PMLevyCOLPEm Resource

From: Habib, Donald
Sent: Friday, July 26, 2013 3:04 PM
To: Bob Kitchen; Waters, David; Tillie Wilkins
Cc: Hale, Jerry
Subject: Levy Draft RAI Related to Branch Technical Position 08-03, Stability of Offsite Power Systems
Attachments: RAI_7208.docx

To All,

Attached is a draft Levy RAI related to the staff's review of Branch Technical Position 08-03 - Stability of Offsite Power Systems.

Please contact Don Habib (Donald.Habib@nrc.gov, 301-415-1035) within 3 days if a conference call is required for clarification, or the final RAI will be issued.

Thank you,

Donald C. Habib
Project Manager
U.S. Nuclear Regulatory Commission
Office of New Reactors, DNRL/LB4
Room T-6D14
Washington, DC 20555
301-415-1035
Donald.Habib@nrc.gov

Hearing Identifier: Levy_County_COL_Public
Email Number: 1212

Mail Envelope Properties (E3D0DF334F617344BE38EB00C881B1B3D33A766059)

Subject: Levy Draft RAI Related to Branch Technical Position 08-03, Stability of Offsite Power Systems
Sent Date: 7/26/2013 3:03:59 PM
Received Date: 7/26/2013 3:04:01 PM
From: Habib, Donald

Created By: Donald.Habib@nrc.gov

Recipients:
"Hale, Jerry" <Jerry.Hale@nrc.gov>
Tracking Status: None
"Bob Kitchen" <robert.kitchen@pgnmail.com>
Tracking Status: None
"Waters, David" <David.Waters@pgnmail.com>
Tracking Status: None
"Tillie Wilkins" <tillie.wilkins@pgnmail.com>
Tracking Status: None

Post Office: HQCLSTR01.nrc.gov

Files	Size	Date & Time
MESSAGE	634	7/26/2013 3:04:01 PM
RAI_7208.docx	34913	

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

Request for Additional Information 114

Issue Date:
Application Title: Levy County, Units 1 and 2 - Dockets 52-029 and 52-030
Operating Company: Progress Energy Florida, Inc.
Docket No. 52-029 and 52-030
Review Section: 08-03 Branch Technical Position - Stability of Offsite Power Systems
Application Section:

QUESTIONS

In response to Request for Additional Information (RAI) No. 08-1 (ADAMS Accession No. ML12228A611, Letter No. 109), dated August 15, 2012, regarding design vulnerability of electric power system due to single-phase open circuit condition, Duke Energy Florida (DEF) provided its supplemental response in a letter dated June 4, 2013 (ADAMS Accession No. ML13157A025), for Levy Nuclear Plant (LNP), Units 1 and 2. The applicant makes the following statements in its response:

An open delta protection scheme is used to detect a bus undervoltage condition on the nonsafety medium voltage buses including ES-1 and ES-2.

The loss of the shared "B" phase would automatically realign the ES-1 and ES-2 buses to the onsite power system (standby diesel generators).

The loss of any phase would generate an alarm from the electrical protection circuitry when the bus is normally loaded supporting power production.

The AP 1000 relay and protection methodology applicable to the ES-1 and ES-2 buses has not been designed to automatically realign to the onsite standby power system in response to all single-phase open circuit conditions, or high impedance ground fault conditions when the bus is lightly loaded.

The turbine-generator is provided with sequence protection that would initiate a generator trip with a loss of phase or high impedance ground fault.

An open delta undervoltage protection scheme cannot detect all open phase conditions or high impedance ground fault conditions when the bus is lightly loaded.

For the protection schemes described herein that would respond to the open phase or high impedance ground fault condition, setpoints and equipment sensitivities have not been finalized.

The undervoltage protection scheme is sensitive to the load on the source transformer.

During a normally loaded condition on the offsite power transformer, a high voltage open phase condition (with or without a high impedance fault) results in secondary voltage deviations that can be detected by the electrical undervoltage protection circuitry.

During a lightly loaded condition on the offsite power transformer, a high voltage open phase condition (with or without a high impedance fault) can result in secondary voltage deviations similar to those expected when high side transformer voltage imbalances are present.

The AP 1000 AC electrical design is in the design finalization stage; and relay settings and detailed coordination studies are not yet available. Therefore, a qualitative assessment is made below for the case of an “A" or "C" high voltage open phase or high impedance fault condition.

As stated in the initial response section, the AP 1000 non-safety related onsite electrical system has not been designed to automatically reconfigure the ES-1 and ES-2 buses to be powered from an onsite standby diesel generator for all single-phase open circuit or high impedance ground fault conditions on the high side of the MSU. With a normally loaded bus, the open phase (or high impedance ground fault) would be detected and alarmed in the main control room.

In the event a single high voltage open phase or high impedance fault occurs and the transient reduces the input voltage to the safety-related IDS equipment to an unacceptable level, safety-related subsystems would generate an alarm in the main control room and the IDS chargers would automatically isolate from the degraded nonsafety-related input voltage condition.

If the undervoltage condition manifests down to the 480 V load centers/motor control centers (MCCs) fed from ES-1 and ES-2, the safety related IDS battery charger would detect an unacceptably low input phase voltage and isolate the Class 1E system from the Non 1E power system. There are two divisions of IDS chargers supplied from each of the ES-1 and ES-2 buses.

One or more main control room alarms would be generated from the safety related subsystems as a result of an undervoltage condition at the input of each IDS charger.

Based on the above, staff cannot determine whether the LNP Units 1 and 2 detection scheme would identify open circuit condition on the high voltage side of a transformer connecting a GDC-17 offsite power circuit to the transmission system for all operating electrical system configurations and loading conditions. Staff requests that DEF clarify or provide support for the following statements from its June 4, 2013 RAI response to allow the Staff to determine whether LNP Units 1 and 2 design meets 10 CFR Part 50, Appendix A, GDC 17 requirements.

1. Identify which offsite circuit is credited to meet the GDC 17 requirements, considering the partial exemption for AP 1000 plants.

2. Provide details of the analyses and relay settings which can detect voltage unbalance on high voltage (HV) side of main transformer and reserve auxiliary transformer (RAT) due to the open phase condition (without and with concurrent high impedance ground on HV side of transformers) under all loading conditions including the light load conditions, and under all operating configurations. If analyses and setting of relays are not readily available, explain how these actions will be completed prior to fuel load.

3. Describe the design features provided for LNP in detail and the analysis performed to verify that, in the event of a single high voltage open phase and/or high impedance fault condition, the input voltage to the safety-related IDS equipment would be detected and alarmed in the main control room and the IDS chargers would automatically isolate from the degraded nonsafety-related input voltage condition for all loading conditions and operating configurations. Also, explain the design features provided and analysis performed to verify the applicant’s statement that one or more main control room alarms would be generated from the safety related subsystems as a result of an undervoltage condition at the input of each IDS charger.

4. Explain the design features provided and analyses performed to verify the applicant’s statement that if the undervoltage condition manifests down to the 480 V load centers/motor control centers (MCCs) fed from ES-1 and ES-2, the safety related IDS battery charger would detect an unacceptably low input phase voltage and isolate the Class 1E system from the Non 1E power system.

5. In the event that an open phase condition on the high side of the transformer results in Unit trip and the plant house loads are supplied through the same transformer with no bus transfer or clear indication of degraded power source, provide details on the consequences on operating equipment and any impact on safe shut down capability. Explain how the defense in depth systems perform their intended design functions in this situation.

6. In the event of an open phase condition occurring during a refueling outage, provide details on consequences on equipment supporting decay heat removal. Provide details if the events were to occur during mid loop operations and any malfunctions are being evaluated.

7. The AP1000 accident analyses assumes DC power is available for the first 72 hours of the accident and safe shutdown conditions are maintained for extended period using the onsite or offsite AC power systems. Provide a detailed explanation of impact on maintaining shutdown conditions if the offsite power source is used to support safe shutdown condition, the offsite source transformer is lightly loaded and has a loss of phase, the proposed protective relaying does not detect the adverse condition and induced voltage at the 480V level maintains the battery charger system with no alarm condition.

8. Explain what is meant by expected voltage imbalances on the HV side of main transformer and RAT under normal operating conditions.

9. Explain what is meant by light load conditions. Identify loads (important to safety) expected to be running under light load conditions.

In addition to the above, DEF is requested to provide sufficient analyses in the final safety analysis report (Sections 8.2 and 8.3 of Chapter 8) and ITAAC information (Table 8.2A-1 for offsite power system) for LNP in accordance with § 52.79, “Contents of applications; technical information,” and § 52.80, “Contents of applications; additional technical information,” for the staff to determine whether the LNP COLA meets the requirements of 10 CFR Part 50, Appendix A, GDC 17 “Electric power systems,” regarding the offsite power circuit and onsite electrical power distribution system to provide adequate capacity and capability in view of the design vulnerability identified in NRC Bulletin 2012-01, “Design Vulnerability in Electric Power System.” If further FSAR or ITAAC information is necessary, it should include, as a minimum, design and analyses information to automatically detect and alarm in the main control room for a single-phase open phase condition with and without a high impedance ground condition, on the high voltage side of a transformer connecting a credited GDC-17 offsite power circuit to the transmission system.