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December 9, 2009

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

BELL BEND NUCLEAR POWER PLANT
RESPONSE TO RAI No. 36
BNP-2009-385 Docket No. 52-039

References: 1) M. Canova (NRC) to R. Sgarro (PPL Bell Bend, LLC), Bell Bend COLA – Request for Information No. 36 (RAI No. 36) – EEB - 2745, email dated July 27, 2009

2) BNP-2009-245, R. R. Sgarro (PPL Bell Bend, LLC) to U.S. Nuclear Regulatory Commission, "Response to RAI No. 36," dated August 26, 2009

The purpose of this letter is to respond to the request for additional information (RAI) identified in the referenced NRC correspondence to PPL Bell Bend, LLC (Reference 1). This RAI addresses Offsite Power System, as discussed in Section 8.2 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Bell Bend Nuclear Power Plant Combined License Application (COLA).

In Reference 2, PPL Bell Bend, LLC informed the NRC additional refined conceptual design was needed to respond to the request for additional information, and that a response would be provided by December 9, 2009. The enclosure provides our responses to RAI No. 36, Questions 08.02-1, 08.02-2, 08.02-3, 08.02-5, 08.02-6, 08.02-7 and 08.02-9; which include revised COLA content. This future revision of the COLA is the only new regulatory commitment.

Question 08.02-4 requested details of entities responsible for switchyard and transmission maintenance, modification, and operation as well as the implementation of the site-specific station equipment inspection and testing plan. Question 08.02-8 requested details of operational experience data, inspection, testing, and maintenance procedures for Gas-Insulated Switchyard (GIS) components. Agreements for transmission and site-specific inspection, testing and maintenance procedures for the Bell Bend 500 kV Switchyard require further development. PPL Bell Bend, LLC will provide a response to Questions 08.02-4 and 08.02-8 by June 1, 2010.

D079
NRO

Should you have questions or need additional information, please contact the undersigned at 570.802.8102.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 9, 2009

Respectfully,

Rocco R. Sgarro

RRS/kw

Enclosure: As stated

cc: (w/o Enclosures)

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Enclosure 1

Response to NRC Request for Additional Information No. 36
Questions 08.02-1, 08.02-2, 08.02-3, 08.02-5, 08.02-6, 08.02-7 and 08.02-9
Bell Bend Nuclear Power Plant

RAI 36
Question 08.02-1

Figure 8.2-2 of FSAR: 500 kV Single Line Diagram

Bell Bend Nuclear Power Plant (BBNPP) 500 kV Switchyard Single Line Diagram shows only new Bell Bend NPP configuration but does not show the connection interface to the existing Susquehanna 500 kV switchyard and new Susquehanna 500 kV Yard 2. For the staff to better understand the planned configuration of the above-mentioned switchyards and transmission systems surrounding BBNPP, the FSAR should include within its scope any significant transmission lines for BBNPP. In order for the staff to obtain a better understanding of the function of the proposed design, as required to make a safety determination with respect to General Design Criterion (GDC) 17, please provide one-line diagrams of the proposed switchyards and transmission system for BBNPP showing interconnections and modifications to the existing switchyards. The single line needs to show the transmission line configuration as shown in Figure 8.2-1 Switchyard and Transmission Line Layout and as described in Section 8.2.2.4 indicating bay positions (e.g., identified as 2S, 2N, 7N, and 4s in Section 8.2.2.4) in these switchyards (i.e., existing 500 kV yard and new 500 kV Yard 2).

Response:

The requested drawings Susquehanna 500/230 kV Overview; Susquehanna 500 kV Yard; and Susquehanna 500 kV, Yard 2, are included, below.

COLA Impact:

The drawings: Susquehanna 500 kV Yard and Susquehanna 500 kV, Yard 2 will be added to the BBNPP COLA FSAR and the BBNPP COLA FSAR will be revised as follows in a future COLA revision:

8.2.1.1 Offsite Power

The new BBNPP 500 kV Yard is described in Section 8.2.1.2, Station Switchyard. The Susquehanna 500 kV Yard 2 is a new facility that will be located directly on the Susquehanna- Roseland corridor, as shown in Figure 8.2-3. The existing Susquehanna 500 kV Yard will be expanded by two bays to accommodate the new Bell Bend connection, as shown in Figure 8.2-4.}

8.2.2.4 Compliance with GDC 17

This COL Item is addressed as follows:

{There are two relevant PJM studies for BBNPP; the preliminary Susquehanna 1600 MW R01- R02 Impact Study Re-study (SIS) (PJM, 2008a), and the PJM Preliminary Stability Study for R01- R02, Bell Bend 500KV-1800MW (PSS) (PJM, 2008b.) The SIS projects the impact that BBNPP will have on the network, including a brief description of the transmission lines and substations, and the PSS shows that PJM Generator Interconnection for Bell Bend is stable for all tested conditions.

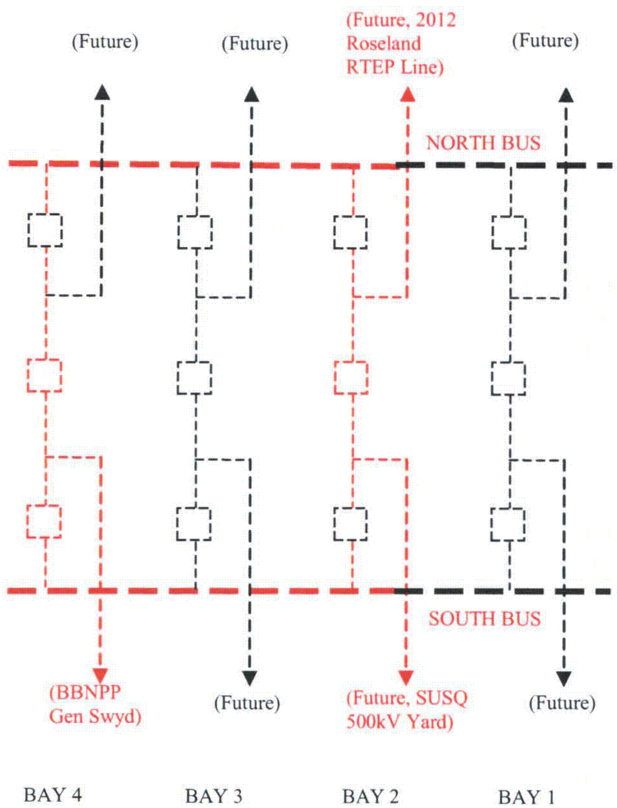
The SIS states that the work will include the construction of a new 500kV switchyard, called Susquehanna 500 kV Yard 2. The yard will be breaker and a half construction with a north and south bus, and room for 4 bays. The initial construction of this yard will be bay 2 and bay 4 with bay 3 left vacant and bay 1 left open for expansion, as shown in Figure 8.2-3. The yard will have three new 500 kV circuit breakers, associated disconnect switches, and controls.

For both transmission lines from the BBNPP Switchyard, PPL EU will:

- Design and construct 500 kV single-circuit transmission lines on self-supporting steel H-frame poles, each line, within a 200 ft R/W, using bundled 1590 ACAR. These lines will be dedicated to only the Bell Bend NPP facility. These lines will be part of the PPL EU 500 kV network, and may have network flows on them. One of the lines will be connected into the existing Susquehanna 500 kV Yard at Bay 7N and the other line will be connected into the new Susquehanna 500 kV Yard 2 at Bay 4S.
- Install one ½-inch extra-high-strength (EHS) overhead ground wire (OHGW) on each transmission line.
- Install one fiber optic grounding wire (OPGW) on each transmission line.

The Susquehanna-Roseland 500 kV line, which is planned to be completed and in service during 2012, will be split near the new Susquehanna 500 kV Yard 2, and re-terminate the lines into the yard. The renamed Roseland-Susquehanna 500 kV Yard 2 line will terminate at Susquehanna 500 kV Yard 2 at bay position 2N. The renamed Susquehanna 500 kV Yard 2-Susquehanna 500 kV Yard line will terminate at Susquehanna 500 kV Yard #2 bay position 2S, as shown in Figure 8.2-3.

{Figure 8.2-3
Susquehanna 500 kV, Yard 2}

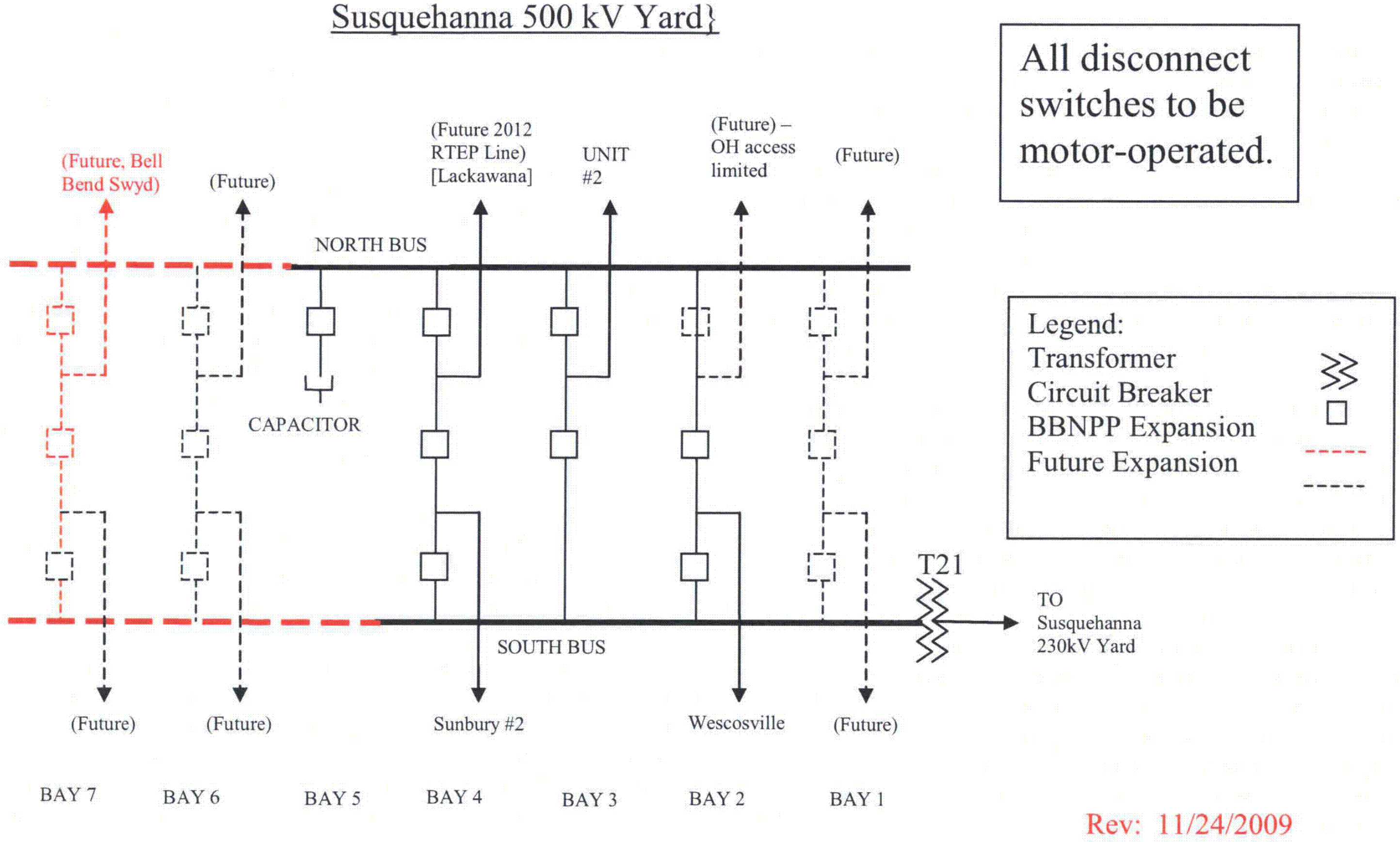


All disconnect switches to be motor-operated.

Legend:
Transformer
Circuit Breaker
BBNPP Expansion
Future Expansion

Rev: 11/24/2009

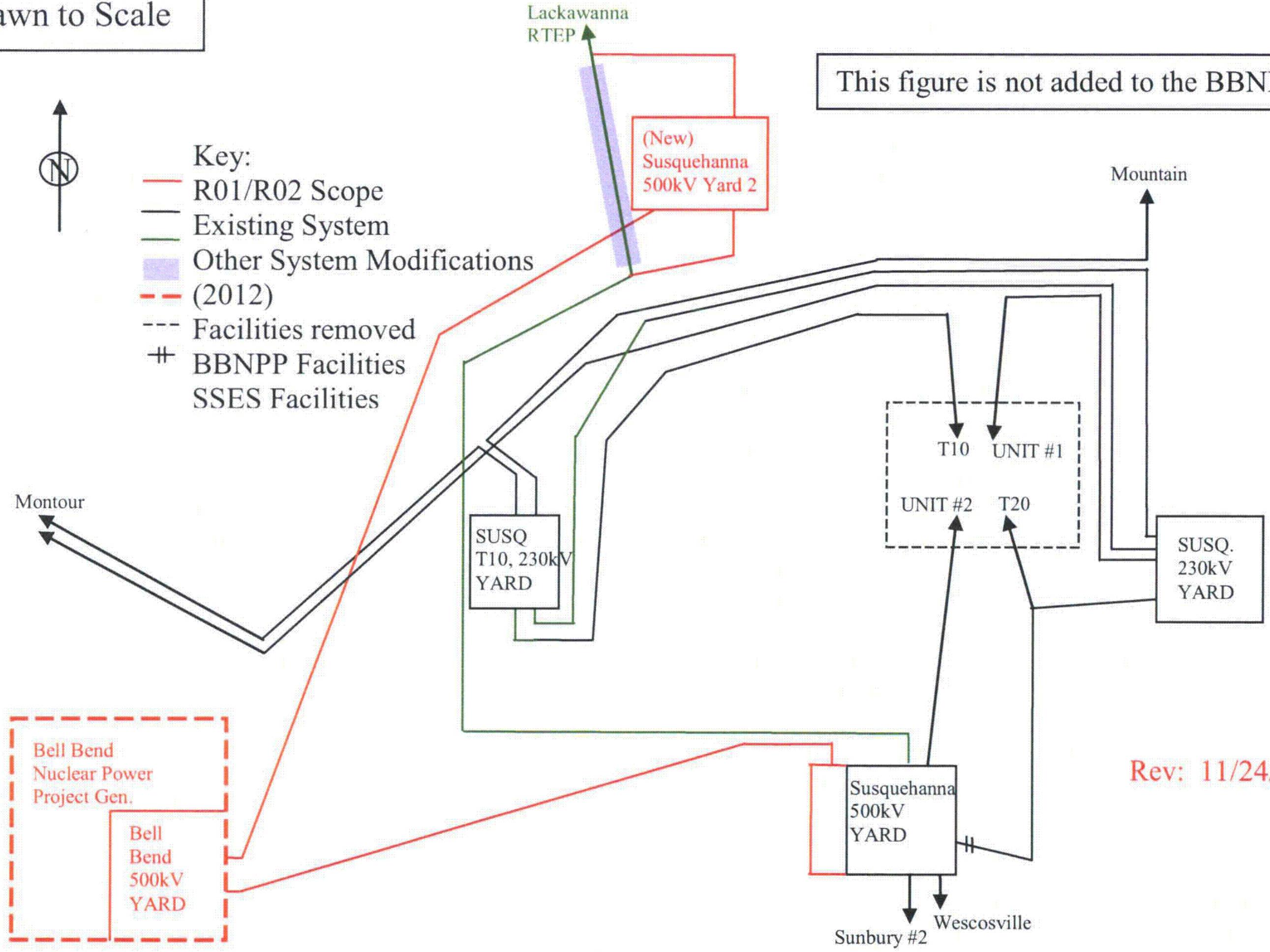
{Figure 8.2-4
Susquehanna 500 kV Yard}



Susquehanna 500/230 kV Overview

Not Drawn to Scale

This figure is not added to the BBNPP FSAR



Rev: 11/24/2009

RAI No. 36
Question 08.02-2

FSAR Section 8.2.1.2, Station Switchyard, states that BBNP is designed with a 500 kV gas insulated switchyard (GIS). In order for the staff to obtain a better understanding of the function of the proposed design, as required to make a safety determination with respect to General Design Criterion (GDC) 17, please confirm the GIS design with regard to the following information:

a) Identify the standards (Institute of Electrical and Electronics Engineers (IEEE) etc.) that are being followed for the design, testing and installation of the GIS.

b) Provide a description of the GIS components/equipment for the site-specific interconnection provisions between the GIS and the transformers (main step up transformer (MSU), emergency auxiliary transformer (EAT) & normal auxiliary transformer (NAT))

c) Confirm that the insulation coordination for the switchyard has been performed to arrive at the basic impulse level (BIL) for the switchyard equipment. Provide summary results and assumptions.

d) Provide the basis for selecting 40 kA as the interrupting rating of the 500 kV switchyard breakers.

Response:

a) The following provides a listing of additional major IEEE and other Standards that will be followed during the design, testing and installation of the GIS:

- ANSI MC96.1, 1982 – Standard Temperature Measurement Thermocouples
- ANSI/ASME Boiler Pressure Vessel Code, 2007 – Section VIII: Pressure Vessels Division 1
- ANSI/ASME B31.1, 2007 - Power Piping
- ANSI/IEEE C63.2, 1996 – Specifications for Electromagnetic Noise and Field Strength Instrumentation
- ASTM D2472, 2000 - Specification for Sulfur Hexafluoride
- CENELEC EN 50 052, 1986 – Specification for Cast Aluminum Alloy Enclosures for Gas Filled High Voltage Switchgear and Controlgear
- CENELEC EN 50 064, 1989 - Specification for Wrought Aluminum and Aluminum Alloy Enclosures for Gas Filled High Voltage Switchgear and Controlgear
- CENELEC EN 50 069, 1991 - Specification for Welded Composite Enclosures of Cast and Wrought Aluminum Alloys for Gas Filled High Voltage Switchgear and Controlgear
- CENELEC EN 50 089, 1992 - Specification for Cast Resin Partitions for Metal Enclosed Gas Filled High Voltage Switchgear and Controlgear
- IEC 60060-1 (1989), 60060-2 (1994), 60060-3 (2006) – High Voltage Test Techniques
- IEC 60270, 2000 – Partial Discharge Measurements
- IEC 62271-203, 2003 – High Voltage Switchgear and Controlgear Part 203: Gas Insulated Metal Enclosed Switchgear for rated Voltages Above 52kV

- IEEE 48, 2009 – Standard Test Procedure and Requirements for High Voltage Alternating Current Cable Terminations
- IEEE 367, 1996 – IEEE Recommended Practice for Determining the Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault
- IEEE 693, 2005 – IEEE Recommended Practice for Seismic Design of Substations
- IEEE C37.010, 1999 – IEEE Applications Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
- IEEE Standard C37.04, R2006 - IEEE Standard Rating Structure for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
- IEEE C37.09, R2007 - IEEE Standard Test Procedure for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
- IEEE C37.122, R2002 – Standard for Gas-Insulated Substations
- IEEE C37.24, R2008 – IEEE Guide for Evaluating the Effect of Solar Radiation on Outdoor Metal Enclosed Switchgear
- IEEE C37.30, 1997 – IEEE Standard Requirements for High Voltage Switches
- IEEE C57.19.01, 2000 – Performance Characteristics and Dimensions for Outdoor Apparatus Bushings
- IEEE C62.11, 2005 – IEEE Standard for Metal Oxide Surge Arresters for AC Power Circuits (>1kV)

b) The following provides a conceptual description of GIS components/equipment for the Bell Bend interconnection provisions between GIS and the transformers (MSU, EAT, and NAT):

<u>Main Step-up Transformer Bank (MSU)</u>

This transformer bank consists of three (3) – single phase transformers plus a single phase spare transformer.

<u>Emergency Auxiliary Transformer (EAT)</u>

Each of these two (2) transformers is a three phase transformer.

<u>Normal Auxiliary Transformer (NAT)</u>

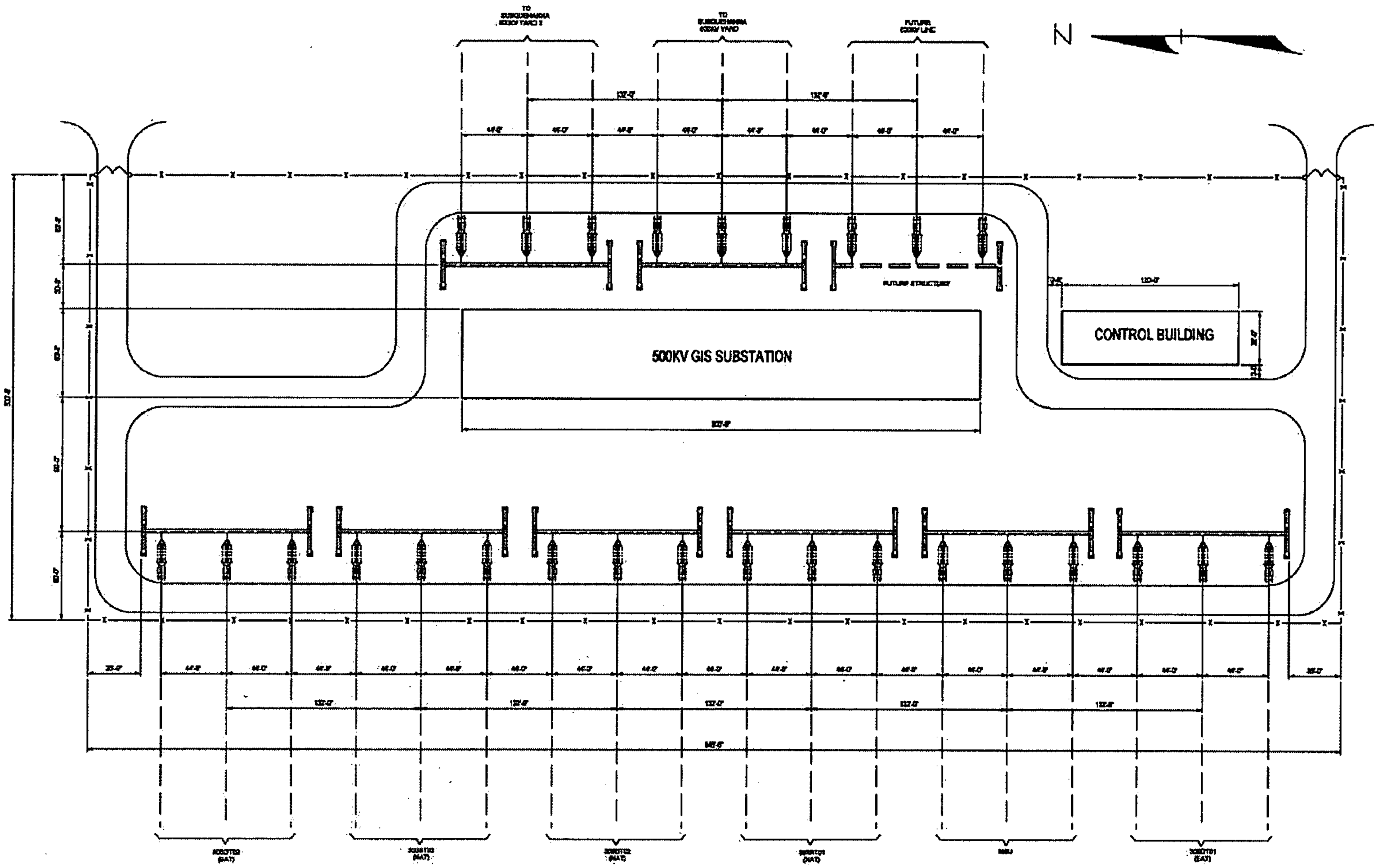
Each of these three (3) transformers is a three phase transformer.

The connection from the 500 kV GIS to the MSU, EAT, and NAT:

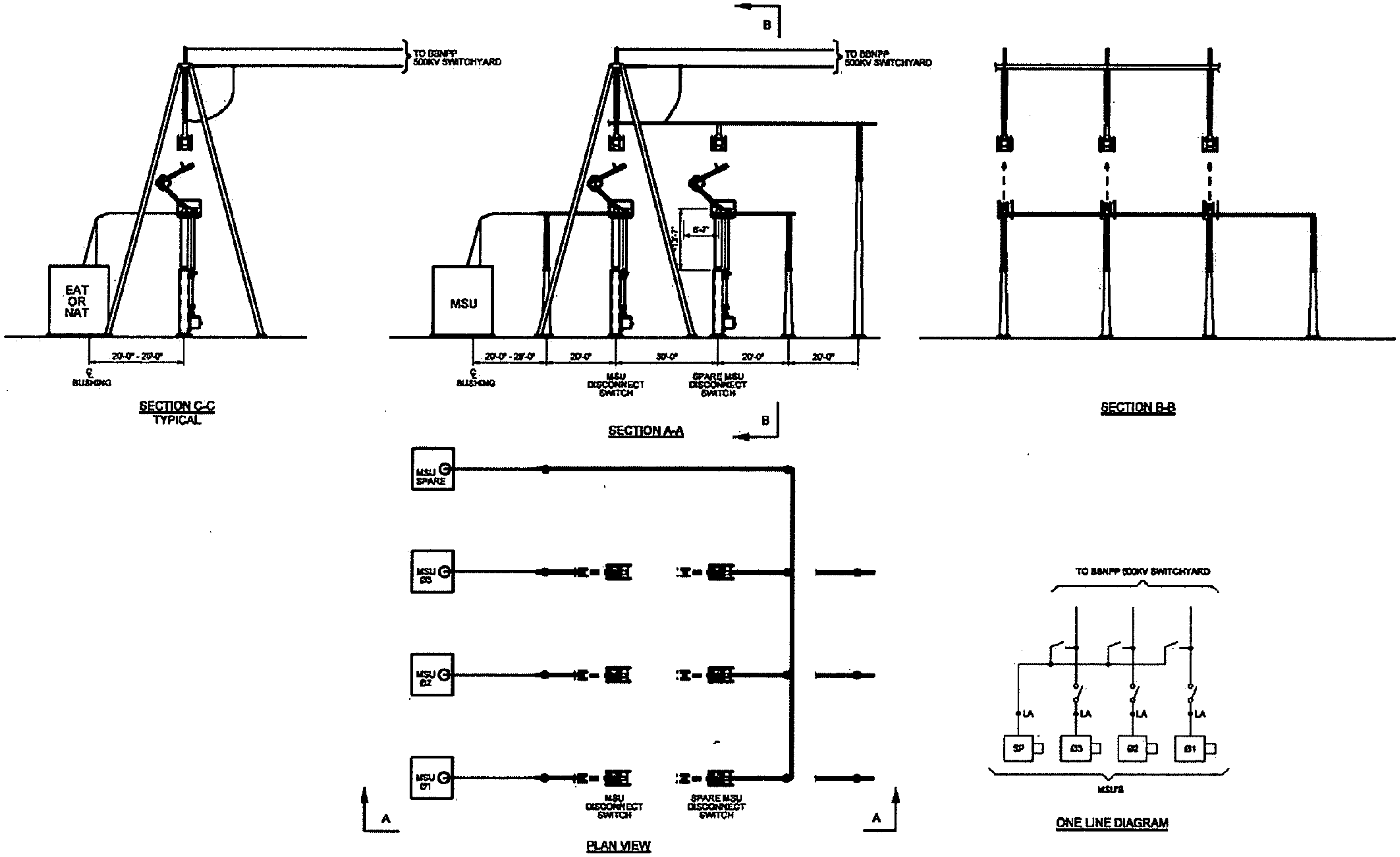
- The 500 kV GIS will be located inside of the substation building. There will be a motor operated, SF_6 gas insulated disconnect switch (MOD) and a manually operated SF_6 gas insulated ground switch at the GIS associated with the MSU, each EAT, and each NAT. The purpose of each MOD is to isolate the gas insulated bus (GIB) and the purpose of each ground switch is to ground the GIB section when it is de-energized for maintenance. A GIB, one per phase, will be routed from the GIS located in the substation building, penetrating the wall of the substation building, to the location of a substation dead-end structure (Figure 1). The GIB will be supported on steel structures anchored to foundations. The GIB will terminate in an SF_6 to air bushing next to the substation dead-end structure. An open wire dropper will connect the SF_6 to air bushing to the overhead line conductor that terminates on the substation dead-end structure and runs to dead-end structures located in front of the MSU, EATs, and NATs (BBNPP FSAR Figure 8.2-1).

- At the MSU, each EAT, and each NAT, an open wire dropper will connect each overhead line to its associated 500 kV motor operated disconnect switch and there will be an open wire connection from each disconnect switch to the 500 kV bushings of the MSU, EATs, and NATs, respectively. The purpose of each disconnect switch is to isolate the MSU, EATs, or NATs from the associated overhead line for maintenance of the line or the associated transformer. For the MSU, there will also be a 500 kV "sparing bus" with associated 500 kV motor operated disconnect switches. The purpose of the "sparing bus" is to facilitate the switching-in of the single phase spare MSU to replace one of the failed single phase MSU transformers.

- Figure 1 is a plan view of the substation building containing the GIS and shows the location of the substation dead-end structures connecting overhead lines from the MSU, EATs, and NATs. BBNPP FSAR Figure 8.2-1 shows the overall general arrangement of the plant site including the conceptual routing of the overhead lines between the GIS and the MSU, EATs, and NATs. A plan view and typical section views of the connections are shown on Figure 2 as Sections "A-A" and "B-B" for the MSU, and Section "C-C" for the EATs, or NATs.



BELL BEND NUCLEAR POWER PLANT
500KV GIS SWITCHYARD
GIS PLAN VIEW
FIGURE 1



BELL BEND NUCLEAR POWER PLANT
500KV GIS SWITCHYARD
TYPICAL MSU PLAN AND SECTION VIEWS

FIGURE 2

c) The new PPL EU Susquehanna 500 kV, Yard 2, will have circuit breakers supplied in adherence to IEEE C37.06 (IEEE, 2009) ratings, and the CCVT's will adhere to IEEE C37.93 (IEEE, 2004). The BIL level for this station and all new 500 kV switchyards is calculated based on IEEE 1313 (IEEE, 2002), and is 1550 kV BIL rating. This IEEE standard and PPL EU's application of surge arresters allows us to meet all IEEE standards for a properly designed substation. The existing Susquehanna 500 kV Yard is 1550 kV BIL, and all expansions of this yard will mimic the 1550 kV BIL.

d) IEEE C37.122 (IEEE, 2002) outlines the guidelines for 500 kV gas insulated substations. 40 kA and 63 kA are standard fault currents found in the standard. 40 kA was selected since it is a standard fault current in the IEEE standard.

COLA Impact:

The BBNPP COLA FSAR will be revised as follows in a future COLA revision:

8.2.1.2 Station Switchyard

The U.S. EPR FSAR includes the following COL Item in Section 8.2.1.2:

> A COL applicant that references the U.S. EPR design certification will provide site-specific information for the switchyard layout design.

This COL Item is addressed as follows:

{The new 500 kV Gas Insulated Switchyard (GIS) for BBNPP has been designed and is sized and configured to accommodate the output of BBNPP. The location of the BBNPP switchyard is on the BBNPP site approximately 150 ft (46 m) east of BBNPP and approximately 2450 ft (747 m) west of the existing Susquehanna 500 kV Yard. The BBNPP 500 kV switchyard transmits electrical power output from BBNPP to the transmission system. The BBNPP switchyard layout and location are shown on Figure 8.2-1. <u>The GIS will be designed, tested, and installed in accordance with the applicable codes and standards in section 8.2.3.</u>

A single line of the BBNPP switchyard layout design, which incorporates a breaker-and-a-half / double breaker scheme, is presented in Figure 8.2-2. Circuit breakers and disconnect switches are sized and designed in accordance with IEEE Standard C37.06 (IEEE, 2000<u>a</u>). All circuit breakers are equipped with dual trip coils. The 500 kV circuit breakers in the switchyard are rated according to the following criteria.

8.2.3 REFERENCES

<u>{**ANSI, 1992.** Standard Temperature Measurement Thermocouples, ANSI MC96.1, American National Standards Institute, 1982.</u>

<u>**ANSI/ASME, 2007a.** ANSI/ASME Boiler Pressure Vessel Code, Section VIII: Pressure Vessels Division 1, American National Standards Institute/ American Society of Mechanical Engineers, 2007.</u>

ANSI/ASME, 2007b. Power Piping, ANSI/ASME B31.1, American National Standards Institute/ American Society of Mechanical Engineers, 2007.

ANSI/IEEE, 1996. Specifications for Electromagnetic Noise and Field Strength Instrumentation, ANSI/IEEE C63.2, American National Standards Institute, 1996.

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CENELEC, 1992. Specification for Cast Resin Partitions for Metal Enclosed Gas Filled High Voltage Switchgear and Controlgear, CENELEC EN 50 089, European Committee for Electrotechnical Standardization, 1992.

{**CFR, 2008.** Loss of All Alternating current Power, Title 10, Code of Federal Regulations, Part 50.63, U.S. Nuclear Regulatory Commission, 2008.

IEC, 2000. Partial Discharge Measurements, IEC 60270, International Electrotechnical Commission, 2000.

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IEEE, 1997. IEEE Standard Definitions and Requirements for High Voltage Air Switches, IEEE C37.30, Institute of Electrical and Electronics Engineers, 1997.

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IEEE, 2000b. Performance Characteristics and Dimensions for Outdoor Apparatus Bushings, IEEE C57.19.01, Institute of Electrical and Electronics Engineers, 2000.

IEEE, 2000c. IEEE Guide for Safety in AC Substation Grounding, IEEE 80, Institute of Electrical and Electronics Engineers, 2000.

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IEEE, 2005. IEEE Standard for Metal Oxide Surge Arresters for AC Power Circuits (>1kV), IEEE C62.11, Institute of Electrical and Electronics Engineers, 2005.

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NRC, 1988. Station Blackout, Regulatory Guide 1.155, U.S. Nuclear Regulatory Commission, August 1988.

PJM, 2008a. PJM Generator Interconnection R01/R02 Susquehanna 1600 MW Impact Study Restudy, DMS #500623, September 2008.

PJM, 2008b. Preliminary Stability Study for R01-R02, Bell Bend 500KV-1800MW, June 2008.

PJM, 2008c. PJM Generator Interconnection R01/R02 Susquehanna 1600 MW Voltage Study, Final, August 2008.}

RAI 36
Question 08.02-3

FSAR Section 8.2.2.4, page 8-1 1, Compliance with General Design Criteria (GDC) 17, states that two relevant studies are available - the preliminary Susquehanna 1600 MW R01-R02 Impact Study Re-study (SIS) (system impact study), and the PJM [Pennsylvania, New Jersey, and Maryland's regional transmission organization] Preliminary Stability Study for R01-R02, Bell Bend 500KV-1800MW (PSS) (grid stability study). Provide a summary of the grid stability study and the system impact study, along with the assumptions made, and the acceptance criteria used for the case(s) analyzed. Please provide a summary of the grid stability steady-state and transient analysis results, and the system voltage study results, in order to demonstrate compliance with GDC 17, with the assumptions made, and the acceptable criteria used for the case(s) analyzed.

It is noted that the Applicant indicated that a system impact study was performed to analyze transient stability for the addition of BBNPP using PJM's reliability planning criteria for the 2012 summer (peak) loading.

(a) Please explain why the year 2012 was selected as the base case time frame for the stated study, and not beyond; and

(b) Explain why the winter loading cases are not considered in the system impact study.

Response:

The "Preliminary Stability Study for R01-R02, Bell Bend 500KV-1800MW, June 2008 study" was performed by PPL Electric Utilities (EU) to determine the stability of Bell Bend 500 kV interconnection under various line fault conditions. The studies were run under 2012 (latest projection by the PJM) light load conditions; with Bell Bend at 1800 MWe plus an additional 7% margin (1926 MWe). The new Susquehanna–Roseland line (scheduled in service date of 2012) was in service for the study. A total of 25 fault conditions were evaluated including 3-phase faults and phase ground faults. The location of the faults was varied in some cases.

The study showed that the Bell Bend 500 kV connection is stable for all tested cases. In twenty-three out of twenty-five cases the fault cleared in primary clearing time. The remaining two cases are described below:

- The case is a phase-ground fault on a line with a stuck pole on the tie breaker. Two of the poles clear in primary time. The stuck pole is delayed in clearing, but the Bell Bend 500 kV connection is stable.
- The case is a phase-ground fault at the Bell Bend 500 kV generation transformer with a stuck breaker. There is a delayed clearing at Bell Bend, but the Bell Bend 500 kV connection is stable.

Based on the above stability results, one required transmission system upgrade is the installation of dual–pilot relaying of the Susquehanna–Lackawanna 500 kV line. A maximum of a 3-cycle breaker at both ends would provide adequate instantaneous clearing times. Both clearing times are contingent on the breaker at Lackawanna having right-of-way to close first. A reclose time of 1 second (60 cycles) is adequate at Lackawanna.

The following is the requested summary of the results of the "PJM Generator Interconnection R01/R02 Susquehanna 1600 MW Impact Study Re-study," DMS # 500623, (September, 2008.):

Direct Connection - High Level

The R01/R02 generation project (Bell Bend Nuclear Power Plant) will be interconnected to the PPL Electric Utilities (PPL EU) system at the Susquehanna 500 kV substation called "Susquehanna 500 kV Yard" and a new 500 kV switchyard called "Susquehanna 500 kV Yard 2".

The R01/R02 generation project will involve the construction of a new customer owned 500 kV substation, a new PPL EU-owned 500 kV switchyard, the expansion of an existing PPL EU-owned 500 kV substation, modification of existing transmission lines, and the construction of two new 500 kV transmission lines.

The R01/R02 owned substation, to be known as "Bell Bend 500 kV substation", will be connected to the PPL EU 500 kV network by two 500 kV PPL EU owned transmission lines. One of the 500 kV transmission lines will connect to the new Susquehanna 500 kV Yard 2. The other 500 kV transmission line will connect to the existing Susquehanna 500 kV Yard. The connection into the existing Susquehanna 500 kV Yard will involve the expansion of the yard to accommodate the line termination.

The existing transmission line that will be modified is the RTEP Susquehanna to Roseland 500 kV line (in service 2012). The RTEP Susquehanna to Roseland 500 kV line will be routed through the R01/R02 developer's property at Susquehanna so that it comes in close proximity of the proposed Susquehanna 500 kV Yard 2 and then to its final termination at Susquehanna 500 kV yard. This will facilitate the opening of the 500 kV line to connect it to the new Susquehanna 500 kV Yard 2. The end result will be that the Susquehanna to Roseland 500 kV line will be divided into the Susquehanna to Susquehanna 500 kV Yard 2 line and the Susquehanna 500 kV Yard 2 to Roseland 500 kV line.

Generator Regulation or Reactive Support Requirements

The PPL EU preliminary load flow studies indicated that the BBNPP generator can maintain the required voltage regulation at the Bell Bend 500 kV bus based on its given electrical characteristics. A voltage schedule of 1.05 or higher may be specified on the Susquehanna 500 kV bus by PJM. The generator will be expected to hold that schedule. PJM and PPL EU will jointly review and potentially revise the voltage schedule after future studies are completed.

As required by PJM tariff, the Interconnection Customer shall design its "R01/R02 Facility" to maintain a composite power factor delivery at continuous rated power output at the generators' terminals at a power factor of at least 0.95 leading (absorbing VARs) to 0.90 lagging (supplying VARs).

Generator and GSU Modeling for the 500 kV Connection

The BBNPP Interconnection Customer supplied the following data which was used in modeling the generator and the GSU:

- One turbine-generator, 2015 MVA base, 27 kV rated voltage, 1600 MW net output, 0.90 nominal pf at the generator terminals (lead & lag), saturated sub-transient reactance of 30.66% on 2015 MVA base, (given)
- GSU (Generator Step-up Transformer): 2130 MVA base, 27/500 kV rated voltage, Z = 10.0% on 2130 MVA base (given). An X/R ratio of 47.3157 was provided.

Network Impacts

The R01/R02 project was studied as a 1600 MW (capacity) injection at the Susquehanna 500 kV substation. Project RO1/R02 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability *(Normal System, and Single or N-1 contingencies for the Capacity portion of the interconnection)*

No problems identified.

Multiple Facility Contingency *(Double circuit towerline, stuck breaker and bus fault contingencies)*

No Problems identified.

Short Circuit

No Problems identified.

Stability Analysis and Reactive Requirements

Will be performed for the Queue R01/R02 Facilities Study expected to be complete early in 2010.

Contribution to Previously Identified Overloads

(Queue ROI/R02 contributes to the following contingency overloads, i.e. Network Impacts, identified for earlier generation or transmission interconnection projects in the PJM Queue)

1. This project contributes to the previously overloaded Graceton - Bagley 230 kV line (emergency rating of 699 MVA) for the tower line outage of Conastone to Northwest 230 kV lines #2310 & #2322. This project contributes approximately 86.1 MW to the thermal violation.

2. This project contributes to the previously overloaded North Meshoppen 230-115 kV transformer (emergency rating of 157 MVA) for the single line outage of North Meshhoppen -- East Towanda 230 kV line and the tapped North Meshhoppen 230-115 kV transformer. This project contributes approximately 44 MW to the thermal violation.

Network Upgrade Projects are planned to mitigate these two overload conditions.

Response to Question 08.02-3, parts (a) and (b):

(a) The R01/R02 project was evaluated in the Impact Study for thermal and voltage compliance with reliability criteria for summer peak conditions in 2012. The R01/R02 project was also evaluated in the Impact Study for stability compliance with reliability criteria for light load conditions in 2012. Note that peak load conditions are not used for stability analysis because such conditions provide for a more stable mode of operation. Light load conditions are typically more severe from a stability perspective.

The R01/R02 project was also evaluated in the Facility Study for thermal and voltage compliance with reliability criteria for summer peak conditions in 2013. The results of the 2013 summer peak case provided the same results as the 2012 summer peak case. The stability study was not repeated in the Facility study. The requested in-service date for R01/R02 is 2018. PPL EU and PJM do not have accurate system models of the network for 2018. The latest accurate model as of this study is summer peak 2013.

(b) Winter peak conditions for this generator injection will provide lower facility loading levels based on the higher winter capability ratings.

COLA Impact:

The COLA will not be revised as a result of this response.

RAI No. 36
Question 08.02-5

FSAR Section 8.2.2.8, page 8-20, which reference compliance with 10 CFR 50.65(a)(4), Requirements for monitoring the effectiveness of maintenance at nuclear power plants, indicates that no departures have been made. US EPR Section 17.6 (Operational Programs) addresses these requirements. Bell Bend FSAR Section 17.6 identifies that NEI Topical Report 07-02, "Maintenance Rule Program Description" is incorporated by reference. Describe the details of the programs for reliability assessment (EPR FSAR 17.4) and maintenance rule program implementation (EPR FSAR 17.6) for offsite power system/ switchyard equipment.

Response:

The maintenance rule program implementation (EPR FSAR 17.6) for offsite power system/equipment is addressed in BBNPP FSAR Section 17.7.1.5, which incorporates by reference NEI 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Descriptions for Plants Licensed Under 10 CFR Part 52". (Note the NEI 07-02A Template and the FSAR Section numbers will be changed from BBNPP FSAR Revision 1). The template for Section 17.7.1.5, Risk Assessment and Risk Management per 10 CFR 50.65(a)(4), specifically addresses the offsite power system equipment as follows:

> The MR program and procedures reflect, as appropriate, consideration of issues associated with grid/offsite power reliability as identified in NRC Generic Letter 2006-02, items 5 and 6.

The reliability assurance program is addressed in BBNPP FSAR Section 17.4.
The BBNPP response to RAI No. 6[1] includes Table 17.4.3 - Site Specific Systems and Structures included within RAP.

COLA Impact:

The BBNPP COLA FSAR will be updated in a future COLA revision as shown below.

17.7 Maintenance Rule Program

This section is added as a supplement to the U.S. EPR FSAR.

The Maintenance Rule Program description included in NEI 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52, " Revision 0, dated March 2008 is incorporated by reference. The text of the template provided in NEI 07-02A is generically numbered as "17.X." The template is incorporated by reference into this FSAR Section by changing the numbering from "17.X" to "17.7."

In Section 17.X.1.1.b of NEI 07-02A the "DRAP" (Reliability Assurance for the Design Phase) is defined to be located in FSAR "17.Y." The DRAP is included in Section 17.4. The template is incorporated by reference into this FSAR section by changing the numbering from "17.Y" to "17.4."

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[1] R.R. Sgarro to U.S. NRC Document Control Desk, "Response to RAI No. 6, Question 17.04-1, Reliability Assurance Program" BNP-2009-270, dated September 24, 2009.

Descriptions of the programs listed in Subsection 17.X.3 of NEI 07-02A are provided in the following FSAR Chapters/Sections or Part 4:

- Maintenance rule program (Section 17.7).
- Quality assurance program (Section 17.5).
- Inservice inspection program (Sections 5.2 and 6.6).
- Inservice testing program (Section 3.9).
- Technical specifications surveillance test program (Part 4).
- Maintenance Programs (Section 13.5.2.2.6).

RAI No. 36
Question 08.02-6

Regarding FSAR Section 8.2:

(1) Describe the site-specific raceway and cable routing for GIS switchyard equipment.

(2) Describe site-specific wetting conditions or submergence, if any, as a result of seasonal or weather event water intrusion, for underground cables connecting offsite sources to safety buses.

(3) Address how the proposed design for cable routing/layout/monitoring is to be implemented to prevent gradual degradation, as addressed in NRC Generic Letter 2007-01: Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients (Feb. 7, 2007) (GL-2007-01).

Response:

(1) The gas-insulated substation is located indoors. Cabling from the gas-insulated substation to the local control cabinets (LCCs) will be routed indoors in cable trays. These cable trays are not exposed to the external environment and wetting / submergence.

Interface wiring points between the gas-insulated substation and the facilities external to the gas-insulated substation are at the LCCs. Cabling from the LCCs to the Bell Bend Nuclear Power Plant (BBNPP) and from the LCCs to the substation control building will be routed in underground duct banks. Duct banks or raceways will be designed to provide a high level of protection against industrial hazards, long-term degradation, and other potential risks such as fire, missiles, pipe failure, water spray or earthquakes. Manholes for duct bank access have recesses for temporary sump pumps for water draining. Manholes below ground water line have a permanent sump pump design. Such areas are also sloped so as to provide water drainage.

Cables associated with normal auxiliary transformers (NATs) and emergency auxiliary transformers (EATs) from the LCCs to the BBNPP and from the LCCs to the substation control building will be routed in separate underground duct banks. These cables will be physically separated to minimize the chance of simultaneous failure and loss of any remaining power supplies. All below-grade cables associated with the normal and emergency auxiliary transformers (NATs and EATs, respectively) will meet the requirements of ANSI / ICEA S-73-532 / NEMA WC 57-2004. All below-grade power, control and instrumentation cables will be specified with jackets suitable for both wet and dry environments and for environmental conditions associated with normal operation.

(2) The U.S. EPR FSAR subsection 8.3.1.1.8 describes that power cables will be installed in duct banks or raceways designed to provide a high level of protection against industrial hazards, long term degradations, and other potential risks such as fire, missiles, pipe failure, water spray or earthquakes. The BBNPP site specific cables routed underground from the GIS switchyard will have design features such as:

- Manholes for duct bank access will have recesses for temporary sump pumps for water draining;

- Manholes below the ground water level will have a permanent sump pump design; such areas will also be sloped to facilitate water drainage.

(3) The U.S. EPR FSAR subsection 8.3.1.1.8 also includes examples of cables which are routed in underground duct banks. The capability is provided to perform periodic tests and to detect insulation degradations in underground cables, whether in duct banks, directly buried, or in a conduit. The capability meets the requirements of NRC Generic Letter 2007-01.

COLA Impact:

The COLA will not be revised as a result of this response.

RAI 36
Question 08.02-7

FSAR Section 8.2.2.4, which references compliance with GDC 17, states that two single circuit transmission lines will be part of the PPL EU 500 kV network. Provide the basis for selecting the thermal rating of the transmission lines (4260 MVA for each line) and the switchyard equipment continuous ratings.

Response:

The 4260 MVA rated 500 kV transmission line is PPL EU's standard design. The selection of the design standard is based on using common material, EMF, corona, and other design criteria. The continuous thermal rating of this line is based on IEEE Standard 738-1993, as incorporated in the PJM TSDS Report of November, 2000, "Bare Overhead Transmission Conductor Ratings."

The continuous thermal ratings of the switchyard equipment are based on (1) ANSI Standard C37.010 (IEEE, 1998) for circuit breakers, (2) IEEE Standard C37.30 (IEEE, 1992) for switches, and (3) IEEE Standard 605-1998 (IEEE, 1998), for bus conductor ratings. In all cases, these standards form the basis for PJM Transmission and Substation Design Committee Reports and PPL EU Engineering Instructions. The PJM reports are available at:

http://www.pjm.org/planning/design-engineering/maac-to-guidelines.aspx

COLA Impact:

The COLA will not be revised as a result of this response.

RAI 36
Question 08.02-9

Section 8.2.2.5, for compliance with GDC 18:
Expand this section to include the testing and inspection of the offsite system for 500 kV switchyard grounding and lightning protection systems. Site-specific design aspects of the lightning protection and surge protection devices need to be addressed, as discussed in RG 1.204 to safeguard the SSCs from lightning strikes and the resulting secondary effects.

Response:

PPL EU ground grid design and testing are in accordance with IEEE Standard 80-2000 grounding standard. PPL EU's lightning protection design utilizes the IEEE 998-1996 rolling sphere method for protection.

COLA Impact:

The BBNPP COLA FSAR will be revised as follows in a future COLA revision:

8.2.2.5 Compliance with GDC 18

For performance of maintenance, testing, calibration and inspection, PPL EU follows its own field test manuals, vendor manuals and drawings, industry's maintenance practices and conforms to Federal Energy Regulatory Commission (FERC) requirements.

PPL EU ground grid design and testing for offsite 500 kV systems are in accordance with IEEE Standard 80 (IEEE, 2000c) grounding standard. PPL EU's lightning protection design utilizes the IEEE Standard 998 (IEEE, 1996b) rolling sphere method for protection.

8.2.3 REFERENCES

IEEE, 2000c. IEEE Guide for Safety in AC Substation Grounding, IEEE 80, Institute of Electrical and Electronics Engineers, 2000.

IEEE, 1996b. IEEE Guide for Direct Lightning Stroke Shielding of Substations, IEEE 998, Institute of Electrical and Electronics Engineers, 1996.