

NRR-DRMAPEm Resource

From: Miller, Ed
Sent: Wednesday, July 10, 2019 2:48 PM
To: craig.d.sly@dominionenergy.com; diane.aitken@dominionenergy.com
Subject: Request for Additional Information Re: Open Phase Condition LAR
Attachments: North Anna OPC 2nd RAIs.pdf

Mr. Craig Sly
Manager, Nuclear Fleet Licensing
Virginia Electric Power Company

Dear Mr. Sly,
By letter dated April 30, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML18127A073), Dominion Energy Nuclear Connecticut, Inc. and Virginia Electric and Power Company (Dominion) requested U.S. Nuclear Regulatory Commission (NRC) approval of a license amendment request (LAR) to implement an open phase protection system for the North Anna Power Station - Units 1 and 2. By letter dated March 24, 2019 (ADAMS Accession No. ML19156A207), Dominion provided a response to NRC staff questions.

The NRC staff has reviewed the submittal, and supplement, and determined that additional information is needed to complete our review, as indicated in the request for additional information (RAIs) attached to this e-mail. On July 9th, a public teleconference was held to discuss outstanding NRC staff information needs regarding the LAR. A draft version of the questions (ADAMS Accession No. ML19179A133) was provided for discussion at the meeting. Based on the discussion, the NRC staff made slight edits to the questions, but they remain substantially the same.

If you have any further questions, please contact me at (301) 415-2481.

Ed Miller
Project Manager
Special Projects and Process Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission

Hearing Identifier: NRR_DRMA
Email Number: 107

Mail Envelope Properties (BN7PR09MB2755E78E47650D071E41443EE9F00)

Subject: Request for Additional Information Re: Open Phase Condition LAR
Sent Date: 7/10/2019 2:47:50 PM
Received Date: 7/10/2019 2:47:00 PM
From: Miller, Ed

Created By: Ed.Miller@nrc.gov

Recipients:

"craig.d.sly@dominionenergy.com" <craig.d.sly@dominionenergy.com>

Tracking Status: None

"diane.aitken@dominionenergy.com" <diane.aitken@dominionenergy.com>

Tracking Status: None

Post Office: BN7PR09MB2755.namprd09.prod.outlook.com

Files	Size	Date & Time
MESSAGE	1493	7/10/2019 2:47:00 PM
North Anna OPC 2nd RAls.pdf	189199	

Options

Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

NORTH ANNA POWER STATION, UNITS 1 AND 2
REQUEST FOR ADDITIONAL INFORMATION (FOLLOW-UP) REGARDING OPEN PHASE
PROTECTION PER NRC BULLETIN 2012-01
(EPID NO. L-2018-LLA-0132)

By application dated April 30, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18127A073), Virginia Electric and Power Company (Dominion Energy Virginia), the licensee for North Anna Power Station, Units 1 and 2, proposed to revise Technical Specifications (TS) 3.3.5 for Loss of Power (LOP) Emergency Diesel Generator Start Instrumentation. The license amendment request (LAR) addresses the potential for an open phase condition (OPC) that could exist on one or two phases of a primary off-site power source and that would not currently be detected and mitigated by the existing station electrical protection scheme. In response to the NRC Staff's request, the licensee provided additional information on March 24, 2019 (ML19156A207).

The NRC staff has identified the need for additional information (follow-up) to complete the review of LAR.

Applicable Regulatory Requirements

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.36(c)(2) provides the requirement for the establishment of TS limiting conditions for operation (LCO). Specifically, paragraph 50.36(c)(2)(ii) requires that a TS LCO of a nuclear reactor be established for each item meeting one or more of the criteria listed. For this LAR, Criterion 3 applies which states: "A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a DBA or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

10 CFR 50.36(c)(3), Surveillance requirements, requires surveillance relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

Request for Additional Information (RAI)

RAI # 1

In the letter dated May 24, 2019 (in response to RAI-EEOB-3), the licensee stated that because BE1-47N relay operates with an inverse time characteristic, which would result in a range of time delays for various OPC events, the inclusion of the allowable values for the full range of time delays in TS is not considered practical. The North Anna Technical Requirements Manual is being revised to incorporate the setpoint for the BE1-47N relay, which will include the time dial setting.

Please provide a mark-up of North Anna Technical Requirements Manual showing how the time delays will be incorporated and explain how any future changes in time delay settings will be controlled.

RAI # 2

The staff noticed the following underlined discrepancies in statements made in the LAR and a statement made in the mark-up of UFSAR provided in response to RAI-EEOB-12:

LAR Attachment 1, Page 8: At a minimum of 4 percent negative sequence, the BE1-47N relay will energize [trip] and send a start signal [to EDG] in approximately **11 seconds**.

LAR Attachment 1, Page 14: Analysis results show that for **most** open phase events in which the BE1-47N relays trip, the tripping time is less than 6 seconds after the open phase event occurs.

Mark-up of UFSAR (Page 8.3-4, Insert A): A time dial setting is used which results in a typical trip time delay of **less than 6 seconds** for **any** open phase condition sensed at an emergency bus.

Please address how you will resolve these discrepancies. If UFSAR changes are needed to make the UFSAR consistent with the LAR, provide any corresponding UFSAR revision markups.

RAI # 3

In the LAR, Attachment 1, Page 10, the licensee stated that the following open phase conditions were considered:

- Single open phase without a ground connections;
- Single open phase with a 350 ohm grounded connection; and
- Single open phase with a solid grounded connection.

Regarding the 350 ohms ground connection, in the letter dated May 24, 2019 (in response to RAI-EEOB-5), the licensee stated that the total fault impedance of a high resistance fault was calculated based on an empirical model as discussed in the Surry Open Phase Condition Detection Analysis calculation and IEEE paper, "Typical Expected Values of the Fault Resistance in Power Systems." Using the most conservative method discussed in the IEEE paper, a total fault impedance of 173.4 ohms was calculated. This value was doubled to 346.8 ohms and rounded to 350 ohms for use in North Anna's calculation.

Please provide the following additional information:

- (a) A brief calculation showing how the above fault impedance of 173.4 ohms was obtained.***
- (b) Confirmation that doubling the fault impedance is considered more conservative.***
- (c) How the above various types of ground connections were considered in the Table-1 provided on Page 15 of LAR, Attachment 1, and explain the significance of "Time = 8 seconds" provided in Table-1.***

RAI # 4

In the letter dated May 24, 2019 (in response to RAI-EEOB-8), the licensee stated that for a voltage unbalance greater than 5%, the BE1-47N relays should isolate the motor loads from

the OPC condition prior to the $I_2^2 \times t$ value reaching 20 pu. To validate this condition was met for the BE1-47N relays, a model was created in EMTP-RV to calculate the time until the $I_2^2 \times t$ value for each monitored motor reached 20 pu. This value was compared to the trip time of the BE1-47N relay for each event modeled.

In the LAR, Attachment 1, Page 13, the licensee also stated: "For a voltage unbalance between 1% and 5%, the NEMA MG-1 de-rating factor was applied to the motor rating. If the brake horsepower (BHP) of the motor is less than the de-rated horsepower rating, then continuous operation of the motor was determined to be acceptable. In cases where the BHP is greater than the de-rated horsepower rating, the motor must be isolated from the faulted source. The calculation quantifies the time duration for which the motor may be operated on the faulted source before the negative sequence current heating capability is exhausted. The resulting time duration was used to determine if manual action (alarm) is acceptable or if automatic action (trip) is necessary."

Because no alarm is provided in the control room if the voltage unbalance is between 1% and 5%, please provide a tabulation of all study cases in which the voltage unbalance is between 1% and 5%, and justification why all these cases are considered acceptable without any alarm or tripping function.