ArevaEPRDCPEm Resource

From: Miernicki, Michael
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To: WILLIFORD Dennis (AREVA)
Cc: Snyder, Amy; Mitra, Sikhindra
Subject: Comments on Advanced Response to U.S. EPR Design Certification Application RAI No. 564 (6901), FSAR Ch. 8, Question 08.02-8
Attachments: EPR - Design Vulnerability Issue.docx

Dennis, please see attached staff comments on subject advanced RAI response.

Mike

Michael J. Miernicki
Sr. Project Manager
NRC/NRO/DNRL/LB1
301-415-2304

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From: Miernicki, Michael

Created By: Michael.Miernicki@nrc.gov

Recipients:
"Snyder, Amy" <Amy.Snyder@nrc.gov>
Tracking Status: None
"Mitra, Sikhindra" <Sikhindra.Mitra@nrc.gov>
Tracking Status: None
"WILLIFORD Dennis (AREVA)" <Dennis.Williford@areva.com>
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EEEB's feedback on AREVA's RAI response concerning the Bulletin issue:

In response to staff's RAI (No.564, Question 8.02-8), AREVA stated the following:

> The U.S. EPR employs a 2-level voltage protection scheme for each of the Class 1E Emergency Power Supply System (EPSS) buses that monitor all three phases of bus voltage. The logic for tripping offsite power and starting the diesel for each bus from either the 1st or 2nd level voltage protection scheme is 2-out-of-3. This scheme, along with sensitive ground detection on each EAT, is capable of open phase or high-impedance ground detection inside the plant. Since the EPSS buses are normally very lightly loaded, additional protective features such as voltage or current imbalance at the EPSS buses would not provide reliable detection of an open phase or high-impedance ground on the offsite circuits. The existing U.S. EPR design of 3-phase voltage monitoring with 2-out-of-3 logic eliminates one of the Byron design vulnerabilities, that of 2-phase voltage monitoring with 2-out-of-2 logic ----
>
> Detection of an open phase or high impedance ground fault condition in the offsite circuits connected to the plant requires site specific information associated with the switchyard and the offsite power grid connections. Therefore, to address RAI 564, the COL item in U.S. EPR FSAR Tier 2 Section 8.2.1.1 and U.S. EPR FSAR Tier 2 Table 1.8-2 (Item 8.2-1) will be revised to specifically address and reference NRC Bulletin 2012-01.

Staff's review of the Bulletin 2012-01 responses from the licensees of the operating plants and the COL plants indicated that single-phase open circuit with or without high impedance fault condition on the high-voltage side of a credited offsite circuit may not be detected by the existing voltage protective relaying schemes. The staff believes that the existing two levels of voltage protection scheme proposed by AREVA for degraded voltage and undervoltage protection with 2-out-of-3 logic for each of the Class 1E buses may not be able to detect a single-phase open phase with or without a high impedance ground fault condition on the high voltage side of offsite power sources. As indicated above, the EPSS buses are lightly loaded during normal plant operation and any voltage drop due to open circuit condition on a single phase on the transformer primary side may not be detected due to induced voltage between the windings on the secondary side. The staff believes that relaying schemes capable of reliably detecting sequence currents including harmonic currents should be used to isolate single-phase open circuit with or without high impedance fault condition and transfer the Engineered Safeguard Features buses to the onsite power sources to preclude any adverse impact on plant equipment or operations.

Staff agrees with AREVA that detection of an open phase or high impedance ground fault condition in the offsite circuits requires site specific information associated with the switchyard and the offsite power grid connections. However, AREVA should provide details as to the basis for why the design features for detecting and automatically responding to a single-phase open circuit condition with or without a high impedance ground fault condition can be addressed as a COL information item (item 8.2-1). The RAI response should also provide information on how the implementation of the design will be addressed and documented in the FSAR

The above information is required in order for staff to verify whether the electrical power system (onsite and offsite power system) design meets the requirements specified in General Design Criterion (GDC) 17, “Electric Power Systems,” Appendix A, “General Design Criteria for Nuclear Power Plants,” and the design criteria for protection systems under 10 CFR 50.55a(h)(3).