

NorthAnnaRAIsPEm Resource

From: Patel, Chandu
Sent: Thursday, February 03, 2011 10:43 AM
To: 'na3raidommailbox@dom.com'
Cc: Pal, Amar; Weisman, Robert; Otto, Ngola; NorthAnnaRAIsPEm Resource
Subject: RAI Letter No. 54 (RAI 5181), Section 8.2, North Anna 3 COLA
Attachments: RAI 5181 Final.doc

By letter dated November 26, 2007, Dominion Virginia Power (Dominion) submitted a Combined License Application for North Anna, Unit 3, pursuant to Title 10 of the *Code of Regulations*, Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this COLA.

The NRC staff has identified that additional information is needed to continue portions of the review and a Request for Additional Information (RAI), is enclosed. To support the review schedule, Dominion is requested to respond within 45 days of the date of this request. If the RAI response involves changes to the application documentation, Dominion is requested to include the associated revised documentation with the response.

Sincerely,
Chandu Patel

Hearing Identifier: NorthAnna3_eRAI
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North Anna, Unit 3
Dominion
Docket No. 52-017
SRP Section: 08.02 - Offsite Power System
Application Section: 8.2

QUESTIONS for Electrical Engineering Branch (EEB)

Request for Additional Information No. 5181

08.02-40

FSAR Subsection 8.2.1.2.3 states that "Upon approaching or exceeding a limit, these procedures verify the availability of required and contingency equipment and materials and direct notifications to outside agencies, until the normal voltage schedule can be maintained." Upon approaching or exceeding a limit, unit Technical Specification should be addressed. Please modify above statement to include "and address unit Technical Specifications"

08.02-41

FSAR Section 8.2.1.2.3 states that Dominion has established a switchyard interface agreement and protocols for maintenance, communication, switchyard controls and system analysis sufficient to safely operate and maintain the power station interconnection to the transmission system. Provide in the FSAR details of such agreement and the split of responsibilities among the entities regarding operation, maintenance and engineering pertaining to the transmission system, including the control of the 500 kV and 230 kV breakers located at the switchyard. In addition, does the interface agreement require that the operators be notified of periods when the system operator is unable to determine if offsite power voltage and capacity is inadequate?

08.02-42

The North Anna 3 switchyard is shared among North Anna Units 1, 2 and 3. Accordingly, GDC 5 appears applicable. Revision 3 of the application incorporates the US APWR design where offsite power is important to safety. GDC 5 requires that component parts of the offsite power system not be shared among units without sufficient justification, thereby ensuring that an accident in one unit of a multi-unit facility can be mitigated using an available complement of mitigative features, including required ac power, irrespective of conditions in the other units and without giving rise to conditions unduly adverse to safety in another unit. RG 1.32 provides acceptable guidance related to the sharing of structures, systems, and components of the preferred offsite power system. Discuss in the FSAR how GDC 5 is met specifically the capacity of transmission lines to adequately support auxiliary loads of one unit during an accident where the other two units are in a safe shutdown condition.

08.02-43

FSAR Subsection 8.2.1.2.1 provides ratings of transformers, breakers, transmission lines and bus work. Please provide the following in the FSAR: (a) The ratings of disconnect switches, (b) identifiers for transformers in the text of FSAR Subsection 8.2.1.2.1, (c) the switchyard bus bracing values, (d) the maximum available fault current from the system and confirm that the breaker interrupting ratings, both symmetrical and asymmetrical, are consistent with the available fault, and (e) statements of assumptions and results of short circuit analysis.

08.02-44

US-APWR DCD, Rev.2, Subsection 8.2.1.2 states that high voltage circuit breakers are sized and designed in accordance with IEEE Std. C37.010 and C37.06. The US-APWR DCD further states that high voltage disconnect switches are sized and designed in accordance with IEEE Std. C37.32. Confirm that high voltage circuit breakers and disconnect switches will meet above qualifications. Discuss why these IEEE Standards are not included in North Anna 3 FSAR.

08.02-45

US-APWR DCD, Rev.2, Subsection 8.3.1.1.11 states that the design of the grounding system follows the procedures and recommended practices stated in IEEE Std. 80, 81, 142, 524a and 665. Additionally, the US-APWR DCD states that the design of the lightning protection is in accordance with NFPA-780. The US-APWR DCD also states that the lightning protection system is designed in accordance with IEEE Std. 665, 666, 1050 and C62.23 as endorsed by RG 1.204. Additionally, FSAR Table 1.9-202 indicates that North Anna 3 conforms to RG 1.204. Confirm that the grounding system and lightning protection system design is consistent with the guidance of RG 1.204. Please include those standards in North Anna 3 FSAR or provide justification for not including them.

08.02-46

FSAR Subsection 8.2.1.2.2 states that switchyard protection system monitoring, maintenance, and testing are performed in accordance with NERC Standards (PRC-005-1, PRC-008-0, and PRC-017-0). Please include these standards in Section 8.2.5, "Reference."

08.02-47

Chapter 8 of the applicant's Combined License Application did not discuss the cable monitoring program for underground and inaccessible cables within the scope of the maintenance rule. 10 CFR 50.65(a)(1) which states that, "Each holder of a license to operate a nuclear plant ... shall monitor the performance or condition of structures, systems, or components... in a manner sufficient to provide reasonable assurance that such structures, systems, and components... are capable of fulfilling their intended functions." Additionally, Standard Review Plan Section 8.2.III.1.L, states, "Operating experience has shown that undetected degradation of underground ...could result in multiple equipment failures. Underground or inaccessible power and control cable runs that are susceptible to protracted exposure to wetted environments or submergence... should be reviewed." Guidance providing an acceptable means of meeting 10 CFR 50.65(a)(1) requirements with respect to the selection of electric cable condition monitoring can be found in Sections 3 and 4.5 of NUREG/CR-7000.

Also, as stated in COL Information Item 17.6(1):

The COL applicant must provide in its FSAR a description of the maintenance rule program, and its implementation, for monitoring the effectiveness of maintenance necessary to meet the requirements of 10 CFR 50.65.

Since the staff did not find a discussion of a cable monitoring program for underground and inaccessible cables within the scope of the maintenance rule as required by 10 CFR 50.65(a)(1), describe the monitoring program for underground and inaccessible cables (power, control and instrumentation) under the maintenance rule and revise the FSAR to reflect this information.

08.02-48

FSAR Subsection 8.2.1.2 states that “Minimum one-hour fire barriers are provided between all transformers.” This appears to conflict with the US-APWR DCD, Rev.2, Subsection 8.2.1.2 requirements of three-hour rated barriers. Either clarify this or provide justification for the departure.

08.02-49

COL Items 8.2(8) and (9) are not described adequately. The FSAR states that support systems, such as grounding, raceway, lighting, AC/DC station service, and switchyard lightning protection are also provided. Describe in the FSAR AC/DC station service and grounding in detail, including physical location, duty cycle of DC system, total ground resistance for grounding system, and how they meet applicable industry standards and regulatory guides, etc.

08.02-50

FSAR Subsection 8.2.2.2 states that stability of the grid will be studied to confirm that after a turbine trip, adequate power to the RPCs is maintained for at least three seconds as required in the transient and accident analysis in Chapter 15. Provide the results of an analysis that demonstrates that after a turbine trip, adequate power to the RCPs is maintained for at least three seconds.

08.02-51

US-APWR DCD, Rev. 2, Subsection 8.2.1.2.1 states that all relay systems used for protection of offsite power circuits and transformers are provided with primary and backup protection. FSAR Subsection 8.2.1.2.1 discusses protective relaying. Identify the relays associated with primary and backup protection scheme in the FSAR. What is meant by high-speed relay schemes?

08.02-52

FSAR Subsection 8.2.2.2 states that “The system will be studied under conditions including loss of the largest generating unit, loss of the most critical transmission line, and multiple facility contingencies.” Provide assumptions and results of the study.

08.02-53

FSAR Subsection 8.2.2.2 states that “Stability of the grid will be studied to confirm that after a turbine trip, adequate power to the RCPs is maintained for at least three seconds as required in the transient and accident analysis in Chapter 15.” Confirm that anti-motoring protective relaying for the main generator will open the generator output breaker after a time delay of at least 15 seconds, during which time the rotating generator will provide voltage support to the grid. An ITAAC is needed to verify the 15 seconds time delay associated with anti-motoring protective relaying to trip generator output breaker. Please provide one. Also, confirm that the analyses in Chapter 15 do not assume (credit) operation of the RCPs following the turbine trip if the initiating event is an electrical system failure.

08.02-54

FSAR Subsection 8.2.2.2 states that maximum and minimum switchyard voltage limits have been established for the 500 kV switchyard at 534 kV and 505 kV respectively. Please confirm that these voltage limits have been established based on the loss of the largest generating units or loss of the most critical transmission line and multiple contingencies. Also, specify the maximum and minimum voltage limits for the 230 kV switchyard in the FSAR.

08.02-55

FSAR Subsection 8.2.2.2 discusses grid reliability and stability analysis. However, the NRC staff did not find any discussion of frequency variation *at the switchyard*. *Provide in the FSAR the frequency variation and the maximum frequency decay rate expected at the switchyard under the most limiting conditions. Confirm that the frequency variations and the maximum frequency decay rate are consistent with requirements specified in Chapter 8 and Chapter 15 of DCD.*

08.02-56

US-APWR DCD, Revision 2, Section 8.2.3 states that transmission system reliability is consistent with the condition of the probability risk analysis of Chapter 19. Confirm that transmission system reliability is consistent with the condition of the probability risk analysis of Chapter 19.

08.02-57

FMEA discussed in FSAR Subsection 8.2.2.3 is inadequate. RG-1.206 states that the COL applicant should perform a FMEA of the switchyard components to assess the possibility of simultaneous failure of both circuits as result of a single events, such as a breaker not opening during fault conditions, a spurious relay trip, a loss of a control circuit power supply, or a fault in a switchyard bus or transformer.

In order for the NRC staff to evaluate the FMEA, describe in detail in the FSAR, how each event (a breaker not operating during a fault on an offsite line; fault on a switchyard bus; a spurious relay trip; and a loss of control power) in the FMEA was evaluated to conclude that the offsite power to each unit is not lost.

Additionally, FSAR Subsection 8.2.1.2.1 indicates that 500 kV breakers are equipped with dual trip coils. The NRC staff understands that 500 kV and 230 kV breakers are equipped with one closing coil. Provide a discussion in the FSAR on how offsite power will be recovered to the unit after an SBO event of eight hour duration with loss of one switchyard dc power system.

08.02-58

FSAR Section 8.2.2.2, "Reliability and Stability Analysis," NAPS COL 8.2 (11), identified maximum and minimum switchyard voltage limits of 534 kV and 505 kV. Explain how these limits were established and confirm that these voltage limits are acceptable for auxiliary power system equipment operation during different operating conditions. The confirmation should include assumptions, acceptance criteria, and summary of results for the following: load flow analysis (bus and load terminal voltages of the station auxiliary system), short-circuit analysis, equipment sizing studies, protective relay setting and coordination, and motor starting with minimum and maximum grid voltage conditions. A separate set of calculations should be performed for each available connection to offsite power supply. In addition, discuss how the results of the calculations will be verified.