# CONTENTS

# LIST OF FIGURES

**No figures are included in this chapter.**

# LIST OF TABLES

**No tables are included in this chapter.**

# 8 ELECTRIC POWER

## 8.1 Introduction

The electric power system is the source of power for station auxiliaries during normal operation and for the reactor protection system and engineered safety features during abnormal and accident conditions at the Turkey Point, Units 6 and 7. This chapter provides information on the functional adequacy of the offsite electric power systems and safety-related onsite electric power systems, as applicable to the application, based on the Westinghouse AP1000 certified standard design, and ensures that these power systems have adequate capacity, capability, redundancy, independence, and testability in conformance with the current criteria established by the U.S. Nuclear Regulatory Commission (NRC).

Chapter 8, "Electric Power," of this advance safety evaluation (ASE) describes the results of the review by the NRC staff (the staff) of the Turkey Point Combined License (COL) Final Safety Analysis Report (FSAR), Part 2 of the COL application (COLA), submitted by Florida Power and Light Company (FPL), the COL applicant (the applicant).

### 8.1.1 Introduction

This section provides the applicant's description of the electric power system with regard to the interrelationships between the nuclear unit, the utility grid, and the interconnecting grids.

In addition, this section includes a regulatory requirements applicability matrix that lists all design bases, criteria, regulatory guides (RGs), standards, and other documents to be implemented in the design of the electrical systems that are beyond the scope of the AP1000 design certification (DC).

### 8.1.2 Summary of Application

Turkey Point Units 6 and 7 COL FSAR, Revision 6, Section 8.1 incorporates by reference AP1000 Design Control Document (DCD), Revision 19, Section 8.1, with some departures and/or supplements.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 8.1, the applicant provided the following:

*Supplemental Information*

- Turkey Point Supplement (PTN SUP) 8.1-1

The applicant provided supplemental information in Turkey Point Units 6 and 7 COL FSAR Section 8.1, "Introduction," describing Turkey Point's connections to the FPL electrical grid and the connection interfaces with neighboring utilities via the Turkey Point, Units 6 and 7, 500/230-kilovolt (kV) Clear Sky switchyard at the Turkey Point site.

- PTN SUP 8.1-2

The applicant provided supplemental information in Turkey Point Units 6 and 7 COL FSAR Section 8.1 describing additional information pertaining to regulatory guides and Institute of Electrical and Electronics Engineers (IEEE) standards identified in AP1000 DCD FSAR,

Table 8.1-1, and to other applicable regulatory guides as indicated in Turkey Point Units 6 and 7 COL FSAR Table 8.1-201, "Site-Specific Guidelines for Electric Power Systems."

## 8.1.3 Regulatory Basis

The regulatory basis for the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report [FSER] Related to Certification of the AP1000 Standard Design," and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of NRC regulations for the introduction to the electric power systems are given in NUREG-0800, Section 8.1, "Standard Review Plan [SRP] for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR [light-water reactor] Edition)."

The applicable regulatory requirements, guidelines, and related acceptance criteria for the supplemental information items are as follows:

- Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR) Subsection 50.63, "Loss of All Alternating Current Power"
- RG 1.155, "Station Blackout"
- RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)"

## 8.1.4 Technical Evaluation

The NRC staff reviewed Turkey Point Units 6 and 7 COL FSAR Section 8.1 and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the introduction to the electric power systems. The results of the staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the following information in the Turkey Point Units 6 and 7 COL FSAR:

*Supplemental Information*

- PTN SUP 8.1-1

The staff reviewed the supplemental information related to the FPL utility grid and its connection to neighboring utilities included under PTN SUP 8.1-1. The applicant's supplement to Turkey Point Units 6 and 7 Section 8.1.1 is summarized as follows:

The FPL power transmission system consists of transmission lines and substations that link various generation facilities, load centers, and grid interties within the FPL service territory at

[1] See Section 1.2.2 of this SER for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a DC. This footnote will be referenced in several places throughout the chapter of this Safety Evaluation.

various voltages. FPL maintains multiple direct interconnections with neighboring utilities. These interconnections serve to increase the reliability of the FPL electrical grid.

Turkey Point, Units 6 and 7 are connected to a new common switchyard, the Clear Sky substation, having dual voltages 500 kV and 230kV. The switchyard also serves as units' preferred and maintenance source. The switchyard has two sections, one operating at 230 kV, and the other at 500 kV. These sections are interconnected with two 230-kV/500-kV autotransformers. The switchyard has both breaker-and-a-half (230 kV) and double breaker (500-kV) schemes. There are two 500-kV and two 230-kV transmission lines that connect the switchyard to the grid.

The NRC staff finds that the applicant has adequately described the Turkey Point, Units 6 and 7, connection to the utility grid and that the information provided is in accordance with the recommendations of RG 1.206 and the guidance in NUREG-0800, Section 8.1.

- PTN SUP 8.1-2

The staff also reviewed supplemental information included in PTN SUP 8.1-2, related to regulatory guidelines and industry standards and concluded that it was consistent with NUREG-0800, Section 8.1, with the exception of the information discussed below.

Turkey Point Units 6 and 7 COL FSAR Table 8.1-201, Item 1b, indicated that RG 1.155 is not applicable to Turkey Point. This item was deemed standard among COL applications being discussed in Bellefonte's (BLN) response to Request for Additional Information (RAI) 08.01-2. In an October 5, 2009 letter, the applicant stated that the standard response to RAI 08.01-2 applies to the Turkey Point COL application.

The standard response submitted by BLN in a June 24, 2008 letter, is summarized as follows: BLN stated that the AP1000 design meets the requirements of 10 CFR 50.63 for 72 hours and, therefore, no specific procedures or training specific to station blackout (SBO) are necessary. The staff determined that the above response was inconsistent with the recommendations of RG 1.155 and the requirements of 10 CFR 50.63. The staff recognizes that the passive systems can maintain safe-shutdown conditions after design-basis events for 72 hours, without operator action, following a loss of both onsite and offsite alternating current (ac) power sources. However, the applicant needs to establish SBO procedures and training for operators to include actions necessary to restore offsite power after 72 hours by addressing alternating current (ac) power restoration (e.g., coordination with transmission system load dispatcher), and severe weather guidance (e.g., identification of site-specific actions to prepare for the onset of severe weather such as an impending tornado) in accordance with RG 1.155, Regulatory Positions C.2 and C.3.4.

Several discussions were held between the staff and the BLN applicant regarding this issue. Subsequently, in an April 15, 2009 letter, the BLN applicant stated that the training and procedures to support mitigation of an SBO event would be implemented in accordance with BLN COL FSAR Sections 13.2 and 13.5, respectively. As recommended by NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," which is endorsed by RG 1.155, the loss of all ac power event mitigation procedures will address response (e.g., restoration of onsite power sources), ac power restoration (e.g., coordination with transmission system load dispatcher), and severe weather guidance (e.g., identification of actions to prepare for the onset of severe weather such as an impending tornado), as applicable. In addition, the BLN applicant stated that there are no nearby large power sources, such as a gas turbine or black-start fossil fuel plant that can

directly connect to the station to mitigate the event. The staff found the BNL applicant's response acceptable.

In a January 26, 2010 letter, the Turkey Point applicant stated that it did not endorse BLN's revised response because nearby large power sources exist at Turkey Point. However, the applicant updated Turkey Point Units 6 and 7 COL FSAR, Revision 6, Section 1.9.5.1.5 included training and procedures to support mitigation of an SBO event.

The staff verified that the Turkey Point Units 6 and 7 COL applicant has updated Turkey Point Units 6 and 7 COL FSAR Sections 1.9.5.1.5 and 1.9.6 to include the above-mentioned items including the implementation of training and procedures to support mitigation of an SBO event. The staff finds that this update satisfies RG 1.155, Regulatory Positions C.2 and C.3.4. Based on the above, the staff considers this item resolved.

### 8.1.5 Post Combined License Activities

There are no post COL activities related to this section.

### 8.1.6 Conclusion

The staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant addressed the required information relating to the introduction to the electric power systems, and there is no outstanding information expected to be addressed in the Turkey Point Units 6 and 7 COL FSAR related to this section. The results of the staff's technical evaluation of the information incorporated by reference in the Turkey Point COL Units 6 and 7 application are documented in NUREG-1793 and its supplements.

In addition, the staff compared the additional COL-specific supplemental information in the application to the relevant NRC regulations; guidance in NUREG-0800, Section 8.1, and other NRC regulatory guides and concluded that the applicant is in compliance with the NRC regulations. The staff based its conclusion on the following:

- PTN SUP 8.1-1 is acceptable because the applicant provided sufficient information regarding the FPL transmission system and its connection to neighboring utilities in accordance with the recommendations of RG 1.206.

- PTN SUP 8.1-2 is acceptable because the COL-specific regulatory guidelines and industry standards and additional new regulatory guidelines, are adequately addressed by the applicant. The applicant has also provided sufficient information to satisfy the requirements of 10 CFR 50.63 and the guidance in RG 1.155.

## 8.2 Offsite Power System

### 8.2.1 Introduction

The offsite power system is referred to in regulatory guides and industry standards as the "preferred power system." The offsite power system includes two or more physically independent circuits capable of operating independently of the onsite standby power sources and encompasses the grid, transmission lines (overhead or underground), transmission line towers, transformers, and other switchyard components.

The AP1000 passive reactor plant standard design supports an exemption in 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants," Appendix D, "Design Certification Rule for the AP1000 Design," paragraph V.B.3, to the requirement of 10 CFR Part 50, "Domestic licensing of production and utilization facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 17, "Electric Power Systems," to have only one (not two) physically independent offsite circuit to provide for defense-in-depth. Therefore, for Turkey Point, Units 6 and 7, the single offsite power source provided from the transmission network is reviewed below to assure that it satisfies the requirements of GDC 17 with respect to its capacity and capability.

## 8.2.2 Summary of Application

Turkey Point Units 6 and 7 COL FSAR, Revision 6, Section 8.2 incorporates by reference AP1000 DCD FSAR, Revision 19, Section 8.2.

In addition in Turkey Point Units 6 and 7 COL FSAR Section 8.2, the applicant provided the following:

*AP1000 COL Information Items*

- PTN COL 8.2-1

The applicant provided additional information in PTN COL 8.2-1 to address COL Information Item 8.2-1 (COL Action Items 8.2.3-1 and 8.2.3.3-1) to address the design of the ac power transmission system and its testing and inspection plan. The information describes: (1) the designs of the plant site 500-kV/230-kV switchyard and the transmission lines connecting Units 6 and 7 to the switchyard and the 500-kV/230 kV switchyard to various substations throughout the transmission grid; (2) the connections of the generator step-up (GSU) transformers and the reserve auxiliary transformers (RATs) to the switchyard; (3) the ratings and arrangement of the switchyard circuit breakers and disconnect switches; (4) the transformer area arrangement for each unit; (5) the locations of the GSU transformers, unit auxiliary transformers (UATs), and RATs; (6) the design of the control building in the plant site 500-kV/230-kV switchyard; (7) the administrative control of the 500-kV/230-kV switchyard and transmission line circuit breakers; (8) the switchyard and transmission line testing and inspection plan; and (9) grid stability analysis. PTN COL 8.2-1 is addressed in Turkey Point Units 6 and 7 COL FSAR Sections 8.2.1, 8.2.1.1, 8.2.1.2, 8.2.1.3, and 8.2.1.4.

- PTN COL 8.2-2

The applicant provided additional information in PTN COL 8.2-2 to address COL Information Item 8.2-2 (COL Action Items 8.2.3.1-1, 8.2.3.1-2, and 8.2.3.1-3), describing: (1) the switchyard arrangement and design of the protective relaying scheme; and (2) a transmission system study performed regularly to verify grid stability, switchyard voltage, and frequency to confirm the transmission system capability to maintain reactor coolant pump (RCP) operation for 3 seconds following a turbine trip as specified in AP1000 DCD FSAR Section 8.2.2. PTN COL 8.2-2 is addressed in Turkey Point Units 6 and 7 COL FSAR Sections 8.2.1.2.1 and 8.2.2.

*Site-Specific Information Replacing Conceptual Design Information (CDI)*

- PTN CDI

The applicant provided site-specific information describing the transformer area located next to each unit's turbine building and containing the GSU transformers, the UATs, and the RATs. This replaced the CDI located in the AP1000 DCD FSAR.

*Supplemental Information*

- PTN SUP 8.2-1

The applicant provided supplemental information describing details of a failure modes and effects analysis (FMEA) performed for the offsite power distribution system, plant site switchyard, and the transmission system.

- PTN SUP 8.2-2

The applicant provided supplemental information describing the formal agreement between Turkey Point and FPL's Transmission Operations and Planning organization, which is the transmission system operator (TSO). The applicant provided supplemental information describing FPL's responsibility for assuring that adequate voltage is available to Turkey Point, Units 6 and 7; maintaining area bulk transmission system reliability and demonstrating, by power system simulation studies, projections, and analyses, the current and future reliability of the system. In addition, the applicant described the interfaces between Turkey Point and FPL's Transmission Operations explaining that protocols are in place for both entities to remain cognizant of grid vulnerabilities in order to make mutually informed decisions regarding maintenance activities critical to the electric system.

- PTN SUP 8.2-3

The applicant provided supplemental information describing the average grid availability of the 230 kV and 500 kV from the Turkey Point substation and transmission lines that feed the Turkey Point site for the period from January 1, 1988, to September 30, 2008.

- PTN RAI LTR 065

The applicant, in response to the staff concern related to the design vulnerability identified in Bulletin 2012-01, proposed the following additional information (ML 15091A388):

> 8.2.1.2.2 Plant Response to High Voltage Open Phase Condition
>
> "A monitoring system is installed on the credited GDC 17 offsite power circuit that provides continuous open phase condition monitoring of the MSU transformer HV input power supply (see Reference 202). The system detects an open phase condition (with or without a concurrent high impedance ground on the HV side of the transformer) on one or more phases under all transformer loading conditions. The open phase condition monitoring system provides an alarm to the operators in the control room should an open phase condition occur on the HV source to the MSU transformers. The system design utilizes commercially available components including state of the art digital relaying equipment and input parameters as required to provide loss of phase detection and alarm capability.

Additionally, a high-voltage open phase condition with or without a ground fault can manifest itself as an unacceptable voltage on the 6.9 kV medium voltage ES-1 and ES-2 buses during normal loading conditions. The presence of unacceptable voltages on the ES-1 and ES-2 buses results in isolation of the affected medium voltage bus from the offsite power supply and enables the onsite standby diesel generators to start and restore ac power to the ES-1 and ES-2 buses and associated defense-in-depth loads. The onsite ac power system is described in AP1000 DCD Section 8.3.1.

Motor management relays for the medium voltage motors on ES-1 and ES-2 provide detection of unacceptably high negative sequence currents. High negative sequence current motor trips or other running load trips provide alarms in the main control room (MCR), which can assist in the detection of a high-voltage open phase condition with or without a ground fault. Electric circuit protection for the medium voltage system and equipment is described in AP1000 DCD Section 8.3.1.1.1.1.

A high-voltage open phase condition with or without a ground fault can also manifest itself as an unacceptable voltage on the 480 VAC low-voltage buses powered from ES-1 and ES-2. The safety related IDS battery chargers are powered from the low-voltage buses and continue to charge the IDS batteries unless the battery charger input or output monitored electrical parameters are unacceptable. If the monitored electrical parameters degrade to the point that the battery charger no longer provides sufficient dc bus voltage, the Class IE electrical system dc bus receives power from the applicable IDS battery and the battery charger maintains isolation between the Non-Class IE ac and Class 1 E dc power systems which generates alarms in the MCR. The onsite AC power system is described in AP1000 DCD Section 8.3.1 and the Class 1 E DC power system is described in AP1000 DCD Section 8.3.2.1.1.

Operator actions and maintenance and testing activities are addressed in procedures, as described in Turkey Point Units 6 and 7 COL FSAR Section 13.5. Plant operating procedures, including off-normal operating procedures associated with the monitoring system will be developed prior to fuel load. Maintenance and testing procedures, including calibration, surveillance testing, set point determination and troubleshooting procedures associated with the monitoring system will be developed prior to fuel load.

Control Room operator and maintenance technician training associated with the operation and maintenance of the monitoring system will be conducted in accordance with the milestones for Non Licensed Plant Staff and Reactor Operator Training Programs in are provided in Turkey Point Units 6 and 7 COL FSAR Table 13.4-201."

*Interface Requirements*

The plant offsite electrical power interfaces for the AP1000 standard design are discussed in AP1000 DCD Tier 2, Section 8.2.5., Table 1.8-1, Items 8.1, 8.2, and 8.3. These interfaces are identified as "non-nuclear safety (NNS)" interfaces in this table.

## 8.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of NRC regulations for the offsite power system are given in NUREG-0800, Sections 8.1 and 8.2.

The regulatory bases for acceptance of the COL information and supplementary information items are established as follows:

- 10 CFR Part 10, "Domestic licensing of production and utilization facilities," Appendix A, "General Design Criteria for Nuclear Power Plants" (GDC) Criterion 17 "Electric power systems,"
- GDC 18, "Inspection and Testing of Electrical Power Systems,"
- 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,"
- RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition),"
- Generic Letter (GL) 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power."

## 8.2.4 Technical Evaluation

The staff reviewed Turkey Point Units 6 and 7 COL FSAR Section 8.2 and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information in the Turkey Point Units 6 and 7 COL application and the DCD information incorporated by reference addresses the required information relating to the offsite power system. The results of the staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the staff to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generation Plant (VEGP) Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed by the Turkey Point Units 6 and 7 COL applicant.
- The staff verified that the site-specific differences were not relevant.

The staff completed its review and concluded that the evaluation performed for the standard content is directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section will have a specific designation (e.g., Confirmatory Item PTN 8.2-1).

The staff reviewed the information in the Turkey Point Units 6 and 7 COL FSAR:

*AP1000 COL Information Items*

- PTN COL 8.2-1

The applicant provided additional information in PTN COL 8.2-1 to resolve COL Information Item 8.2-1, which states:

> Combined License applicants referencing the AP1000 certified design will address the design of the ac power transmission system and its testing and inspection plan (DCD Section 8.2.5).

The commitment was also captured as COL Action Items 8.2.3-1 and 8.2.3.3-1 in NUREG-1793, Appendix F, which states:

> The operating voltage for the high side of the AP1000 transformer and transmission switchyard, as well as the frequency decay rate are site-specific and, therefore, will be addressed in the COL application. The COL applicant will provide analysis of these matters, including transient stability, voltage operating range, and preservation of the grid connections, in the COL application (COL Action Item 8.2.3-1).
>
> Combined License applicants referencing the AP1000 certified design will address the design of the ac power transmission system and its testing and inspection plan (COL Action Item 8.2.3.3-1).

The staff reviewed the resolution to COL information item, PTN COL 8.2-1, related to the transmission system design, testing, and inspection included in Turkey Point Units 6 and 7 COL FSAR Section 8.2. The staff's evaluation is as follows:

Turkey Point, Units 6 and 7, receive offsite ac power from a common 500/230-kV switchyard (Clear Sky substation), which is connected to the FPL transmission network through four transmission lines. The applicant described the connection of the RATs to the 230-kV bus in the switchyard. The normal power supply to the main ac power system is provided from the main generator through the UATs. Any of the four transmission lines can serve as the preferred power supply and is the recognized GDC 17 offsite power source for Turkey Point, Units 6 and 7. When either the normal power or the preferred power supply is available, the RATs serve as a source of maintenance power.

In Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.3, regarding the switchyard control building, the applicant stated that the controls for switchyard breakers associated with the Turkey Point Units 6 and 7 main step-up transformers are located inside the plant and are under the administrative control of the plant. The system control center of FPL transmission and substation operations has operational control over the other breakers in the switchyard (including those associated with the reserve auxiliary transformers). Normal ac power for the switchyard is supplied from station service transformers supplied by the tertiary windings of the 500/230-kV autotransformers. A backup source of ac power to the switchyard is supplied from a plant source.

Regarding switchyard and transmission line testing and inspection, in Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.4, the applicant stated that FPL uses a process called, "The

Phoenix Assurance Process," to ensure the installations of new, relocated, or modified facilities are fully operational before being placed into service. FPL explained as follows: The objectives of the Phoenix Assurance Process are as follows: safety (zero injuries); correct operation of facilities after they are put into service; no rework associated with the installation of facilities; and documentation of new assets and lessons learned. The Phoenix Assurance Process covers acceptance, commissioning, and in-service testing for new equipment and defines the responsibility of each person associated with the project. The transmission switchyard interface agreement will specify that grid maintenance and testing activities that could affect offsite power reliability be closely coordinated with Turkey Point Units 6 and 7. This agreement will also specify that the plant switchyard equipment is maintained by FPL transmission and substation operations. FPL transmission and substation operations will conduct regular inspections of the plant switchyard and perform regular maintenance and necessary repair or replacement of equipment.

The staff reviewed the resolution to the COL information Item PTN COL 8.2-1 related to the description of the offsite power system. The staff determined that additional information was needed to complete the technical evaluation of this item.

Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.1 describes the ratings for the 500-kV and 230-kV circuit breakers associated with the Turkey Point, Units 6 and 7 and states that the 500-kV switchyard is rated for a continuous current of 4000 amperes (A) and fault duty rating of 50 kilo amperes (kA) and 230-kV switchyard is rated for a continuous current of 4000 A and fault duty rating of 63 kA. Since no basis is provided for the specified ratings, in RAI 38 (eRAI 5993), Question 08.02-2**,** the staff requested that the applicant explain why the ratings for circuit breakers and disconnect switches in the switchyard are adequate for the application. Specifically, the staff requested that the applicant identify the maximum fault available from the system and confirm that the breaker interrupting ratings, both symmetrical and asymmetrical, are consistent with the available fault. In an October 31, 2011, response to RAI 38 eRAI 5993), Question 08.02-2**,**, the applicant stated that it had used steady state power flow simulations to determine the required current capability (amperes RMS) of the 500-kV and 230-kV circuit breakers and disconnect switches. The equipment ratings were determined for all line-in and line-out conditions. The applicant determined that the load current in the 500-kV and 230-kV circuit breakers and disconnect switches is less than 4000 amps for all conditions, and were therefore adequate.

The applicant also stated that they had used short circuit simulations to determine the required maximum interrupting capability of the circuit breakers. The applicant further indicated that the analysis assumed that all generating sources relevant to the facility were in service and that under this assumption, the maximum symmetrical (RMS) fault currents are 21.2 kA and 58.1 kA for the 500-kV and 230-kV circuit breakers, respectively. The applicant concluded that the 500-kV circuit breakers with 50 kA rating and the 230-kV circuit breakers with 63 kA rating have the capability to interrupt the maximum asymmetrical fault. The applicant further stated that Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.1 will be revised to indicate rating for buses and disconnect switches. The staff finds the applicant's response acceptable because the design of the offsite system components meets the requirements of GDC 17. Therefore, the staff finds the issues in RAI 38 (eRAI 5993), Question 08.02-2 are resolved and has verified that this change was incorporated in Revision 6 of the Turkey Point Units 6 and 7 COL FSAR.

Turkey Point Units 6 and 7 COL FSAR, Revision 2, Section 8.2.1.1 stated that the switchyard includes surge protective devices, and grounding and a lightning protection system in accordance with standard industry practice. Turkey Point Units 6 and 7 COL FSAR

Table 8.1-201 states that RG 1.204 is applicable to offsite and onsite power systems. In RAI 38 (eRAI 5993), Question 08.02-3, the staff requested that the applicant clarify if the surge protective devices, and grounding and lightning protection system will follow the guidelines of RG 1.204 and revise Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.1 accordingly. In an October 31, 2011, response to RAI 38 (eRAI 5993), Question 08.02-3, the applicant stated that Turkey Point will comply with the applicable portions of the standards referenced in RG 1.204, Revision 0. Because the design will include the surge protection features recommended in RG 1.204, Rev 0, the staff finds the applicant's response acceptable and, therefore, considers RAI 38 (eRAI 5993), Question 08.02-3 resolved. The staff verified that this change was incorporated in Revision 4 of the Turkey Point Units 6 and 7 COL FSAR.

With regard to switchyard and transmission lines testing and inspections, described in Turkey Point Units 6 and 7 COL FSAR, Revision 2, Section 8.2.1.4, in RAI 38 (eRAI 5993), Question 08.02-4 the staff requested that the applicant indicate the extent to which maintenance and modifications to the switchyard and substation will be reviewed, controlled, and approved through the Turkey Point process. In addition, Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.4 did not provide details regarding testing and inspection of switchyard components. Therefore, in RAI 38 (eRAI 5993), Question 08.02-5, the staff requested that the applicant provide details in the Turkey Point Units 6 and 7 COL FSAR regarding testing and inspection of switchyard components and the frequency at which these components will be tested/inspected. The staff also requested that the applicant discuss whether North American Electric Reliability Corporation (NERC) standards will be used for switchyard maintenance and testing. In an October 31, 2011, response to RAI 38 (eRAI 5993), Question 08.02-5, the applicant stated that Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.4 will be revised to include additional details regarding testing and inspection of switchyard components and to discuss compliance with NERC reliability standards applicable to testing and maintenance. In response to RAI 38, Questions 08.02-2, 08.02-3, 08.02-4, and 08.02-5, the applicant augmented Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.4 in Revision 4 to address these issues. Additionally, the applicant provided the site-specific voltage and frequency variations expected at the Turkey Point, Units 6 and 7, switchyard during transient and steady state operating conditions and the site-specific frequency decay rate to satisfy PTN COL 8.2-1. Since the applicant provided all of the information necessary for the staff to complete the review, the staff finds the applicant's response acceptable and therefore, considers RAI 38 (eRAI 5993), Questions 08.02-4 and 08.02-5 resolved. The staff also verified that these changes were incorporated in Turkey Point Units 6 and 7 COL FSAR, Revision 6.

- PTN COL 8.2-2

The applicant provided additional information in PTN COL 8.2-2 to resolve COL Information Item 8.2-2, which states:

> The Combined License applicant will address the technical interfaces listed in Table 1.8-1 and Section 8.2.2. These technical interfaces include those for ac power requirements from offsite and the analysis of the offsite transmission system and the setting of protective devices.

The staff's evaluation of the technical interfaces is addressed under "Interface Requirements" section of this report.

The commitment was also captured as COL Action Items 8.2.3.1-1, 8.2.3.1-2, and 8.2.3.1-3 in NUREG-1793, Appendix F, which states:

> The COL applicant will perform a site-specific grid stability analysis to show that, with no electrical system failures, the grid will remain stable and the reactor coolant pump bus voltage will remain above the voltage necessary to maintain the flow assumed in the Chapter 15 analyses for a minimum of 3 seconds following a turbine trip (COL Action Items 8.2.3.1-1 and 8.2.3.1-3).
>
> The COL applicant will set the protective devices controlling the switchyard breakers in such a way as to preserve the grid connection following a turbine trip (COL Action Item 8.2.3.1-2).

The staff reviewed the resolution to COL information item, PTN COL 8.2-2, related to the transmission system stability analysis and switchyard circuit breaker protective device settings included under Turkey Point Units 6 and 7 COL FSAR Section 8.2. The staff's evaluation is as follows.

PTN COL 8.2-2 was provided by the applicant describing details of the following: the switchyard's arrangement and design of the protective relaying scheme; and a transmission system study performed regularly to verify grid stability; switchyard voltage; and frequency to confirm the transmission system capability to maintain RCP operation for three seconds following a turbine trip as specified in AP1000 DCD FSAR Section 8.2.2. PTN COL 8.2-2 is addressed in Turkey Point Units 6 and 7 COL FSAR Sections 8.2.1.2.1 and 8.2.2.

The applicant stated that the 500-kV and 230-kV switchyards are locally interconnected and each designed with two full-capacity main buses and composite double-breaker/ breaker-and-a half arrangement for reliability and maintainability. This arrangement allows for isolation of components and buses, while preserving the plant's connection to the grid. In addressing the switchyard protection relay scheme, the applicant stated that the relay protection schemes consist of primary and secondary relaying systems that use separate instrument current transformers, trip circuits, and direct current (dc) power supplies to achieve redundancy in their protection functions. The applicant also stated as follows: Each of the four transmission lines is protected by two independent pilot systems that provide high-speed clearing for a fault anywhere on the line. The 500/230-kV autotransformers and switchyard buses have primary and secondary protective relaying systems that provide high-speed clearing for a fault within the switchyard. The 230-kV circuits to the main step-up and reserve auxiliary transformers have primary and secondary protective relaying systems located in the switchyard control building that communicate via fiber optics to the associated protective relaying system located in the plant. Breaker failure relays are also provided for all switchyard breakers to isolate a failed breaker from all switchyard sources.

The staff finds that the switchyard breaker arrangement, the protection of lines by independent high speed relay schemes, and the breaker failure scheme would combine to preserve Turkey Point's Units 6 and 7 connection to the grid following a turbine trip. The staff considers COL Action Item 8.2.3.1-2 satisfied.

The applicant stated that FPL had performed the required studies to provide an analysis of the stability of the grid with the Turkey Point Units 6 and 7 nuclear units interconnected and integrated into the FPL transmission system. The applicant described the analysis as follows: The analysis included an assessment of how the generators and system would perform following potential severe grid disturbances. Models used for the analysis were based on the latest available load forecasts, generation expansion plan and system plans for 10 years into the future, in accordance with the NERC and Florida Reliability Coordinating Council (FRCC)

reliability standards. The performance of the grid stability analysis study consisted of dynamic simulation and power flow analysis that assessed the response of the transmission system to various system disturbances, including loss of the largest source; loss of the most critical transmission circuit; loss of the largest load; turbine trip (minimum of 3 seconds); and breaker failure. The simulation results were analyzed for any sign of instability, protective relay action, load shedding, voltage, or line-loading violations. The simulation results showed that the Turkey Point Units 6 and 7 plant and transmission system responses to the contingency events were acceptable. Specifically, the applicant found that, (1) the results of the grid stability analysis study do not indicate a loss of electric power from any remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power units or the loss of power from the transmission network; (2) the results of turbine trip simulations demonstrate that the voltage and frequency of the 230-kV switchyard buses remain within the limits required to maintain reactor coolant pump operation for at least 3 seconds following a turbine trip in either Turkey Point Unit 6 or 7; and (3) the transmission study confirmed that the interface requirements for steady-state load, in-rush kVA for motors, nominal voltage, allowable voltage regulation, nominal frequency, allowable frequency fluctuation, maximum frequency decay rate, and the limiting under frequency value for the reactor coolant pump are met.

In RAI 38 (eRAI 5993), Question 08.02-7, the staff requested that the applicant provide in the Turkey Point Units 6 and 7 COL FSAR the assumptions made, results (maximum and minimum voltage, frequency variations, and frequency decay rate, etc.) and acceptance criteria for each case. In the response to RAI 38 (eRAI 5993), Question 08.02-7, the applicant added in Turkey Point Units 6 and 7 COL FSAR, Revision 4, the applicant added Table 8.2-201 to provide the additional requested information. From the table, the results of the grid analysis shows the limiting under frequency value for the RCPs to be 57.7 Hz and the calculated value specific to Turkey Point to be 59.73 Hz. The staff confirmed this additional information and the results presented and concludes that the expected grid performance is within the parameters specified in the AP 1000 DCD.

*Submerged/Inaccessible Electrical Cables*

The following portion of this technical evaluation section is reproduced from VEGP SER Section 8.2.4:

> *In RAI 8.2-14, the staff asked the applicant to describe the inspection, testing and monitoring program to detect degradation of inaccessible or underground control and power cables that support equipment and other systems that are within the scope of 10 CFR 50.65. The description should include the frequency of testing and inspection. Guidance on the selection of electric cable condition monitoring can be found in Sections 3 and 4.5 of NUREG/CR-7000, "Essential Elements of an Electric Cable Condition Monitoring Program."*
>
> *In a letter dated May 6, 2010, the applicant stated that the Maintenance Rule (MR) program will not be implemented until prior to fuel load; as such, specific information necessary to determine appropriate inspections, tests and monitoring is not available at this time. In order to determine the method and frequency, a review of detailed design and procurement information is needed. The applicant also stated that the latest industry experience and other available information, including NUREG/CR-7000, will be followed in developing a cable condition monitoring program as part of the MR program. The applicant also committed to*

*revise its FSAR to include condition monitoring of underground or inaccessible cables in its MR program. The commitment will be reflected in the COL application Part 2, FSAR Chapter 17, Section 17.6 as shown below.*

> *The Condition monitoring of underground or inaccessible cables is incorporated into the maintenance rule program. The cable condition monitoring program incorporates lessons learned from industry operating experience, addresses regulatory guidance, and utilizes information from detailed design and procurement documents to determine the appropriate inspections, tests and monitoring criteria for underground and inaccessible cables within the scope of the maintenance rule (i.e., 10 CFR 50.65). The program takes into consideration Generic Letter 2007-01.*

*Based on the above, the staff concludes that the applicant's condition monitoring program for underground or inaccessible cables satisfies the recommendations of GL 2007-01, and the guidance in NUREG/CR-7000 and NUREG-0800 Section 8.2.III.1.L. Therefore, this item is resolved subject to the verification that the VEGP COL FSAR has been updated to include applicable portions of the RAI response. This is identified as Confirmatory Item 8.2-3.*

*Resolution of Standard Content Confirmatory Item 8.2-3*

*Confirmatory Item 8.2-3 is an applicant commitment to revise its FSAR Section 17.6 to address condition monitoring of underground or inaccessible cables. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 8.2-3 is now closed.*

*Supplemental Information*

- PTN SUP 8.2-1

PTN SUP 8.2-1 was provided by the applicant describing details of a FMEA performed for the offsite power distribution system, plant site switchyard, and the FPL transmission system. The staff reviewed the FMEA of the Turkey Point switchyard and confirmed that the applicant has identified no single initiating event, such as a breaker not operating during a fault condition, a fault on a switchyard bus, a spurious relay trip, a loss of control power supply that would cause failure of more than one single offsite transmission line, or a loss of offsite power to either Turkey Point unit via the GSU transformer. This list conforms to the pertinent guidance of RG 1.206. Therefore, the staff considers PTN SUP 8.2-1 acceptable.

- PTN SUP 8.2-2

With regard to PTN SUP 8.2-2 the applicant provided, in part, the following information:

> FPL is the transmission system provider/operator and it constructs, owns, and operates all substation and transmission facilities between the plant and the points of interconnection to the grid. An interface agreement in accordance with the North American Electric Reliability Corporation (NERC) Standard NUC-001-01, between FPL Transmission & Substation-Power Supply Department and Units 6 & 7 will establish the protocol to provide effective monitoring and oversight of all grid, switchyard, and plant activities. These

activities include maintenance, testing, planned outages, load reductions, and emergent conditions that could affect offsite power reliability. Department directives will implement the agreement and will facilitate prompt and effective communications between the FPL power supply system operator and Units 6 & 7 shift manager or unit supervisor. Procedures will be established to ensure switchyard maintenance and design changes are reviewed before implementation.

FPL uses a real-time contingency analysis computer program that is used by FPL's transmission system operators in determining the security level of the transmission system by performing an analysis using a predefined set of contingency criteria (e.g., single contingency). The computer program simulates a list of active contingencies on the current power system and produces an output of system conditions for each defined contingency. The program provides an updated output approximately every 5 minutes using real-time system conditions (e.g., real-time line outages, real-time flows and voltages, real-time breaker status, etc.). For each defined contingency simulated, specified elements are checked for limit violations (e.g. line overloads, voltage limits, and reactive limits at generator buses). All contingencies that cause violations are output along with the identification of the violations and information on the magnitude of the violation. The current and previous outputs are displayed to determine degree of change as compared to the previous contingency analysis output result.

A priority is also designated for each contingency. Violations of nuclear plant limits are assigned the highest priority and if a violation is detected by the contingency analysis computer program, it is reported at the top of the output violation list. The computer program alerts the system operator of abnormal voltages, overloads, or unit limitations that can be created by a loss of one or several elements of the transmission system. The output of the contingency analysis computer program is used continuously by the operators to make critical decisions in response to potential severe conditions.

Minimum and maximum voltage criteria specific to the Units 6 & 7 switchyard buses will be documented in the interface agreement. The Units 6 & 7 agreement will also specify that the Units 6 & 7 shift manager or unit supervisor be notified within 15 minutes if a condition exists or is forecasted to exist (i.e., via contingency analysis computer program) that would result in minimum or maximum switchyard voltage requirements for Units 6 & 7 switchyard being exceeded. This agreement, as well as the overall switchyard agreement, will require restoration of power to Units 6 & 7 on a first-priority basis in the event of a loss of offsite power. The goal for maximum restoration time will be 30 minutes.

The staff reviewed the information provided by the applicant on the functions of FPL and the transmission system operator (TSO). The staff observed that the scope of the interface agreement does not include communication to the grid operator of risk-sensitive plant maintenance activities that could affect grid conditions. Therefore, in RAI 38 (eRAI 5993) Question 08.02-9, the staff requested that the applicant indicate whether they coordinate maintenance activities that can have an impact on the transmission system with the TSO and have contacts with the TSO to determine current and anticipated grid conditions as part of the grid reliability evaluation performed before conducting grid-risk-sensitive maintenance activities.

Additionally, the staff requested that the applicant indicate whether risk-sensitive maintenance activities are shared between the units and confirm that a quantitative or qualitative grid reliability evaluation will be performed at Turkey Point, Units 6 and 7 as part of the maintenance risk assessment as required by 10 CFR 50.65(a)(4) before performing grid-risk-sensitive maintenance.

In an October 31, 2011, response to RAI 38 (eRAI 5993) Question 08.02-9, the applicant stated that interface agreement and associated communication protocols will be in accordance with the requirements of NERC reliability standard NUC-001. The applicant further stated that the interface agreement will require a qualitative risk assessment of plant maintenance and testing activities and will require these activities to be coordinated with TSO to prevent inadvertent reduction in nuclear plant defense-in-depth. The applicant indicated that the Turkey Point Units 6 and 7 operators will inform the power supply system dispatcher of planned outages and planned load reductions. The Turkey Point shift manager (SM) or unit supervisor (US) for maintenance and testing activities on the affected unit will provide early warning to the power supply system dispatcher and the SM and/or US of the unaffected units of potential or developing plant conditions that could cause grid instabilities. The detailed interface coordination for plant interface requirements and work controls for Turkey Point Units 6 and 7 will be controlled by plant procedures. The NRC staff has determined that the information provided by the applicant describes how risk-sensitive plant maintenance activities that could affect grid operations will be communicated to the grid operator. The NRC staff also has determined that all other proposed communication protocols between the plant operations staff and the grid operator are acceptable.

Based on the information provided by the applicant on the functions of TSO, and as explained above, the staff finds that the applicant has demonstrated that protocols are in place for Turkey Point Units 6 and 7 to remain cognizant of grid vulnerabilities in order to make informed decisions regarding maintenance activities critical to the electric system. This is consistent with Generic Letter (GL) 2006-2 of which one of the provisions is to reduce the likelihood of losing offsite power. The staff finds that the information provided is also consistent with the guidelines of RG 1.206 and, therefore, considers PTN SUP 8.2-2 acceptable.

- PTN SUP 8.2-3

With regard to PTN SUP 8.2-3, the applicant provided, in part, the following information:

> For the period from January 1, 1988, through September 30, 2008, the average grid availability for the eight 230 kV lines from the existing Turkey Point substation and two 500 kV lines from Levee substation in the FPL system is approximately 99.8 percent with only 48 forced outages lasting more than one hour. The average frequency of forced line outages is approximately 1.4 line outages per year for these transmission lines. The majority of the outages where the cause was recorded were due to environmental conditions and equipment malfunction. Other causes for outages were foreign intervention, human error, and relay misoperation.

The guidance of RG 1.206 recommends the inclusion of historical availability performance of the grid at the plant site. Although the acceptability of grid availability is based upon the site with the new units present, history provides insight into the approval process. The staff reviewed the grid availability historical data information provided by the applicant and determined that the

information provided by the applicant demonstrated that prior grid availability has not presented an issue of concern. Therefore, the staff considers PTN SUP 8.2-3 acceptable.

- PTN CDI

The CDI information provided by the applicant regarding the transformer area (containing the main step-up transformer, the unit auxiliary transformers, and reserve auxiliary transformers) being located next to each unit's turbine building is consistent with the AP1000 DCD FSAR Section 8.2.1.2 and satisfies the applicable requirements of GDC 17 and is acceptable.

In light of recent operating experience that involved the loss of one of the three phases of the offsite power circuit (i.e., loss of a single-phase) at Byron Station, Unit 2, the NRC issued Bulletin 2012-01, "Design Vulnerability in Electric Power System," on July 27, 2012, to all holders of operating and combined licenses requesting information about the facilities' electric power system designs. The above operating event resulted in neither the onsite nor the offsite electric power system being able to perform its intended safety functions (i.e., to provide electric power to the important to safety buses with sufficient capacity and capability to permit functioning of structures, systems, and components important to safety). NRC Bulletin 2012-01 was issued to operating and new reactor licensees to affirm compliance with GDC 17 requirements and to evaluate whether further NRC action is warranted to address this design vulnerability. Subsequently, in RAI 065 (eRAI 6750), Question 08-1, the staff requested that the Turkey Point Units 6 and 7 applicant address the matters described in NRC Bulletin 2012-01 and to ensure that the Turkey Point Units 6 and 7 design meets GDC 17.

In a December 4, 2012, response to RAI 065 (eRAI 6750), Question 08-1, the applicant provided its response to RAI 108, Question 08-1, "Single-Phase Open Circuit Condition," for Turkey Point Units 6 and 7. The proposed design utilized existing undervoltage relays on the ES-1 and ES-2 buses as well as existing undervoltage relays on the loads, on or downstream of the ES-1 and ES-2 buses. Based on review of this response, the staff was unable to determine whether the existing protection schemes would detect open circuit conditions on the high voltage side of a transformer connecting a GDC 17 offsite power circuit to the transmission system for all operating electrical system configurations and loading conditions.

On November 1, 2013, the NRC conducted a public meeting with representatives from the Nuclear Energy Institute (NEI) and other industry representatives to discuss the industry initiative associated with resolving NRC Bulletin 2012-01. During the meeting, industry representatives provided feedback regarding their review of an offsite power two-phase open circuit event that occurred at Forsmark Nuclear Power Plant in Sweden (see NRC Information Notice 2006-18, Supplement 1: "Significant Loss of Safety-Related Electrical Power at Forsmark Unit 1 in Sweden"). The industry representatives informed the staff that their detailed analyses of this condition indicated that the proposed single-open phase detection system may not be sensitive enough to detect a two-phase open circuit condition. Therefore, the industry has taken the position that a two-phase open circuit condition must be considered when developing a resolution for the NRC Bulletin open phase issue.

GDC 17 requires, in part, "An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure: (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences; and (2) the core is cooled and containment

integrity and other vital functions are maintained in the event of postulated accidents." For AP1000 reactors, the main ac power system is non-Class 1E and not safety-related. During a loss of offsite power, ac power is supplied by the onsite standby diesel generators, which are also not safety-related. However, the ac power system is designed such that plant auxiliaries can be powered from the grid under all modes of operation. Furthermore, the ac power systems do supply power to equipment that is important to safety since that equipment serves defense-in-depth functions. The offsite power supply system provides power to the safety-related loads through the battery chargers, and both the offsite power system and the standby diesel generators provide defense-in-depth functions to supplement the capability of the safety-related passive systems for reactor coolant makeup and decay heat removal. In this regard, offsite power is the preferred power source, and supports the first line of defense. In addition, the safety analyses take credit for the grid remaining stable to maintain reactor coolant pump operation for three seconds following a turbine trip in accordance with the guidance of RG 1.206. Accordingly, these electric power systems are important to safety, and subject to the requirements of GDC 17. Consequently, it was the staff's position that AP1000 COL applicants address the design vulnerability identified in NRC Bulletin 2012-01.

Furthermore, it is the staff's position that an acceptable approach for passive designs includes the following four elements: (1) a dedicated automatic detection for an offsite power system single-phase open circuit condition with, and without, a high impedance ground fault condition on the high voltage side of the main power transformer including two open phase conditions under all loading and operating configurations; (2) an alarm in the main control room for operators to take manual actions if the standby diesel generators are not automatically connected to the ES-1 and ES-2 buses; (3) an inspection, test, analysis, and acceptance criteria (ITAAC) to confirm that the analyses for developing the proper set points were completed in accordance with the acceptance criteria and to perform testing to demonstrate that the design functions as described in the Turkey Point Units 6 and 7 COL FSAR; and (4) procedures and training for the operating and maintenance staff. This approach ensures the required offsite ac power source with adequate capacity and capability is available to important safety equipment including safety-related battery chargers to meet their intended safety function in accordance with GDC 17 requirements.

The applicant provided a response in a March 30, 2015, letter. The response is technically identical to the Levy and Lee responses provided by Duke Energy. The staff reviewed this supplemental response. The supplement acceptably addresses the staff position, as described above, for measures necessary to protect a plant against an open phase condition as described in NRC Bulletin 2012-01. The applicant has provided (1) detection of an offsite power system open phase circuit condition, both with and without a high impedance ground fault condition, on the high voltage side of the MSU transformer under all loading and operating configurations, and (2) an alarm of an open phase condition in the MCR. The staff finds this acceptable since it meets the staff's position on passive reactor designs for open phase circuit conditions, as described above. The staff finds that the information provided in the above supplement is consistent with the information requested within RG 1.206 and the regulatory requirements and complies with the requirements of GDC 17. Therefore, the staff finds this acceptable and considers the issue resolved.

The supplemental response to RAI 108, Question 08-1, the applicant provided text that will be added to the next revision of the Turkey Point Units 6 and 7 COL FSAR, including but not limited to, ITAAC to confirm that the analyses for developing the proper set points were completed in accordance with the acceptance criteria and to perform testing to demonstrate that the design functions as described in the Turkey Point Units 6 and 7 COL FSAR. These

proposed additions to the Turkey Point Units 6 and 7 COL FSAR and the ITAAC acceptably address the staff's position as that which is necessary to protect a plant with regard to an open phase condition as described in NRC Bulletin 2012-01, and that the Turkey Point Units 6 and 7 design meets GDC 17***. Therefore, the staff considers this issue resolved and RAI 108, Question 08-1, closed pending the staff's confirmation that the revisions to the Turkey Point Units 6 and 7 COL FSAR identified in the application summary of this SE and provided in the Applicant's letter dated March 30, 2015 are incorporated in the Revision 7 of the Turkey Point Units 6 and 7 application.*** Confirmatory Item 8.2-1 is an applicant commitment to update its Turkey Point Units 6 and 7 COL FSAR and ITAAC to include details necessary to protect a plant with regard to an open phase condition, described in NRC Bulletin 2012-01***. RAI 108, Question 08-1 is being tracked as Confirmatory Item 8.2-1.***

*Interface Requirements*

The plant interfaces for the standard design of the AP1000 are discussed in DCD Tier 2, Section 8.2.5, and in Items 8.1, 8.2, and 8.3 of AP1000 DCD Tier 2, Table 1.8-1, where they are identified as non-Nuclear Safety (NNS) interfaces.

The applicant incorporated by reference AP1000 DCD FSAR Section 1.8. This section of the AP1000 DCD FSAR identifies certain interfaces with the standard design that have to be addressed in accordance with 10 CFR 52.47(a)(1)(vii).[2] As required by 10 CFR 52.79(d)(2), the COL application must demonstrate how these interface items have been met.

To satisfy plant Interface Item 8.1 in AP1000 DCD FSAR Tier 2, Table 1.8-1, the applicant provided the design criteria, regulatory guides, and IEEE standards in Turkey Point Units 6 and 7 COL FSAR Section 8.1.4.3. The staff finds the information to be consistent with NUREG-0800, Section 8.1 and is acceptable. Therefore, this interface item for the offsite power system has been met.

With regard to plant Interface Item 8.2 in AP1000 DCD FSAR Tier 2 Table 1.8-1, the staff observed that in Turkey Point Units 6 and 7 COL FSAR Section 8.2.2, the applicant stated, "[the] transmission study has confirmed that the interface requirements for steady state load, inrush kVA for motors, 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." In RAI 38 (eRAI 5993), Question 08.02-10, the staff requested that the applicant provide in the Turkey Point Units 6 and 7 COL FSAR a summary of the grid stability analysis results, the assumptions made, and the acceptance criteria for each case analyzed. Additionally, the staff requested that the applicant provide the nominal frequency, allowable frequency fluctuation, maximum frequency decay rate, and the limiting under-frequency values used for the reactor coolant pump (RCP) in the analysis. In an October 31, 2011, response to RAI 38 (eRAI 5993), Question 08.02-10, the applicant provided a table comparing the required parameter values (acceptance criteria) and the associated analysis results. Additionally, the applicant stated that the Turkey Point Units 6 and 7 COL FSAR would be revised to include such table. The staff verified that this information has been incorporated into Turkey Point Units 6 and 7 COL FSAR, Revision 4 (Table 8.2-201). The staff finds that the analysis results meet the AP1000 design requirements, the requirements of

[2] Following the update to 10 CFR Part 52 (72 *Federal Register* [FR] 49517), this provision has changed to 10 CFR 52.47(a)(25).

GDC 17 and the guidelines of RG 1.206. Therefore, the staff considers this issue resolved and Interface Item 8.2 in AP1000 DCD FSAR Tier 2, Table 1.8-1 is satisfied.

Regarding plant Interface Item 8.3 in AP1000 DCD FSAR Tier 2, Table 1.8-1, the applicant did not provide a statement affirming, "that the protective devices controlling the switchyard breakers are set with consideration given to preserving the plant grid connection following a turbine trip." Therefore, in RAI 38 (eRAI 5993), Question 08.02-11**,** the staff requested that the applicant provide a reference to where this issue is discussed in the Turkey Point Units 6 and 7 COL application, or to provide a proposed revision to the application to address the issue. In an October 31, 2011 response to RAI 38 (eRAI 5993), Question 08.02-11, the applicant stated that Turkey Point Units 6 and 7 COL FSAR Section 8.2.1.2.1 will be revised to include an affirmation that "the protective devices controlling the switchyard breakers are set with consideration given to preserving the plant grid connection following a turbine trip." The staff verified that the Turkey Point Units 6 and 7 COL FSAR was updated in Revision 6 to include this change and concludes that the switchyard arrangement, the protection of lines by independent high speed relaying, and breaker failure scheme would preserve the Turkey Point Units 6 and 7 connection to the grid following a turbine trip satisfying the requirements of GDC 17. Accordingly, the staff finds this interface has been met and the issue in RAI 38 (eRAI 5993), Question 08.02-11 resolved. On this basis, AP1000 DCD Interface Item 8.3 is resolved.

The staff reviewed the information supplied by the applicant and, as discussed directly above, concludes that the applicant has adequately addressed Interface Items 8.1, 8.2, and 8.3 of AP1000 DCD FSAR Tier 2, Table 1.8-1.

*Inspections, Tests, Analyses and Acceptance Criteria*

As part of the applicant's resolution of electrical power issues, discussed in the subsection NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System*,"* above, the applicant made changes to the Turkey Point Units 6 and 7 COL application, Part 10, Appendix B, "Inspections, Tests, Analysis and Acceptance Criteria."

The applicant proposed the following site-specific ITAAC for the offsite power system to be added in the Turkey Point Units 6 and 7 COL application, Part 10, Appendix B, as new line item 7, in Table 2.6.12-1. **This is being tracked as Confirmatory Item 8.2-2**

| Design Commitment | Inspections, Tests, and Analyses | Acceptance Criteria |
|---|---|---|
| 7. The credited GDC 17 off-site power source is monitored by an open phase condition monitoring system that can detect the following at the high voltage terminals of the transformer connecting to the off-site source, over the full range of transformer loading from no load to full load:<br><br>(1) loss of one of the three phases of the offsite power source<br><br>a. with a high impedance ground fault condition, or<br><br>b. without a high impedance ground fault condition; or<br><br>(2) loss of two of the three phases of the offsite power source<br><br>a. with a high impedance ground fault condition, or<br><br>b. without a high impedance ground fault condition.<br><br>Upon detection of any condition described above, the system will actuate an alarm in the main control room. | i) Analysis shall be used to determine the required alarm set points for the open phase condition monitoring system to indicate the presence of open phase conditions described in the design commitment.<br><br>ii) Testing of the credited GDC-17 off-site power source open phase condition monitoring system will be performed using simulated signals to verify that the as-built open phase condition monitoring system detects open phase conditions described in the design commitment and at the established set points actuates an alarm in the main control room. | i) Alarm set points for the open phase condition monitoring system to indicate the presence of open phase conditions as described in the design commitment have been determined by analysis.<br><br>ii) Testing demonstrates the credited GDC 17 off-site power source open phase condition monitoring system detects open phase conditions described in the design commitment and at the established set points actuates an alarm in the main control room. |

The evaluation of the applicant-proposed site-specific ITAAC Item 7 is presented in the subsection, NRC Bulletin 2012-01, “Design Vulnerability in Electric Power System,” above.

### 8.2.5 Post Combined License Activities

There are no post COL activities related to this section.

### 8.2.6 Conclusion

The staff reviewed the Turkey Point Units 6 and 7 COL application and checked the referenced DCD. The staff's review confirmed that the applicant adequately addressed the required information relating to the offsite power system, and there is no outstanding information expected to be addressed in the Turkey Point Units 6 and 7 COL FSAR related to this section. The results of the staff's technical evaluation of the AP1000 DCD information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented within the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the requirements of GDC 17 and GDC 18. The staff based its conclusion on the following:

- PTN COL 8.2-1 is acceptable because the applicant provided sufficient information involving the design details of the plant site switchyard, its interface with the local transmission grid, and its testing and inspection plan in accordance with the guidelines of RG 1.206.

- PTN COL 8.2-2 is acceptable because the applicant provided sufficient information to demonstrate that the grid will remain stable to maintain RCP operation for 3 seconds following a turbine trip in accordance with the guidelines of RG 1.206. In addition, the staff finds that the switchyard breaker arrangement, the protection of lines by independent high speed relay schemes, and the breaker failure scheme would preserve the Turkey Point Units 6 and 7 connection to the grid following a turbine trip.

- PTN CDI in Turkey Point Units 6 and 7COL FSAR, Section 8.2.1 is acceptable because the applicant provided sufficient information involving the transformer area being located next to each unit's turbine building in accordance with the guidelines of RG 1.206

- PTN SUP 8.2-1 is acceptable because the applicant provided sufficient information describing details of a failure analysis performed for the offsite power distribution system, and plant site switchyard in accordance with the guidelines of RG 1.206.

- PTN SUP 8.2-2 is acceptable because the applicant provided sufficient information to describe FPL's responsibility for maintaining area bulk transmission system reliability. The applicant also provided sufficient information to demonstrate that protocols are in place for LNS to remain cognizant of grid vulnerabilities in order to make informed decisions regarding maintenance activities critical to the electric power system in accordance with the guidelines of RG 1.206 and GL 2006-2.

- PTN SUP 8.2-3 is acceptable because the applicant provided sufficient information regarding causes of outages of the transmission line over the past five years in accordance with the guidelines of RG 1.206.

- The applicant provided sufficient information regarding the interfaces for standard design from the AP1000 DCD FSAR Table 1.8-1, Items 8.1, 8.2, and 8.3.

## 8.2.A Site-Specific ITAAC for Offsite Power Systems

### 8.2.A.1 *Introduction*

This section specifically addresses the site-specific inspections, tests, analyses, and acceptance criteria (SS-ITAAC), that the applicant proposed related to the offsite power system that is necessary and sufficient to provide reasonable assurance that the facility has been constructed and will operate in conformance with the COL, the provisions of the Atomic Energy Act of 1954, as amended, and NRC regulations.

### 8.2.A.2 *Summary of Application*

Turkey Point Units 6 and 7 COL FSAR, Revision 6, Section 14.3 incorporates by reference AP1000 DCD FSAR, Revision 19, Section 14.3 with departures and/or supplements.

To address the departures and/or supplements in Turkey Point Units 6 and 7 COL FSAR Section 14.3, the applicant provided the following additional information:

*Supplemental Information*

- STD. SUP 14.3-1

The applicant provided supplemental information related to the offsite power system in STD. SUP 14.3-1 in Turkey Point COL FSAR Section 14.3.2.3.

### 8.2.A.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of NRC regulations for ITAAC are given in NUREG-0800, Section 14.3.

The applicable regulatory requirements for electrical SS-ITAAC are in 10 CFR 52.80(a), "Contents of applications; additional technical information."

### 8.2.A.4 *Technical Evaluation*

The staff reviewed Turkey Point Units 6 and 7 COL FSAR Section 14.3 and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to SS-ITAAC for offsite power systems. The results of the staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the staff to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff completed its review and concluded that the evaluation performed for the standard content is directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from VEGP SER Section 8.2.A.4:

*Supplemental Information*

- STD. SUP 14.3-1, addressing SS-ITAACs *[COL Standard Content Evaluation]*

*ITAAC Screening Summary Table 14.3-201 of the BLN FSAR identified the transmission switchyard and offsite power system as a site-specific system and selected them for ITAAC, but the table indicated "title only, no entry for COLA." Consequently, Section 2.6.12 of Part 10 of Appendix B, "License Conditions and ITTAC" of the BLN COL application (COLA) provided no ITAAC information for the transmission switchyard and offsite power system. The COL applicant must provide this site-specific ITAAC for compliance with 10 CFR 52.79(d) and 10 CFR 52.80(a). In RAI 14.3-1, the NRC staff stated that RG 1.206, CIII.7.2, Site-Specific ITAAC, recommends that applicants develop ITAAC for the site-specific systems that are designed to meet the significant interface requirements of the standard certified design, that is, the site-specific systems that are needed for operation of the plant (e.g., offsite power). Therefore, the applicant should justify why there is no ITAAC entry associated with offsite power, or revise Table 14.3-201 of the BNL FSAR to include ITAAC entries for the transmission switchyard and the offsite power system.*

*By letter dated June 24, 2008, the applicant stated that approved DCD Section 14.3 refers to the selection criteria and processes used for developing the AP1000 Certified Design Material (CDM) and identifies no interfaces (e.g., systems for storm drain, raw water, and closed circuit TV system, etc.) meeting this definition. Thus, according to the applicant, the CDM does not include ITAAC or a requirement for COL developed ITAAC for the offsite power interface system. The staff found the above response to be inconsistent with the requirements of 10 CFR 52.80(a), and guidance of NUREG-0800 Section 14.3 and RG 1.206.*

*Several discussions were held between the applicant and the NRC staff to discuss this issue. The staff pointed out that the offsite power system performs an important function in the passive designs as it provides power to the safety-related loads through battery chargers during normal, abnormal and accident conditions. It also provides power to those active systems that provide defense-in-depth capabilities for reactor coolant make-up and decay heat removal. These active systems are the first line of defense to reduce challenges to the passive systems in the event of plant transients. The above function of the offsite power system in passive designs supports the need for ITAAC for these systems so that the staff can verify that (1) the designed and installed systems, structures, or components of the offsite power systems will perform as designed and (2) the required single circuit from the transmission network satisfies the requirements of GDC 17.*

*Subsequently, in a letter dated May 11, 2009, the applicant revised its response to RAI 14.3-1 and provided an ITAAC for the offsite power system to verify that the as-built offsite portion of the power supply from the transmission network to the interface with the onsite ac power system will satisfy the applicable provisions of GDC 17. Specifically, the ITAAC shall verify:*

*(1) A minimum of one offsite circuit supplies electric power from the transmission network to the interface with the onsite portions of the ac power system.*

*(2) Each offsite circuit interfacing with the onsite ac power system is adequately rated to supply assumed loads during normal, abnormal and accident conditions.*

*(3) During steady state operation, each offsite circuit is capable of supplying required voltage to the interface with the onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.*

*(4) During steady state operation, each offsite circuit is capable of supplying required frequency to the interface with the onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.*

*(5) The fault current contribution of each offsite portion circuit is compatible with the interrupting capability of the onsite ac power system fault current interrupting devices.*

*(6) The reactor coolant pumps continue to receive power from either the main generator or the grid for a minimum of 3 seconds following a turbine trip.*

*To ensure that the requirements of GDC 17 for the adequacy of the offsite power source within the standard design scope are met, the proposed ITAAC would verify the capacity and capability of the offsite source to feed the onsite power system. The proposed ITAAC provides for the inspection of the connection of the offsite source to the onsite power system.*

*Additionally, the applicant identified all associated changes that will be made in a future revision of the Bellefonte FSAR. On the basis of its review, the staff finds that the applicant has adequately addressed the site-specific ITAAC for the offsite power system so that the staff can verify that the designed and installed systems, structures, or components of the offsite power system will perform as designed. Therefore, the staff concludes that the applicant meets the requirements of 10 CFR 52.79(d) and 10 CFR 52.80(a), and the guidance of SRP 14.3 and RG 1.206. The applicant will revise the BLN COL FSAR to include the proposed ITAAC for offsite power system. This is identified as Confirmatory Item 8.2A-**1**, pending NRC review and approval of the revised BLN COL FSAR.*

*Resolution of Standard Content Confirmatory Item 8.2A-1*

*The applicant proposed a license condition in Part 10 of the VEGP COL application, which will incorporate the ITAAC identified in Appendix B. Appendix B includes ITAAC for the offsite power system. The license condition's proposed text is evaluated in Chapter 1 of this SER.*

*Confirmatory Item 8.2A-1 required the applicant to update its FSAR to include proposed ITAAC for the offsite power system. The NRC staff verified that the VEGP COL application was appropriately updated. The ITAAC associated with the offsite power system are shown in VEGP COL Part 10, Appendix B, Table 2.6.12-1. Table 8.2A-1 of this SER reflects this table. As a result, Confirmatory Item 8.2A-1 is resolved. Therefore, the staff will include the ITAAC for the offsite power system in the license.*

#### 8.2.A.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following ITAAC proposed by the applicant acceptable:

- The licensee shall perform and satisfy the ITAAC defined in Turkey Point Units 6 and 7 COL FSAR Part 10, Appendix B, Table 2.6.12-1, "Offsite Power System."

#### 8.2.A.6 *Conclusion*

The staff concludes that the relevant information presented within the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the requirements of GDC 17 and GDC 18.

## 8.3 Onsite Power Systems

### 8.3.1 Alternating Current Power Systems

#### 8.3.1.1 *Introduction*

The onsite ac power system includes those standby power sources, distribution systems, and auxiliary supporting systems provided to supply power to safety-related equipment or equipment important to safety for all normal operating and accident conditions. In the AP1000 passive reactor design used at Turkey Point Units 6 and 7, the onsite ac power system is a

non-Class 1E system that provides reliable ac power to the various system electrical loads. The onsite ac power system does not perform any safety-related functions. These loads enhance an orderly shutdown under emergency conditions when offsite power is not available. Additional loads for investment protection can be manually loaded on the standby power supplies. Diesel generator sets are used as the standby power source for the onsite ac power systems.

### 8.3.1.2 *Summary of Application*

Turkey Point Units 6 and 7 COL FSAR, Revision 6, Section 8.3 incorporates by reference AP1000 DCD FSAR, Revision 19, Section 8.3 with departures and supplements. AP1000 DCD FSAR Section 8.3 includes Section 8.3.1. In addition, in Turkey Point Units 6 and 7 COL FSAR Section 8.3.1, the applicant provided the following:

*AP1000 COL Information Items*

- PTN COL 8.3-1

PTN COL 8.3-1 describes the grounding grid system design within the plant boundary and a lightning protection risk assessment for the buildings comprising Turkey Point Units 6 and 7.

- STD. COL 8.3-2

STD. COL 8.3-2 describes the details of: (1) the bases of the recommendations in operation, inspection, and maintenance procedures for the onsite standby diesel generators; and (2) the procedures for the periodic testing of penetration overcurrent protective devices.

*Supplemental Information*

- PTN SUP 8.3-1

PTN SUP 8.3-1 provides supplemental information describing the site-specific switchyard and power transformer voltage.

- PTN SUP 8.3-2

PTN SUP 8.3-2 describes the site conditions provided in Turkey Point Units 6 and 7 COL FSAR Sections 2.1 and 2.3 that are bounded by the standard site conditions used to rate the diesel engine and the associated generator in AP1000 DCD Section 8.3.1.1.2.3.

- STD. SUP 8.3-4

STD. SUP 8.3-4 provides supplemental information regarding periodic verification of the onsite ac power system's capability to transfer between the preferred power supply and the maintenance power supply.

### 8.3.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG -1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of NRC regulations for the ac power systems are given in NUREG-0800, Section 8.3.1.

The regulatory bases for acceptance of PTN COL 8.3-1, addressing the grounding and lightning protection systems, are the guidelines of the following documents:

- RG 1.204, "Guidelines for Lightning Protection of Nuclear Power Plants"
- IEEE Standard (Std.) 80, "Guide for Safety in AC Substation Grounding"
- IEEE Std. 665, "Guide for Generating Station Grounding"
- IEEE C.62.23, "Application Guide for Surge Protection of Electric Generating Plants"
- National Fire Protection Association (NFPA) 780, "Standard for the Installation of Lightning Protection Systems"

The bases for acceptance of the part of STD. COL 8.3-2, addressing the recommendations in operation, inspection, and maintenance procedures for the onsite standby diesel generators, are the guidelines of the manufacturer and the appropriate industry diesel generator working group recommendations.

The regulatory bases for acceptance of the part of STD. COL 8.3-2, addressing procedures for penetration protective device testing, are the guidelines of the following regulatory guide:

- RG 1.63, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants"

### 8.3.1.4 *Technical Evaluation*

The staff reviewed Turkey Point Units 6 and 7 COL FSAR Section 8.3.1 and checked the reference DCD to ensure that the combination of the DCD and the information in the COL represent the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information contained in the application and incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the staff to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR, Revision 6. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff completed its review and concluded that the evaluation performed for the standard content is directly applicable to the Turkey Point Units 6 and 7COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The staff reviewed the information contained in the Turkey Point Units 6 and 7 COL FSAR:

*AP1000 COL Information Items*

- PTN COL 8.3-1

The staff reviewed PTN COL 8.3-1 related to COL Information Item 8.3-1. COL Information Item 8.3-1 states:

> Combined License applicants referencing the AP1000 certified design will address the design of grounding and lightning protection.

The commitment was also captured as COL Action Item 8.3.1.6-1 in the staff's FSER for the AP1000 DCD FSER (NUREG-1793), Appendix F, which states:

> The COL applicant will provide the design of the site-specific grounding and lightning protection.

The staff reviewed the resolution to COL information item, PTN COL 8.3-1, related to the ground grid system and lightning protection included in Turkey Point Units 6 and 7 COL FSAR Section 8.3. The staff's evaluation is described below.

The applicant stated that a grounding grid system design within the plant boundary includes a determination of step and touch potentials and ensuring that they are within the acceptable limit for personnel safety. Actual resistivity measurements from soil samples taken at the plant site were analyzed to create a soil model. The ground grid conductor size was then determined using the methodology outlined in IEEE Std. 80, "IEEE Guide for Safety in AC Substation Grounding," and a grid configuration for the site was created. The grid configuration was modeled in conjunction with the soil model.

The staff review of the grounding grid system design description observed that Turkey Point Units 6 and 7 COL FSAR Table 8.1-201 includes RG 1.204 which endorses IEEE Std. 665 for generation station grounding. The staff also observed that the same subsection of the DCD indicates compliance with IEEE Std. 665. Therefore, in RAI 39 (eRAI 5995), Question 08.03-01-X the staff requested that the applicant discuss the extent to which the Turkey Point Units 6 and 7 ground grid design complies with IEEE Std.. 665 and confirm that their use of IEEE Std. 80 did not invalidate the Turkey Point conformance to the guidelines of RG 1.204. In an October 31, 2011, response to RAI 39, Question 08.03-01-X, the applicant stated that IEEE Std. 80 methodology was used to determine the ground grid conductor size and that this methodology did not invalidate their conformance to the guidance of RG 1.204. The applicant also clarified that Turkey Point Units 6 and 7 COL FSAR, Appendix 1AA includes RG 1.204, Revision 0, with no exceptions taken. The staff finds the applicant's response

acceptable because it is consistent with the guidelines of RG 1.206. Therefore, the staff considers the issues in RAI 39 (eRAI 5995), Question 08.03-01-X resolved.

With regard to lightning protection, the applicant stated that, a lightning risk assessment was performed for the structures comprising Turkey Point, Units 6 and 7 based on the methodology of NFPA 780-2008 in accordance with IEEE Std. 665-1995 and lightning protection is provided for the structures in accordance with NFPA 780. Specifically, the applicant stated that the zone of protection is based on elevations and geometry of the structures. The zone of protection also 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. Lightning protection grounding is interconnected with the station/switchyard grounding system. The staff review of the applicant's description of the Turkey Point Units 6 and 7 lightning protection system design found that in Turkey Point Units 6 and 7 COL FSAR Table 8.1-201, where it is stated that RG 1.204 is implemented via IEEE Std. 665. Since the regulatory guide also endorses IEEE Std. 666-1991, "IEEE Design Guide for Electric Power Service Systems for Generating Systems"; IEEE Std. 1050-1996, "IEEE Guide for Instrumentation and Control Grounding in Generating Stations"; and IEEE C62.23-1995, "IEEE Application guide for Surge Protection of Electric Generating Plants"; in Question 08.03-02 the staff requested that the applicant discuss the applicability of these other standards. In an October 31, 2011 response, the applicant clarified that Turkey Point Units 6 and 7 COL FSAR Appendix 1AA includes RG 1.204, Revision 0, with no exceptions taken. Therefore, the applicant stated that they would also conform to the other standards in accordance with RG 1.204. Additionally, the applicant stated that Turkey Point Units 6 and 7 COL FSAR Table 8.1-201 will be revised to remove the note: "Implemented via IEEE Std. 665, IEEE Guide for Generating Station Grounding, (DCD section 8.3, and Reference 201)," under the "Remarks" column for RG 1.204. The staff verified this change to the Turkey Point Units 6 and 7 COL FSAR was accomplished in Revision 4. The staff finds the applicant's response acceptable because it is consistent with the guidelines of RG 1.206. Accordingly, the staff considers Question 08.03-02 resolved.

Based on the above, the staff concludes that IEEE Std. 665 provides an acceptable method for lightning protection; therefore, the supplemental information provided by the applicant on lightning protection is acceptable.

- STD. COL 8.3-2

The staff reviewed STD. COL 8.3-2 as follows.

The following portion of this technical evaluation section is reproduced from VEGP SER Section 8.3.1.4 [which itself was reproduced from Section 8.3.1.4 of the Bellefonte SER]:

- *STD. COL 8.3-2*

*The NRC staff reviewed STD. COL 8.3-2 related to COL Information Item 8.3-2. COL Information Item 8.3-2 states (in part):*

*The Combined License applicant will establish plant procedures as required for:*

– *Periodic testing of penetration protective devices*

– *Diesel generator operation, inspection and maintenance in accordance with manufacturers' recommendations*

*The commitment was also captured as COL Action Items 8.3.1.2-1 and 8.4.1-1 in [AP 1000 DCD, Section 8.3.3, "Combined License Information for Onsite Electrical Power," as discussed in] Appendix F of the NRC staff's FSER for the AP1000 [standard design] (NUREG-1793), which states:*

> *The COL applicant will establish plant procedures for preoperational testing to verify proper operation of the ac power system. (COL Action Item 8.3.1.2-1)*
>
> *The COL applicant will establish plant procedures for periodic testing of penetration protective devices. (COL Action Item 8.4.1-1)*

*A part of standard information item, STD. COL 8.3-2, was provided by the applicant describing the bases of the recommendations in operation, inspection, and maintenance procedures for the onsite standby diesel generators. This part of STD. COL 8.3-2 is addressed in BLN COL FSAR Section 8.3.1.1.2.4.*

*A portion of the standard information item, STD. COL 8.3-2, was provided by the applicant describing procedures for the testing of penetration protective devices. This portion of STD. COL 8.3-2 is addressed in BLN COL FSAR Section 8.3.1.1.6.*

*The NRC staff reviewed the resolution to COL information item, STD. COL 8.3-2, related to testing procedures for standby diesel generators and electrical penetrations included under Section 8.3 of the BLN COL FSAR. The NRC staff's evaluation follows.*

*For the operation, inspection and maintenance for diesel generators, the applicant's procedures will consider both the diesel generator manufacturer and industry diesel working group recommendations.*

*In RAI 8.3.1-2, the NRC staff stated that COL Action Item 8.3.1.2-1 in the NRC's FSER for the AP1000 DCD FSER (NUREG-1793), contains the following discussion:*

> *Preoperational tests are conducted to verify proper operation of the ac power system. The preoperational tests include operational testing of the diesel load sequencer and diesel generator capacity testing. The diesel generators are not safety-related and will be maintained in accordance with the requirements of the overall plant maintenance program. This program will cover the preventive, corrective, and predictive maintenance activities of the plant systems and equipment and will be presented in the COL application. This COL information is discussed in DCD Tier 2, Section 8.3.3, "Combined License Information for Onsite Electrical Power."*

*In RAI 8.3.1-2, the applicant was asked to provide a reference to where the preoperational testing program and the preventive, corrective, and predictive maintenance activities for the diesel generators are discussed in the application, or provide a proposed revision to the application to address this issue.*

*In a letter dated April 6, 2009, the applicant stated that COL Action Item 8.3.1.2-1 in Appendix F of the FSER does not indicate that "pre-operational testing" of the diesel generators has been addressed in the DCD. Pre-operational testing of the ac power system is described in FSER Section 14, DCD Section 14, and BLN COL FSAR Chapter 14. Specifically, DCD Sections 14.2.9.2.15 and 14.2.9.2.17 address the onsite ac power system and diesel generator testing, including diesel generator capacity and sequencer tests. BLN COL FSAR Section 14.2.9.4.23 describes testing of the offsite power system. The NRC staff agrees that pre-operational testing of the diesel generators is addressed in DCD Section 14.2.9.2.17 and was found acceptable by the staff as indicated in FSER NUREG-1793 Section 14.2.9. Based on the above, the NRC staff finds that the applicant's response to the portion of the RAI regarding COL areas of responsibility is acceptable.*

*In addition, the applicant stated that BLN COL FSAR Section 8.3.1.1.2.4 will be revised to include inspection and maintenance (including preventive, corrective, and predictive maintenance) procedures considering both the diesel generator manufacturer's recommendations and industry diesel working group recommendations.*

*The NRC staff concludes that following the manufacturer and industry diesel generator working group recommendations for onsite standby diesel generator inspection and maintenance including preventive, corrective, and predictive maintenance provides reasonable assurance that the diesel generators will be adequately maintained. Therefore, DCD COL Information Item 8.3-2 and FSER COL Action Item 8.3.1.2-1 are resolved subject to the verification that the BLN COL FSAR has been updated to include applicable portions of the RAI response. This is identified as Confirmatory Item 8.3.1-1.*

*With regard to establishing plant procedures for periodic testing of protective devices that provide penetration overcurrent protection, the applicant will implement procedures to periodically test a sample of each different type of overcurrent device. 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*

*Because the above testing is consistent with the recommendation of RG 1.63, the NRC staff concludes that the above information satisfies COL Information Item 8.3-2 and FSER COL Action Item 8.3.1.6-1, and that these items are resolved.*

*Resolution of Standard Content Confirmatory Item 8.3.1-1*

*Confirmatory Item 8.3.1-1 required the applicant to update its FSAR to specify that onsite standby diesel generator inspection and maintenance (including*

*preventive, corrective, and predictive maintenance) procedures will consider both the diesel generator manufacturer's recommendations and industry diesel working group recommendations. The NRC staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 8.3.1-1 is resolved.*

*Supplemental Information*

- PTN SUP 8.3-1

Because switchyard power transformer voltages are site-specific, the referenced DCD requires this information be provided in the COLA. The applicant provided information in PTN SUP 8.3-1 describing the site-specific switchyard and power transformer voltage. The staff finds this description adequate to allow the staff to complete its review of electrical power system.

- PTN SUP 8.3-2

The applicant stated in PTN SUP 8.3-2 that their site conditions are bounded by the standard site conditions in AP1000 DCD Section 8.3.1.1.2.3 used to rate the diesel generators. The staff agrees that the Turkey Point Units 6 and 7 site conditions are bounded by the standard site conditions used to determine the rating.

- STD. SUP 8.3-4

The applicant provided information in STD. SUP 8.3-4 to include implementation of procedures for periodic verification of proper operation of the onsite ac power system capability for automatic and manual transfer from the preferred power supply to the maintenance power supply and return from the maintenance power supply to the preferred power supply. The staff finds that the information satisfies the requirements of GDC 18 and is, therefore, acceptable.

### 8.3.1.5 *Post Combined License Activities*

There are no post COL activities related to this section.

### 8.3.1.6 *Conclusion*

The staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant addressed the required information relating to ac power systems, and there is no outstanding information expected to be addressed in the Turkey Point Units 6 and 7 COL FSAR related to this section. The results of the staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In addition, the staff compared the COL information items, the supplemental information, the interfaces for standard design, and the proposed design changes and corrections within the application to the relevant NRC regulations, guidance in NUREG-0800, Section 8.3.1, and other NRC regulatory guides and concludes that the applicant is in compliance with the NRC regulations. The staff based its conclusion on the following:

- PTN COL 8.3-1 is acceptable because the applicant provided sufficient information related to the grounding grid system design and lightning protection consistent with the recommendations of RG 1.206 and RG 1.204.

- STD. COL 8.3-2 is acceptable because the applicant provided sufficient information related to preoperational testing of the diesel generators and periodic testing of the penetration overcurrent protective devices consistent with industry standards and the recommendations of RG 1.63.

- PTN SUP 8.3-1 is acceptable because the applicant adequately addressed the site-specific switchyard and transformer voltage.

- PTN SUP 8.3-2 is acceptable because the applicant demonstrated its site-specific conditions are bounded by the standard site conditions in the AP1000 DCD FSAR for rating the diesel generator.

- STD. SUP 8.3-4 is acceptable because the applicant will implement procedures for periodic verification of offsite power system capacity for automatic and manual transfer from the preferred power supply to the maintenance power supply and vice versa to satisfy the requirements of GDC 18.

## 8.3.2 Direct Current Power Systems

### 8.3.2.1 *Introduction*

The dc power systems include those dc power sources and their distribution systems provided to supply motive or control power to safety-related equipment. Batteries and battery chargers serve as the power sources for the dc power system and inverters convert dc from the dc distribution system to ac instrumentation and control power, as required. These three components, when combined, provide an uninterruptible power supply (UPS) that furnishes a continuous, highly reliable source of ac supply.

The AP1000 dc power system is comprised of independent Class 1E and non-Class 1E dc power systems. Each system consists of ungrounded stationary batteries, dc distribution equipment, and UPS.

### 8.3.2.2 *Summary of Application*

Turkey Point Units 6 and 7 COL FSAR, Revision 6, Section 8.3 incorporates by reference AP1000 DCD FSAR, Revision 19, Section 8.3 with several departures and/or supplements. AP1000 DCD FSAR Section 8.3 includes Section 8.3.2. After submitting AP1000 DCD Revision17 to the NRC, Westinghouse revised the COL information Item (COL 8.3-2) and the applicant took a departure (STD. DEP 8.3-1) to address the revised COL information item. This COL information item has been incorporated into AP1000 DCD, Revision 19; however, the discussion of the COL information item below did not change.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 8.3.2, the applicant provided the following:

*Tier 2 Departure*

- STD. DEP 8.3-1

In an April 20, 2011, letter to the NRC, the applicant endorsed an October 15, 2010, Southern Nuclear letter, for the VEGP application that proposed the following Tier 2 standard departure related to a proposed revision to AP1000 DCD FSAR Section 8.3.2.2. In the October 15, 2010, Southern Nuclear stated that the Class 1E battery chargers are designed to limit the input (ac) current to an acceptable value under faulted conditions on the output side, however, the voltage regulating transformers do not have active components to limit current. Therefore, the Class 1E voltage regulating transformer maximum current is determined by the impedance of the transformer. The voltage regulating transformer in combination with fuses and/or breakers will interrupt the input or output (ac) current under faulted conditions on the output side. Since AP1000 DCD FSAR Section 8.3.2.2 states that the Class 1E voltage regulating transformers are designed to limit the input (ac) current to an acceptable value under faulted conditions on the output side, the use of the breakers/fuses for the regulating transformers for isolation function, in lieu of current limiting characteristics as presented in the AP1000 DCD FSAR, is a departure for VEGP. Since the issue is identified as a standard item it is also a departure for Turkey Point Units 6 and 7.

*AP1000 COL Information Item*

- STD. COL 8.3-2

STD. COL 8.3-2 describes in detail the procedures for inspection, maintenance, and testing of Class 1E batteries, and the clearing of ground faults on the Class 1E dc power system. In an April 20, 2011, letter to the NRC, the applicant endorsed a Southern Nuclear October 15, 2010, letter for the VEGP application that proposed to revise STD. COL 8.3-2 by adding information related to periodic testing for the battery chargers and voltage regulating transformers.

*Supplemental Information*

- STD. SUP 8.3-3

The applicant provided supplemental information stating that no site-specific non-Class 1E dc loads were connected to the Class 1E dc system.

### 8.3.2.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements. In addition, the acceptance criteria associated with the relevant requirements of NRC regulations for the dc power systems are given in NUREG-0800, Section 8.3.2.

The regulatory basis for acceptance of COL information item, STD. COL 8.3-2 and STD. SUP 8.3-3, is established in:

- GDC 17, “Electric Power Systems”
- GDC 18, “Inspection and Testing of Electric Power Systems”
- RG 1.206, “Combined License Applications for Nuclear Power Plants(LWR Edition)”

- RG 1.129, "Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants"

- IEEE Std. 450, "Recommended Practice for the Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications"

- RG 1.75, "Criteria for Independence of Electrical Safety Systems," Revision 3

### 8.3.2.4 *Technical Evaluation*

The staff reviewed Turkey Point Units 6 and 7 COL FSAR Section 8.3.2 and checked the referenced DCD to ensure that the combination of the DCD and the information in the Turkey Point Units 6 and 7 COL application represent the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information contained in the application and incorporated by reference addresses in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the staff to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff completed its review and concluded that the evaluation performed for the standard content is directly applicable to the Turkey Point COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from VEGP SER Section 8.3.2.4:

> *AP1000 COL Information Item*
>
> - *STD. COL 8.3-2, involving the inspection, maintenance, and testing of Class 1E batteries and clearing of ground faults on the Class 1E dc system.*
>
> *The NRC staff reviewed STD. COL 8.3-2 related to COL Information Item 8.3-2. COL Information Item 8.3-2 states (in part):*

*The Combined License applicant will establish plant procedures as required for:*

- *Clearing ground fault on the Class 1E dc system*
- *Checking sulfated battery plates or other anomalous conditions through periodic inspections*
- *Battery maintenance and surveillance (for battery surveillance requirements, refer to DCD Chapter 16, Section 3.8)*

*The commitment was also captured as COL Action Item 8.4.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:*

> *The COL applicant will establish plant procedures for periodic testing of penetration protective devices. (COL Action Item 8.4.1-1)*

*The Class 1E 125 volts direct current (Vdc) system components undergo periodic maintenance tests to determine the condition of the system. The applicant has established procedures for inspection and maintenance of Class 1E batteries and non-Class 1E batteries. Class 1E battery maintenance and service testing is performed in conformance with RG 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. In addition, the applicant has established procedures for clearing of ground faults on the Class 1E dc system. The battery testing procedures are written in conformance with IEEE 450 and the Technical Specifications. The NRC staff concludes that the applicant has established procedures for inspection and maintenance of Class 1E and non-Class 1E batteries to satisfy COL Information Item 8.3-2; therefore, this item is resolved.*

*With regard to periodic testing of electrical penetration protective devices (COL Action Item 8.4.1-1) for dc systems, the applicant has not addressed periodic testing of the penetration over load protective devices related to dc systems. In RAI 8.3.1-1, the staff requested that the applicant address the periodic testing of the electrical penetration primary and backup protective devices protecting Class 1E and non-Class 1E dc circuits. In a letter dated January 2, 2009, the applicant stated that the BLN COL FSAR will be revised in the next COLA submittal to include periodic testing of the electrical penetration primary and backup protective devices protecting Class 1E and non-Class 1E dc circuits, as well as control of protective devices. The staff has reviewed the information in the applicant's response, which provided for the testing of Class 1E and non-Class 1E dc penetration overload protection devices. The staff also reviewed the proposed change to BLN COL FSAR Section 8.3.1.1.6 and concludes that COL Action Item 8.4.1-1 is resolved subject to the verification that the BLN COL FSAR has been updated to include portions of the RAI response. This is identified as Confirmatory Item 8.3.2-1.*

*Resolution of Standard Content Confirmatory Item 8.3.2-1*

*Confirmatory Item 8.3.2-1 required the applicant to update its FSAR to provide for the testing of Class 1E and non-Class 1E dc penetration overload protection devices. The NRC staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 8.3.2-1 is resolved.*

*Evaluation of Tier 2 Departure STD. DEP 8.3-1 and Revised STD. COL 8.3-2*

*In a letter dated June 18, 2010, Westinghouse provided a response to Open Item OI-SRP 8.3.2-EEB-09, Revision 3, related to the periodic testing of battery chargers and voltage regulating transformers. The response included a COL information item to be added to AP1000 DCD Section 8.3.3 to ensure that periodic testing is performed on the battery chargers and voltage regulating transformers. Specifically, this section will be revised to include the following COL information item:*

> *The Combined License applicant will establish plant procedures as required for:*
>
> > *Combined License applicants referencing the AP1000 certified design will ensure that periodic testing is performed on the battery chargers and voltage regulating transformers.*

*In a letter dated October 15, 2010, the applicant submitted its response to address the above-identified AP1000 DCD revision to the Section 8.3.3 COL information item regarding battery charger and voltage regulating transformer testing. The applicant stated that procedures are established for periodic testing of the Class 1E battery chargers and the Class 1E regulating transformers in accordance with the manufacturer recommendations. The battery chargers and regulating transformers are tested periodically in accordance with manufacturer recommendations. Circuit breakers in the Class 1E battery chargers and Class 1E voltage regulating transformers that are credited for an isolation function are tested through the use of breaker test equipment. This verification confirms the ability of the circuit to perform the designed coordination and corresponding isolation function between Class 1E and non-Class 1E components. Circuit breaker testing is done as part of the MR program and testing frequency is determined by that program. Fuses/fuse holders that are included in the isolation circuit are visually inspected. Class 1E battery chargers are tested to verify current limiting characteristic utilizing manufacturer recommendation and industry practices. Testing frequency is in accordance with that of the associated battery.*

*The applicant clarified that the voltage regulating transformers do not have active components to limit current and, therefore, the voltage regulating transformer in combination with fuses and/or breakers will interrupt the input or output (ac) current under faulted conditions on the output side. The NRC staff finds this to be inconsistent with AP1000 DCD Section 8.3.2.2, which states that Class 1E voltage regulating transformers are designed to limit the input (ac) current to an acceptable value under faulted conditions on the output side. As such the use of the breakers/fuses for regulating transformers for isolation function in lieu of*

*current limiting characteristics as presented in the AP1000 DCD is a departure for VEGP. The applicant stated that Part 7 of the COL application will be revised to include a departure from AP1000 DCD Section 8.3.2.2 clarifying the current limiting feature of voltage regulating transformers. The applicant has included, in its response, the appropriate changes related to the above departure that will be included in VEGP COL FSAR Sections 8.3.2.1.4 and 8.3.2.2, in Chapter 1, Table 1.8-201 and in Part 7 of the VEGP COL application. These changes will be included in a future revision to the VEGP COL application.*

*The NRC staff has reviewed the proposed changes to the VEGP COL application and concludes that the applicant has provided sufficient information regarding the isolation function and the periodic inspection and testing of the isolating devices for the Class 1E battery chargers and Class 1E voltage regulating transformers. In addition, the staff finds that, although the use of the breakers/fuses for regulating transformers isolation function in lieu of current limiting characteristics as presented in the AP1000 DCD is a departure for VEGP, the departure is acceptable because the use of the breakers/fuses for regulating transformers for isolation function is consistent with the recommendations in IEEE-384, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits," endorsed by RG 1.75. Therefore, AP1000 COL Information Item STD. DEP 8.3-1 and the revised STD. COL 8.3-2 are resolved subject to NRC staff verification of the revision to the VEGP COL FSAR sections discussed above. This is being tracked as Confirmatory Item 8.3.2-2.*

*Resolution of Standard Content Confirmatory Item 8.3.2-2*

*Confirmatory item 8.3.2-2 is an applicant commitment to revise its FSAR Table 1.8-201 and Section 8.3.2.1.4 to address COL Information Item STD. COL 8.3-2 and a departure, STD. DEP 8.3-1. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 8.3.2-2 is now closed.*

*The following portion of this technical evaluation section is reproduced from Section 8.3.2.4 of the BLN SER:*

*Supplemental Information*

- *STD. SUP 8.3-1*

*STD. SUP 8.3-1 was provided by the applicant indicating that there are no site-specific non-Class 1E dc loads connected to the Class 1E dc system. The staff finds this acceptable because it is consistent with the guidance in RG 1.206.*

*Evaluation of Site-specific Response to Standard Content*

*In VEGP COL FSAR, Revision 2, the VEGP applicant changed the number of the supplemental information item from STD. SUP 8.3-1 to STD. SUP 8.3-3. The associated VEGP COL FSAR, Revision 2 text, which is identical to the BLN COL FSAR, Revision 1 text accepted by the staff, was not changed. Therefore, the staff concludes that this difference is not relevant and that the staff's evaluation of STD. SUP 8.3-1 for BLN applies to STD. SUP 8.3-3 for VEGP.*

### 8.3.2.5 *Post Combined License Activities*

There are no post COL activities related to this section.

### 8.3.2.6 *Conclusion*

The staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant addressed the required information relating to dc power systems, and there is no outstanding information expected to be addressed in the Turkey Point Units 6 and 7 COL FSAR related to this section. The results of the staff's technical evaluation of the information incorporated by reference in the Turkey Point COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented within the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the relevant NRC regulations, guidance in NUREG-0800, Section 8.3.2, and other NRC regulatory guides and concludes that the applicant is in compliance with NRC regulations. The staff based its conclusion on the following:

- STD. DEP 8.3-1 is acceptable because the applicant provided sufficient information involving the use of breakers/fuses for regulating transformers for isolation function that is consistent with IEEE-384, endorsed by RG 1.75.

- STD. COL 8.3-2 is acceptable because the applicant provided sufficient information involving the inspection, maintenance, and testing of Class 1E batteries and clearing of ground faults on the Class 1E dc system, and periodic testing of the battery chargers and voltage regulating transformers.

- STD. SUP 8.3-3 is acceptable because the applicant made a commitment that there are no site-specific non-Class 1E dc loads connected to the Class 1E dc system.