CHAPTER 8

ELECTRICAL POWER

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CHAPTER 8

ELECTRICAL POWER

8.1 INTRODUCTION

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.1.1 UTILITY GRID DESCRIPTION

LNP SUP 8.1-1 Replace the existing information in DCD Subsection 8.1.1 with the following:

Progress Energy Florida (PEF) is an investor-owned electric utility serving a 20,000 square mile area in central and north Florida, including metropolitan St. Petersburg, Clearwater and the greater Orlando area. The PEF electrical grid consists of nuclear and fossil fuel generating facilities and an extensive 500/230 kV bulk power transmission system serving 1.7 million customers and a population of more than 5 million people. PEF maintains multiple direct interconnections with neighboring utilities. These interconnections with neighboring utilities serve to increase the reliability of the PEF electrical grid. PEF participates as a member of the Florida Reliability Coordinating Council (FRCC) and the Southeastern Electric Reliability Corporation (SERC).

LNP 1 and 2 are connected to a new common switchyard having dual voltages 500 kV and 230 kV. The switchyard also serves as units' preferred and maintenance source. The switchyard has a breaker and a half scheme. There are four 500 kV transmission lines that connect the switchyard to the grid.

8.1.2 ON-SITE POWER SYSTEM DESCRIPTION

LNP SUP 8.1-2 Add the following information between the second and third paragraphs of this subsection.

The reserve auxiliary transformers (RAT) for LNP 1 and LNP 2 also serve as sources of maintenance power.

The LNP 1 reserve auxiliary transformers RAT A and RAT B are supplied from the 500 kV / 230 kV step down transformers located in the switchyard.

The LNP 2 reserve auxiliary transformers RAT A and RAT B are supplied from the 500 kV / 230 kV step down transformers located in the switchyard.

8.1.4.3 Design Criteria, Regulatory Guides, and IEEE Standards

LNP SUP 8.1-3

Add the following information between the second and third paragraph of this subsection.

Off-site and on-site ac power systems' conformance to Regulatory Guides and IEEE Standards is identified by DCD Table 8.1-1 as site-specific, and to other applicable Regulatory Guides is as indicated in Table 8.1-201.

LNP SUP 8.1-3

Table 8.1-201
Site-Specific Guidelines for Electric Power Systems

Criteria			Applicability (FSAR[a] Section/Subsection) 8.2	8.3.1	8.3.2	Remarks
1. Regulatory Guides						
a.	RG 1.129	Maintenance, Testing, and Replacement of Vented Lead-Acid Storage Batteries for Nuclear Power Plants			G	Battery Service tests are performed in accordance with the Regulatory Guide.
b.	RG 1.155	Station Blackout				Not Applicable [b]
c.	RG 1.204	Guidelines for Lightning Protection of Nuclear Power Plants	G	G		Implemented via IEEE-665, "IEEE Guide for Generating Station Grounding" (DCD Section 8.3, Reference 201).
d.	RG 1.206	Combined License Applications for Nuclear Power Plants (LWR Edition)	G	G	G	
2. Branch Technical Positions						
a.	BTP 8-3 (BTP ICSB-11 in DCD)	Stability of Off-Site Power Systems	G			Stability Analysis of the Off-Site Power System is performed in accordance with the BTP.

a) "G" denotes guidelines as defined in NUREG-0800, Rev. 3, Table 8-1 (SRP). No Letter denotes "Not applicable".

b) Station Blackout and the associated guidelines were addressed as a design issue in the DCD.

8.2 OFFSITE POWER SYSTEM

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.2.1 SYSTEM DESCRIPTION

Delete the first, second, and sixth paragraphs, and the first and last sentences of the fourth paragraph of DCD Subsection 8.2.1. Add the following information before the fifth paragraph of DCD Subsection 8.2.1.

LNP COL 8.2-1

The Progress Energy Florida (PEF) transmission network (grid) system supplies the off-site ac power for the LNP 1 and LNP 2 via a common switchyard. The connections of LNP 1, LNP 2, the switchyard, and the 500 kV transmission system are shown in Figures 8.2-201 and 8.2-202 respectively.

The common 500 kV/230 kV switchyard provides a 500 kV circuit feed to the main step-up transformer of each unit. The two reserve auxiliary transformers for each unit are provided with separate 230 kV circuit feeds. A 500kV/230 kV step down transformer for each unit is located within the switchyard boundary to feed 230 kV buses. Figure 8.2-202 shows the switchyard connections to the main step-up and reserve auxiliary transformers for LNP 1 and LNP 2.

The off-site power sources to the 500 kV LNP 1 and LNP 2 common switchyard consist of four transmission lines listed in Table 8.2-201. The four 500 kV transmission lines are to Central Florida South (LCFS), Crystal River Plant (LCR), Citrus 1 and Citrus 2 (LPC).

The transmission lines routing near the plant are shown in Figure 8.2-202. The lines originate from different substations and enter the common switchyard from one direction. As they enter the plant area, the four 500 kV transmission lines stated above and two future transmission lines share a common right-of-way. The transmission line structures are placed such that failure of one structure will not impact the next structure.

The LNP 1 and LNP 2 related transmission structures and support structures and systems are designed to withstand standard loading conditions for the LNP site as provided in DCD Section 8.2.

The transmission lines are designed with an insulation level that will minimize lightning flashover. Historically, the Levy county area of Florida has experienced an average of 80 to 90 thunderstorm days per year. Experience with 1477.66 miles of 230 kV lines indicates that PEF's transmission lines are subjected to one lightning outage per year per 200 miles. The experience with 169.16 miles of 500kV lines indicates that PEF’s transmission lines are subjected to 0.25 lightning outages per year per 100 miles. The new transmission lines will have similar operating characteristics.

The LNP 1 and LNP 2 transmission lines are designed to meet NESC C2-2007, "National Electrical Safety Code" (Reference 201).

Galloping conductors are not anticipated at the LNP site and should not affect the reliability of the transmission lines. PEF has not experienced line outages resulting from galloping conductors most likely due to the lack of ice formation in the Central Florida Region. The proposed structure configuration further reduces the probability of flashover in the rare event that conductors should gallop.

The LNP 1 and LNP 2 common switchyard has multiple off-site power sources from the transmission network (refer to Table 8.2-201). Each of the off-site sources have sufficient capacity and capability to support start-up, normal running, generator/turbine trip, and normal shutdown for LNP 1 and LNP 2.

LNP CDI

A transformer area containing the main step-up transformers, unit auxiliary transformers (UAT), and reserve auxiliary transformers (RAT) is located next to each turbine building (DCD Figure 1.2-2).

8.2.1.1 Transmission Switchyard

LNP COL 8.2-1

Replace the information in the DCD Subsection 8.2.1.1 with the following information.

8.2.1.1.1 LNP 1 and LNP 2 Switchyard

LNP 1 and LNP 2 are served by a common 500 kV/230 kV switchyard. Each 500 kV and 230 kV switchyard has two full capacity main buses. Each bus is individually capable of supplying the entire load required for the 500 kV or 230 kV systems. Each of the four (4) incoming 500 kV transmission lines are normally connected to both buses. Two 500 kV to 230 kV step-down transformers, used to supply power to the RATs, are located in the 500 kV switchyard. Each transformer is capable of carrying the RAT's of both LNP 1 and LNP 2 and can be connected to both buses.

The 500 kV and 230 kV circuit breakers associated with the LNP 1 and LNP 2 switchyard are rated 3000A, 60 Hz, 3-pole gas type with interrupting capability of 50,000 amperes RMS.

The switchyard also has a number of disconnect switches, which are 3-pole and are rated on the same continuous current basis as the associated circuit breakers.

The various elements of the LNP1 and LNP 2 switchyard are connected via a breaker-and-a-half scheme as shown in Figure 8.2-201.

There are two 125 Vdc battery systems. Each system consists of 125 Vdc battery and battery charger.

The switchyard includes surge protective devices, grounding, and a lightning protection system in accordance with standard industry practice.

LNP SUP 8.2-1

8.2.1.1.2 Failure Modes and Effects Analysis (FMEA)

The design of the off-site power system provides for a robust system that supports reliable power production. While off-site power is not required to meet any safety function, and physical independence is obviated by this lack of safety function and by the certified design's partial exemption to GDC 17 granted by the NRC, multiple, reliable transmission circuits are provided to support operation of the LNP 1 and LNP 2 facilities. Neither the accident analysis nor the Probabilistic Risk Assessment has identified the non-safety related off-site power system as risk significant for normal plant operation.

LNP 1 and LNP 2 are connected to four (4) transmission lines. No single transmission line is designated as the preferred circuit for LNP 1 or LNP 2. Each of the transmission lines has sufficient capacity and capability from the transmission network to power the house loads under normal running, normal shut down, turbine trip event, cooldown and normal starting for both units.

A failure modes and effects analysis (FMEA) of the LNP 1 and LNP 2 switchyards confirms that a single initiating event, such as transmission line fault plus a single breaker not operating, does not cause failure of more than one single off-site transmission line, or a loss of off-site power to either LNP 1 and LNP 2 on-site buses via the main step-up transformer. This evaluation recognizes that a single failure of some switchyard components could directly cause the loss of the LNP 1 and LNP 2 switchyard feeds to each unit's main step-up transformer such as a fault on this feed. Evaluated events include a breaker not operating during a fault condition, a fault on a switchyard bus, a spurious relay trip; and a loss of control power supply. In summary:

- In the event of a fault on a 500 kV transmission line, the associated switchyards' circuit breakers trip and both 500 kV buses stay energized and LNP 1 and LNP 2 continue operation.

- In the event of a fault on a 500 kV transmission line with a stuck breaker, the breaker failure relay trips the adjacent breaker, isolating the faulted transmission line and the adjacent transmission line. Both 500 kV buses stay energized and LNP 1 and LNP 2 continue operation.

- In the event of a fault on a 500 kV transmission line with a stuck bus breaker, the affected bus differential relays cause all circuit breakers on the affected bus to trip, and thereby, isolate the faulted bus. LNP 1 and LNP 2 continue operation through the non-affected 500 kV bus.

- In the event of a 500 kV bus fault, bus differential relays sense the fault and the breakers associated with the affected bus trip, thereby isolating the faulted bus. In this event, LNP 1 and LNP 2 continue normal operation through the non-affected 500 kV bus.

- In the event of a 500 kV bus fault with a stuck breaker, the adjacent breaker will sense the fault and trip, which will isolate the faulted bus. If the stuck breaker is associated with either the LNP 1 or LNP 2 main step up transformer output, opening of the adjacent breaker will interrupt power to the associated main step-up transformer and unit auxiliary transformers resulting in the loss of both preferred and normal sources of power to the unit. The switchyard feeds to the reserve auxiliary transformers will still be available.

- In the event of a 500 kV transmission line, or a 500 kV bus under a relay spurious operation, the associated switchyards' breakers trip, isolating the transmission line from the respective switchyards. In this event, switchyard buses stay energized for LNP 1 and LNP 2, and the units continue normal operation.

- In the event of a loss of dc control power to a 500 kV breaker or to a 500 kV transmission line, the primary relay is compensated for by redundant trip coils powered from a different dc source, which allows the protective function to occur.

- In the event of a fault on a 230 kV transmission line, the associated switchyards' bus breakers trip and both 230 kV buses stay energized and LNP 1 and LNP 2 continue operation.

- In the event of a fault on a 230 kV transmission line with a stuck breaker, the breaker failure relay trips the adjacent breaker, isolating the faulted transmission line and the adjacent transmission line. Both 230 kV buses stay energized and LNP 1 and LNP 2 continue operation.

- In the event of a fault on a 230 kV transmission line with a stuck bus breaker, the affected bus differential relays cause all circuit breakers on the affected bus to trip, and thereby, isolate the faulted bus. LNP 1 and LNP 2 continue operation through the non-affected 230 kV bus.

- In the event of a 230 kV bus fault, bus differential relays sense the fault and the breakers associated with the affected bus trip, thereby isolating the faulted bus. In this event, LNP 1 and LNP 2 continue normal operation through the non-affected 230 kV bus.

- In the event of a 230 kV bus fault with a stuck breaker, the adjacent breaker will sense the fault and trip, which will isolate the faulted bus.

Both LNP 1 and LNP 2 continue normal operation through the non-affected 230 kV bus.

- In the event of a 230 kV transmission line, or a 230 kV bus, relay spurious operation, the associated switchyards' breakers trip, isolating the transmission line from the respective switchyards. In this event, the 500 kV switchyard buses stay energized for LNP 1 and LNP 2, and the units continue normal operation.

- In the event of a loss of dc control power to a 230 kV breaker, or to a 230 kV transmission line, the primary relay is compensated for by redundant trip coils powered from a different source, which allows the protective function to occur.

- In the event of a fault on one of the 500/230 kV autotransformers connected between the 500 kV section and the 230 kV section, the associated switchyards' bus breakers trip, and both the 500 kV buses and both the 230 kV buses stay energized, and LNP 1 and LNP 2 continue operation.

- In the event of a fault on one of the 500/230 kV autotransformers connected between the 500 kV section and the 230 kV section with a stuck 500 kV circuit breaker, the breaker failure relay trips the adjacent breaker, isolating the faulted autotransformer and the adjacent 500 kV transmission line. Both 500 kV buses, and both 230 kV buses stay energized and LNP 1 and LNP 2 remain energized.

- In the event of a fault on one of the 500/230 kV autotransformers connected between the 500 kV section and the 230 kV section with a stuck 500 kV bus – breaker, the affected bus differential relays cause all circuit breakers on the affected 500 kV bus to trip, and thereby, isolate the faulted bus. LNP 1 and LNP 2 continue operation through the non-affected 500 kV bus and 230 kV buses.

- In the event of a fault on one of the 500/230 kV autotransformers connected between the 500 kV section and the 230 kV section, with a stuck 230 kV circuit breaker, the breaker failure relay trips the adjacent breaker, isolating the faulted autotransformer and the adjacent 500 kV transmission line. Both 500 kV buses, and both 230 kV buses stay energized and LNP 1 and LNP 2 remain energized.

- In the event of a fault on one of the 500/230 kV autotransformer connected between the 500 kV section and the 230 kV section with a stuck 230 kV bus – breaker, the affected bus differential relays cause all circuit breakers on the affected 230 kV bus to trip, and thereby, isolate the faulted bus. LNP 1 and LNP 2 continue operation through the non-affected 500 kV and 230 kV buses.

- In the event of 500/230 kV autotransformer relay spurious operation, the associated switchyards' circuit breakers trip, isolating the autotransformer from the respective switchyards. In this event, switchyard buses stay energized for LNP 1 and LNP 2, and the units continue normal operation.

- In the event of loss of dc control power in one of the 500/230 kV autotransformers, the autotransformer primary relay is compensated for by redundant trip coils powered from a different source which allows the protective function to occur.

The analysis demonstrates that with a single event failure, one of the two 500 kV buses, one of the 230 kV buses, and one of the two autotransformers, at LNP 1 and LNP 2 switchyard, as a minimum, will be available to power the plant buses. A bus fault with a stuck breaker associated with either the LNP 1 or LNP 2 main step-up transformer output will cause the loss of normal and preferred power to the associated unit. The switchyard feeds to the reserve auxiliary transformers will still be available. A bus fault concurrent with any other stuck breaker will not cause a loss of power to either LNP 1 or LNP 2.

8.2.1.1.3 Transmission System Provider/Operator (TSP/TSO)

LNP SUP 8.2-2

The interfaces between LNP and PEF's Transmission Operations and Planning Department are managed via a formal Interface Agreement. PEF conducts transmission system operations under a vertically integrated utility business model. Under this business model, the transmission system is not in an Regional Transmission Organization (RTO) or operated by an Independent System Operator (ISO). Instead, under a vertically integrated utility business model, the System Operators (Grid Operators) are the TSO, and operate both the transmission and generation systems (nuclear and non-nuclear) and work in the same company that will hold the license to operate LNP. LNP off-site power reliability is jointly managed by the system operators, transmission personnel, and licensed nuclear plant personnel through communications and actions governed and coordinated by the formal Interface Agreement.

The Interface Agreement specifies the responsibilities and lines of communication for the various organizations responsible for the operation, maintenance, and engineering of facilities associated with LNP, as well as the consideration of the impact their activities may have on the plant's facilities. The requirements for communication of planned activities and changes in plant structures, systems, and components (SSC) status, which may affect grid stability/reliability, are clearly defined. LNP operators are directed to notify the TSO of any plant activity that may impact generation capability. The TSO is also required to monitor system conditions to ensure adequate voltage is maintained to support LNP, and promptly notify the LNP operators of existing, or anticipated conditions, which would result in inadequate voltage support. The agreement, along with the operating procedures used by the TSOs, ensures that early notification of worsening grid conditions takes place.

The TSO and LNP plant operators coordinate operations to maintain the switchyard voltage such that the steady state voltage on the 26 kV isophase bus is within 0.95 – 1.05 pu of its nominal value.

The TSO coordinates transmission system maintenance activities that can have an impact on plant operation with the LNP operators and the Plant Transmission Activities Coordinator (PTAC). The Interface Agreement defines and controls the interfaces for operations, maintenance, and engineering activities at LNP. The PTAC serves as the single point of contact at the plant for transmission engineering, construction, and maintenance personnel performing activities impacting LNP. In addition, the TSO communicates directly with the LNP operators regarding operational interfaces as required by the Interface Agreement.

LNP procedures address the criteria used to determine when the main control room (MCR) is required to contact the TSO.

Per the Interface Agreement requirements, the TSO monitors key grid parameters and uses predictive analysis tools. The procedures used by the TSOs direct them to promptly notify the LNP operators of conditions for which there would not be adequate switchyard voltage, including predicted post LNP trip conditions. These procedures include separate steps that address both current and anticipated conditions. The intent of these separate steps is to provide, to the extent possible, early warning to the LNP operators of problem conditions.

The TSO uses procedures based on enveloping transmission planning analyses to operate the grid. As long as the grid configuration is within that allowed by the procedure under various system loading conditions, adequate plant voltage support is assured. Specific case studies are also used to support planned grid configurations when not clearly bounded by existing analyses. In addition to the transmission system analysis-based procedures, the TSO also use monitoring/predictive analysis computer programs that can predict LNP switchyard voltages expected to occur upon realization of any one of a number of possible losses to the grid, including a trip of the LNP generator, a trip of another large generator, or the loss of an important transmission line. This monitoring/predictive analysis computer program tool operates based on raw data from transducers across the system, which is processed through a state estimator to generate a current state of the system snapshot. The output is then processed through a contingency analysis program that generates a set of new results with various single elements of the system out of service. These results are then screened against a predetermined set of acceptance limits. Postulated scenarios, which then do not meet the acceptance limits, are listed for review by the TSO. Notifications are made based on grid configurations being outside of predefined procedure requirements or based on unsatisfactory monitoring/predictive analysis computer program tool results. The predictive analysis computer program updates approximately every 10 minutes. Also, the grid operating procedures that are based on enveloping transmission system

analyses are updated when transmission system or plant changes require it.

Procedural guidance is provided regarding a target switchyard voltage schedule and operation of the main generator voltage regulator. Operation of the main generator within the plant voltage schedule ensures that a trip of the generator does not result in an unacceptable voltage drop in the switchyard. The TSO procedure for LNP voltage support and coordination defines the TSO's actions and requirements during high load conditions relative to LNP voltage support. These actions are based on transmission system enveloping analyses wherein the worst-case loss of a generating station (including LNP) on the PEF system is considered relative to LNP voltage support. In the event system conditions are outside the guidelines of the analysis-based procedure, the TSO will alert the LNP operators to that effect.

8.2.1.2 Transformer Area

Add the following paragraph and subsections at the end of the DCD Subsection 8.2.1.2.

LNP COL 8.2-1

The transformer area for each unit contains the main step-up (three single phase transformers plus one spare), three unit auxiliary transformers, and two reserve auxiliary transformers. The two reserve auxiliary transformers are connected to the 230kV bus fed by 500 kV/230 kV auto transformers located in 500 kV switchyard. The secondary windings (500 kV side) of the main step-up are connected in wye configuration and connected to the 500 kV switchyard.

8.2.1.2.1 Switchyard Protection Relay Scheme

LNP COL 8.2-2

The 500kV and 230kV switchyards are locally interconnected and each designed with two (2) full capacity main buses and breaker-and-a half switching arrangement for reliability and maintainability. This arrangement allows for isolation of components and buses, while preserving the Plant's connection to the grid.

Under normal operating conditions, all 500 kV and 230 kV circuit breakers and bus sectionalizing disconnect switches are closed; all bus sections are energized.

Transmission line protection consists of three different high speed schemes for 500 kV and two high speed schemes for 230 kV lines. The schemes use various standard end to end communication assisted tripping as commonly practiced in industry. Each scheme has impedance backup non-pilot schemes and directional comparison blocking schemes with (as necessary) permissive over reach trip schemes used for bus fault protection. For both 500 kV and 230 kV systems, breaker failure protection schemes are also used. Transformer protection consists of two different high speed schemes.

LNP COL 8.2-1

8.2.1.3 Switchyard Control Building

A control building is included in the design to serve the needs of the LNP 1 and LNP 2 switchyard. The control building houses switchyard batteries (redundant battery systems are housed in separate battery rooms and appropriately ventilated) and accommodates a sufficient number of relay/control panels.

The 500 kV switchyard breakers associated with the main step-up transformers and all 230kV breakers are under the administrative control of the plant. Transmission line circuit breakers in the LNP1 and LNP2
500 kV switchyard are under the administrative control of TSO.

8.2.1.4 Switchyard and Transmission Lines Testing and Inspection

The Switchyard and Transmission Lines Testing and Inspection Program ensures that equipment, components, and systems are proactively maintained at intervals that promote safety and reliability. Results of an effective maintenance program include extended equipment life, lower total life cycle cost, enhanced system reliability, and improved customer satisfaction. Substation Maintenance, Transmission Line Maintenance, and Relay Maintenance procedures have been developed to achieve these goals.

An interface agreement between Transmission Operations and Planning and LNP 1 and 2 for development, maintenance, calibration, testing, and modification of transmission lines, switchyards, transformer yards, and associated transmission equipment, provides the procedure, policy, and organization to carry out maintenance, calibration, testing, and inspection of transmission lines and switchyards.

An individual is assigned from the LNP engineering organization to serve as the Plant Transmission Activities Coordinator (PTAC). The PTAC's oversight responsibilities extend beyond the switchyard boundary to include the transmission lines, structures, and relaying from the nuclear plant out to and including the circuit breakers at the opposite end of the transmission lines. The PTAC's responsibilities include, but are not limited to the following:

- Serve as the single point of contact for transmission engineering, construction, and maintenance activities impacting LNP 1 and 2 .
- Interface with the local transmission maintenance organization and Transmission Asset Management personnel.
- Monitor inspection schedules, results of inspections and tests, material conditions, and maintenance backlogs to ensure that:
  - Appropriate inspections and testing are performed on schedule to ensure reliability.

  - Results are analyzed and appropriately prioritized actions are taken to resolve any negative findings.
  - Defective equipment is replaced or repaired before reliability is affected.

- Serve as the liaison regarding transmission system interfaces between the nuclear plant organizations and other organizations.
- Coordinate transmission system activities requiring pre-planning and scheduling among various nuclear and non-nuclear organizations including, but not limited to:
  - Transmission Engineering
  - Transmission Area Maintenance
  - System Planning and System Operations
- Provide system oversight of the switchyard, off-site transmission lines through the next remote circuit breakers, and on-site equipment (transformers, circuit breakers, etc.) that Transmission services.

PEF's transmission planning assessment practices are developed to test the ability of the planned system to meet criteria pursuant to comply with PEF, FRCC Regional Planning process and North American Electric Reliability Corporation (NERC) Reliability Standards TPL-001 through TPL-004. This involves the use of load flow and transient stability programs to model various contingency situations that may occur, and determining if the system response meets criteria.

NERC reliability standards used including, but not limited to the following:

- TPL-001-0 System Performance under Normal Conditions.
- TPL-002-0 System Performance Following Loss of a Single Bulk Electric System (BES) Element.
- TPL-003-0 System Performance Following loss of Two or More BES Elements.
- TPL-004-0 System Performance Following Extreme BES Events.

PEF's maintenance and testing program covers the following equipment as required by NERC Reliability Standards:

- Protective Relays

- Instrument Transformers
- Communications Systems
- Batteries

The protective relay maintenance program includes the necessary verification to ensure proper calibration of protective relays. Maintenance of protective relays is accomplished through procedures, which address visual and mechanical inspections, protective and auxiliary relays, and other relay protective schemes. The relay testing program includes the functional testing of the relay protection system to insure operations as designed. Functional testing of relays is performed periodically and in accordance with a functional guideline procedure.

Maintenance and testing interval schedules have been developed for maintenance of substation equipment. The equipment/programs included are as follows:

- Air break switches and ground switches
- Structures
- Ground system
- Transformers
- Circuit breakers
- Neutral grounding equipment
- Batteries
- Infrared scan
- Instrument class transformers

Transmission verifies that these test results demonstrate compliance with design requirements and takes corrective actions as necessary. Transmission plans and schedules maintenance activities, notifying the plant and internal organizations in advance. Transmission also procures and stores necessary spare parts prior to the commencement of inspection, testing, and maintenance activities.

Transmission's surveillance and maintenance procedures include requirements for transmission line inspections through an aerial inspection program usually twice per year. These procedures include checks for encroachments, broken conductors, broken or leaning structures, and signs of trees burning, any of which would be evidence of clearance problems. Ground inspections conducted once every two years include examination for clearance at questionable

locations, integrity of structures, and surveillance for dead or diseased trees that might fall on the transmission lines. Problems noted during any inspection are brought to the attention of the appropriate organization(s) for corrective action.

The interconnecting switchyard, as well as other substation facilities, has multiple levels of inspection and maintenance. They include the following:

- Monthly visual inspections of the entire substation facility.
- Relay functional tests.
- Oil sampling of large power transformers. Dissolved gas tests, oil quality analyses, and power factor tests are regularly performed.
- Power circuit breakers are subjected to time based and operational based maintenance requirements. The program includes the use of external visual inspection of all functional systems, external tests, and internal inspections. Information required for performing specific equipment maintenance is obtained from manufacturer's instruction books, service bulletins, and/or specification data.
- A power factor test performed on circuit breakers, power transformers, and transmission class instrument transformers.
- A thermography (infrared scan) program is used to identify potential thermal heating issues on buses, conductors, connectors, and switches.

8.2.2 GRID STABILITY

Add the following information at the end of DCD Subsection 8.2.2.

LNP COL 8.2-2 A transmission system study of the off-site power system was completed for the addition of LNP 1 and LNP 2 which evaluated the following:

- Overloads and voltage impact on the transmission system
- Transient and dynamic stability of LNP 1 and LNP 2
- Voltage and frequency response during a turbine trip followed by a generator Trip
- Frequency decay rate for large, regional generation/load mismatches

Computer simulations were used to perform the powerflow and dynamic (stability and turbine trip) analyses. The computer simulation model was developed from the Florida Reliability Coordinating Council (FRCC) FY06 case for summer 2016.

This model includes all Florida Utilities and neighboring states. In this model, the representation for Southern Company and all utilities are provided by Southern Company and include some equivalent representations of the Eastern Interconnection. A model for summer 2017 was developed for the evaluation by escalating all Florida load by 3%.

The powerflow analysis indicates that the transmission system, with the planned transmission system changes, will accommodate the addition of LNP 1 and LNP2 The study also indicates that transient and dynamic stability performance of LNP 1 and LNP 2 is within acceptable limits for the proposed configuration.

In order to maintain Reactor Coolant Pump (RCP) operation for three seconds following a turbine trip as specified in DCD Subsection 8.2.2, the grid voltage at the high side of the main step-up and reserve auxiliary transformers can not drop from the pre-trip steady-state value by more than 15 percent of the rated voltage. The results of turbine trip simulations demonstrate that the voltage and frequency of the 26 kV generator buses and 500 kV switchyard buses will remain within the required limits for at least 3 seconds following the turbine trip of either LNP 1 or LNP 2.

Additionally, simulations performed as part of joint studies within FRCC demonstrate that the rate of frequency decay for large generation/load mismatches is well within acceptable limits.

The transmission study has confirmed that the interface requirements for steady state load, nominal voltage, allowable voltage regulation, nominal frequency, allowable frequency fluctuation, maximum frequency decay rate, and the limiting under frequency value for the RCP have been met.

The assessment also indicates that the plant interface requirement for inrush KVA for motors has been met.

LNP SUP 8.2-3

From August 2003 to January 2008, the average grid availability for the existing PEF 500 kV transmission lines within the system is approximately 99.9 percent, with eleven (11) forced outages. The average frequency of forced line outages since 2003 is approximately 2.44 per year for the involved lines, with the majority due to public interference, animal or lightning strikes causing the outages. Leading causes of forced outages of significant duration that were recorded are public interference.

8.2.5 COMBINED LICENSE INFORMATION FOR OFF-SITE ELECTRICAL POWER

LNP COL 8.2-1	This COL item is addressed in Subsections 8.2.1, 8.2.1.1, 8.2.1.1.2, 8.2.1.1.3, 8.2.1.2, 8.2.1.3, and 8.2.1.4.
LNP COL 8.2-2	This COL item is addressed in Subsections 8.2.1.2.1 and 8.2.2.

LNP COL 8.2-1

Table 8.2-201
Transmission Lines Connecting LNP 1 and 2 to PEF Transmission System

Termination	Nominal Voltage (kV)	Rated MVA	Approximate Length
Central Florida South	500	2598	59 miles
Crystal River Plant	500	2598	14 miles
Citrus 1	500	2598	9 miles
Citrus 2	500	2598	9 miles

8.3 ONSITE POWER SYSTEM

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

8.3.1.1.1 On-Site AC Power System

LNP SUP 8.3-2 Add the following to the end of the fourth paragraph of DCD Subsection 8.3.1.1.1.

The site specific switchyard and transformer voltage is shown in Figures 8.2-201 and 8.2-202.

8.3.1.1.2.3 On-Site Standby Power System Performance

Add the following text between the second and third paragraphs of DCD Subsection 8.3.1.1.2.3.

LNP SUP 8.3-1 The LNP site conditions provided in Sections 2.1 and 2.3 are bounded by the standard site conditions used to rate both the diesel engine and the associated generator in DCD Subsection 8.3.1.1.2.3.

Add the following subsection after DCD Subsection 8.3.1.1.2.3.

8.3.1.1.2.4 Operations, Inspection, and Maintenance

STD COL 8.3-2 Operation, inspection, and maintenance procedures, consider both the diesel generators manufacturer's recommendations and industry diesel working group recommendations.

8.3.1.1.6 Containment Building Electrical Penetrations

Add the following text at the end of DCD Subsection 8.3.1.1.6.

STD COL 8.3-2 Procedures implement periodic testing of protective devices that provide penetration overcurrent protection. A sample of each different type of overcurrent device is selected for periodic testing during refueling outage. Testing includes:

- Verification of thermal and instantaneous trip characteristics of molded case circuit breakers.

- Verification of long time, short time, and instantaneous trips of medium voltage air circuit breakers.
- Verification of long time, short time, and instantaneous trips of low voltage air circuit breakers.

8.3.1.1.7 Grounding System

Replace the sixth paragraph of DCD Subsection 8.3.1.1.7 with the following information.

LNP COL 8.3-1

A Grounding Grid System design within the plant boundary includes determination of step and touch potentials and ensuring that they are within the acceptable limit for personnel safety. The soil resistivity data from the LNP site was analyzed and used in the grounding grid system design. The ground grid conductor size was determined using methodology outlined in IEEE 80, "IEEE Guide for Safety in AC Substation Grounding" (Reference 202).

8.3.1.1.8 Lightning Protection

Replace the third paragraph of DCD Subsection 8.3.1.1.8 with the following information.

LNP COL 8.3-1

Lightning protection is included for LNP 1 and LNP 2 plant buildings in accordance with the guidelines in Regulatory Guide 1.204. The zone of protection is based on elevations and geometry of the structures. It includes the space covered by a rolling sphere having a radius sufficient enough to cover the building to be protected. The zone of protection method is based on the use of ground masts, air terminals, and shield wires. Either copper or aluminum is used for lightning protection. Lightning protection grounding is interconnected with the station/switchyard grounding system.

8.3.2.1.1.1 Class 1E DC Distribution

Add the following text at the end of DCD Subsection 8.3.2.1.1.1.

STD SUP 8.3-1

No site-specific non-class 1E dc loads are connected to the Class 1E dc system.

8.3.2.1.4 Maintenance and Testing

Add the following text at the end of DCD Subsection 8.3.2.1.4.

STD COL 8.3-2

Procedures are established for inspection and maintenance of class 1E and non-class 1E batteries. Class 1E battery maintenance and service testing are performed in conformance with Regulatory Guide 1.129. Batteries are inspected periodically to verify proper electrolyte levels, specific gravity, cell temperature, and battery float voltage. Cells are inspected in conformance with IEEE 450, and vendor recommendations.

The clearing of ground faults on the class 1E dc system is also addressed by procedure. The battery testing procedures are written in conformance with IEEE 450 and the Technical Specifications.

8.3.3 COMBINED LICENSE INFORMATION FOR ONSITE ELECTRICAL POWER

LNP COL 8.3-1

This COL Item is addressed in Subsections 8.3.1.1.7 and 8.3.1.1.8.

STD COL 8.3-2

This COL Item is addressed in Subsections 8.3.1.1.2.4, 8.3.1.1.6, and 8.3.2.1.4.

8.3.4 REFERENCES

201. Institute of Electrical and Electronics Engineers (IEEE), “National Electrical Safety Code,” Document Number IEEE C2-2007.

202. Institute of Electrical and Electronics Engineers (IEEE), “IEEE Guide for Safety in AC Substation Grounding,” Document Number IEEE Std 80-2000.

203. Institute of Electrical and Electronics Engineers (IEEE), “IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications,” Document Number IEEE Std 450-2002.