

SummerRAIsPEm Resource

From: McGovern, Denise
Sent: Thursday, January 02, 2014 3:43 PM
To: SummerRAIsPEm Resource
Cc: Gonzalez, Carlos
Subject: VC Summer Units 2 and 3 Electrical Bulleting RAI
Attachments: VC Summer Electrical Bulletin RAI.docx

Importance: High

Denise L. McGovern

Senior Project Manager
U.S. Nuclear Regulatory Commission
Office of New Reactors
301.415.0681

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Recipients:

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"SummerRAIsPEm Resource" <SummerRAIsPEm.Resource@nrc.gov>

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January 2, 2014

Mr. Ronald A. Jones, Vice President
New Nuclear Operations
South Carolina Electric & Gas Company
14368 State Highway 213
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION UNITS 2 AND 3: REQUEST FOR
ADDITIONAL INFORMATION REGARDING RESPONSE TO BULLETIN 2012-01,
“DESIGN VULNERABILITY IN ELECTRIC POWER SYSTEM”

Dear Mr. Jones:

On July 27, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Bulletin 2012-01, “Design Vulnerability in Electric Power System” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12074A115), to all holders of operating licenses and combined licenses for nuclear power reactors. Bulletin 2012-01 requested information about each facility’s electric power system designs, in light of recent operating experience involving the loss of one of the three phases of the offsite power circuit (single-phase open circuit condition) at Byron Station, Unit 2. South Carolina Electric and Gas (SCE&G) provided its response in a letter dated October 25, 2012 (ADAMS Accession No. ML12305A040) for Virgil C. Summer Nuclear Station (VCSNS), Units 2 and 3.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff’s request for additional information (RAI) is contained in the enclosure to this letter.

You are requested to respond, signed under oath or affirmation, by February 14, 2014. If changes are needed to the final safety analysis report, the staff requests that the RAI response include the proposed wording changes.

R.Jones

If you have any questions or comments concerning this matter, you may contact me at 301-415-0681 or denise.mcgovern@nrc.gov.

Sincerely,

/RA/

Denise L. McGovern, Senior Project Manager
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

Docket No(s): 52-027
52-028

eRAI Tracking No. 7365

Enclosure:
Request for Additional Information

cc: See next page

R.Jones

If you have any questions or comments concerning this matter, you may contact me at 301-415-0681 or denise.mcgovern@nrc.gov.

Sincerely,

/RA/

Denise L. McGovern, Senior Project Manager
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

Docket No(s): 52-027
52-028

eRAI Tracking No. 7365

Enclosure:
Request for Additional Information

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*Approval captured electronically in the electronic RAI system

NRO-002

OFFICE	NRR/DE/EEEB	NRR/DE/EEEB:BC	DNRL/LB4:PM	DNRL/LB4:BC
NAME	TMartinez-Navedo*	JZimmerman*	DMcGovern	LBurkhart
DATE	12/19/13	12/19/13	12/19/13	1/2/14

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Request for Additional Information
Virgil C. Summer Nuclear Station, Units 2 and 3
South Carolina Electric and Gas Company
Docket No. 52-027 and 52-028
Bulletin 2012-01 Offsite Power System

QUESTIONS:

In response to the Bulletin 2012-01, "Design Vulnerability in Electric Power Systems," regarding design vulnerability of electric power system due to single-phase open circuit condition, South Carolina Electric and Gas (SCE&G) provided its response in a letter dated October 25, 2012 (ADAMS Accession No. ML12305A040) for Virgil C. Summer Nuclear Station (VCSNS), Units 2 and 3. The licensee makes the following statements in its response:

An open delta voltage sensing scheme is used to detect a bus undervoltage condition on the non-safety medium voltage buses.

The AP1000 relay and protection methodology applicable to the Non-1E buses has not been designed to detect 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 sensing scheme cannot detect all open phase conditions or high impedance ground fault conditions.

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 use of the open delta potential transformer undervoltage detection scheme is sensitive to the load on the source transformer.

The AP1000 AC electrical design is in the design finalization stage, and relay settings, detailed coordination studies, etc. are not yet available.

Although the staff identified Byron event as an emerging issue for new reactors, SCE&G asserted that their 6.9 kV buses (ES-1 and ES-2) have not been designed to detect a single-phase open circuit condition as those 6.9 kV buses are not relied upon to maintain core cooling or containment integrity. The staff views that availability of the offsite ac power is important for all modes of plant operation including a safe shutdown. The staff also views that no real difference exists regarding how the offsite power from the grid has been utilized between the current operating reactors and AP1000 reactors (i.e., the offsite power is chosen as the preferred power source before transferring the auxiliary power system to onsite power source). In the event offsite ac power source is not available, all operating plants use Class 1E emergency diesel generators, while AP1000 relies on nonsafety-related standby diesel generators, before relying on the safety-related dc battery for plant safe shutdown. For AP1000 plant design, the offsite power system is the preferred power system used for supporting the design functions of important to safety systems during normal, abnormal, and accident conditions before using the onsite safety-related dc power system.

The staff determined that AP1000 plant design should have one offsite power circuit from transmission system to 6.9 kV buses to support safe shutdown of the power plant to meet the GDC 17 requirements concerning offsite power system. This offsite power circuit must have adequate capacity and capability to provide the functions described in GDC 17. Therefore, the staff determined that for SCE&G, AP1000 passive reactor design should provide automatic detection for an offsite power system single-phase open circuit condition with and without a high impedance ground fault condition on the high voltage side of the main power transformer including two-phase open conditions under all loading and operating configurations. In addition, an alarm should be provided in the main control room for operators to take manual actions if the standby diesel generators are not automatically connected to the ES-1 and ES-2 buses. This ensures the required AC power with adequate capacity and capability is available to the important to safety equipment including safety related battery chargers to meet their intended safety function in accordance with GDC 17 requirements.

Based on the above, staff cannot determine whether the VCSNS Units 2 and 3 detection scheme would identify open circuit conditions 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 SCE&G clarify or provide support for the following statement to allow the Staff to determine whether the VCS Units 2 and 3 response meets 10 CFR Part 50, Appendix A, GDC 17 requirements.

1. Provide summary of the assumptions, 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 conditions (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. Open phase condition is defined as:
 - a. The loss of one of the three phases of the offsite power circuit on the high voltage side of a transformer connecting a GDC 17 offsite power circuit to the transmission system with and without a high impedance ground fault condition under all operating electrical system configurations and loading conditions, and
 - b. The loss of two of the three phases of the offsite power circuit on the high voltage side of a transformer connecting a GDC 17 offsite power circuit to the transmission system under all operating electrical system configurations and loading conditions.

If analyses and setting of relays are not readily available, explain how these actions will be completed prior to fuel load.

In addition to the above, SCE&G is requested to provide sufficient analyses for the staff to determine whether the VCSNS response 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 FSAR changes or ITAAC are 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.