr	River-S	to	River-S 69/230kv	TEC	Kathleen	to	Zephyr N 230kv	-226	-26	227	-221	-26	223	224/ 232	103%	98%	101%	96%
217	Line	Avon Pkn	to	Frostprf 69kv	FPC	N Bartow	to	Pebb 230kv	79	-3	79	78	-3	78	75/ 82	104%	96%	104%	96%
218	Line	Avon Pkn	to	Frostprf 69kv	FPC	N Bartow	to	Selose T 230kv	79	-3	79	79	-4	79	75/ 82	104%	96%	104%	96%

No.	Overload				Area	Outage			Base Case Ldg MW	Base Case Ldg MVar	Base Case Ldg MVA	Alt. Case Ldg MW	Alt. Case Ldg MVar	Alt. Case Ldg MVA	Rating MVA	Base Case Rtg1	Base Case Rtg2	Alt. Case Rtg1	Alt. Case Rtg2
223	Line	Avon Pkn	to	Frostprf 69kv	FPC	Wlk Wale	to	Selose T 230kv	77	-4	78	77	-3	77	75/ 82	102%	94%	102%	94%
227	Line	Mcntshtp	to	Reddick 69kv	FPC	Archer	to	Martin W 230kv	-25	6	26	-33	10	34	32/ 38	81%	68%	107%	90%
232	Line	Bell Tp	to	Trenton 69kv	FPC	Ft Wht N	to	Ft Wht S 230kv	-29	10	31	-35	11	37	32/ 38	97%	81%	116%	97%
232	Line	Jasper	to	Wghtchpl 115kv	FPC	Ft Wht N	to	Ft Wht S 230kv	-8	30	31	-7	34	35	35/ 43	95%	74%	103%	80%
234	Line	Bell Tp	to	Neals Tp 69kv	FPC	Ft Wht S	to	Newberry 230kv	23	-13	26	31	-17	35	32/ 38	82%	69%	111%	93%
207	Line	Barcola	to	Pebb 230kv	FPC	Barcola	to	West 230kv	574	-16	574	529	-9	529	492/ 542	112%	106%	103%	98%
208	Line	Avon Pkn	to	Frostprf 69kv	FPC	Barcola	to	Pebb 230kv	81	-4	81	79	-3	80	75/ 82	106%	98%	105%	97%
359	Xfmr	River-N	to	River-N 230/ 69kv	TEC	11th Ave	to	So Gib 230kv	222	70	233	215	66	225	224/ 234	104%	100%	100%	96%
370	Xfmr	River-N	to	River-N 230/ 69kv	TEC	So Gib	to	B Bend 230kv	223	68	233	216	65	226	224/ 234	104%	100%	101%	96%
378	Line	Barcola	to	Pebb 230kv	FPC	Polkplnt	to	Hardesub 230kv	543	-27	544	517	-21	517	492/ 542	106%	100%	101%	95%
237	Line	Lebanon	to	Ottrcktp 69kv	FPC	Newberry	to	Wilcox 230kv	33	-6	33	35	-7	36	32/ 38	105%	88%	113%	95%
238	Line	Ottrcktp	to	Usher Tp 69kv	FPC	Newberry	to	Cr Plant 230kv	16	-21	26	21	-25	32	32/ 38	84%	69%	103%	85%
242	Line	Jasper	to	Wghtchpl 115kv	FPC	Suwannee	to	Sterling 230kv	-19	35	40	-18	34	38	35/ 43	117%	93%	111%	88%
245	Xfmr	Dallas	to	Dallas 69/230kv	FPC	Andersen	to	Holder 230kv	-142	-50	150	-144	-49	152	150/ 280	103%	54%	104%	54%
246	Line	Brkridge	to	Brksvl W 115kv	FPC	Brkridge	to	Brksvwtp 230kv	246	-10	246	254	-15	255	246/ 302	98%	81%	101%	84%
246	Line	Hudson	to	Hudsontp 115kv	FPC	Brkridge	to	Brksvwtp 230kv	246	72	256	250	67	259	246/ 302	102%	85%	103%	86%
249	Line	Sprghltp	to	Heritgtp 115kv	FPC	Brkridge	to	Hudson 230kv	121	-53	133	129	-56	141	136/ 169	96%	78%	102%	83%
251	Line	Hudson	to	Hudsontp 115kv	FPC	Brksvwtp	to	Gulfpine 230kv	260	66	268	267	64	274	246/ 302	107%	89%	109%	91%
256	Line	Jasper	to	Wghtchpl 115kv	FPC	Cr Plant	to	Cryst R4 230kv	-15	38	41	-14	37	39	35/ 43	120%	95%	115%	91%
256	Xfmr	Dallas	to	Dallas 69/230kv	FPC	Cr Plant	to	Cryst R4 230kv	-142	-48	150	-145	-46	152	150/ 280	102%	53%	104%	54%
256	Line	Juneau-W	to	Gannon 138kv	TEC	Cr Plant	to	Cryst R4 230kv	-303	-19	304	-297	-19	297	300/ 300	101%	101%	99%	99%
259	Xfmr	Dallas	to	Dallas 69/230kv	FPC	Dallas	to	Silvr Sp 230kv	-121	-52	132	-145	-47	153	150/ 280	90%	47%	104%	54%
260	Xfmr	Dallas	to	Dallas 69/230kv	FPC	Martin W	to	Sllv Spn 230kv	-143	-50	151	-147	-48	155	150/ 280	104%	54%	106%	55%
266	Xfmr	Dallas	to	Dallas 69/230kv	FPC	Brdg-Dum	to	Brkridge 500kv	-138	-52	148	-141	-49	149	150/ 280	101%	53%	102%	53%
267	Xfmr	Dallas	to	Dallas 69/230kv	FPC	Brkridge	to	Cryst Rv 500kv	-145	-45	152	-149	-47	157	150/ 280	104%	55%	107%	56%
267	Line	Disston	to	N East B 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-123	-97	157	-123	-97	156	144/ 183	111%	88%	107%	85%

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
267	Line	Zephyr N	to	Zephyrhl 69kv	FPC	Brkridge	to	Cryst Rv 500kv	141	13	141	143	9	143	126/ 150	109%	94%	111%	95%
267	Line	Hudson	to	Hudsontp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	237	91	254	241	87	256	246/ 302	104%	85%	103%	85%
267	Line	Tri-City	to	Ulmerton 115kv	FPC	Brkridge	to	Cryst Rv 500kv	1	-118	118	2	126	126	125/ 137	97%	88%	101%	92%
267	Line	River-N	to	Gte-Coll 69kv	TEC	Brkridge	to	Cryst Rv 500kv	138	38	143	135	37	140	143/ 143	102%	102%	99%	99%
267	Xfmr	River-S	to	River-S 69/230kv	TEC	Brkridge	to	Cryst Rv 500kv	-221	-45	226	-217	-45	222	224/ 232	104%	98%	102%	95%
267	Line	Chapman	to	Gannon 230kv	TEC	Brkridge	to	Cryst Rv 500kv	-523	-130	539	-504	-126	520	550/ 550	104%	104%	99%	99%
267	Xfmr	Hkrs Pt	to	Hkrspt-S 138/ 69kv	TEC	Brkridge	to	Cryst Rv 500kv	176	51	183	175	50	182	168/ 187	109%	99%	109%	98%
267	Line	Pt Suttn	to	Baymet T 69kv	TEC	Brkridge	to	Cryst Rv 500kv	-67	-21	71	-66	-19	68	72/ 121	102%	59%	98%	57%
271	Line	Jasper	to	Wghtchpl 115kv	FPC	Cryst Rv	to	Cryst R5 500kv	-13	36	38	-12	35	37	35/ 43	113%	89%	109%	87%
271	Line	Juneau-W	to	Gannon 138kv	TEC	Cryst Rv	to	Cryst R5 500kv	-304	-21	305	-297	-19	298	300/ 300	102%	102%	99%	99%
281	Line	Hudson	to	Hudsontp 115kv	FPC	Anclote	to	Seven Sp 230kv	253	70	263	258	73	268	246/ 302	105%	87%	106%	89%
283	Line	Hudson	to	Hudsontp 115kv	FPC	Gulfpine	to	Seven Sp 230kv	260	66	268	267	65	274	246/ 302	107%	89%	109%	91%
336	Xfmr	Ocala 1	to	Ocala-1 230/ 69kv	FPC	Ocala 2	to	Silv Spn 230kv	145	59	157	145	59	157	150/ 165	104%	94%	104%	95%
336	Xfmr	Ocala 1	to	Ocala-1 230/ 69kv #2	FPC	Ocala 2	to	Silv Spn 230kv	145	59	157	145	59	157	150/ 165	105%	95%	105%	95%
347	Line	Avon Pkn	to	Frostprf 69kv	FPC	Osceola	to	Lkagnes 230kv	79	-3	79	78	-3	78	75/ 82	103%	95%	103%	95%
349	Xfmr	Hkrs Pt	to	Hkrspt-S 138/ 69kv	TEC	Sheld	to	Jaxsn230 230kv	175	47	181	174	47	180	168/ 187	108%	97%	107%	96%
351	Line	Juneau-W	to	Gannon 138kv	TEC	Dlmbry-W	to	Dlmbry-E 230kv	-301	-22	302	-294	-22	294	300/ 300	101%	101%	98%	98%
351	Xfmr	Hkrs Pt	to	Hkrspt-S 138/ 69kv	TEC	Dlmbry-W	to	Dlmbry-E 230kv	176	49	182	174	48	181	168/ 187	109%	98%	108%	97%
351	Line	So Gib	to	B Bend 230kv	TEC	Dlmbry-W	to	Dlmbry-E 230kv	-647	-184	673	-616	-182	643	634/ 634	102%	102%	97%	97%
352	Xfmr	Hkrs Pt	to	Hkrspt-S 138/ 69kv	TEC	Dlmbry-E	to	Chapman 230kv	177	51	184	176	49	183	168/ 187	110%	98%	109%	98%
354	Line	Hydepk-N	to	Hydepk-S 69kv	TEC	Ohio-N	to	11th Ave 230kv	-144	-14	145	-136	-14	137	143/ 143	105%	102%	99%	96%
354	Line	Hydepk-N	to	Matz-N T 69kv	TEC	Ohio-N	to	11th Ave 230kv	120	6	121	112	6	113	120/ 120	104%	104%	97%	97%
354	Line	River-N	to	Gte-Coll 69kv	TEC	Ohio-N	to	11th Ave 230kv	143	31	146	138	31	141	143/ 143	101%	101%	97%	97%
354	Xfmr	River-S	to	River-S 69/230kv	TEC	Ohio-N	to	11th Ave 230kv	-218	-31	221	-213	-31	215	224/ 232	101%	95%	98%	93%
366	Xfmr	Hamptn	to	Hamptn 230/ 69kv	TEC	Sr60-N	to	Sr60-N T 230kv	216	60	224	215	60	223	224/ 242	100%	93%	99%	92%
366	Line	So Gib	to	B Bend 230kv	TEC	Sr60-N	to	Sr60-N T 230kv	-648	-184	674	-621	-183	647	634/ 634	102%	102%	98%	98%

No.	Overload			Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
								MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
367	Xfmr River-S	to	River-S 69/230kv	TEC	Sr60-S	to	Sr60-S T 230kv	-219	-29	221	-215	-30	217	224/ 232	101%	95%	99%	93%
367	Line So Gib	to	B Bend 230kv	TEC	Sr60-S	to	Sr60-S T 230kv	-641	-180	665	-614	-178	640	634/ 634	101%	101%	97%	97%
370	Line Higgins	to	Griffin 115kv	FPC	So Gib	to	B Bend 230kv	-133	51	142	-124	47	133	142/ 168	101%	85%	93%	79%
370	Line Cooldg	to	Juneau-W 138kv	TEC	So Gib	to	B Bend 230kv	-242	25	243	-234	23	235	249/ 249	101%	101%	97%	97%
370	Xfmr Sr60-N	to	Sr60-N 230/ 69kv	TEC	So Gib	to	B Bend 230kv	192	60	201	189	58	198	196/ 208	103%	97%	101%	95%
370	Line Ruskint2	to	Delweb 69kv	TEC	So Gib	to	B Bend 230kv	81	16	83	79	15	81	82/ 82	101%	101%	98%	98%
371	Line So Gib	to	B Bend 230kv	TEC	Ruskin T	to	B Bend 230kv	-652	-172	674	-625	-171	648	634/ 634	102%	102%	98%	98%
388	Xfmr Dallas	to	Dallas 69/230kv	FPC	Brdg-Dum	to	Brkridge 500/230kv	-138	-52	148	-141	-49	149	150/ 280	101%	53%	102%	53%
356	Line Juneau-W	to	Gannon 138kv	TEC	River-N	to	Sr60-S T 230kv	-303	-19	303	-296	-19	297	300/ 300	101%	101%	99%	99%
356	Xfmr Hkrs Pt	to	Hkrspt-S 138/ 69kv	TEC	River-N	to	Sr60-S T 230kv	175	47	182	174	46	180	168/ 187	108%	97%	107%	96%
359	Line Higgins	to	Griffin 115kv	FPC	11th Ave	to	So Gib 230kv	-134	51	143	-125	48	133	142/ 168	101%	86%	94%	79%
359	Line Cooldg	to	Juneau-W 138kv	TEC	11th Ave	to	So Gib 230kv	-248	22	249	-238	20	239	249/ 249	104%	104%	99%	99%
359	Line Cargill	to	Baymet T 69kv	TEC	11th Ave	to	So Gib 230kv	94	26	97	89	24	92	93/ 93	105%	105%	99%	99%
359	Xfmr Sr60-N	to	Sr60-N 230/ 69kv	TEC	11th Ave	to	So Gib 230kv	188	59	197	184	57	193	196/ 208	100%	95%	98%	93%
359	Line Nitrm T	to	Pt Suttn 69kv	TEC	11th Ave	to	So Gib 230kv	-80	-17	82	-76	-15	77	72/ 120	116%	68%	109%	64%
359	Line Pt Suttn	to	Baymet T 69kv	TEC	11th Ave	to	So Gib 230kv	-93	-21	95	-88	-19	90	72/ 121	135%	79%	128%	75%
360	Xfmr River-S	to	River-S 69/230kv	TEC	Hamptn	to	Hamptn T 230kv	-225	-34	227	-220	-35	223	224/ 232	104%	98%	102%	96%
360	Xfmr Hkrs Pt	to	Hkrspt-S 138/ 69kv	TEC	Hamptn	to	Hamptn T 230kv	178	49	185	177	48	183	168/ 187	110%	99%	109%	98%
360	Line Mulb-S	to	Sandhl-W 69kv	TEC	Hamptn	to	Hamptn T 230kv	-143	-16	144	-137	-17	138	143/ 143	103%	103%	98%	98%
364	Xfmr Hkrs Pt	to	Hkrspt-S 138/ 69kv	TEC	Gannon	to	Sr60-N T 230kv	177	46	183	175	46	181	168/ 187	109%	98%	108%	97%
366	Line Juneau-W	to	Gannon 138kv	TEC	Sr60-N	to	Sr60-N T 230kv	-300	-21	300	-293	-21	294	300/ 300	100%	100%	98%	98%

OVERLOAD DOES NOT EXCEED 115% OF RATING 1 IF RATING 1 EQUALS RATING 2

No.	Overload				Area	Outage			Base Case Ldg MW	Base Case Ldg MVar	Base Case Ldg MVA	Alt. Case Ldg MW	Alt. Case Ldg MVar	Alt. Case Ldg MVA	Rating MVA	Base Case Rtg1	Base Case Rtg2	Alt. Case Rtg1	Alt. Case Rtg2
90	Line	Hartman	to	F Pierce 138kv	FPL	Emerson	to	Emerson 138/230kv	165	39	169	263	39	266	241/ 241	71%	71%	112%	112%
139	Xfmr	Hart-Fmp	to	Hartman 138/ 69kv #2	FTP	Hartman	to	Hart-Fmp 69/138kv	38	-10	40	49	-11	50	50/ 50	81%	81%	102%	102%
140	Xfmr	Hart-Fmp	to	Hartman 138/ 69kv	FTP	Hartman	to	Hart-Fmp 69/138kv #2	39	-10	40	49	-11	50	50/ 50	82%	82%	103%	103%
181	Xfmr	Brkridge	to	Brdg-Dum 230/500kv	FPC	Lk Tarpn	to	Brkridge 500kv	-676	-146	691	-710	-146	725	750/ 750	96%	96%	101%	101%

PRE-EXISTING VIOLATIONS - OVERLOADED IN THE BASE CASE WITHOUT THE PROJECT

No.	Overload				Area	Outage	Base Case Ldg MW	Base Case Ldg MVar	Base Case Ldg MVA	Alt. Case Ldg MW	Alt. Case Ldg MVar	Alt. Case Ldg MVA	Rating MVA	Base Case Rtg1	Base Case Rtg2	Alt. Case Rtg1	Alt. Case Rtg2
0	Line	Howey Tp	to	Howeymtr 69kv	FPC	No Outage	32	11	33	32	11	33	32/ 38	102%	87%	103%	88%
0	Line	Howeymtr	to	Howey 69kv	FPC	No Outage	32	10	33	32	11	33	31/ 37	106%	89%	107%	90%
0	Line	Dlarpttp	to	Dalasmet 69kv	FPC	No Outage	-59	-29	66	-54	-30	62	50/ 62	132%	106%	125%	100%
0	Line	Dlarpttp	to	Belvew 69kv	FPC	No Outage	67	29	73	67	29	73	52/ 52	141%	141%	142%	142%
0	Line	Dalasmet	to	Dallas 69kv	FPC	No Outage	-59	-29	66	-55	-30	62	50/ 62	132%	106%	125%	101%
0	Xfmr	Dallas	to	Dallas 69/230kv	FPC	No Outage	-137	-50	146	-140	-49	148	150/ 280	100%	52%	101%	53%
0	Line	Martin W	to	Reddick 69kv	FPC	No Outage	33	4	33	36	2	36	32/ 38	100%	86%	110%	95%
0	Line	Brt St T	to	Lee 138kv	FPL	No Outage	-221	-78	234	-221	-78	234	173/ 173	137%	137%	137%	137%
0	Line	Corbett	to	Lee 138kv	FPL	No Outage	-171	-58	181	-171	-58	181	173/ 173	103%	103%	103%	103%
0	Xfmr	Miccosk	to	Miccosk 115/ 69kv	FPC	No Outage	28	11	30	28	11	30	20/ 20	152%	152%	152%	152%
0	Line	Hudson	to	Sea P Tp 115kv	FPC	No Outage	126	50	135	126	50	135	114/ 114	118%	118%	118%	118%

No.	Overload	Area	Outage	Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
				MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
0	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	No Outage	184	27	186	181	27	183	168/183	111%	102%	109%	100%
0	Xfmr Hkrs Pt to Hkrspt-S 138/69kv	TEC	No Outage	173	46	179	172	45	178	168/187	107%	96%	106%	95%
18	Line Britgoab to Morris 69kv	FPL	Okechobe to Morris 69kv	-54	-87	103	-54	87	103	44/44	235%	235%	235%	235%
57	Line Midway to Wh Ctytp 138kv	FPL	Sanpiper to Turnpike 230kv	252	93	268	252	93	268	241/241	110%	110%	110%	110%
95	Xfmr Sherman to Sherman 69/230kv	FPL	Sherman to Sherman 69/230kv #2	-58	-6	58	-58	-6	58	50/50	120%	120%	120%	120%
113	Line Midway to Wh Ctytp 138kv	FPL	Sanpiper to Sanpiper 138/230kv	252	93	268	252	93	268	241/241	110%	110%	110%	110%
131	Xfmr Hart-Fmp to Hartman 138/69kv	FTP	Ftp-Ga C to Fv-Ctyln 138kv	58	1	58	58	5	58	50/50	115%	115%	116%	116%
131	Xfmr Hart-Fmp to Hartman 138/69kv #2	FTP	Ftp-Ga C to Fv-Ctyln 138kv	57	1	57	57	4	57	50/50	113%	113%	113%	113%
141	Xfmr Hart-Fmp to Hartman 138/69kv	FTP	Garden C to Ftp-Ga C 69/138kv	58	1	58	58	5	58	50/50	115%	115%	116%	116%
141	Xfmr Hart-Fmp to Hartman 138/69kv #2	FTP	Garden C to Ftp-Ga C 69/138kv	57	1	57	57	4	57	50/50	113%	113%	113%	113%
151	Xfmr Altamont to Altamont 69/230kv	FPC	Spg Lake to Altamont 230kv	-231	-45	236	-213	-69	224	200/224	122%	105%	117%	100%
177	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Griffin to Kathleen 230kv	187	27	188	182	27	184	168/183	112%	103%	109%	100%
178	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Griffin to West 230kv	190	27	192	184	27	186	168/183	114%	105%	111%	102%
181	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Lk Tarpn to Brkridge 500kv	191	37	194	188	37	192	168/183	116%	106%	114%	105%
181	Line Juneau-W to Gannon 138kv	TEC	Lk Tarpn to Brkridge 500kv	-310	-35	312	-305	-36	308	300/300	107%	107%	105%	105%
181	Line So Gib to B Bend 230kv	TEC	Lk Tarpn to Brkridge 500kv	-710	-293	768	-689	-286	746	634/634	117%	117%	114%	114%
189	Line Dlarpttp to Dalasmet 69kv	FPC	Deland W to Silvr Sp 230kv	-60	-28	66	-58	-29	64	50/62	134%	107%	130%	104%
189	Line Dalasmet to Dallas 69kv	FPC	Deland W to Silvr Sp 230kv	-60	-28	66	-58	-29	65	50/62	134%	107%	130%	104%
201	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Loughman to Intercsn 230kv	186	27	188	183	27	185	168/183	112%	103%	110%	101%
202	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Loughman to Wlk Wale 230kv	186	27	188	183	27	185	168/183	112%	103%	110%	101%
204	Line Avon Pkn to Frostprf 69kv	FPC	Avon Pk to Ft Meade 230kv	101	-6	101	95	-6	95	75/82	135%	123%	128%	116%
214	Line Avon Pkn to Frostprf 69kv	FPC	Ft Meade to Wlk Wale 230kv	88	-4	88	88	-4	88	75/82	115%	106%	116%	107%
214	Line Barcola to Pebb 230kv	FPC	Ft Meade to Wlk Wale 230kv	582	-13	582	574	-4	574	492/542	114%	107%	112%	106%
216	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Kathleen to Zephyr N 230kv	189	28	191	186	29	188	168/183	114%	105%	112%	103%
227	Line Martin W to Reddick 69kv	FPC	Archer to Martin W 230kv	42	1	42	50	-3	50	32/38	127%	109%	152%	131%
238	Line Inglis to Lebanon 69kv	FPC	Newberry to Cr Plant 230kv	43	-8	43	49	-9	50	32/38	132%	114%	152%	132%

No.	Overload	Area	Outage	Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
				MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
238	Line Lebanon to Ottrcktp 69kv	FPC	Newberry to Cr Plant 230kv	38	-12	39	44	-14	46	32/ 38	123%	103%	143%	120%
238	Line Martin W to Reddick 69kv	FPC	Newberry to Cr Plant 230kv	38	2	38	43	-1	43	32/ 38	116%	100%	130%	112%
245	Line Dlarpttp to Dalasmet 69kv	FPC	Andersen to Holder 230kv	-68	-27	73	-62	-29	68	50/ 62	148%	118%	138%	110%
245	Line Dalasmet to Dallas 69kv	FPC	Andersen to Holder 230kv	-68	-27	74	-62	-29	69	50/ 62	148%	118%	138%	111%
255	Xfmr Juneau-E to Juneau-E 138/ 69kv	TEC	Cr Plant to Cryst Re 230kv	185	31	188	182	30	185	168/ 183	112%	103%	110%	101%
256	Line So Gib to B Bend 230kv	TEC	Cr Plant to Cryst R4 230kv	-668	-175	690	-640	-172	663	634/ 634	105%	105%	101%	101%
256	Line Dlarpttp to Dalasmet 69kv	FPC	Cr Plant to Cryst R4 230kv	-70	-24	74	-65	-26	70	50/ 62	149%	119%	142%	113%
256	Line Dalasmet to Dallas 69kv	FPC	Cr Plant to Cryst R4 230kv	-70	-24	74	-65	-26	70	50/ 62	149%	120%	142%	114%
256	Xfmr Juneau-E to Juneau-E 138/ 69kv	TEC	Cr Plant to Cryst R4 230kv	188	28	190	185	27	187	168/ 183	113%	104%	111%	102%
264	Xfmr Oc R-Oak to Oc R-Oak 230/ 69kv	FPC	Ocala 1 to Ocala 1 230kv	147	74	165	147	74	165	150/ 165	110%	100%	110%	100%
267	Line Juneau-W to Gannon 138kv	TEC	Brkridge to Cryst Rv 500kv	-319	-37	322	-316	-36	318	300/ 300	113%	113%	110%	110%
267	Line Higgins to Griffin 115kv	FPC	Brkridge to Cryst Rv 500kv	-190	56	198	-183	61	193	142/ 168	146%	119%	141%	115%
267	Line Dlarpttp to Dalasmet 69kv	FPC	Brkridge to Cryst Rv 500kv	-63	-27	69	-59	-29	66	50/ 62	139%	111%	132%	106%
267	Line Dalasmet to Dallas 69kv	FPC	Brkridge to Cryst Rv 500kv	-63	-27	69	-59	-29	66	50/ 62	139%	111%	132%	106%
267	Line 11th Ave to So Gib 230kv	TEC	Brkridge to Cryst Rv 500kv	-658	-240	701	-637	-226	676	634/ 634	114%	114%	109%	109%
267	Line So Gib to B Bend 230kv	TEC	Brkridge to Cryst Rv 500kv	-768	-337	838	-748	-315	812	634/ 634	130%	130%	125%	125%
267	Line Dade Cty to Dc Notap 69kv	TEC	Brkridge to Cryst Rv 500kv	64	10	65	66	7	66	63/ 63	100%	100%	103%	103%
267	Line Dc Notap to Ft King 69kv	TEC	Brkridge to Cryst Rv 500kv	64	10	65	66	7	66	63/ 63	100%	100%	103%	103%
271	Line Dlarpttp to Dalasmet 69kv	FPC	Cryst Rv to Cryst R5 500kv	-65	-26	70	-60	-28	66	50/ 62	141%	113%	134%	107%
271	Line Dalasmet to Dallas 69kv	FPC	Cryst Rv to Cryst R5 500kv	-65	-26	70	-60	-28	66	50/ 62	141%	113%	134%	107%
271	Xfmr Juneau-E to Juneau-E 138/ 69kv	TEC	Cryst Rv to Cryst R5 500kv	189	28	191	186	27	188	168/ 183	114%	105%	112%	103%
267	Xfmr Juneau-E to Juneau-E 138/ 69kv	TEC	Brkridge to Cryst Rv 500kv	195	39	199	193	38	197	168/ 183	118%	110%	117%	108%
349	Xfmr Juneau-E to Juneau-E 138/ 69kv	TEC	Sheld to Jaxsn230 230kv	188	28	191	186	28	188	168/ 183	113%	104%	112%	103%
350	Xfmr Juneau-E to Juneau-E 138/ 69kv	TEC	Sheld to Ohio-S 230kv	210	37	213	201	36	204	168/ 183	127%	116%	122%	112%
352	Xfmr Juneau-E to Juneau-E 138/ 69kv	TEC	Dimbry-E to Chapman 230kv	190	30	192	186	30	188	168/ 183	114%	105%	112%	103%
354	Xfmr 11th Ave to Eleven-E 230/ 69kv	TEC	Ohio-N to 11th Ave 230kv	254	71	263	247	67	256	224/ 246	118%	107%	114%	104%

No.	Overload	Area	Outage	Base Case Ldg MW	Base Case Ldg MVar	Base Case Ldg MVA	Alt. Case Ldg MW	Alt. Case Ldg MVar	Alt. Case Ldg MVA	Rating MVA	Base Case Rtg1	Base Case Rtg2	Alt. Case Rtg1	Alt. Case Rtg2
356	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	River-N to Sr60-S T 230kv	191	29	193	187	29	190	168/183	115%	106%	113%	104%
357	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	River-S to B Bend 230kv	188	31	191	185	31	187	168/183	113%	104%	112%	102%
358	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Chapman to Gannon 230kv	216	39	220	211	39	215	168/183	131%	120%	128%	117%
358	Xfmr Hkrs Pt to Hkrspt-S 138/69kv	TEC	Chapman to Gannon 230kv	181	52	188	179	51	186	168/187	112%	101%	111%	100%
363	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Gannon to Sr60-S T 230kv	192	30	195	189	30	191	168/183	116%	106%	114%	105%
363	Xfmr Hkrs Pt to Hkrspt-S 138/69kv	TEC	Gannon to Sr60-S T 230kv	191	52	198	190	51	197	168/187	118%	106%	117%	105%
366	Xfmr Hkrs Pt to Hkrspt-S 138/69kv	TEC	Sr60-N to Sr60-N T 230kv	181	51	188	180	50	186	168/187	112%	100%	111%	100%
367	Xfmr Hkrs Pt to Hkrspt-S 138/69kv	TEC	Sr60-S to Sr60-S T 230kv	194	54	202	193	53	200	168/187	120%	108%	119%	107%
370	Xfmr River-S to River-S 69/230kv	TEC	So Gib to B Bend 230kv	-252	-35	254	-245	-34	247	224/232	116%	110%	113%	107%
370	Xfmr Hkrs Pt to Hkrspt-S 138/69kv	TEC	So Gib to B Bend 230kv	191	58	199	189	57	198	168/187	119%	107%	118%	106%
370	Xfmr Belcrk to Belcrk 230/69kv	TEC	So Gib to B Bend 230kv	246	58	252	240	56	246	224/247	113%	103%	110%	100%
370	Xfmr Ruskin T to Ruskin 230/69kv	TEC	So Gib to B Bend 230kv	173	49	179	169	45	175	168/175	107%	103%	104%	100%
271	Line So Gib to B Bend 230kv	TEC	Cryst Rv to Cryst R5 500kv	-673	-179	696	-645	-172	668	634/634	106%	106%	101%	101%
299	Line Putnam to Tocoi 230kv	FPL	Greenlnd to Swtzrlnd 230kv	391	165	424	392	164	425	402/402	102%	102%	103%	103%
309	Line Osceola to Studio 69kv	TEC	Can Isl to Ouccitp1 230kv	154	9	155	159	11	160	143/143	106%	106%	110%	110%
310	Line Osceola to Studio 69kv	TEC	Can Isl to Ouccitp2 230kv	151	3	151	159	8	159	143/143	104%	104%	111%	111%
319	Line Osceola to Studio 69kv	TEC	Taft to Ouccitp1 230kv	154	9	155	159	11	160	143/143	106%	106%	110%	110%
323	Line Osceola to Studio 69kv	TEC	Ouccitp2 to Osceola 230kv	151	3	151	159	8	159	143/143	104%	104%	111%	111%
352	Line Juneau-W to Gannon 138kv	TEC	Dlmbry-E to Chapman 230kv	-313	-26	314	-305	-25	306	300/300	105%	105%	102%	102%
352	Xfmr Chapman to Chapman 230/69kv	TEC	Dlmbry-E to Chapman 230kv	232	60	240	222	59	230	224/224	107%	107%	103%	103%
352	Line So Gib to B Bend 230kv	TEC	Dlmbry-E to Chapman 230kv	-670	-194	697	-639	-190	667	634/634	106%	106%	101%	101%
353	Xfmr Juneau-E to Juneau-E 138/69kv	TEC	Ohio-N to Ohio-S 230kv	195	29	197	190	29	193	168/183	117%	108%	115%	105%
354	Line Cooldg to Ohio 138kv	TEC	Ohio-N to 11th Ave 230kv	191	-41	195	180	-38	184	186/186	107%	107%	100%	100%
354	Line Juneau-W to Gannon 138kv	TEC	Ohio-N to 11th Ave 230kv	-328	-29	329	-319	-31	320	300/300	112%	112%	108%	108%
370	Line Cooldg to Ohio 138kv	TEC	So Gib to B Bend 230kv	194	-45	199	186	-44	191	186/186	111%	111%	106%	106%
370	Line Juneau-W to Gannon 138kv	TEC	So Gib to B Bend 230kv	-332	-26	333	-324	-27	325	300/300	115%	115%	111%	111%

No.	Overload					Area	Outage				Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
											MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
370	Line	Seven8-T	to	Twelfth	69kv	TEC	So Gib	to	B Bend	230kv	103	13	104	98	11	99	93/ 93	115%	115%	108%	108%
357	Line	Gannon	to	Sr60-S T	230kv	TEC	River-S	to	B Bend	230kv	477	127	494	468	127	485	402/ 402	118%	118%	115%	115%
357	Line	So Gib	to	B Bend	230kv	TEC	River-S	to	B Bend	230kv	-665	-181	689	-639	-180	664	634/ 634	105%	105%	101%	101%
358	Line	River-N	to	Gte-Coll	69kv	TEC	Chapman	to	Gannon	230kv	156	33	160	151	33	154	143/ 143	111%	111%	107%	107%
358	Xfmr	River-S	to	River-S	69/230kv	TEC	Chapman	to	Gannon	230kv	-247	-36	250	-240	-36	242	224/ 232	114%	108%	111%	104%
358	Line	Fort6 T	to	Gte-Coll	69kv	TEC	Chapman	to	Gannon	230kv	-133	-16	134	-128	-17	129	128/ 128	108%	108%	104%	104%
358	Line	Juneau-W	to	Gannon	138kv	TEC	Chapman	to	Gannon	230kv	-332	-30	333	-323	-30	325	300/ 300	113%	113%	110%	110%
358	Line	Gannon	to	Sr60-S T	230kv	TEC	Chapman	to	Gannon	230kv	452	111	465	436	106	449	402/ 402	110%	110%	107%	107%
358	Line	So Gib	to	B Bend	230kv	TEC	Chapman	to	Gannon	230kv	-717	-225	751	-682	-216	716	634/ 634	114%	114%	109%	109%
359	Line	Cooldg	to	Ohio	138kv	TEC	11th Ave	to	So Gib	230kv	200	-42	204	191	-40	195	186/ 186	114%	114%	108%	108%
359	Xfmr	River-S	to	River-S	69/230kv	TEC	11th Ave	to	So Gib	230kv	-250	-36	252	-243	-36	245	224/ 232	116%	109%	112%	106%
359	Line	Juneau-W	to	Gannon	138kv	TEC	11th Ave	to	So Gib	230kv	-336	-29	337	-328	-30	329	300/ 300	116%	116%	113%	113%
359	Xfmr	Hkrs Pt	to	Hkrspt-S	138/ 69kv	TEC	11th Ave	to	So Gib	230kv	181	55	189	179	54	187	168/ 187	112%	101%	112%	100%
359	Line	Seven8-T	to	Twelfth	69kv	TEC	11th Ave	to	So Gib	230kv	97	13	98	92	12	93	93/ 93	108%	108%	102%	102%
363	Line	Juneau-W	to	Gannon	138kv	TEC	Gannon	to	Sr60-S T	230kv	-309	-20	309	-302	-21	303	300/ 300	103%	103%	101%	101%

60% LOAD LEVEL

POTENTIAL CONCERNS

No.	Overload				Area	Outage			Base Case Ldg MW	MVar	MVA	Alt. Case Ldg MW	MVar	MVA	Rating MVA	Base Case Rtg1	Rtg2	Alt. Case Rtg1	Rtg2
181	Line	Dade Cty	to	Dc Notap 69kv	TEC	Lk Tarpn	to	Brkridge 500kv	64	-8	64	74	-9	75	63/ 63	99%	99%	116%	116%
181	Line	Dc Notap	to	Ft King 69kv	TEC	Lk Tarpn	to	Brkridge 500kv	64	-8	64	74	-9	75	63/ 63	99%	99%	116%	116%

POTENTIAL CONCERNS WHERE RATING 1 EQUALS RATING 2 AND THE LOADING IS INCREASED FROM BELOW 115% OF RATING 1 TO GREATER THAN 115% OF RATING 1

No.	Overload				Area	Outage			Base Case Ldg MW	MVar	MVA	Alt. Case Ldg MW	MVar	MVA	Rating MVA	Base Case Rtg1	Rtg2	Alt. Case Rtg1	Rtg2
267	Line	Brkridge	to	Brk98 Tp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-117	102	155	-139	122	185	137/ 137	112%	112%	132%	132%
267	Line	Brk98 Tp	to	Hammcktp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-128	94	159	-151	112	188	137/ 137	114%	114%	135%	135%
385	Xfmr	Lk Tarpn	to	Lkt-Dum2 230/500kv	FPC	Lkt-Dum1	to	Lk Tarpn 500/230kv	-768	55	770	-874	87	878	750/ 750	103%	103%	117%	117%
386	Xfmr	Lk Tarpn	to	Lkt-Dum1 230/500kv	FPC	Lkt-Dum2	to	Lk Tarpn 500/230kv	-760	55	762	-865	87	870	750/ 750	102%	102%	116%	116%

MINOR OVERLOAD

No.	Overload	Area	Outage	Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
				MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
143	Line Enola to Umatilla 69kv	FPC	Hainesck to Sorrento 230kv	114	-20	116	141	-21	142	126/138	90%	84%	110%	103%
249	Line Sprghltp to Heritgtp 115kv	FPC	Brkridge to Hudson 230kv	139	-56	150	158	-64	171	136/169	107%	88%	123%	101%

OVERLOADED FOR ANOTHER CONTINGENCY IN THE BASE CASE

No.	Overload	Area	Outage	Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
				MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
248	Line Homsatp2 to Villa Tp (1) 115kv	FPC	Brkridge to Cryst Re 230kv	-132	59	145	-151	69	166	137/137	104%	104%	119%	119%

(1) Loaded to 125% of Rating 1 in 60% Base Case for Contingency 267, Brookridge to Crystal River 500 kV

DOES NOT EXCEED RATING 2 FOR A CONTINGENCY

No.	Overload	Area	Outage	Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
				MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
170	Line Hudson to Hudsontp 115kv	FPC	Lk Tarpn to Hudson 230kv	237	52	243	255	53	261	246/302	96%	80%	103%	86%
181	Line Higgins to Griffin 115kv	FPC	Lk Tarpn to Brkridge 500kv	-137	60	149	-143	64	157	142/168	104%	89%	109%	93%
181	Line Sprghltp to Heritgtp 115kv	FPC	Lk Tarpn to Brkridge 500kv	108	-48	119	128	-58	140	136/169	86%	70%	101%	83%
181	Line Brkridge to Brksvwtp 230kv	FPC	Lk Tarpn to Brkridge 500kv	655	68	659	722	84	727	677/812	97%	80%	109%	90%
181	Line Brkridge to Hudson 230kv	FPC	Lk Tarpn to Brkridge 500kv	613	40	615	686	61	689	677/812	91%	75%	103%	85%
181	Line Hudson to Hudsontp 115kv	FPC	Lk Tarpn to Brkridge 500kv	259	51	264	280	52	285	246/302	105%	88%	113%	94%
227	Line Martin W to Reddick 69kv	FPC	Archer to Martin W 230kv	21	4	22	37	-2	37	32/38	66%	57%	112%	97%
234	Line Bell Tp to Trenton 69kv	FPC	Ft Wht S to Newberry 230kv	-26	8	27	-33	14	36	32/38	85%	72%	110%	94%
238	Line Inglis to Lebanon 69kv	FPC	Newberry to Cr Plant 230kv	28	-8	29	33	-9	34	32/38	87%	75%	103%	90%

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
247	Line	Cr Plant	to	Cryst Re 230kv	FPC	Brkridge	to	Cr Plant 230kv	671	106	679	717	121	727	677/ 812	96%	84%	103%	90%
249	Line	Heritgtp	to	Hudson 115kv	FPC	Brkridge	to	Hudson 230kv	120	-69	139	140	-79	160	136/ 169	99%	82%	115%	95%
251	Line	Hudson	to	Hudsontp 115kv	FPC	Brksvwtp	to	Gulfpine 230kv	250	50	255	266	50	271	246/ 302	101%	84%	107%	90%
267	Line	Cryst Rs	to	Villa Tp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	171	-65	183	197	-77	212	173/ 215	103%	85%	120%	99%
267	Line	Cr Plant	to	Cryst Re 230kv	FPC	Brkridge	to	Cryst Rv 500kv	674	153	691	733	192	757	677/ 812	98%	85%	107%	93%
267	Line	Zephyr N	to	Zephyrhl 69kv	FPC	Brkridge	to	Cryst Rv 500kv	118	-11	119	133	-9	133	126/ 150	92%	79%	103%	89%
283	Line	Hudson	to	Hudsontp 115kv	FPC	Gulfpine	to	Seven Sp 230kv	250	50	255	266	50	271	246/ 302	101%	85%	107%	90%
371	Line	Manatee	to	B Bend 230kv	FPL	Ruskin T	to	B Bend 230kv	-937	157	950	-856	130	865	900/ 900	101%	101%	92%	92%
371	Line	Ruskmtr8	to	B Bend 230kv	TEC	Ruskin T	to	B Bend 230kv	-506	7	506	-465	10	465	478/ 478	101%	101%	93%	93%

OVERLOAD DOES NOT EXCEED 15% GREATER THAN RATING 1 IF RATING 1 EQUALS RATING 2

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
181	Xfmr	Brkridge	to	Brdg-Dum 230/500kv	FPC	Lk Tarpn	to	Brkridge 500kv	-710	-71	713	-789	-89	794	750/ 750	98%	98%	109%	109%
247	Line	Brkridge	to	Brk98 Tp 115kv	FPC	Brkridge	to	Cr Plant 230kv	-90	81	121	-107	92	141	137/ 137	87%	87%	101%	101%
247	Line	Brk98 Tp	to	Hammcktp 115kv	FPC	Brkridge	to	Cr Plant 230kv	-99	75	124	-117	85	144	137/ 137	89%	89%	104%	104%
247	Line	Hammcktp	to	Tc Ranch 115kv	FPC	Brkridge	to	Cr Plant 230kv	-105	72	127	-122	81	147	137/ 137	92%	92%	106%	106%
247	Line	Homsatp2	to	Tc Ranch 115kv	FPC	Brkridge	to	Cr Plant 230kv	117	-64	133	136	-72	153	137/ 137	95%	95%	110%	110%
247	Line	Homsatp2	to	Villa Tp 115kv	FPC	Brkridge	to	Cr Plant 230kv	-127	58	140	-146	66	160	137/ 137	101%	101%	115%	115%
248	Line	Brkridge	to	Brk98 Tp 115kv	FPC	Brkridge	to	Cryst Re 230kv	-95	82	125	-111	95	146	137/ 137	90%	90%	105%	105%
248	Line	Brk98 Tp	to	Hammcktp 115kv	FPC	Brkridge	to	Cryst Re 230kv	-104	76	129	-121	88	150	137/ 137	93%	93%	108%	108%
248	Line	Hammcktp	to	Tc Ranch 115kv	FPC	Brkridge	to	Cryst Re 230kv	-109	73	132	-127	84	153	137/ 137	95%	95%	110%	110%
248	Line	Homsatp2	to	Tc Ranch 115kv	FPC	Brkridge	to	Cryst Re 230kv	122	-65	138	140	-74	159	137/ 137	99%	99%	114%	114%
267	Line	Dade Cty	to	Dc Notap 69kv	TEC	Brkridge	to	Cryst Rv 500kv	62	-7	62	72	-8	72	63/ 63	96%	96%	112%	112%
267	Line	Dc Notap	to	Ft King 69kv	TEC	Brkridge	to	Cryst Rv 500kv	62	-7	62	72	-8	72	63/ 63	96%	96%	112%	112%

PRE-EXISTING VIOLATIONS - OVERLOADED IN THE BASE CASE WITHOUT THE PROJECT

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
18	Line	Britgoab	to	Morris 69kv	FPL	Okechobe	to	Morris 69kv	-53	-88	102	-53	-88	102	44/ 44	235%	235%	235%	235%
20	Line	Plumosus	to	Oakes 138kv	FPL	Bee Line	to	Plumosus 138kv #99	220	-54	226	221	-53	227	221/ 221	101%	101%	101%	101%
179	Xfmr	Lk Tarpn	to	Lkt-Dum2 230/500kv	FPC	Lk Tarpn	to	Lkt-Dum1 500kv	-768	55	770	-874	87	878	750/ 750	103%	103%	117%	117%
180	Xfmr	Lk Tarpn	to	Lkt-Dum1 230/500kv	FPC	Lk Tarpn	to	Lkt-Dum2 500kv	-760	55	762	-865	87	870	750/ 750	102%	102%	116%	116%
267	Line	Hammcktp	to	Tc Ranch 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-134	91	161	-157	108	190	137/ 137	116%	116%	137%	137%
267	Line	Homsatp2	to	Tc Ranch 115kv	FPC	Brkridge	to	Cryst Rv 500kv	148	-80	168	173	-94	197	137/ 137	120%	120%	141%	141%
267	Line	Homsatp2	to	Villa Tp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-158	74	175	-183	88	203	137/ 137	125%	125%	146%	146%
267	Line	Higgins	to	Griffin 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-167	78	184	-174	86	194	142/ 168	128%	110%	135%	115%
346	Line	Havana	to	Quincy 115kv	FPC	Sub 20	to	S Bainbr 230kv	-89	55	105	-89	55	105	83/ 103	129%	102%	128%	101%
346	Line	Woodruff	to	Scholz 2 115kv	FPC	Sub 20	to	S Bainbr 230kv	-131	24	133	-131	24	133	119/ 124	113%	107%	113%	107%

40% LOAD LEVEL

POTENTIAL CONCERNS WHERE RATING 1 EQUALS RATING 2 AND THE LOADING IS INCREASED FROM BELOW 115% OF RATING 1 TO GREATER THAN 115% OF RATING 1

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
267	Line	Brkridge	to	Brk98 Tp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-114	92	146	-127	107	166	137/ 137	105%	105%	119%	119%
267	Line	Brk98 Tp	to	Hammcktp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-122	85	148	-136	98	168	137/ 137	107%	107%	120%	120%

MINOR OVERLOAD

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
143	Line	Enola	to	Umatllla 69kv	FPC	Hainesck	to	Sorrento 230kv	110	-24	113	137	-27	140	126/ 138	87%	82%	108%	101%
227	Line	Mcntshtp	to	Reddick 69kv	FPC	Archer	to	Martin W 230kv	-32	12	34	-36	14	39	32/ 38	106%	90%	120%	101%

OVERLOADED FOR ANOTHER CONTINGENCY IN THE BASE CASE

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
248	Line	Homsatp2	to	Villa Tp (1) 115kv	FPC	Brkridge	to	Cryst Re 230kv	-122	56	134	-129	60	142	137/ 137	96%	96%	102%	102%
267	Line	Hammcktp	to	Tc Ranch (2) 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-126	81	150	-140	95	169	137/ 137	108%	108%	122%	122%
267	Line	Homsatp2	to	Tc Ranch (3) 115kv	FPC	Brkridge	to	Cryst Rv 500kv	136	-72	154	152	-83	173	137/ 137	110%	110%	124%	124%
267	Line	Homsatp2	to	Villa Tp (1) 115kv	FPC	Brkridge	to	Cryst Rv 500kv	-143	66	157	-159	77	177	137/ 137	113%	113%	127%	127%

(1) Loaded to 125% of Rating 1 in 60% Base Case for Contingency 267, Brookridge to Crystal River 500 kV
(2) Loaded to 116% of Rating 1 in 60% Base Case for Contingency 267, Brookridge to Crystal River 500 kV
(3) Loaded to 120% of Rating 1 in 60% Base Case for Contingency 267, Brookridge to Crystal River 500 kV

DOES NOT EXCEED RATING 2 FOR A CONTINGENCY

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtgl	Rtg2	Rtgl	Rtg2
224	Line	Union Hl	to	Dadect T 69kv	FPC	Kath-Dum	to	Kathleen 500kv	117	-11	118	130	-11	130	126/ 150	91%	78%	101%	87%
225	Line	Union Hl	to	Dadect T 69kv	FPC	Kathleen	to	Cent Fla 500kv	117	-11	118	130	-11	130	126/ 150	91%	78%	101%	87%
227	Line	Cara Tp	to	Mcntshtp 69kv	FPC	Archer	to	Martin W 230kv	-27	16	31	-31	18	36	32/ 38	98%	83%	112%	94%
227	Line	Cara Tp	to	Willistn 69kv	FPC	Archer	to	Martin W 230kv	24	-18	30	28	-21	35	32/ 38	94%	79%	108%	91%
232	Line	Bell Tp	to	Neals Tp 69kv	FPC	Ft Wht N	to	Ft Wht S 230kv	32	-16	36	33	-16	36	32/ 38	112%	95%	112%	95%
232	Line	High Spg	to	Neals Tp 69kv	FPC	Ft Wht N	to	Ft Wht S 230kv	-28	20	35	-28	20	35	32/ 38	108%	91%	108%	92%
238	Line	Inglis	to	Lebanon 69kv	FPC	Newberry	to	Cr Plant 230kv	36	-10	37	35	-10	36	32/ 38	113%	97%	111%	96%
238	Line	Lebanon	to	Ottrcktp 69kv	FPC	Newberry	to	Cr Plant 230kv	33	-13	36	32	-13	35	32/ 38	110%	93%	109%	92%
249	Line	Sprghltp	to	Heritgtp 115kv	FPC	Brkridge	to	Hudson 230kv	131	-49	140	141	-54	152	136/ 169	101%	83%	109%	90%
249	Line	Heritgtp	to	Hudson 115kv	FPC	Brkridge	to	Hudson 230kv	119	-62	134	129	-68	145	136/ 169	96%	79%	104%	86%
267	Line	Cryst Rs	to	Villa Tp 115kv	FPC	Brkridge	to	Cryst Rv 500kv	152	-57	162	168	-68	182	173/ 215	92%	76%	102%	84%
387	Line	Union Hl	to	Dadect T 69kv	FPC	Kath-Dum	to	Kathleen 500/230kv	117	-11	118	130	-11	130	126/ 150	91%	78%	101%	87%

OVERLOAD DOES NOT EXCEED 15% GREATER THAN RATING 1 IF RATING 1 EQUALS RATING 2

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
177	Line	Dade Cty	to	Dc Notap 69kv	TEC	Griffin	to	Kathleen 230kv	58	-12	60	69	-13	70	63/ 63	92%	92%	108%	108%
177	Line	Dc Notap	to	Ft King 69kv	TEC	Griffin	to	Kathleen 230kv	58	-12	60	69	-13	70	63/ 63	92%	92%	108%	108%
178	Line	Dade Cty	to	Dc Notap 69kv	TEC	Griffin	to	West 230kv	56	-12	57	65	-13	67	63/ 63	88%	88%	103%	103%
178	Line	Dc Notap	to	Ft King 69kv	TEC	Griffin	to	West 230kv	56	-12	57	65	-13	67	63/ 63	88%	88%	103%	103%
179	Xfmr	Lk Tarpn	to	Lkt-Dum2 230/500kv	FPC	Lk Tarpn	to	Lkt-Dum1 500kv	-730	60	733	-811	83	815	750/ 750	98%	98%	109%	109%
180	Xfmr	Lk Tarpn	to	Lkt-Dum1 230/500kv	FPC	Lk Tarpn	to	Lkt-Dum2 500kv	-723	60	726	-804	82	808	750/ 750	97%	97%	108%	108%
181	Line	Dade Cty	to	Dc Notap 69kv	TEC	Lk Tarpn	to	Brkridge 500kv	62	-12	64	68	-13	70	63/ 63	98%	98%	108%	108%
181	Line	Dc Notap	to	Ft King 69kv	TEC	Lk Tarpn	to	Brkridge 500kv	62	-12	64	68	-13	70	63/ 63	98%	98%	108%	108%
267	Xfmr	Kathleen	to	Kath-Dum 230/500kv	FPC	Brkridge	to	Cryst Rv 500kv	-590	54	592	-776	81	780	750/ 750	79%	79%	104%	104%
267	Line	Dade Cty	to	Dc Notap 69kv	TEC	Brkridge	to	Cryst Rv 500kv	60	-11	61	66	-12	67	63/ 63	95%	95%	104%	104%
267	Line	Dc Notap	to	Ft King 69kv	TEC	Brkridge	to	Cryst Rv 500kv	60	-11	61	66	-12	67	63/ 63	95%	95%	104%	104%
385	Xfmr	Lk Tarpn	to	Lkt-Dum2 230/500kv	FPC	Lkt-Dum1	to	Lk Tarpn 500/230kv	-730	60	733	-811	83	815	750/ 750	98%	98%	109%	109%
386	Xfmr	Lk Tarpn	to	Lkt-Dum1 230/500kv	FPC	Lkt-Dum2	to	Lk Tarpn 500/230kv	-723	60	726	-804	82	808	750/ 750	97%	97%	108%	108%

PRE-EXISTING VIOLATIONS - OVERLOADED IN THE BASE CASE WITHOUT THE PROJECT

No.	Overload				Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
									MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
18	Line	Britgoab	to	Morris 69kv	FPL	Okechobe	to	Morris 69kv	-53	-88	102	-53	-88	102	44/ 44	235%	235%	235%	235%
65	Line	Martin	to	Sherman 230kv	FPL	Midway	to	Sherman 230kv	-512	132	529	-512	132	529	502/ 502	101%	101%	101%	101%
227	Line	Martin W	to	Reddick 69kv	FPC	Archer	to	Martin W 230kv	39	-5	40	44	-7	44	32/ 38	121%	105%	134%	116%
232	Line	Bell Tp	to	Trenton 69kv	FPC	Ft Wht N	to	Ft Wht S 230kv	-36	13	38	-36	13	39	32/ 38	119%	101%	120%	102%

No.	Overload					Area	Outage			Base Case Ldg			Alt. Case Ldg			Rating	Base Case		Alt. Case	
										MW	MVar	MVA	MW	MVar	MVA	MVA	Rtg1	Rtg2	Rtg1	Rtg2
234	Line	Bell Tp	to	Neals Tp	69kv	FPC	Ft Wht S	to	Newberry 230kv	38	-20	43	37	-19	42	32/ 38	134%	114%	129%	110%
234	Line	Bell Tp	to	Trenton	69kv	FPC	Ft Wht S	to	Newberry 230kv	-42	17	46	-41	16	44	32/ 38	141%	120%	136%	116%
234	Line	High Spg	to	Neals Tp	69kv	FPC	Ft Wht S	to	Newberry 230kv	-34	25	42	-32	24	41	32/ 38	130%	111%	125%	107%

APPENDIX B: CONTINGENCY LIST

C- 1	Line	123	EMERSON	230kV	to	266	MIDWAY	230kV	Ckt	1
C- 2	Line	122	EMERSON	138kV	to	441	F PIERCE	138kV	Ckt	99
C- 3	Line	122	EMERSON	138kV	to	449	OSLO	138kV	Ckt	1
C- 4	Line	122	EMERSON	138kV	to	9383	FV-CTYLN	138kV	Ckt	1
C- 5	Line	123	EMERSON	230kV	to	464	MALABAR	230kV	Ckt	99
C- 6	Line	191	CITRUS	138kV	to	229	HARTMAN	138kV	Ckt	1
C- 7	Line	191	CITRUS	138kV	to	240	MIDWAY	138kV	Ckt	1
C- 8	Line	197	WARFIELD	230kV	to	263	INDN TWN	230kV	Ckt	1
C- 9	Line	197	WARFIELD	230kV	to	265	MARTIN	230kV	Ckt	1
C- 10	Line	201	BL GLADE	69kV	to	210	PAHOKEE	69kV	Ckt	99
C- 11	Line	201	BL GLADE	69kV	to	214	SO BAY	69kV	Ckt	1
C- 12	Line	201	BL GLADE	69kV	to	214	SO BAY	69kV	Ckt	2
C- 13	Line	203	W PM BCH	69kV	to	204	DATURA	69kV	Ckt	1
C- 14	Line	203	W PM BCH	69kV	to	204	DATURA	69kV	Ckt	2
C- 15	Line	205	MARTIN	69kV	to	277	BRYANT	69kV	Ckt	99
C- 16	Line	208	OKECHOBE	69kV	to	213	SHERMAN	69kV	Ckt	2
C- 17	Line	208	OKECHOBE	69kV	to	213	SHERMAN	69kV	Ckt	99
C- 18	Line	208	OKECHOBE	69kV	to	6781	MORRIS	69kV	Ckt	1
C- 19	Line	210	PAHOKEE	69kV	to	277	BRYANT	69kV	Ckt	1
C- 20	Line	218	BEE LINE	138kV	to	245	PLUMOSUS	138kV	Ckt	99
C- 21	Line	218	BEE LINE	138kV	to	250	RIVIERA	138kV	Ckt	1
C- 22	Line	222	BOYNTON	138kV	to	223	CEDAR	138kV	Ckt	1
C- 23	Line	222	BOYNTON	138kV	to	578	QUANTUM	138kV	Ckt	1
C- 24	Line	223	CEDAR	138kV	to	249	RANCH	138kV	Ckt	99
C- 25	Line	223	CEDAR	138kV	to	257	YAMATO	138kV	Ckt	99
C- 26	Line	223	CEDAR	138kV	to	596	HYPOLUXO	138kV	Ckt	1
C- 27	Line	229	HARTMAN	138kV	to	441	F PIERCE	138kV	Ckt	1
C- 28	Line	229	HARTMAN	138kV	to	4001	HART-FMP	138kV	Ckt	1
C- 29	Line	232	HOBE	138kV	to	245	PLUMOSUS	138kV	Ckt	98
C- 30	Line	232	HOBE	138kV	to	245	PLUMOSUS	138kV	Ckt	99
C- 31	Line	232	HOBE	138kV	to	247	PT SEWEL	138kV	Ckt	1
C- 32	Line	232	HOBE	138kV	to	247	PT SEWEL	138kV	Ckt	99
C- 33	Line	237	LANTANA	138kV	to	578	QUANTUM	138kV	Ckt	1
C- 34	Line	237	LANTANA	138kV	to	596	HYPOLUXO	138kV	Ckt	1
C- 35	Line	240	MIDWAY	138kV	to	796	WH CTYTP	138kV	Ckt	1
C- 36	Line	245	PLUMOSUS	138kV	to	539	OAKES	138kV	Ckt	1
C- 37	Line	247	PT SEWEL	138kV	to	685	MONTEREY	138kV	Ckt	1
C- 38	Line	249	RANCH	138kV	to	250	RIVIERA	138kV	Ckt	98
C- 39	Line	249	RANCH	138kV	to	250	RIVIERA	138kV	Ckt	99
C- 40	Line	249	RANCH	138kV	to	253	W PM BCH	138kV	Ckt	1
C- 41	Line	249	RANCH	138kV	to	253	W PM BCH	138kV	Ckt	99
C- 42	Line	249	RANCH	138kV	to	547	OSCEOLA	138kV	Ckt	99

C- 43	Line	250 RIVIERA	138kV	to	253 W PM BCH	138kV	Ckt	99
C- 44	Line	250 RIVIERA	138kV	to	539 OAKES	138kV	Ckt	99
C- 45	Line	250 RIVIERA	138kV	to	600 RECWAY	138kV	Ckt	1
C- 46	Line	251 SO BAY	138kV	to	547 OSCEOLA	138kV	Ckt	1
C- 47	Line	251 SO BAY	138kV	to	549 OKEELNTA	138kV	Ckt	1
C- 48	Line	255 WEST	138kV	to	449 OSLO	138kV	Ckt	1
C- 49	Line	255 WEST	138kV	to	457 WABASSO	138kV	Ckt	1
C- 50	Line	255 WEST	138kV	to	9381 WEST-FMP	138kV	Ckt	1
C- 51	Line	256 WH CITY	138kV	to	441 F PIERCE	138kV	Ckt	1
C- 52	Line	256 WH CITY	138kV	to	796 WH CTYTP	138kV	Ckt	1
C- 53	Line	257 YAMATO	138kV	to	990 DEERFDTP	138kV	Ckt	99
C- 54	Line	258 CEDAR	230kV	to	268 RANCH	230kV	Ckt	1
C- 55	Line	258 CEDAR	230kV	to	273 YAMATO	230kV	Ckt	99
C- 56	Line	258 CEDAR	230kV	to	535 CORBETT	230kV	Ckt	99
C- 57	Line	259 SANPIPER	230kV	to	532 TURNPIKE	230kV	Ckt	1
C- 58	Line	261 HOBE	230kV	to	582 BRIDGE	230kV	Ckt	1
C- 59	Line	263 INDN TWN	230kV	to	265 MARTIN	230kV	Ckt	99
C- 60	Line	263 INDN TWN	230kV	to	266 MIDWAY	230kV	Ckt	1
C- 61	Line	263 INDN TWN	230kV	to	268 RANCH	230kV	Ckt	99
C- 62	Line	263 INDN TWN	230kV	to	582 BRIDGE	230kV	Ckt	1
C- 63	Line	265 MARTIN	230kV	to	270 SHERMAN	230kV	Ckt	1
C- 64	Line	266 MIDWAY	230kV	to	268 RANCH	230kV	Ckt	99
C- 65	Line	266 MIDWAY	230kV	to	270 SHERMAN	230kV	Ckt	1
C- 66	Line	266 MIDWAY	230kV	to	272 ST LUCIE	230kV	Ckt	1
C- 67	Line	266 MIDWAY	230kV	to	272 ST LUCIE	230kV	Ckt	2
C- 68	Line	266 MIDWAY	230kV	to	272 ST LUCIE	230kV	Ckt	3
C- 69	Line	266 MIDWAY	230kV	to	532 TURNPIKE	230kV	Ckt	1
C- 70	Line	268 RANCH	230kV	to	535 CORBETT	230kV	Ckt	1
C- 71	Line	268 RANCH	230kV	to	535 CORBETT	230kV	Ckt	99
C- 72	Line	274 CORBETT	500kV	to	275 MARTIN	500kV	Ckt	1
C- 73	Line	274 CORBETT	500kV	to	275 MARTIN	500kV	Ckt	2
C- 74	Line	274 CORBETT	500kV	to	276 MIDWAY	500kV	Ckt	1
C- 75	Line	274 CORBETT	500kV	to	666 CONSRVTN	500kV	Ckt	1
C- 76	Line	275 MARTIN	500kV	to	276 MIDWAY	500kV	Ckt	1
C- 77	Line	275 MARTIN	500kV	to	476 POINSETT	500kV	Ckt	1
C- 78	Line	276 MIDWAY	500kV	to	476 POINSETT	500kV	Ckt	1
C- 79	Line	479 CLEWSTN9	138kV	to	637 HEND-FPL	138kV	Ckt	1
C- 80	Line	479 CLEWSTN9	138kV	to	864 MONT-FPL	138kV	Ckt	1
C- 81	Line	479 CLEWSTN9	138kV	to	6783 S CLEWIS	138kV	Ckt	1
C- 82	Line	530 SANPIPER	138kV	to	685 MONTEREY	138kV	Ckt	99
C- 83	Line	530 SANPIPER	138kV	to	796 WH CTYTP	138kV	Ckt	99
C- 84	Line	532 TURNPIKE	230kV	to	582 BRIDGE	230kV	Ckt	99
C- 85	Line	549 OKEELNTA	138kV	to	637 HEND-FPL	138kV	Ckt	1
C- 86	Line	582 BRIDGE	230kV	to	601 PLUMOSUS	230kV	Ckt	99
C- 87	Line	596 HYPOLUXO	138kV	to	5451 HYPO-FMP	138kV	Ckt	1
C- 88	Line	637 HEND-FPL	138kV	to	6601 HEND-FMP	138kV	Ckt	1
C- 89	Line	864 MONT-FPL	138kV	to	6769 MONTURA	138kV	Ckt	1
C- 90	Transformer	122 EMERSON	138kV	to	123 EMERSON	230kV	Ckt	1
C- 91	Transformer	203 W PM BCH	69kV	to	253 W PM BCH	138kV	Ckt	1
C- 92	Transformer	203 W PM BCH	69kV	to	253 W PM BCH	138kV	Ckt	2
C- 93	Transformer	205 MARTIN	69kV	to	265 MARTIN	230kV	Ckt	1
C- 94	Transformer	213 SHERMAN	69kV	to	270 SHERMAN	230kV	Ckt	1

C- 95	Transformer	213 SHERMAN	69kV	to	270 SHERMAN	230kV	Ckt	2
C- 96	Transformer	214 SO BAY	69kV	to	251 SO BAY	138kV	Ckt	1
C- 97	Transformer	214 SO BAY	69kV	to	251 SO BAY	138kV	Ckt	2
C- 98	Transformer	223 CEDAR	138kV	to	258 CEDAR	230kV	Ckt	1
C- 99	Transformer	223 CEDAR	138kV	to	258 CEDAR	230kV	Ckt	2
C-100	Transformer	232 HOBE	138kV	to	261 HOBE	230kV	Ckt	1
C-101	Transformer	240 MIDWAY	138kV	to	266 MIDWAY	230kV	Ckt	1
C-102	Transformer	240 MIDWAY	138kV	to	266 MIDWAY	230kV	Ckt	2
C-103	Transformer	245 PLUMOSUS	138kV	to	601 PLUMOSUS	230kV	Ckt	1
C-104	Transformer	249 RANCH	138kV	to	268 RANCH	230kV	Ckt	1
C-105	Transformer	249 RANCH	138kV	to	268 RANCH	230kV	Ckt	2
C-106	Transformer	250 RIVIERA	138kV	to	212 RIVIERA	69kV	Ckt	1
C-107	Transformer	250 RIVIERA	138kV	to	212 RIVIERA	69kV	Ckt	2
C-108	Transformer	257 YAMATO	138kV	to	273 YAMATO	230kV	Ckt	1
C-109	Transformer	273 YAMATO	230kV	to	257 YAMATO	138kV	Ckt	2
C-110	Transformer	274 CORBETT	500kV	to	535 CORBETT	230kV	Ckt	1
C-111	Transformer	275 MARTIN	500kV	to	265 MARTIN	230kV	Ckt	1
C-112	Transformer	276 MIDWAY	500kV	to	266 MIDWAY	230kV	Ckt	1
C-113	Transformer	530 SANPIPER	138kV	to	259 SANPIPER	230kV	Ckt	1
C-114	Line	9382 VER-SOUT	138kV	to	9383 FV-CTYLN	138kV	Ckt	1
C-115	Line	9396 DOWNTN5	69kV	to	9397 VB SUB7	69kV	Ckt	1
C-116	Line	9396 DOWNTN5	69kV	to	9404 VB SUB1	69kV	Ckt	1
C-117	Line	9397 VB SUB7	69kV	to	9398 VB SUB6	69kV	Ckt	1
C-118	Line	9397 VB SUB7	69kV	to	9403 VB SUB8	69kV	Ckt	1
C-119	Line	9398 VB SUB6	69kV	to	9399 VBSUB12	69kV	Ckt	1
C-120	Line	9398 VB SUB6	69kV	to	9400 VB SUB9	69kV	Ckt	1
C-121	Line	9399 VBSUB12	69kV	to	9400 VB SUB9	69kV	Ckt	1
C-122	Line	9399 VBSUB12	69kV	to	9404 VB SUB1	69kV	Ckt	1
C-123	Line	9400 VB SUB9	69kV	to	9401 VB SUB1	69kV	Ckt	1
C-124	Line	9401 VB SUB1	69kV	to	9402 VBSUB11	69kV	Ckt	1
C-125	Line	9401 VB SUB1	69kV	to	9404 VB SUB1	69kV	Ckt	1
C-126	Line	9402 VBSUB11	69kV	to	9403 VB SUB8	69kV	Ckt	1
C-127	Line	9403 VB SUB8	69kV	to	9404 VB SUB1	69kV	Ckt	1
C-128	Transformer	9397 VB SUB7	69kV	to	9381 WEST-FMP	138kV	Ckt	1
C-129	Transformer	9397 VB SUB7	69kV	to	9381 WEST-FMP	138kV	Ckt	2
C-130	Transformer	9403 VB SUB8	69kV	to	9382 VER-SOUT	138kV	Ckt	1
C-131	Line	4002 FTP-GA C	138kV	to	9383 FV-CTYLN	138kV	Ckt	1
C-132	Line	4011 HARTMAN	69kV	to	4012 SAVANNAH	69kV	Ckt	1
C-133	Line	4011 HARTMAN	69kV	to	4014 LAWNWOOD	69kV	Ckt	1
C-134	Line	4012 SAVANNAH	69kV	to	4013 HD KING	69kV	Ckt	1
C-135	Line	4013 HD KING	69kV	to	4016 KING GEN	69kV	Ckt	1
C-136	Line	4014 LAWNWOOD	69kV	to	4015 GARDEN C	69kV	Ckt	1
C-137	Line	4015 GARDEN C	69kV	to	4016 KING GEN	69kV	Ckt	1
C-138	Line	4016 KING GEN	69kV	to	4017 CAUSEWAY	69kV	Ckt	1
C-139	Transformer	4011 HARTMAN	69kV	to	4001 HART-FMP	138kV	Ckt	1
C-140	Transformer	4011 HARTMAN	69kV	to	4001 HART-FMP	138kV	Ckt	2
C-141	Transformer	4015 GARDEN C	69kV	to	4002 FTP-GA C	138kV	Ckt	1
C-142	Line	266 MIDWAY	230kV	to	464 MALABAR	230kV	Ckt	99
C-143	Line	2068 HAINESCK	230kV	to	2072 SORRENTO	230kV	Ckt	1
C-144	Line	2068 HAINESCK	230kV	to	3521 CENT FLA	230kV	Ckt	1
C-145	Line	2069 LOCKHART	230kV	to	2073 SPG LAKE	230kV	Ckt	1
C-146	Line	2069 LOCKHART	230kV	to	2168 WOODSMER	230kV	Ckt	1

C-147	Line	2070 PIEDMONT	230kV	to	2071 WELCH RD	230kV	Ckt	1
C-148	Line	2070 PIEDMONT	230kV	to	2074 WEKIVA	230kV	Ckt	1
C-149	Line	2070 PIEDMONT	230kV	to	2168 WOODSMER	230kV	Ckt	1
C-150	Line	2071 WELCH RD	230kV	to	2072 SORRENTO	230kV	Ckt	1
C-151	Line	2073 SPG LAKE	230kV	to	2580 ALTAMONT	230kV	Ckt	1
C-152	Line	2074 WEKIVA	230kV	to	2584 MYRTL LK	230kV	Ckt	1
C-153	Line	2163 CAMP LK	230kV	to	2167 WINDERME	230kV	Ckt	1
C-154	Line	2163 CAMP LK	230kV	to	3521 CENT FLA	230kV	Ckt	1
C-155	Line	2164 CLMT EST	230kV	to	2167 WINDERME	230kV	Ckt	1
C-156	Line	2164 CLMT EST	230kV	to	3521 CENT FLA	230kV	Ckt	1
C-157	Line	2165 INTERNAT	230kV	to	2166 LK BRYAN	230kV	Ckt	1
C-158	Line	2165 INTERNAT	230kV	to	2167 WINDERME	230kV	Ckt	1
C-159	Line	2166 LK BRYAN	230kV	to	2167 WINDERME	230kV	Ckt	2
C-160	Line	2166 LK BRYAN	230kV	to	2883 INTERCSN	230kV	Ckt	1
C-161	Line	2166 LK BRYAN	230kV	to	2883 INTERCSN	230kV	Ckt	2
C-162	Line	2167 WINDERME	230kV	to	2168 WOODSMER	230kV	Ckt	1
C-163	Line	2167 WINDERME	230kV	to	5701 SO WOOD	230kV	Ckt	1
C-164	Line	2168 WOODSMER	230kV	to	5700 PINEHILL	230kV	Ckt	1
C-165	Line	2267 E CLRWTR	230kV	to	2269 LK TARPN	230kV	Ckt	1
C-166	Line	2267 E CLRWTR	230kV	to	3834 ANCLOTE	230kV	Ckt	1
C-167	Line	2267 E CLRWTR	230kV	to	3932 ULMERTON	230kV	Ckt	1
C-168	Line	2268 HIGGINS	230kV	to	2269 LK TARPN	230kV	Ckt	1
C-169	Line	2269 LK TARPN	230kV	to	2270 PALM HBR	230kV	Ckt	1
C-170	Line	2269 LK TARPN	230kV	to	3836 HUDSON	230kV	Ckt	1
C-171	Line	2269 LK TARPN	230kV	to	3837 SEVEN SP	230kV	Ckt	1
C-172	Line	2269 LK TARPN	230kV	to	3932 ULMERTON	230kV	Ckt	1
C-173	Line	2269 LK TARPN	230kV	to	8000 SHELD	230kV	Ckt	1
C-174	Line	2269 LK TARPN	230kV	to	8000 SHELD	230kV	Ckt	2
C-175	Line	2269 LK TARPN	230kV	to	8000 SHELD	230kV	Ckt	3
C-176	Line	2270 PALM HBR	230kV	to	3930 LARGO	230kV	Ckt	1
C-177	Line	2271 GRIFFIN	230kV	to	2884 KATHLEEN	230kV	Ckt	1
C-178	Line	2271 GRIFFIN	230kV	to	6102 WEST	230kV	Ckt	1
C-179	Line	2288 LK TARPN	500kV	to	2289 LKT-DUM1	500kV	Ckt	1
C-180	Line	2288 LK TARPN	500kV	to	2290 LKT-DUM2	500kV	Ckt	1
C-181	Line	2288 LK TARPN	500kV	to	3550 BRKRIDGE	500kV	Ckt	1
C-182	Line	2437 DEBARY	230kV	to	2439 DUMMY 1	230kV	Ckt	1
C-183	Line	2437 DEBARY	230kV	to	2440 DUMMY 2	230kV	Ckt	1
C-184	Line	2437 DEBARY	230kV	to	2441 DUMMY 3	230kV	Ckt	1
C-185	Line	2437 DEBARY	230kV	to	2442 ORANGE C	230kV	Ckt	1
C-186	Line	2437 DEBARY	230kV	to	2582 LK EMMA	230kV	Ckt	1
C-187	Line	2437 DEBARY	230kV	to	2585 N LONGWD	230kV	Ckt	1
C-188	Line	2438 DELAND W	230kV	to	2442 ORANGE C	230kV	Ckt	1
C-189	Line	2438 DELAND W	230kV	to	3529 SILVR SP	230kV	Ckt	1
C-190	Line	2581 ECON	230kV	to	2586 RIO PINR	230kV	Ckt	1
C-191	Line	2581 ECON	230kV	to	2589 WTR PK E	230kV	Ckt	1
C-192	Line	2582 LK EMMA	230kV	to	2590 WTR SPGS	230kV	Ckt	1
C-193	Line	2583 MEADWD S	230kV	to	5704 TAFT	230kV	Ckt	1
C-194	Line	2584 MYRTL LK	230kV	to	2585 N LONGWD	230kV	Ckt	1
C-195	Line	2585 N LONGWD	230kV	to	2590 WTR SPGS	230kV	Ckt	1
C-196	Line	2586 RIO PINR	230kV	to	2591 CURRY FD	230kV	Ckt	1
C-197	Line	2587 SKY LAKE	230kV	to	5701 SO WOOD	230kV	Ckt	1
C-198	Line	2588 TAYLR CK	230kV	to	2882 HOLOPAW	230kV	Ckt	1

C-199	Line	2589 WTR PK E	230kV	to	2590 WTR SPGS	230kV	Ckt	1
C-200	Line	2591 CURRY FD	230kV	to	5705 STANTON	230kV	Ckt	1
C-201	Line	2876 LOUGHMAN	230kV	to	2883 INTERCSN	230kV	Ckt	1
C-202	Line	2876 LOUGHMAN	230kV	to	2891 WLK WALE	230kV	Ckt	1
C-203	Line	2877 AVON PK	230kV	to	2880 FISH CRK	230kV	Ckt	1
C-204	Line	2877 AVON PK	230kV	to	2881 FT MEADE	230kV	Ckt	1
C-205	Line	2878 BARCOLA	230kV	to	2887 HINES	230kV	Ckt	1
C-206	Line	2878 BARCOLA	230kV	to	2887 HINES	230kV	Ckt	2
C-207	Line	2878 BARCOLA	230kV	to	6102 WEST	230kV	Ckt	1
C-208	Line	2878 BARCOLA	230kV	to	9050 PEBB	230kV	Ckt	1
C-209	Line	2879 CANOE CK	230kV	to	2882 HOLOPAW	230kV	Ckt	1
C-210	Line	2879 CANOE CK	230kV	to	2891 WLK WALE	230kV	Ckt	1
C-211	Line	2881 FT MEADE	230kV	to	2887 HINES	230kV	Ckt	1
C-212	Line	2881 FT MEADE	230kV	to	2889 TIGERBAY	230kV	Ckt	1
C-213	Line	2881 FT MEADE	230kV	to	2890 VANDOLAH	230kV	Ckt	1
C-214	Line	2881 FT MEADE	230kV	to	2891 WLK WALE	230kV	Ckt	1
C-215	Line	2882 HOLOPAW	230kV	to	7431 STC EAST	230kV	Ckt	1
C-216	Line	2884 KATHLEEN	230kV	to	3530 ZEPHYR N	230kV	Ckt	1
C-217	Line	2885 N BARTOW	230kV	to	9050 PEBB	230kV	Ckt	1
C-218	Line	2885 N BARTOW	230kV	to	9130 SELOSE T	230kV	Ckt	1
C-219	Line	2887 HINES	230kV	to	2889 TIGERBAY	230kV	Ckt	1
C-220	Line	2888 TIGER PL	230kV	to	2889 TIGERBAY	230kV	Ckt	1
C-221	Line	2888 TIGER PL	230kV	to	2889 TIGERBAY	230kV	Ckt	2
C-222	Line	2890 VANDOLAH	230kV	to	7121 CC PLANT	230kV	Ckt	1
C-223	Line	2891 WLK WALE	230kV	to	9130 SELOSE T	230kV	Ckt	1
C-224	Line	2911 KATH-DUM	500kV	to	2913 KATHLEEN	500kV	Ckt	1
C-225	Line	2913 KATHLEEN	500kV	to	3551 CENT FLA	500kV	Ckt	1
C-226	Line	3159 ARCHER	230kV	to	3171 HAILE	230kV	Ckt	1
C-227	Line	3159 ARCHER	230kV	to	3528 MARTIN W	230kV	Ckt	1
C-228	Line	3159 ARCHER	230kV	to	4102 PKRD	230kV	Ckt	1
C-229	Line	3160 CRAWFDVL	230kV	to	3164 GUM BAY	230kV	Ckt	1
C-230	Line	3160 CRAWFDVL	230kV	to	3167 PERRY	230kV	Ckt	1
C-231	Line	3160 CRAWFDVL	230kV	to	7600 HOPKINS	230kV	Ckt	1
C-232	Line	3162 FT WHT N	230kV	to	3163 FT WHT S	230kV	Ckt	1
C-233	Line	3162 FT WHT N	230kV	to	3169 SUWANNEE	230kV	Ckt	1
C-234	Line	3163 FT WHT S	230kV	to	3165 NEWBERRY	230kV	Ckt	1
C-235	Line	3163 FT WHT S	230kV	to	3171 HAILE	230kV	Ckt	1
C-236	Line	3164 GUM BAY	230kV	to	3166 P ST JOE	230kV	Ckt	1
C-237	Line	3165 NEWBERRY	230kV	to	3170 WILCOX	230kV	Ckt	1
C-238	Line	3165 NEWBERRY	230kV	to	3522 CR PLANT	230kV	Ckt	1
C-239	Line	3166 P ST JOE	230kV	to	17860 CALLAWAY	230kV	Ckt	1
C-240	Line	3167 PERRY	230kV	to	3169 SUWANNEE	230kV	Ckt	1
C-241	Line	3168 SUWAN PK	230kV	to	3169 SUWANNEE	230kV	Ckt	1
C-242	Line	3169 SUWANNEE	230kV	to	11870 STERLING	230kV	Ckt	1
C-243	Line	3171 HAILE	230kV	to	6736 HAIL MIL	230kV	Ckt	1
C-244	Line	3515 ANDERSEN	230kV	to	3521 CENT FLA	230kV	Ckt	1
C-245	Line	3515 ANDERSEN	230kV	to	3527 HOLDER	230kV	Ckt	1
C-246	Line	3518 BRKRIDGE	230kV	to	3520 BRKSVWTP	230kV	Ckt	1
C-247	Line	3518 BRKRIDGE	230kV	to	3522 CR PLANT	230kV	Ckt	1
C-248	Line	3518 BRKRIDGE	230kV	to	3523 CRYST RE	230kV	Ckt	1
C-249	Line	3518 BRKRIDGE	230kV	to	3836 HUDSON	230kV	Ckt	1
C-250	Line	3519 BRKSVL W	230kV	to	3520 BRKSVWTP	230kV	Ckt	1

C-251	Line	3520 BRKSVWTP	230kV	to	3835 GULFPINE	230kV	Ckt	1
C-252	Line	3521 CENT FLA	230kV	to	3525 DALLAS	230kV	Ckt	1
C-253	Line	3521 CENT FLA	230kV	to	3527 HOLDER	230kV	Ckt	1
C-254	Line	3521 CENT FLA	230kV	to	3529 SILVR SP	230kV	Ckt	1
C-255	Line	3522 CR PLANT	230kV	to	3523 CRYST RE	230kV	Ckt	1
C-256	Line	3522 CR PLANT	230kV	to	3524 CRYST R4	230kV	Ckt	1
C-257	Line	3522 CR PLANT	230kV	to	3527 HOLDER	230kV	Ckt	1
C-258	Line	3522 CR PLANT	230kV	to	3527 HOLDER	230kV	Ckt	2
C-259	Line	3525 DALLAS	230kV	to	3529 SILVR SP	230kV	Ckt	1
C-260	Line	3528 MARTIN W	230kV	to	7120 SILV SPN	230kV	Ckt	1
C-261	Line	3529 SILVR SP	230kV	to	3531 OCALA 1	230kV	Ckt	1
C-262	Line	3529 SILVR SP	230kV	to	7120 SILV SPN	230kV	Ckt	1
C-263	Line	3529 SILVR SP	230kV	to	7120 SILV SPN	230kV	Ckt	2
C-264	Line	3531 OCALA 1	230kV	to	6296 OCALA 1	230kV	Ckt	1
C-265	Line	3531 OCALA 1	230kV	to	7120 SILV SPN	230kV	Ckt	1
C-266	Line	3548 BRDG-DUM	500kV	to	3550 BRKRIDGE	500kV	Ckt	1
C-267	Line	3550 BRKRIDGE	500kV	to	3555 CRYST RV	500kV	Ckt	1
C-268	Line	3551 CENT FLA	500kV	to	3552 CENT-DM2	500kV	Ckt	1
C-269	Line	3551 CENT FLA	500kV	to	3553 CENT-DUM	500kV	Ckt	1
C-270	Line	3551 CENT FLA	500kV	to	3555 CRYST RV	500kV	Ckt	1
C-271	Line	3555 CRYST RV	500kV	to	3556 CRYST R5	500kV	Ckt	1
C-272	Line	3702 40TH ST	230kV	to	3704 NORTHEST	230kV	Ckt	1
C-273	Line	3702 40TH ST	230kV	to	3705 PASADENA	230kV	Ckt	1
C-274	Line	3703 BARTOW	230kV	to	3704 NORTHEST	230kV	Ckt	1
C-275	Line	3703 BARTOW	230kV	to	3704 NORTHEST	230kV	Ckt	2
C-276	Line	3704 NORTHEST	230kV	to	3706 PNELRCOV	230kV	Ckt	1
C-277	Line	3704 NORTHEST	230kV	to	3932 ULMERTON	230kV	Ckt	1
C-278	Line	3704 NORTHEST	230kV	to	3932 ULMERTON	230kV	Ckt	2
C-279	Line	3705 PASADENA	230kV	to	3931 SEMINOLE	230kV	Ckt	1
C-280	Line	3833 ANC COOL	230kV	to	3834 ANCLOTE	230kV	Ckt	1
C-281	Line	3834 ANCLOTE	230kV	to	3837 SEVEN SP	230kV	Ckt	1
C-282	Line	3834 ANCLOTE	230kV	to	3930 LARGO	230kV	Ckt	1
C-283	Line	3835 GULFPINE	230kV	to	3837 SEVEN SP	230kV	Ckt	1
C-284	Line	3929 BLCHR RD	230kV	to	3930 LARGO	230kV	Ckt	1
C-285	Line	3929 BLCHR RD	230kV	to	3932 ULMERTON	230kV	Ckt	1
C-286	Line	3930 LARGO	230kV	to	3931 SEMINOLE	230kV	Ckt	1
C-287	Line	4650 CENTR PK	230kV	to	4875 NORTHSDE	230kV	Ckt	1
C-288	Line	4650 CENTR PK	230kV	to	4950 ROBNWOOD	230kV	Ckt	1
C-289	Line	4650 CENTR PK	230kV	to	4960 SJRPP	230kV	Ckt	1
C-290	Line	4650 CENTR PK	230kV	to	4960 SJRPP	230kV	Ckt	2
C-291	Line	4650 CENTR PK	230kV	to	4972 S KERNAN	230kV	Ckt	1
C-292	Line	4700 FIRESTNE	230kV	to	4865 NORMANDY	230kV	Ckt	1
C-293	Line	4700 FIRESTNE	230kV	to	6673 BLK CK.	230kV	Ckt	1
C-294	Line	4710 FT CAROL	230kV	to	4830 MILL CVE	230kV	Ckt	1
C-295	Line	4710 FT CAROL	230kV	to	4960 SJRPP	230kV	Ckt	1
C-296	Line	4735 GREENLND	230kV	to	4750 HARTLEY	230kV	Ckt	1
C-297	Line	4735 GREENLND	230kV	to	4955 SE JAX	230kV	Ckt	1
C-298	Line	4735 GREENLND	230kV	to	4972 S KERNAN	230kV	Ckt	1
C-299	Line	4735 GREENLND	230kV	to	4985 SWTZRLND	230kV	Ckt	1
C-300	Line	4865 NORMANDY	230kV	to	4875 NORTHSDE	230kV	Ckt	1
C-301	Line	4865 NORMANDY	230kV	to	4897 PATILLO	230kV	Ckt	2
C-302	Line	4865 NORMANDY	230kV	to	4960 SJRPP	230kV	Ckt	1

C-303	Line	4865 NORMANDY	230kV	to	5005 WEST JAX	230kV	Ckt	1
C-304	Line	4875 NORTHSDE	230kV	to	5005 WEST JAX	230kV	Ckt	1
C-305	Line	4897 PATILLO	230kV	to	4960 SIRPP	230kV	Ckt	2
C-306	Line	4950 ROBNWOOD	230kV	to	4955 SE JAX	230kV	Ckt	1
C-307	Line	5351 KIS MARY	230kV	to	5704 TAFT	230kV	Ckt	1
C-308	Line	5352 CAN ISL	230kV	to	5353 KIS CLAY	230kV	Ckt	1
C-309	Line	5352 CAN ISL	230kV	to	5800 OUCCITP1	230kV	Ckt	1
C-310	Line	5352 CAN ISL	230kV	to	5801 OUCCITP2	230kV	Ckt	1
C-311	Line	5701 SO WOOD	230kV	to	5704 TAFT	230kV	Ckt	1
C-312	Line	5702 PERSHING	230kV	to	5705 STANTON	230kV	Ckt	1
C-313	Line	5702 PERSHING	230kV	to	5705 STANTON	230kV	Ckt	2
C-314	Line	5702 PERSHING	230kV	to	5708 R-22	230kV	Ckt	1
C-315	Line	5703 IND RIV	230kV	to	5705 STANTON	230kV	Ckt	1
C-316	Line	5703 IND RIV	230kV	to	5705 STANTON	230kV	Ckt	2
C-317	Line	5704 TAFT	230kV	to	5705 STANTON	230kV	Ckt	1
C-318	Line	5704 TAFT	230kV	to	5706 AIP	230kV	Ckt	1
C-319	Line	5704 TAFT	230kV	to	5800 OUCCITP1	230kV	Ckt	1
C-320	Line	5706 AIP	230kV	to	5709 R-23	230kV	Ckt	1
C-321	Line	5707 AIRPORT	230kV	to	5708 R-22	230kV	Ckt	1
C-322	Line	5707 AIRPORT	230kV	to	5709 R-23	230kV	Ckt	1
C-323	Line	5801 OUCCITP2	230kV	to	7890 OSCEOLA	230kV	Ckt	1
C-324	Line	6101 MCINTOSH	230kV	to	6104 TENOROC	230kV	Ckt	1
C-325	Line	6101 MCINTOSH	230kV	to	9150 LKAGNES	230kV	Ckt	1
C-326	Line	6102 WEST	230kV	to	6106 I-STATE	230kV	Ckt	1
C-327	Line	6103 EATON PK	230kV	to	6104 TENOROC	230kV	Ckt	1
C-328	Line	6103 EATON PK	230kV	to	6105 CREWSLK	230kV	Ckt	1
C-329	Line	6104 TENOROC	230kV	to	6106 I-STATE	230kV	Ckt	1
C-330	Line	6104 TENOROC	230kV	to	6114 MP4-230	230kV	Ckt	1
C-331	Line	6104 TENOROC	230kV	to	6115 MP5-230	230kV	Ckt	1
C-332	Line	6105 CREWSLK	230kV	to	9050 PEBB	230kV	Ckt	1
C-333	Line	6105 CREWSLK	230kV	to	9100 RECKER	230kV	Ckt	1
C-334	Line	6296 OCALA 1	230kV	to	6299 OC R-OAK	230kV	Ckt	1
C-335	Line	6297 OCALA 2	230kV	to	6299 OC R-OAK	230kV	Ckt	1
C-336	Line	6297 OCALA 2	230kV	to	7120 SILV SPN	230kV	Ckt	1
C-337	Line	6673 BLK CK.	230kV	to	6694 KEY HTS.	230kV	Ckt	1
C-338	Line	6682 FLRAHM.	230kV	to	6694 KEY HTS.	230kV	Ckt	1
C-339	Line	6682 FLRAHM.	230kV	to	6707 RIVRVU	230kV	Ckt	1
C-340	Line	6707 RIVRVU	230kV	to	7119 SEMINOLE	230kV	Ckt	1
C-341	Line	7119 SEMINOLE	230kV	to	7120 SILV SPN	230kV	Ckt	1
C-342	Line	7119 SEMINOLE	230kV	to	7120 SILV SPN	230kV	Ckt	2
C-343	Line	7121 CC PLANT	230kV	to	9090 HARDESUB	230kV	Ckt	1
C-344	Line	7600 HOPKINS	230kV	to	7620 SUB 20	230kV	Ckt	1
C-345	Line	7607 SUB 7	230kV	to	7620 SUB 20	230kV	Ckt	1
C-346	Line	7620 SUB 20	230kV	to	10218 S BAINBR	230kV	Ckt	1
C-347	Line	7890 OSCEOLA	230kV	to	9150 LKAGNES	230kV	Ckt	1
C-348	Line	8000 SHELD	230kV	to	8010 DLMBRY-W	230kV	Ckt	1
C-349	Line	8000 SHELD	230kV	to	8100 JAXSN230	230kV	Ckt	1
C-350	Line	8000 SHELD	230kV	to	8120 OHIO-S	230kV	Ckt	1
C-351	Line	8010 DLMBRY-W	230kV	to	8020 DLMBRY-E	230kV	Ckt	1
C-352	Line	8020 DLMBRY-E	230kV	to	8400 CHAPMAN	230kV	Ckt	1
C-353	Line	8110 OHIO-N	230kV	to	8120 OHIO-S	230kV	Ckt	1
C-354	Line	8110 OHIO-N	230kV	to	8500 11TH AVE	230kV	Ckt	1

C-355	Line	8300 RIVER-N	230kV	to	8310 RIVER-S	230kV	Ckt	1
C-356	Line	8300 RIVER-N	230kV	to	8750 SR60-S T	230kV	Ckt	1
C-357	Line	8310 RIVER-S	230kV	to	8900 B BEND	230kV	Ckt	1
C-358	Line	8400 CHAPMAN	230kV	to	8700 GANNON	230kV	Ckt	1
C-359	Line	8500 11TH AVE	230kV	to	8860 SO GIB	230kV	Ckt	1
C-360	Line	8600 HAMPTN	230kV	to	8610 HAMPTN T	230kV	Ckt	1
C-361	Line	8610 HAMPTN T	230kV	to	8700 GANNON	230kV	Ckt	1
C-362	Line	8610 HAMPTN T	230kV	to	9050 PEBB	230kV	Ckt	1
C-363	Line	8700 GANNON	230kV	to	8750 SR60-S T	230kV	Ckt	1
C-364	Line	8700 GANNON	230kV	to	8760 SR60-N T	230kV	Ckt	1
C-365	Line	8700 GANNON	230kV	to	8850 BELCRK	230kV	Ckt	1
C-366	Line	8730 SR60-N	230kV	to	8760 SR60-N T	230kV	Ckt	1
C-367	Line	8740 SR60-S	230kV	to	8750 SR60-S T	230kV	Ckt	1
C-368	Line	8760 SR60-N T	230kV	to	8900 B BEND	230kV	Ckt	1
C-369	Line	8850 BELCRK	230kV	to	9050 PEBB	230kV	Ckt	1
C-370	Line	8860 SO GIB	230kV	to	8900 B BEND	230kV	Ckt	1
C-371	Line	8870 RUSKIN T	230kV	to	8900 B BEND	230kV	Ckt	1
C-372	Line	8880 RUSKMTR8	230kV	to	8900 B BEND	230kV	Ckt	1
C-373	Line	8890 BIGBGT-T	230kV	to	8900 B BEND	230kV	Ckt	1
C-374	Line	8900 B BEND	230kV	to	9010 MINES W	230kV	Ckt	1
C-375	Line	9000 POLKPLNT	230kV	to	9030 BRADLY T	230kV	Ckt	1
C-376	Line	9000 POLKPLNT	230kV	to	9050 PEBB	230kV	Ckt	1
C-377	Line	9000 POLKPLNT	230kV	to	9050 PEBB	230kV	Ckt	2
C-378	Line	9000 POLKPLNT	230kV	to	9090 HARDESUB	230kV	Ckt	1
C-379	Line	9010 MINES W	230kV	to	9020 MINES E	230kV	Ckt	1
C-380	Line	9020 MINES E	230kV	to	9030 BRADLY T	230kV	Ckt	1
C-381	Line	9100 RECKER	230kV	to	9110 ARIANA	230kV	Ckt	1
C-382	Line	9100 RECKER	230kV	to	9150 LKAGNES	230kV	Ckt	1
C-383	Line	9100 RECKER	230kV	to	9160 GAPWAY	230kV	Ckt	1
C-384	Line	9120 SELOSE	230kV	to	9130 SELOSE T	230kV	Ckt	1
C-385	Transformer	2289 LKT-DUM1	500kV	to	2269 LK TARPN	230kV	Ckt	1
C-386	Transformer	2290 LKT-DUM2	500kV	to	2269 LK TARPN	230kV	Ckt	1
C-387	Transformer	2911 KATH-DUM	500kV	to	2884 KATHLEEN	230kV	Ckt	1
C-388	Transformer	3548 BRDG-DUM	500kV	to	3518 BRKRIDGE	230kV	Ckt	1
C-389	Transformer	3552 CENT-DM2	500kV	to	3521 CENT FLA	230kV	Ckt	1
C-390	Transformer	3553 CENT-DUM	500kV	to	3521 CENT FLA	230kV	Ckt	1
C-391	Line	2163 CAMP LK	230kV	to	90000 LEESBURG	230kV	Ckt	1
C-392	Line	2164 CLMT EST	230kV	to	90000 LEESBURG	230kV	Ckt	1
C-393	Line	90000 LEESBURG	230kV	to	3521 CENT FLA	230kV	Ckt	1
C-394	Line	90000 LEESBURG	230kV	to	3521 CENT FLA	230kV	Ckt	2