

BellBendCOLPEm Resource

From: Bhatia, Bhupendra
Sent: Saturday, February 27, 2010 12:22 PM
To: BellBendCOL Resource
Cc: Johnson, Robert
Subject: FW: NUMARK Documents for the NRC Hearing File for TO #49, Bell Bend, Chapter #8.
Attachments: BBNPP 8.2 Draft 3-SCOL w RAIs.doc; Response to PQOG_comments_on_8.2_Callaway_NMP_BB[1].doc

From: Bhatia, Bhupendra
Sent: Thursday, December 31, 2009 1:34 PM
To: Steckel, James
Cc: Jenkins, Ronaldo; Kang, Peter
Subject: FW: NUMARK Documents for the NRC Hearing File for TO #49, Bell Bend, Chapter #8.

Jim,

Attached please find information received from Numark Associates pertaining to TO #49, Bell Bend, Chapter 8 for inclusion in the NRC Hearing File.

Bhupendra

From: Shaareem Wall [<mailto:SWall@numarkassoc.com>]
Sent: Monday, December 28, 2009 11:17 AM
To: Bhatia, Bhupendra
Subject: NUMARK Documents for the NRC Hearing File for TO #49, Bell Bend, Chapter #8.

The attached information is being provided to you from Numark Associates, Inc pursuant to 10 CFR 2.1203(b) for inclusion in the NRC Hearing File.

Please contact Ms Karen Hall if you have any questions.

Shaareem Wall, Administrative Assistant
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From: Shaareem Wall
Sent: Tuesday, November 17, 2009 1:09 PM
To: 'swagata.som@nrc.gov'; 'james.steckel@nrc.gov'
Cc: 'sally.adams@nrc.gov'
Subject: NUMARK Documents for the NRC Hearing File for TO #49, Bell Bend Chapter #8.

The attached information is being provided to you from Numark Associates, Inc pursuant to 10 CFR 2.1203(b) for inclusion in the NRC Hearing File.

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From: Loraine Wilson
Sent: Thursday, November 05, 2009 10:03 AM
To: Shaareem Wall
Subject: FW: NUMARK Documents for the NRC Hearing File for TO #49, Bell Bend Chapter #8.

From: Loraine Wilson
Sent: Wednesday, September 09, 2009 5:03 PM
To: 'Swagata.som@nrc.gov'
Cc: 'James.Steckel@nrc.gov'; 'sally.adams@nrc.gov'
Subject: FW: NUMARK Documents for the NRC Hearing File for TO #49, Bell Bend Chapter #8.

The attached information is being provided to you from Numark Associates, Inc pursuant to 10 CFR 2.1203(b) for inclusion in the NRC Hearing File.

Please contact Ms Karen Hall if you have any questions.

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-----Original Message-----

From: George Morris

Sent: Sunday, March 01, 2009 9:47 PM

To: Marty Bowling

Cc: Brian Grimes; Stan Kobylarz; Hearing File

Subject: Incorporation of PQOG comments into TER 8.2 for TO 47, 48 and 49

Marty,

Attached are the revised files for TER 8.2 for TOs 47, 48 and 49 and the Form 3 addressing the PQOG comments.

George Morris

Hearing Identifier: BellBend_COL_Public
Email Number: 499

Mail Envelope Properties (87B1F1BDFE5A554CA9DC5EAA75EB6D0D1BFBBA7B07)

Subject: FW: NUMARK Documents for the NRC Hearing File for TO #49, Bell Bend, Chapter #8.
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From: Bhatia, Bhupendra
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Recipients:
"Johnson, Robert" <Robert.Johnson@nrc.gov>
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BBNPP 8.2 Draft 3-SCOL w RAIs.doc	113658	
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Reply Requested: No
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8.2 Offsite Power System

The BBNPP offsite power system is designed to provide reliable electric power from the transmission system to provide for safe shutdown of the reactor.

8.2.1 Introduction

The safety function of the offsite power system (assuming the onsite power system is not functioning) is to provide sufficient capacity and capability to ensure that the structures, systems, and components important to safety perform as intended. The objective of the staff review is to determine that the offsite power system satisfies the requirements of 10 CFR 50, Appendix A, General Design Criteria (GDC) 2, 4, 5, 17, and 18 and will perform its design function during all plant operating and accident conditions.

8.2.2 Summary of Application

Section 8.2 of the BBNPP FSAR incorporates by reference Section 8.2 of the U.S. EPR FSAR. (See section 1.1 of this SER.)

In addition, in FSAR Sections 8.2.1.1, 8.2.1.2, 8.2.2.4, 8.2.2.5, and 8.2.2.7, the applicant provided the following:

Interface Requirements:

Tier 1 Chapter 4, Section 2.5 of the U.S. EPR Application contains information related to the following plant interfaces that are required to be addressed in the COL designs:

- Off-site AC power transmission system connections to the switchyard and the connection to the plant power distribution system.
- Auxiliary power and generator transformer areas.

The BBNPP FSAR Section 8.2 addresses the transmission system, switchyard design and the auxiliary power and generator transformer areas as noted below.

Combined License Information Items:

The applicant provided additional site-specific information in Section 8.2.1.1 to address COL Information Item 8.2-1, the offsite transmission system and their connections to the station switchyard.

The applicant provided additional site-specific information in Section 8.2.1.1 to address COL Information Item 8.2-7:

- (a) A description of the communication agreements between the nuclear generator and the transmission entities, and

(b) A description of the analysis tools used by the transmission entities to determine the impact that the loss of transmission system elements will have on the capability of the offsite power supply to provide adequate post-trip voltage.

The applicant provided additional site-specific information in Section 8.2.1.2 to address COL Information Item 8.2-2, the switchyard layout design.

FSAR Figure 8.2-1 provided a switchyard single line diagram for Unit 2.

The applicant provided additional site-specific information in Section 8.2.1.2 to address COL Information Item 8.2-5, protective devices that control the switchyard breakers and other switchyard relay devices.

The applicant provided additional site-specific information in Section 8.2.1.2 to address COL Information Item 8.2-8, indication and control of switchyard components.

The applicant provided additional site-specific information in Section 8.2.2.4 to address COL Information Item 8.2-4, grid stability analysis.

The applicant provided additional site-specific information in Section 8.2.2.5 to address COL Information Item 8.2-6, switchyard equipment inspection and testing plan.

The applicant provided additional site-specific information in Section 8.2.2.7 to address COL Information Item 8.2-3, actions necessary to restore offsite power and use available nearby power sources when offsite power is unavailable.

ITAAC:

Site-specific inspections, tests, analyses and acceptance criteria (ITAACs) are given in Appendix B to Part 10 of the BBNPP application. No license conditions are proposed for this section. The staff reviewed the following ITAACs, listed in tabular form in the application, as applicable to this section:

Table 2.4-11, Grid Systems Control Building

Table 2.4-24, Offsite Power

Table 2.4-25, Power Generation

Technical Specifications:

The applicant did not incorporate by reference the U.S. EPR generic Technical Specifications and Bases. The applicant stated that they used the U.S. EPR generic Technical Specifications as a reference when developing the site specific Technical Specifications. The applicant included the site specific Technical Specifications in Part 4 of their COL application. The staff reviewed the technical specifications applicable to this section during the review of Chapter 16 and Part 4, Section 3.8, Electrical Systems, of the BBNPP application.

8.2.3 Regulatory Basis

The relevant requirements of the Commission regulations for this area of review, and the associated acceptance criteria, are given in Section 8.2 of NUREG-0800 and are summarized below. Review interfaces with other NUREG-0800 sections also can be found in Section 8.2 of NUREG-0800. The BBNPP application incorporated by reference (IBR) the EPR FSAR commitments to most of the requirements for this section found in NUREG-0800, Section 8.2.

1. GDC 17 as it relates to the preferred power system's (i) capacity and capability to permit functioning of structures, systems, and components important to safety; (ii) provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies; (iii) physical independence; (iv) availability; and (v) capability.
2. GDC 18 as it relates to the inspection and testing of the offsite electric power system.
3. 10 CFR 50.63 as it relates to an alternate AC (AAC) power source (as defined in 10 CFR 50.2) provided for safe shutdown in the event of a station blackout (non-design-basis accident (non-DBA)).

Acceptance criteria adequate to meet the above requirements include:

1. RG 1.32 (see also IEEE Std 308) as related to the availability and number of immediate access circuits from the transmission network.
2. Acceptance is based on meeting the guidelines of RG 1.155 as they relate to the adequacy of the AAC source and the independence of the AAC power source from the offsite and onsite power systems and sources. New applications must provide an adequate AAC source of diverse design (with respect to AC onsite emergency sources) that is consistent with the guidance in RG 1.155 and capable of powering at least one complete set of normal safe shutdown loads.
3. RG 1.206 as it relates to power system analytical studies and stability studies to verify the capability of the offsite power systems and their interfaces with the onsite power system.
4. SECY 91-078 as it relates to the interface between the onsite AC power system and the offsite power system.

8.2.4 Technical Evaluation

The NRC staff reviewed Section 8.2 of the BBNPP FSAR and considered the referenced U.S. EPR FSAR sections. The NRC staff's review confirmed that the information contained in the application and incorporated by reference addresses the relevant information related to this section.

The staff reviewed the information contained in Sections 8.2.1.1, 8.2.1.2, 8.2.2.4, 8.2.2.5, and 8.2.2.7 of the BBNPP FSAR:

Combined License Information Items:

The staff review of BBNPP FSAR Section 8.2.1.1 found the applicant provided sufficient site specific information regarding the offsite transmission system and their connections to the station switchyard to demonstrate the independence of the transmission lines feeding the BBNPP switchyard. (COL Information Item 8.2-1)

FSAR Figures 8.2-1 and 8.2-1 show the new BBNPP switchyard is connected to BBNPP by means of six overhead lines. The BBNPP switchyard is connected to the PPL Electric Utilities Corporation (PPL EU) transmission system by two normally energized, physically independent, overhead 500 kV transmission lines.

FSAR Table 8.2-1 shows the 500 kV transmission lines are single circuits, each circuit having a thermal rating of 4260 MVA. One transmission line connects the BBNPP site to an expansion of the existing Susquehanna 500 kV Yard and the other transmission line connects the BBNPP site to the new Susquehanna 500 kV Yard 2. This arrangement provides two preferred sources of power for the reactor protection system and engineered safety features (ESFs) during normal, abnormal, and accident conditions.

The two transmission lines and their associated structures interconnecting the BBNPP switchyard and the transmission system are designed and located to successfully withstand the loading requirements for postulated environmental conditions and for postulated line breaking and tower failures to minimize the possibility of their simultaneous failure.

The staff review of BBNPP FSAR Section 8.2.1.2 found the applicant provided sufficient site-specific information for the switchyard layout design to demonstrate the independence of the offsite power connection from the BBNPP switchyard to the BBNPP auxiliary transformers. (COL Information Item 8.2-2)

The new 500 kV Gas Insulated Switchyard (GIS) for BBNPP has been designed to accommodate the output of BBNPP. The switchyard is located on the BBNPP site approximately 150 ft east of BBNPP. The BBNPP switchyard includes six bays in a breaker-and-a-half / double breaker configuration.

The BBNPP switchyard circuit breakers and disconnect switches are sized in accordance with IEEE Standard C37.06 and the breakers are equipped with dual trip coils. The 500 kV circuit breakers in the switchyard are rated according to the following criteria.

- Continuous current.
- Interrupting duty.
- Momentary rating.
- Maximum expected operating voltage.

The staff review of BBNPP FSAR Section 8.2.2.7 found the applicant provided site-specific information for responding to a loss of Offsite Power. (COL Information Item 8.2-3)

The staff found that identifies BBNPP includes two redundant SBO diesel generators designed in accordance with 10 CFR 50.63 and Regulatory Guide 1.155. The staff agreed that reliance on additional off-site power sources as an alternate AC source was not required. The staff addressed actions necessary to restore off-site power are described in FSAR Section 8.4.2.6.4.

The staff review of BBNPP FSAR Section 8.2.2.4 found the applicant provided sufficient site-specific information regarding grid stability analysis. (COL Information Item 8.2-4)

Two PJM studies are relevant for BBNPP: The preliminary Susquehanna 1600 MW R01-R02 Impact Study Re-study (SIS) and the PJM Preliminary Stability Study for R01-R02, Bell Bend 500KV-1800MW (PSS). The SIS projects the impact that BBNPP will have on the network and the PSS shows that PJM Generator Interconnection for Bell Bend is stable for all tested conditions. The PSS analyzed transient stability for the addition of BBNPP, and was prepared using PJM's planning criteria against the 2012 summer peak conditions load and identified design requirements necessary to maintain the reliability of the transmission system. The criteria are based on PJM planning procedures, NERC Planning Standards, and RFC Regional Reliability Council planning criteria. For the stability analysis, light loading (50% of peak loading) is utilized with maximum generation.

The computer analysis was performed using the Siemens Power Technology International Software PSS/E. The analysis examined conditions involving loss of the largest generating unit, loss of the most critical transmission line, and multiple facility contingencies.

The results of the study conclude that with the additional generating capacity of BBNPP the transmission system remains stable under the analyzed conditions, preserving the grid connection, and supporting the normal and shutdown requirements of BBNPP.

A PJM System Voltage Study, using PSS/E software for load flow, was performed to determine the maximum and minimum voltage that the switchyard can maintain without any reactive support from BBNPP. The study used the same reliability planning criteria as was used on the SIS. Based on the results of the System Voltage Study, the grid will not be lost due to the loss of the largest generating unit (i.e., BBNPP), the loss of the most critical transmission line, or the loss of the largest load on the grid. The design of the on-load tap changers for each Emergency Auxiliary Transformer (EAT) ensures that the downstream EPSS 6.9 kV buses have sufficient voltage to preclude the degraded voltage protection scheme from separating the buses from the preferred power source.

The application also indicated that following recommended modifications to the renamed Susquehanna-Lackawanna 500 kV line the local transmission system would remain stable. Upon completion of these modifications and verification of the updated analysis

following those modifications, the staff believes BBNPP will satisfy the requirements of GDC 17, Section ii. **(RAI 8.2-1)**

The staff review of BBNPP FSAR Section 8.2.1.2 found the applicant provided adequate site-specific information for the protective devices that control the BBNPP switchyard breakers and other switchyard relay devices. (COL Information Item 8.2-5)

Electrical protection of circuits from the BBNPP switchyard is provided by a primary and secondary relaying scheme and a breaker failure scheme. The current input for the protective relaying schemes come from separate sets of circuit breaker bushing current transformers. Also, the control power for all primary and secondary relaying schemes is supplied from two switchyard 125 VDC battery systems located in the BBNPP 500 kV switchyard control house, separate from the battery systems within the BBNPP, which support the physical independence of the offsite power transmission sources required by GDC-17, Section iii.

In FSAR Section 8.2.2.5, the applicant provided adequate site-specific information for the station switchyard equipment inspection and testing plan. (COL Information Item 8.2-6)

The applicant referred to a future interface agreement between BBNPP and PJM that would address the inspection and maintenance of the transmission components of the offsite power system. **(Post COL ITEM 8.2-2)**

In FSAR Section 8.2.1.1 the applicant provided site specific information regarding future communication agreements and protocols between the station and the transmission system operator, independent system operator, or reliability coordinator/authority. (COL Information Item 8.2-7)

In FSAR Section 8.2.1.1, the applicant stated PJM, PPL EU and the BBNPP operator would have formal agreements and protocols in place to provide safe and reliable operation of the transmission system and equipment at BBNPP. These agreements would ensure Nuclear Plant Licensing Requirements will be monitored and maintained to ensure compliance with GDC 17 and GDC 18.

The applicant indicated in FSAR Section 8.2.1.1 that during plant operation, BBNPP would rely on PPL EU and PJM (through PJM's Energy Management System (EMS) program) to continuously monitor real-time power flows and assesses contingency impacts. Operational planning studies would also be performed using offline power flow study tools to assess near term operating conditions under varying load, generation, and transmission topology patterns to ensure compliance with GDC 17.

The BBNPP FSAR did not address the North American Electric Reliability Corporation reliability standard NUC-001-1, Nuclear Plant Interface, which formalizes agreements between the nuclear plant operator and the transmission entities for the purpose of ensuring nuclear plant safe operation and shutdown. **(RAI 8.2-2)**

The staff review of BBNPP FSAR Section 8.2.1.2 found the applicant provided adequate site-specific information regarding indication and control of switchyard components. (COL Information Item 8.2-8)

Control power for switchyard breakers required for BBNPP offsite power from the transmission system is provided by a dual set of batteries located inside the switchyard control house in the switchyard. A switchyard DC system undervoltage condition is alarmed in the main control room.

Administrative control of switchyard breakers is shared between BBNPP and PJM. The switchyard breakers connecting the Main Step-Up transformers and the auxiliary transformers are controlled by BBNPP and the breakers associated with the offsite connecting transmission lines is delegated to the transmission system owner (PPL EU). Local tripping control is also provided at the circuit breakers. Disconnect switches are provided to individually isolate each circuit breaker from the switchyard bus and associated lines. This ensures compliance to GDC-17 Sections ii, iv and v.

The staff addressed 10 CFR 50.63 as it relates to an alternate AC (AAC) power source as part of their review of FSAR Section 8.4.

ITAAC:

Site-specific inspections, tests, analyses and acceptance criteria for the site-specific supplemental information for the offsite power system are given in the BBNPP application Part 10. No license conditions are proposed for this section. Site specific ITAACs are presented in Appendix B to Part 10 of the application. The staff reviewed the site-specific ITAACs, and found them adequate to address the required site specific inspections, tests, analyses and acceptance criteria for the offsite power system. The results of the following off-site power system inspections, tests, or analyses are required for post COL review:

- Verify the as-built Load Flow and Voltage studies **(RAI 8.2-3)**
- Verify that modifications required to ensure the stability of the transmission system required by the PSS, and other modifications identified in subsequent studies **(RAI 8.2-1)**
- Verify the conclusions of the Load Flow and Voltage Regulation studies (by measurement) to demonstrate transmission system capability to provide adequate voltage to the Class 1E loads during static and dynamic conditions. **(RAI 8.2-4)**

Technical Specifications:

The staff review of BBNPP FSAR Section 16 and Part 4 of the BBNPP application for the offsite power system and found the applicant provided adequate site-specific Technical Specifications except as noted below.

Surveillance Requirement 3.8.1.1 verifies Offsite Power Operability by solely using circuit breaker alignment. General Design Criteria 17 requires that the design minimize the potential of losing offsite power following a trip of the nuclear unit. Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power, demonstrated that circuit breaker alignment is insufficient, by itself, to confirm that the Offsite Power System has the capacity and capability to provide sufficient voltage and frequency to power the required safe shutdown loads following a trip of the

nuclear unit. The COL applicant must demonstrate that the Offsite Power System has the capacity and capability to provide sufficient voltage and frequency to power the required safe shutdown loads following a trip of the nuclear unit on a real time basis. **(RAI 8.2-5)**

8.2.5 Post Combined License Activities

There are no post COL activities related to this section.

8.2.6 CONCLUSION

The staff is reviewing the information for the U.S EPR on Docket No. 52-020. The results of the NRC staff's technical evaluation of the information related to this section to be incorporated by reference in the BBNPP FSAR will be documented in the staff's safety evaluation report on the design certification application for the U.S EPR. The SER for the U.S. EPR is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 8.2 of this SER to reflect the final disposition of the design certification application for the U.S EPR.

As the bases for evaluating the adequacy of the design of the Offsite Power System to accomplish the plant's safety-related functions as presented in the U.S. EPR Design Control Document (DCD) Tier 2, Chapter 8, "Electric Power," the U.S. Nuclear Regulatory Commission (the staff) used the acceptance criteria and guidelines for electric power systems contained in Chapter 8, "Electric Power," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants—LWR Edition" (SRP); Regulatory Guide (RG) 1.153, "Criteria for Safety Systems"; RG 1.155, "Station Blackout"; and Section 50.63 of Title 10 of the Code of Federal Regulations (CFR), "Loss of All Alternating Current Power."

With respect to the supplemental information presented in the BBNPP application, the staff concluded that the supplemental information adequately addressed the acceptance criteria contained in the bases documents, with the exceptions noted below.

In conclusion, the applicant has provided sufficient information for satisfying the following applicable regulations:

- 1 GDC 17 as it relates to the Offsite Power System except as noted above in the Technical Evaluation.
 - a. capacity and capability to permit functioning of structures, systems, and components important to safety; **(RAI 8.2-1 through RAI 8.2-4)**
 - b. provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit or loss of power from the onsite electric power supplies; **(RAI 8.2-2)**
 - c. physical independence; and
 - d. availability. **(RAI 8.2.2)**
- 2 GDC 18 Inspection and testing of the offsite power systems. **(RAI 8.2.2)**

- 3 10 CFR 50.63 An AAC power source provided for safe shutdown (non-design-basis accident) in the event of a station blackout. (See the staff review of FSAR Section 8.4)
- 4 10 CFR 50.65(a)(4) Assessment and management of the increase in risk that may result from proposed maintenance activities before performing the maintenance activities. These activities include, but are not limited to, surveillances, post-maintenance testing, and corrective and preventive maintenance. **(RAI 8.2-2)**
- 5 Regulatory Guide (RG) 1.155 Adequacy of the AAC source and the independence of the AAC power source from the offsite power system and onsite power system and sources. (See the staff review of FSAR Section 8.4)
- 6 RG 1.160, Effectiveness of maintenance activities for onsite emergency AC power sources including grid-risk-sensitive maintenance activities (i.e., activities that tend to increase the likelihood of a plant trip, increase loss of onsite power (LOOP) frequency, or reduce the capability to cope with a LOOP or station blackout (SBO)). **(RAI 8.2-2)**

As a result of RAIs 8.2-1 and RAI 16.3.8.1-1, the staff is unable to finalize its conclusions on the capability and availability of the offsite power system in accordance with the requirements of the following NRC regulations:

- 1 GDC 17 as it relates to the Offsite Power System's capacity and capability to power the required BBNPP loads. **(RAI 8.2-1 through RAI 8.2-4)**
- 2 GDC 17 as it relates to the Offsite Power System's provisions to minimize the probability of losing electric power as a result of, or coincident with, the loss of power generated by the nuclear power unit; **(RAI 8.2-2)**
- 3 GDC 17 as it relates to the availability of the Offsite Power System and 10 CFR 50.65(a)(4) (and RG 1.160) as it relates to the assessment and management of the increase in risk that may result from maintenance activities on the transmission system affecting the nuclear unit; **(RAI 8.2-2 and RAI 8.2-5)**

BBNPP
REQUESTS for ADDITIONAL INFORMATION

FSAR Section 8.2

RAI 8.2-1 Transmission System Modifications

GDC 17 requires that the Offsite Power System have the capacity and capability to provide sufficient power to allow the safety-related loads to perform their safety function

FSAR Section 8.2.1.1 and 8.2.2.4 indicate there are a number of modifications required to permit the Bell Bend plant to be connected to the transmission. Verify that modifications to the breakers at both ends of the renamed Susquehanna-Lackawanna 500 kV transmission line, and other recommendations related to stability, have been completed prior to initial fuel loading. Add this verification to the FSAR as a Post COL Activity and/or as an ITAAC activity.

A response to this RAI is required to clarify how the interface agreements contribute to the assurance of the availability and capability of the offsite power system as required by GDC 17 and the testing requirements of GDC 18.

RAI 8.2-2 Conformance to NERC Reliability Standards

GDC 17 requires the preferred power system (i) have the capacity and capability to permit functioning of structures, systems, and components important to safety; (ii) be physically independent; (iii) be availability and (iv) have provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit or loss of power from the onsite electric power supplies.

GDC 18 requires the capability for inspection and testing of the offsite electric power system.

10 CFR 50.63 requires an alternate AC (AAC) power source (as defined in 10 CFR 50.2) be provided for safe shutdown in the event of a station blackout.

10 CFR 50.65(a)(4) requires the assessment and management of the increase in risk that may result from proposed maintenance activities before performing the maintenance activities. These activities include, but are not limited to, surveillances, post-maintenance testing, and corrective and preventive maintenance in the interface between the nuclear generator and the transmission entity.

FSAR Section 8.2.1.1 states the frequency and type of studies to be performed, as well as the required transmission system operation criteria are outlined in the agreements and are in accordance with Federal Energy Regulatory Commission (FERC) reliability standards, PJM and PPL EU standards, regional practices and the Bell Bend Transmission Owner Agreement. The applicant failed to mention the Reliability

Standards of the North American Reliability Corporation (NERC), and in particular, NERC Reliability Standard NUC-001-1, Nuclear Plant Interface.

FSAR Sections 8.2.1.1 and 8.2.2.4 state a system impact study was performed for the addition of Bell Bend based upon Regional Reliability criteria. The applicant again failed to mention the Reliability Standards of the North American Reliability Corporation (NERC), and in particular, NERC Reliability Standard NUC-001-1, Nuclear Plant Interface.

FSAR Section 8.2.2.5 states maintenance, testing, calibration and inspection, PPL EU follows its own field test manuals, vendor manuals and drawings, industry's maintenance practices and observes (FERC) requirements. The applicant again failed to mention the Reliability Standards of the North American Reliability Corporation (NERC), and in particular, NERC Reliability Standard NUC-001-1, Nuclear Plant Interface.

FSAR Section 8.2.2.8 indicates no departures were taken from the U.S. EPR approach for 10 CFR 50.65 (a)(4) regarding assessment of risk.

FERC has endorsed the North American Reliability Corporation (NERC) Reliability Standard NUC-001-01, Nuclear Plant Interface. The interface between the generator and the transmission system should be governed by NERC Reliability Standard NUC-001-01. FSAR Section 8.2.1.1, 8.2.2.5, 8.2.2.7 and Section 8.2.2.8 failed to address this NERC reliability standard on Nuclear Plant Interface. This interface standard addresses communication protocols to assure the offsite power system has the capacity and capability to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit or loss of power from the onsite electric power supplies.

NERC Reliability Standard NUC-001-01 interface requirements also address GDC 17, as it relates to the availability of the offsite power system and provisions to minimize the probability of losing electric power from the offsite power system upon loss of the generating unit, and 10 CFR 50.65(a)(4), as it relates to the assessment and management of the increase in risk that may result from proposed maintenance activities before performing the maintenance activities. Conformance to this reliability standard will increase the assure maintenance at either the nuclear generating unit or the transmission system is coordinated to reduce risk and control availability of the offsite power supply.

Confirm the interface agreements between the generator (BBNPP) and the transmission system entities (PJM and PPL EU) that are in place are governed by the North American Reliability Corporation, Reliability Standard NUC-001-1, Nuclear Plant Interface Coordination. This standard requires coordination between Nuclear Plant Generator Operators and Transmission Entities for the purpose of ensuring nuclear plant safe operation and shutdown.

A response to this RAI is required to assure the provisions are in place to (1) Minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit or loss of power from the onsite electric power supplies as required by GDC 17; (2) assure communication protocols address GDC 18 and 10 CFR 50.65 as they relate to the maintenance and testing of interface components; and, (3) agreements are in place that

address 10 CFR 50.65 as it relates to operating procedures between the transmission system entities and the nuclear unit to restore offsite power following a loss of offsite power.

RAI 8.2-3 Incorporate Results of Load Flow and Voltage Regulation Studies into Interface Agreement

GDC 17 as it relates to the preferred power system's (i) capacity and capability to permit functioning of structures, systems, and components important to safety; (ii) provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit or loss of power from the onsite electric power supplies; (iii) physical independence; and (iv) availability.

FSAR Section 8.2.2.4 describes the load flow and voltage studies that were performed as part of the PPL studies for the inclusion of the BBNPP onto the PPL EU system. These studies were performed to establish the minimum switchyard voltage that would result in adequate voltage at the Class 1E loads. Confirm (1) this information is included in the interface agreements with the transmission entities, and (2) confirm that the final studies will be performed with as-built data prior to fuel loading at BBNPP.

Include this commitment in the FSAR as a Post COL Activity and an ITAAC item, "Verify the as-built Load Flow and Voltage studies have been performed to establish the minimum voltage required at the switchyard to ensure adequate voltage at the Class 1E loads and the results have been transmitted to the transmission entities".

RAI 8.2-4 Verify Results of Load Flow and Voltage Studies by Site-specific Field Measurements

GDC 17 as it relates to the preferred power system's (i) capacity and capability to permit functioning of structures, systems, and components important to safety; (ii) provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit or loss of power from the onsite electric power supplies; (iii) physical independence; and (iv) availability.

FSAR Section 8.2.2.4 describes the load flow and voltage studies that were performed as part of the PJM studies for the inclusion of the BBNPP onto the PPL EU system. Confirm the results of the load flow and voltage regulation studies will be verified by actual measurement at the BBNPP interface.

Include this commitment in the FSAR as a Post COL Activity and an ITAAC item, "Verify the conclusions of the Load Flow and Voltage studies (by measurement) to demonstrate transmission system capability to provide adequate voltage to the Class 1E loads during static and dynamic conditions following a Unit 2 plant trip during startup testing".

RAI 8.2-5 Ability to Determine Offsite Power Operability

GDC 17 requires that the offsite power system have the availability to perform its safety function as required by GDC 17 and the capacity and capability to satisfy the last paragraph of GDC 17.

Surveillance Requirement 3.8.1.1 verifies Offsite Power Operability by solely using circuit breaker alignment. General Design Criteria 17 requires that the design minimize the potential of losing offsite power following a trip of the nuclear unit. Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power, demonstrated that circuit breaker alignment is insufficient, by itself, to confirm that the Offsite Power System has the capacity and capability to provide sufficient voltage and frequency to power the required safe shutdown loads following a trip of the nuclear unit. State how the COL applicant will demonstrate that the Offsite Power System is available with the capacity and capability to provide sufficient voltage and frequency to power the required safe shutdown loads following a trip of the nuclear unit on a real time basis.

Response to this RAI is required to assure the Offsite Power System has the availability to perform its safety function as required by GDC 17 and the capacity and capability to satisfy the last paragraph of GDC 17.

**NUMARK FORM-3
DOCUMENT TRANSMISSION RECORD FORM**

**DOCUMENT TITLE/NUMBER
Draft TER for SCOL Section 8.2 – Offsite Power System
(Callaway, NMP, Bell Bend)**

NRC Task Order #	47, 48, 49
NRC Task #	4
NRC JCN #	Q-4159

DOCUMENT RECEIVED BY TM FROM AUTHOR	DATE
DOCUMENT SENT TO PQOG	2/7/09
DOCUMENT SENT TO TD	NA
DOCUMENT SENT TO TM FROM PQOG	2/12/09
DOCUMENT SENT TO TM FROM TD	NA
ALL COMMENTS RESOLVED BY TM	
FINAL DRAFT SENT TO PM	
FINAL DOCUMENT SENT TO NRC	

**NUMARK FORM F-2
COMMENT AND DISPOSITION RECORD FORM**

DOCUMENT TITLE/NUMBER

**Draft TER for SCOL Section 8.2 – Offsite Power System
(Callaway, NMP, Bell Bend)**

NRC Task Order # 47, 48, 49

NRC Task # 4

NRC JCN # Q-4159

PQOG COMMENTS/RESOLUTIONS

REVIEWER NAME / ORGANIZATION: Brian Grimes/PQOG

**Steve Lewis: Regulatory Review; George Skinner: Technical Review; Brian Grimes:
template subsections review**

Regulatory Review Comments: See attached checklist.

Technical Review Comments: See attached checklist.

Template Subsections Comments: See three attached checklists.

Brian Grimes, Chair, PQOG

**PQOG Regulatory Review of TERs for Callaway2, NMP3, and BBNPP SCOLs Section 8.2
Technical Evaluation, Conclusions, RAI**

PQOG Reviewer: Stephen Lewis Date: 02/12/09

Checklist Item	PQOG Review Comments	Disposition
Technical Evaluation	Note: comments to all three Applications, unless otherwise indicated	
Sections incorporated by reference (IBR) use the standard wording in the NUMARK COL Guidance Document. Outstanding DC RAI or Open Items for the corresponding DC section are noted.	Yes, as to wording. Cannot answer further because the writers of the TERs did not state whether the Section 8.2 TERs address all outstanding DC RAIs and Open Items within the scope of 8.2. Such an affirmative statement is required.	
For sections not entirely IBR, system/program description is provided for the scope of COL information being reviewed (synopsis)	Yes.	
For sections not entirely IBR, a general description of the review process is provided including any confirmatory analyses, site visits, or audits.	Yes.	
Material is not copied from the FSAR	This reviewer did not identify any material in Section 8.2 of these TERs as being copied from the FSARs	
For sections that are not entirely IBR, the following subheadings are used in the Technical Evaluation section (only if applicable to this TER section):		
Tier 1 Departures	Done correctly	
Tier 2 Departures	With respect to the matter to be further addressed by NMP3 <u>Callaway2</u> regarding different voltages (345kV and 500kV), the Departure process (similar to the 10 CFR 50.59 process) needs to be followed. See Revision 3 (February 7, 2009) to "COL FSAR GUIDANCE DOCUMENT FOR NUMARK TEMPLATE WRITERS AND TECHNICAL REVIEWERS [for] THE U.S. EPR" page 7. The NRC staff does not consider <u>The reviewer needs to state whether this matter is considered</u> , to require prior NRC approval. Nevertheless, the Applicant will have to undertake a review to verify	This is not a 50.59 type departure and the RAI is sufficient to identify this difference.

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	that this matter can be properly handled under the “change” process	
Interfaces Requirements (Plant or Site Parameter) COL Table 1.8-1	Cannot answer because writer did not affirmatively state in the Technical Evaluation that all of the Interface Requirements within 8.2 scope have been addressed, as required per NUREG 0800, Section 1, pp1.03-1.04.	
Combined License Information Items The adequacy of the COL disposition of the U.S. EPR COL Information Items is addressed. Deferral of information or actions to the post-COL stage is determined appropriate and the need for any additional items is addressed. A positive statement confirming this is required.	Cannot answer because the writers of the TER did not affirmatively state in the Technical Evaluation that all of the Combined Information Items have been addressed. NUREG 0800, Section 1, pp. 1.03-1.04. As an example, for Callaway2, the sequence of numbering of the Combined License Information indicates that some of the Information Items are not addressed.	See Section 8.2.2 Interface Requirements
Site-specific information replacing Conceptual Design Information An assessment is made as to the adequacy of the information, (whether included or IBR) and the FSAR content. A positive statement confirming this is required. Statements are consistent with any review of this information in the U.S. EPR SER.	N/A because there was no Conceptual Design Information provided in the U.S.EPR FSAR Section 8.2.	
Supplemental Information	N/A	
License Conditions	No license conditions are proposed by the Applicant or considered by the NRC.	
Initial Test Program Adequacy of applicable initial testing requirements applicable to the COL scope of review is addressed. A positive statement confirming this is required.	Cannot answer because the writers of the TER have not stated whether Offsite Power is covered within the Initial Test Program.	Initial Test Program addressed in TER 14.2
Technical Specifications Adequacy of Technical Specifications applicable to the COL scope of review is addressed. A positive statement confirming this is required.	All three TERs appropriately acknowledge the relevance of TS. In all three TERs the technical reviewer correctly addresses where the reader should look for the TS. There is (properly) no issue raised with respect to the TS.	
ITAAC	All three Applicants have handled this item correctly	

Adequate additional COL ITAAC are proposed, if appropriate. A positive statement confirming this is required.		
Cross-cutting requirements (TMI, USI/GSI, Op Experience)	N/A.	
Evaluation elements for each applicable review area:		
GDC/Regulations that apply to the COL information being reviewed are stated	Yes.	
What reviewer did to evaluate the submittal is stated and related to the SRP section Review Procedures	Yes.	
There are placeholders in bold type for any related section reviews that need to be done before the conclusions stated in the TER are valid	N/A. The NRC staff NUMARK PQOG believes that the reference to Chapter 16 as underlying an RAI is not appropriate and that the RAI should, instead, reference section 8.2	RAI number changed to refer to Section 8.2.
How the acceptance criterion is met is stated (e.g., followed regulatory guidance)	Yes.	
A conclusion is reached on each GDC/regulation applicable to the COL information being reviewed. A positive statement confirming this is required.	Yes.	
If TER is not comparable to another COL or ESP SER level of detail there is a reason (not to be stated in the TER). Note: only if such becomes available.	N/A.	
If the COL FSAR incorporates by reference U.S. EPR conceptual design information rather than replacing it, the SER for the US EPR adequately evaluates the information.	N/A, in that the equivalent section of the U.S. EPR does not include any conceptual design criteria.	
Conclusions		
Applicable standard wording in the NUMARK COL Guidance	Yes.	

Document is used. SRP section Evaluation Findings wording applicable to the COL scope of review is generally followed: Length is typically one paragraph for a mostly IBR section.		
Brief statements are added on the bases for each conclusion that a GDC/regulation is met.	Yes.	
Conclusions are consistent with Technical Evaluation section and supported by a discussion in the technical evaluation section.	Yes.	
RAI		
Reason for RAI is briefly addressed in Technical Evaluation section of draft TER	Yes.	
RAI number is inserted in Technical Evaluation section text and bolded .	Yes.	
Additional post-Combined License activities proposed in the TER have an RAI to determine whether applicant will add to their list in the FSAR.	All three Applicants should review their FSARs to determine that all such activities are covered by an RAI be requested by RAIs to include the proposed Post Combined License Activities in their <u>FSAR</u> .	New RAIs prepared to address the potential Post COL activities.
The regulatory basis is provided at the beginning of each RAI (or RAI cluster). This includes the applicable GDC or reg. and may also refer to acceptance criteria.	All three Applicants-reviewers have stated the regulatory basis in an acceptable manner in their RAIs, which is not always at the beginning of the RAI. No corrective actions needed.	
RAI is within the scope of the COL information reviewed in the section.	All three Applicants-TERs meet this item.	
RAI is phrased as a question or questions.	No, but the RAIs are clear. In these RAIs, regulatory reviewer suggests that the wording be left as is.	
RAIs noting inconsistencies are generated (but the regulatory basis is to “assure completeness and accuracy of the plant design and licensing basis.”). These should be collected into one RAI if possible.	N/A.	

**PQOG Template Subsections Review for Callaway, NMP, Bell Bend SCOL Section 8.2 – Offsite Power System
Introduction, Summary of Application, Regulatory Basis, COL Information Items**

PQOG Reviewer: Brian Grimes Date: 9 February 2009

Checklist Item	PQOG Review Comments	Disposition
Title	Note: Comments apply to all three SCOL TERS unless otherwise indicated.	
The FSAR title, rather than the NUREG-0800 section title is used	OK	
For the first template in a chapter, the Chapter title and a short summary paragraph are inserted. If there are additional sections without templates after the Chapter title (typically an X.1 section), the title for these should also be listed and a short summary paragraph inserted.	N/A	
Sections incorporated by reference (IBR) use the standard wording in the NUMARK COL Guidance Document. Outstanding DC RAI or Open Items for the corresponding DC section are noted.	OK. Conclusion section has an adequate general statement on the ongoing review. Perhaps the Phase 2 SER (after review of the EPR RAI responses) should flag any specific open items.	Open Items will be identified in Phase 2
Where multiple sections in the same chapter are incorporated by reference, summarization at a higher level is acceptable.	N/A	
Note: the following is for sections IBR with departures, additional information, or that are primarily COL-specific.		
Introduction		
Length: one or two paragraphs	OK	
Description: generic summary of section topic, not FSAR wording. Can use SRP wording. Can use DC section Introduction if applicable.	Could shorten the second sentence to leave out the GDC citations, since they are not completely consistent with those given in the Regulatory Basis or Conclusions sections.	GDCs 2,4 and 5 removed.
Summary of Application		
Length: Up to one page. Roadmap provided to FSAR information for following subtitles.	Length is on the order of 7 pages. Far too long. For this section (with 8 COL items), less than three pages should be the target. See individual comments below.	Shortened by only including a pointer to the section that addresses the COL items.
Information not quoted from the FSAR.	Callaway: literal use of text from the FSAR is extensive. Should be summarized in our own words. NMP: literal use of text from the FSAR is extensive. Should	Revised wording

	be summarized in our own words. Bell Bend: some FSAR words, but probably OK., except bullets could be summarized.	
Roadmap references correct and complete.	See comments below.	
Uses the standard wording in the NUMARK COL Guidance Document for partial IBR. For no IBR, describes the system or program for the section that is proposed in the COL FSAR.	OK	
Note: list and provide a brief description only for the following headings that are applicable.		
FSAR Tier 1 Departures (Exemptions): (The small number of Calvert Cliffs COL departures from U.S. EPR Tier 1 with related exemption requests are listed in Part 7 of the application. Additional exemption requests are also listed. The departures are also listed in COL FSAR section 1.8.2.)	N/A	
FSAR Tier 2 Departures: (Departures from U.S. EPR Tier 2, from the COL FSAR section text.)	N/A	
Interface Requirements: This should include information related to plant and site parameter interfaces (COL FSAR Table 1.8-1)	At the end of the first bullet add : “also Tier 2, Table 1.8-1, item 8-1)” At the end of the second bullet add: “also Tier 2, Table 1.8-1, item 8-3)” Eliminate the third bullet, as it is evaluated in section 8.3.	Added references to Table 1.8-1 Moved third bullet to 8.3
Combined License Information Items: (From COL FSAR Table 1.8-2. The wording of these may be different than in the US EPR FSAR.)	OK. Should be shortened to a paragraph or two under each item (eliminating FSAR literal wording). If details are needed, these should appear in the Technical Evaluation section in support of our evaluation.	Shortened items.
Replacement of Conceptual Design Information: (Or incorporation by reference of conceptual information in the U.S. EPR Tier 2 section.)	N/A	
Supplemental Information:	N/A	
License Conditions:	N/A	
Initial Test Program:	No site-specific items proposed in the FSAR. The items proposed in the TER for Post-COL activities may fall in this category.	These items may windup in ITAAC following response to RAIs
Technical Specifications:	OK.	
ITAAC:	OK	
Cross Cutting Requirements (TMI, USI/GSI,	N/A	

Operating Experience):		
Regulatory Basis		
Length: Up to one page.	OK	
The applicable standard introductory wording used from the NUMARK COL Guidance Document followed by list of requirements, followed by acceptance criteria wording, followed by brief paragraph summarizing acceptance criteria (e.g., listing R.G.)	Introductory wording is OK.	
Words from NUREG-0800 may be used without quotes	OK	
The 52.80(a) requirement should not be listed as it is the same for all sections (will be covered in COL SER Chapter 1)	OK	
GDC 5 should not be listed (will be covered in COL SER Chapter 1)	OK	
Requirements may be abbreviated from those listed in NUREG-0800, but all requirements relevant to the COL scope of review (and only those requirements) should be listed.	NUREG-0800, Section 8.2 also lists GDC-2, GDC-4, and 50.65(a)(4). These should be listed. An interface with the Chapter 3 reviews of GDC 2 and 4 could be inserted (and bolded). This would also eliminate the need to discuss these in the Technical Evaluation section. 50.65(a)(4) is mentioned in the Conclusion section, but not in the Technical Evaluation section.	GDC 2 & 4 IBR Added discussion to Tech Eval
Requirements and Acceptance Criteria are those found in the relevant NUREG-0800 section.	R.G. 1.160 and R.G. 1.182 are included in the SER and could be listed. (R.G. 1.160 is mentioned in the Conclusion section, but not in the Technical Evaluation section.)	Removed from conclusions
Post Combined License Activities		
Those U.S. EPR Combined License Information Items that will continue beyond granting the Combined License are correctly extracted and listed from COL FSAR Table 1.8-2. (These are the items with a "Y" in the COL Holder column of U.S. EPR FSAR Tier 2 Table 1.8-2.)	(Note: different Post COL items are listed in the three TERs, but the same comment applies. See p. 8 of the NUMARK COL Guidance, Rev.3.) The items listed in the Table do not appear in COL FSAR Table 1.8-2. There are no corresponding items in the USEPR marked as a COL Holder responsibility. If the TER developer believes that these items should be a COL holder responsibility, then an RAI should be developed, with corresponding rationale in the Technical Evaluation section. Delete these Table items until the applicant has agreed to include them in the FSAR.	Changed the Post COL Activity Items into RAIs.
Standard language from the NUMARK COL Guidance Document is Used	OK	

PQOG Technical Review for TER of NMP3NPP COL Section 8.2 - Technical Evaluation, Conclusions, RAI

PQOG Reviewer: George Skinner Date: 2/12/09

Checklist Item	PQOG Review Comments	Disposition
Technical Evaluation		
Assumptions and logic of the FSAR safety evaluation are addressed and TER evaluation appears technically correct and is logically supported in each of the following areas. System information needed to reach a conclusion is included. Applicable Generic Letters and NRC Knowledge Transfer Guides are considered (if listed in the SRP (NUREG-0800)).	See individual items.	
List and evaluate specific Areas of Review (from SRP _____ Section I) and additional items from Review Procedures (from SRP ____ Section III) <i>Note: only those that are applicable to the COL scope of review for this section.</i>	See individual items.	
COL Information Items		
Site-specific information regarding transmission system and its connection to switchyard reviewed.	OK	
Site-specific information on switchyard layout design reviewed.	OK	
Site-specific information on actions to restore offsite power and use nearby sources reviewed.	OK	
Site-specific grid stability analysis reviewed.	OK	
Site-specific information on switchyard breaker protective devices and controls reviewed.	OK	
Site-specific information on switchyard inspection and testing reviewed.	OK	
Site-specific information on communication protocols between the station and the TSO reviewed.	See comment for RAI 8.2-3	
Site-specific information on analysis tool used to determine real time condition of the transmission system reviewed.	OK	
Site-specific information on indication and control of switchyard component indications and controls reviewed.	OK	
SRP 8.2, Section I, Areas of Review		
Preferred power system arrangement reviewed.	OK	
The independence of the preferred power system is evaluated with respect to the onsite power system and any AAC power source provided for station blackout.	OK (Referred to 8.4 Review)	
Design information and analyses demonstrating the suitability of the power sources from the grid, including transmission lines, breakers, and transformers used for supplying preferred power from distant sources, are reviewed to ensure that each path has sufficient capacity	OK	

and capability to perform its intended function.		
Effect of environmental conditions on preferred power reviewed.	This does not appear to be addressed in any detail in the DC or COL FSAR. Should RAI be issued?	All three plants address environmental condition withstand capability in 8.2.1.1
SRP 8.2, Section III, Review Procedures		
Review determined that at least two separate circuits from the transmission network to the onsite power distribution system buses are provided	This attribute was not mentioned in the Technical Evaluation or Conclusions sections.	Added pointer to attribute
Routing of transmission lines was examined on the station layout drawings to ensure that at least two circuits from the offsite grid to the onsite distribution buses are physically separate and independent.	This attribute was not mentioned in the Technical Evaluation or Conclusions sections.	Added reference to the transmission layout drawing
The electrical schematics of the switchyard breaker control system, its power supply and the breaker arrangement itself were examined for the possibility of simultaneous failure of both circuits from single events	OK	
Loads for normal or abnormal operating conditions, accident conditions, or plant shutdown conditions were examine to ensure circuits from the offsite system to the onsite distribution buses have sufficient capacity and capability.	I did not see where the capacity and capability of the offsite power supplies was compared with plant loads. This appears to have been addressed by the reviewer in Post COL items 8.2-1 and 8.2-3, but an RAI should be issued.	Added RAI
The results of the grid stability analysis reviewed.	OK	
Verified that provisions are included in the design to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.	OK	
Verified that adequate procedures, administrative controls, and protocols are in place to ensure that no modifications to the offsite power system circuits credited for satisfying GDC 17 are implemented by offsite transmission system operating authorities, responsible for maintenance, modification, and operation of the offsite transmission grid, without the performance of a proper safety evaluation	This topic does not appear to have been addressed as part of the review of COL Information Item 8.2-7.	See RAI 8.2-1 reference to NUC-001-1
Underground or inaccessible power cables connecting offsite power to safety buses or power and control cables to equipment with accident mitigating functions reviewed.	N/A	Add RAI to describe the 5 secondary connections from the EAT/NATs to the plant in 8.3
The plant's offsite communications equipment and protocols, communication contingency procedures, communications circuit routing, and telemetry links used to monitor the power grid and to verify and maintain grid stability and operability were reviewed to determine that they are secure and will continue to function during	This topic does not appear to have been addressed as part of the review of COL information item 8.2-7.	See RAI 8.2-1 reference to NUC-001-1

severe weather events causing regional effects.		
To ensure that the requirements of GDC 5 are satisfied, the structures, systems, and components of the preferred power systems were examined to identify any that are shared between units of a multi-unit station.	U.S. EPR FSAR 8.2.2.3 discussed GDC 5 as relating only to <u>safety related</u> SSCs, and the COL FSARs IBR'd it, but SRP 8.2 appears to include the preferred power system in its scope. This may be due to a difference in interpretation of the terms "important to safety" used in the GDC and "safety related" used in the U.S. EPR FSAR. The offsite power system may be considered important to safety because it is the preferred source of power for ESF buses to mitigate an accident. Suggest writing an RAI to clarify this point. A similar question relates to compliance with GDCs 2 and 4.	The EPR design is a single unit design and GDC 5 does not apply
Review determined that grid reliability evaluations are performed, as part of the maintenance risk assessment required by 10 CFR 50.65 before performing "grid-risk-sensitive" maintenance activities.	Addressed in Conclusions, but not addressed in Technical Evaluation of COL Information item 8.2-7. Suggest providing discussion.	Added discussion in the Tech Eval to refer to NUC-001-1
ITAAC	OK	
CH 16, 3.8 Technical Specifications	OK	
Conclusion		
List and evaluate EVALUATION FINDINGS (from SRP 8.2 Section IV – also include any important Technical Rationale items in the SRP that bear on the conclusions). Note: only those that are applicable to the COL scope of review for this section.	See individual items.	
Statement describing basis for conclusions provided.	Statement prescribed in SRP 8.2, IV not provided. See SRP 8.2, IV, first indented paragraph	Added SRP wording
Compliance with GDC 2.	Not provided (see comment for GDC 5)	IBR
Compliance with GDC 4.	Not provided (see comment for GDC 5)	IBR
Compliance with GDC 17.	Statement not as completed as the one in SRP 8.2, IV 4, especially with regards to environmental conditions.	Added SRP wording
Compliance with GDC 18.	OK	
Compliance with 10 CFR 50.63	OK	
Compliance with 10 CFR 50.65(a)(4)	OK (SRP 8.2, IV 7 inexplicably refers to the onsite dc power system. The TER discusses correct scope.)	
RAI		
Technical adequacy of each RAI proposed (list RAIs)	See individual items.	

RAI 8.2-1	OK	
RAI 8.2-2	OK	
RAI 8.2-3	Reliability Standard NUC-001-1 is not identified SRP 8.2 as providing acceptance criteria for compliance with GDC-17 and GDC-18. Reference to this standard should be removed from the RAI. Similarly, Post COL item 8.2-4 should be deleted.	NO, NRC, NERC, FERC and industry worked together to develop this Reliability Standard to ensure adequate interface between the nuclear generator and the transmission system.
RAI 16.3.8.1-1	OK	
Other RAI that should be considered, including additional COL holder Action Items	RAI needed for additional COL Holder Activities 8.2-1, 8.2-2, and 8.2-3 to address capacity and capability of offsite power supply for voltage.	Added RAI

PQOG Technical Review for TER of BBNPP COL Section 8.2 - Technical Evaluation, Conclusions, RAI
PQOG Reviewer: George Skinner Date: 2/12/09

Checklist Item	PQOG Review Comments	Disposition
Technical Evaluation		
Assumptions and logic of the FSAR safety evaluation are addressed and TER evaluation appears technically correct and is logically supported in each of the following areas. System information needed to reach a conclusion is included. Applicable Generic Letters and NRC Knowledge Transfer Guides are considered (if listed in the SRP (NUREG-0800)).	See individual items.	
List and evaluate specific Areas of Review (from SRP ____ Section I) and additional items from Review Procedures (from SRP ____ Section III) <i>Note: only those that are applicable to the COL scope of review for this section.</i>	See individual items	
COL Information Items		
Site-specific information regarding transmission system and its connection to switchyard reviewed.	OK	
Site-specific information on switchyard layout design reviewed.	OK	
Site-specific information on actions to restore offsite power and use nearby sources reviewed.	OK	
Site-specific grid stability analysis reviewed.	A Post COL item was listed that was not in Table 1.8-2. If additional information is required to evaluate this item, an RAI should be used.	Added RAI
Site-specific information on switchyard breaker protective devices	OK	

and controls reviewed.		
Site-specific information on switchyard inspection and testing reviewed.	A Post COL item was listed that was not in Table 1.8-2. If additional information is required to evaluate this item, an RAI should be used.	Added RAI
Site-specific information on communication protocols between the station and the TSO reviewed.	Reliability Standard NUC-001-1 is not identified SRP 8.2 as providing acceptance criteria for compliance with GDC-17 and GDC-18. Reference to this standard should be removed. Similarly, Post COL item 8.2-3 should be deleted.	NO, NRC, NERC, FERC and industry worked together to develop this Reliability Standard to ensure adequate interface between the nuclear generator and the transmission system.
Site-specific information on analysis tool used to determine real time condition of the transmission system reviewed.	OK	
Site-specific information on indication and control of switchyard component indications and controls reviewed.	OK	
SRP 8.2, Section I, Areas of Review		
Preferred power system arrangement reviewed.	OK	
The independence of the preferred power system is evaluated with respect to the onsite power system and any AAC power source provided for station blackout.	OK (Referred to 8.4 Review)	
Design information and analyses demonstrating the suitability of the power sources from the grid, including transmission lines, breakers, and transformers used for supplying preferred power from distant sources, are reviewed to ensure that each path has sufficient capacity and capability to perform its intended function.	OK	
Effect of environmental conditions on preferred power reviewed.	This does not appear to be addressed in any detail in the DC or COL FSAR. Should RAI be issued?	Addresses in 8.2.1.1
SRP 8.2, Section III, Review Procedures		
Review determined that at least two separate circuits from the transmission network to the onsite power distribution system buses are provided	This attribute was not mentioned in the Technical Evaluation or Conclusions sections.	Added attribute with reference to the switchyard layout drawing
Routing of transmission lines was examined on the station layout drawings to ensure that at least two circuits from the offsite grid to the onsite distribution buses are physically separate and independent.	This attribute was not mentioned in the Technical Evaluation or Conclusions sections.	Added discussion on transmission line routing
The electrical schematics of the switchyard breaker control system, its power supply and the breaker arrangement itself were examined for the possibility of simultaneous failure of both circuits from single events	OK	

<p>Loads for normal or abnormal operating conditions, accident conditions, or plant shutdown conditions were examined to ensure circuits from the offsite system to the onsite distribution buses have sufficient capacity and capability.</p>	<p>I did not see where the capacity and capability of the offsite power supplies was compared with plant loads. BBNPP FSAR 8.2.2.4 indicated that a site specific calculation would be done later to demonstrate capability for a -5%, +10% transmission system operating voltage in lieu of the $\pm 10\%$ range stated in the U.S. EPR FSAR. This appears to have been addressed by the reviewer in Post COL items 8.2-4 and 8.2-5, but an RAI should be issued.</p>	<p>See discussion in 8.3</p> <p>Replaced Poat COL Items with RAIs</p>
<p>The results of the grid stability analysis reviewed.</p>	<p>OK</p>	
<p>Verified that provisions are included in the design to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.</p>	<p>OK</p>	
<p>Verified that adequate procedures, administrative controls, and protocols are in place to ensure that no modifications to the offsite power system circuits credited for satisfying GDC 17 are implemented by offsite transmission system operating authorities, responsible for maintenance, modification, and operation of the offsite transmission grid, without the performance of a proper safety evaluation</p>	<p>This topic does not appear to have been addressed as part of the review of COL information item 8.2-7.</p>	<p>See discussion in RAI for NERC Reliability Standard NUC-001-1</p>
<p>Underground or inaccessible power cables connecting offsite power to safety buses or power and control cables to equipment with accident mitigating functions reviewed.</p>	<p>N/A</p>	
<p>The plant's offsite communications equipment and protocols, communication contingency procedures, communications circuit routing, and telemetry links used to monitor the power grid and to verify and maintain grid stability and operability were reviewed to determine that they are secure and will continue to function during severe weather events causing regional effects.</p>	<p>This topic does not appear to have been addressed as part of the review of COL information item 8.2-7.</p>	<p>See discussion in RAI for NERC Reliability Standard NUC-001-1</p>
<p>To ensure that the requirements of GDC 5 are satisfied, the structures, systems, and components of the preferred power systems were examined to identify any that are shared between units of a multi-unit station.</p>	<p>N/A</p>	
<p>Review determined that grid reliability evaluations are performed, as part of the maintenance risk assessment required by 10 CFR 50.65 before performing "grid-risk-sensitive" maintenance activities.</p>	<p>This topic does not appear to have been addressed as part of the review of COL information item 8.2-7.</p>	<p>See discussion in RAI for NERC Reliability Standard NUC-001-1</p>
<p>ITAAC</p>	<p>OK</p>	

CH 16, 3.8 Technical Specifications	OK	
Conclusion		
List and evaluate EVALUATION FINDINGS (from SRP 8.2 Section IV – also include any important Technical Rationale items in the SRP that bear on the conclusions). Note: only those that are applicable to the COL scope of review for this section.	See individual items.	
Statement describing basis for conclusions provided.	Statement prescribed in SRP 8.2, IV not provided. See SRP 8.2, IV, first indented paragraph	Added wording from SRP
Compliance with GDC 2.	Not provided.	
Compliance with GDC 4.	Not provided.	
Compliance with GDC 17.	Statement not as completed as the one in SRP 8.2, IV 4, especially with regards to environmental conditions.	Added wording from SRP
Compliance with GDC 18.	OK	
Compliance with 10 CFR 50.63	OK	
Compliance with 10 CFR 50.65(a)(4)	OK (SRP 8.2, IV 7 inexplicably refers to the onsite dc power system. The TER discusses correct scope.)	
RAI		
Technical adequacy of each RAI proposed (list RAIs)	See individual items	
RAI 8.2-1	Reliability Standard NUC-001-1 is not identified SRP 8.2 as providing acceptance criteria for compliance with GDC-17 and GDC-18. Reference to this standard should be removed.	See discussion in RAI for NERC Reliability Standard NUC-001-1
RAI 16.3.8-1	OK	
Other RAI that should be considered, including additional COL holder Action Items	RAI needed for additional COL Holder Activities 8.2-4 and 8.2-5 to address capacity and capability of offsite power supply for a -5%, +10% voltage range.	Added RAIs
	RAIs needed for Post COL Activities 8.2-1, 8.2-2, and 8.2-6	Added RAIs

PQOG Technical Review for TER of Callaway COL Section 8.2 - Technical Evaluation, Conclusions, RAI

PQOG Reviewer: George Skinner Date: 2/12/09

Checklist Item	PQOG Review Comments	Disposition
Technical Evaluation		
Assumptions and logic of the FSAR safety evaluation are addressed and TER evaluation appears technically correct and is logically supported in each of the following areas. System information needed	See individual items.	

to reach a conclusion is included. Applicable Generic Letters and NRC Knowledge Transfer Guides are considered (if listed in the SRP (NUREG-0800)).		
List and evaluate specific Areas of Review (from SRP ____ Section I) and additional items from Review Procedures (from SRP ____ Section III) Note: only those that are applicable to the COL scope of review for this section.	See individual items	
COL Information Items		
Site-specific information regarding transmission system and its connection to switchyard reviewed.	OK	
Site-specific information on switchyard layout design reviewed.	OK	
Site-specific information on actions to restore offsite power and use nearby sources reviewed.	OK	
Site-specific grid stability analysis reviewed.	This item was not discussed in the Technical Evaluation section. Please revise.	Tech Eval Revised
Site-specific information on switchyard breaker protective devices and controls reviewed.	OK	
Site-specific information on switchyard inspection and testing reviewed.	This item was not discussed in the Technical Evaluation section. Please revise.	See discussion in RAI for NERC Reliability Standard NUC-001-1
Site-specific information on communication protocols between the station and the TSO reviewed.	Reliability Standard NUC-001-1 is not identified SRP 8.2 as providing acceptance criteria for compliance with GDC-17 and GDC-18. Reference to this standard should be removed.	See discussion in RAI for NERC Reliability Standard NUC-001-1
Site-specific information on analysis tool used to determine real time condition of the transmission system reviewed.	OK	
Site-specific information on indication and control of switchyard component indications and controls reviewed.	OK	
SRP 8.2, Section I, Areas of Review		
Preferred power system arrangement reviewed.	OK	
The independence of the preferred power system is evaluated with respect to the onsite power system and any AAC power source provided for station blackout.	OK (Referred to 8.4 Review)	
Design information and analyses demonstrating the suitability of the power sources from the grid, including transmission lines, breakers, and transformers used for supplying preferred power from distant sources, are reviewed to ensure that each path has sufficient capacity and capability to perform its intended function.	OK	
Effect of environmental conditions on preferred power reviewed.	This does not appear to be addressed in	Adequately addressed in 8.2.1.1

	any detail in the DC or COL FSAR. Should RAI be issued?	
SRP 8.2, Section III, Review Procedures		
Review determined that at least two separate circuits from the transmission network to the onsite power distribution system buses are provided	This attribute was not mentioned in the Technical Evaluation or Conclusions sections.	Added discussion to Tech Evaluation
Routing of transmission lines was examined on the station layout drawings to ensure that at least two circuits from the offsite grid to the onsite distribution buses are physically separate and independent.	This attribute was not mentioned in the Technical Evaluation or Conclusions sections.	Added discussion to Tech Evaluation
The electrical schematics of the switchyard breaker control system, its power supply and the breaker arrangement itself were examined for the possibility of simultaneous failure of both circuits from single events	OK	
Loads for normal or abnormal operating conditions, accident conditions, or plant shutdown conditions were examined to ensure circuits from the offsite system to the onsite distribution buses have sufficient capacity and capability.	I did not see where the capacity and capability of the offsite power supplies was compared with plant loads. Callaway Unit 2 FSAR 8.2.2.4 indicated that a site specific calculation had been done to demonstrate capability for a -5%, +10% transmission system operating voltage in lieu of the $\pm 10\%$ range stated in the U.S EPR FSAR. This appears to have been addressed by the reviewer in Post COL items 8.2-1 and 8.2-2, but an RAI should be issued.	Replaced Post COL Item with RAI
The results of the grid stability analysis reviewed.	This attribute was not mentioned in the Technical Evaluation section.	Added discussion to Tech Evaluation
Verified that provisions are included in the design to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.	OK	
Verified that adequate procedures, administrative controls, and protocols are in place to ensure that no modifications to the offsite power system circuits credited for satisfying GDC 17 are implemented by offsite transmission system operating authorities, responsible for maintenance, modification, and operation of the offsite transmission grid, without the performance of a proper safety evaluation	This topic does not appear to have been addressed as part of the review of COL Information Item 8.2-7.	See discussion in RAI for NERC Reliability Standard NUC-001-1
Underground or inaccessible power cables connecting offsite power to safety buses or power and control cables to equipment with accident mitigating functions reviewed.	N/A	

The plant's offsite communications equipment and protocols, communication contingency procedures, communications circuit routing, and telemetry links used to monitor the power grid and to verify and maintain grid stability and operability were reviewed to determine that they are secure and will continue to function during severe weather events causing regional effects.	This topic does not appear to have been addressed as part of the review of COL information item 8.2-7.	See discussion in RAI for NERC Reliability Standard NUC-001-1
To ensure that the requirements of GDC 5 are satisfied, the structures, systems, and components of the preferred power systems were examined to identify any that are shared between units of a multi-unit station.	U.S. EPR FSAR 8.2.2.3 discussed GDC 5 as relating only to <u>safety related</u> SSCs, and the COL FSARs IBR'd it, but SRP 8.2 appears to include the preferred power system in its scope. This may be due to a difference in interpretation of the terms "important to safety" used in the GDC and "safety related" used in the U.S. EPR FSAR. The offsite power system may be considered important to safety because it is the preferred source of power for ESF buses to mitigate an accident. Suggest writing an RAI to clarify this point. A similar question relates to compliance with GDCs 2 and 4.	These GDCs are IBR. The EPR design is a single unit design
Review determined that grid reliability evaluations are performed, as part of the maintenance risk assessment required by 10 CFR 50.65 before performing "grid-risk-sensitive" maintenance activities.	This topic does not appear to have been addressed as part of the review of COL information item 8.2-7.	See discussion in RAI for NERC Reliability Standard NUC-001-1
ITAAC	OK	
CH 16, 3.8 Technical Specifications	OK	
Conclusion		
List and evaluate EVALUATION FINDINGS (from SRP 8.2 Section IV – also include any important Technical Rationale items in the SRP that bear on the conclusions). Note: only those that are applicable to the COL scope of review for this section.	See individual items.	
Statement describing basis for conclusions provided.	Statement prescribed in SRP 8.2, IV not provided. See SRP 8.2, IV, first indented paragraph	Added SRP wording
Compliance with GDC 2.	Not provided (see comment for GDC 5)	
Compliance with GDC 4.	Not provided (see comment for GDC 5)	
Compliance with GDC 17.	Statement not as completed as the one in SRP 8.2, IV 4, especially with regards to environmental conditions.	Revised wording
Compliance with GDC 18.	OK	
Compliance with 10 CFR 50.63	OK	
RAI		

Technical adequacy of each RAI proposed (list RAIs)	See individual items	
RAI 8.2-1	OK	
RAI 8.2-2	Reliability Standard NUC-001-1 is not identified SRP 8.2 as providing acceptance criteria for compliance with GDC-17 and GDC-18. Reference to this standard should be removed.	See discussion in RAI for NERC Reliability Standard NUC-001-1
RAI 16.3.8.1-1	OK	
Other RAI that should be considered, including additional COL holder Action Items	RAI needed for additional COL Holder Activities 8.2-1 and 8.2-2 to address capacity and capability of offsite power supply for a -5%, +10% voltage range.	Replaced Post COL Item with RAI