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General Comment

See attached file(s)

Attachments

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SUNSI Review Complete
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add = K. Miller
(Kgm4)

Comments on RIS 2011-0013 – Jerry Nicely 3/17/11

1. Section DVR Setting Design Calculations states:
At the DVR dropout setting....., the DVR ensures adequate operational (starting and running) voltage to all safety related equipment, independent of voltage controlling equipment external to the plant safety related electrical distribution system.

Comments: From BTP PSB-1: "Two separate time delays shall be selected for the second level of undervoltage protection based on the following conditions: 1) The first time delay should be of a duration that established the existence of a ***sustained*** degraded voltage condition (i.e., something longer than a motor starting transient). "

BTP PSB-1 states, "sustained", implying a steady state voltage condition and not a transient voltage condition that exists during a motor starting event. The original 1977 NRC Letter, the later PSB-1, or GL 79-36 does not require plants to demonstrate the ability to start motors at the DVR settings. This appears to be a new interpretation of the regulations by NRR. Additionally, current written regulations and guidance allows for interpretation by CDBI inspectors, which has resulted in many unreasonable violations at the plants, especially since none of the written guidance is clear on what is required. Should the safety relay bus voltage degrade to a point slightly above the degraded voltage relay's lowest (after tolerances) dropout setting, all that is necessary to evaluate is that safety related equipment terminal voltages are within the manufacturers' recommended voltage range for continuous operation, which is also in compliance with the recommendations of IEEE 741 Annex A. This would ensure that those connected loads would not be damaged during this time. Requiring the ability to start motors at the DVR dropout setting does not accomplish anything or make sense, since starting a motor at this voltage will ensure a resultant voltage below the DVR dropout; result in not being able to be reset the relay, and as a result causing a spurious disconnection from offsite power and transferring to the emergency diesel generator. Having a requirement to be able to start motors at the DVR dropout setting will result in the raising the DVR settings to a higher value and is more likely to result in spurious separation from the grid which is in direct conflict with PSB-1.

The capability to start motors, however, should be evaluated and that evaluation should be performed at or below the lowest expected preferred power supply voltage. This is in compliance with the recommendations of IEEE 741-1997 Annex A. In order to be able to start motors, the voltage source has to have sufficient capacity and capability to do so. An example of this simplistically, is that although both a lantern battery and an automobile battery will measure 12 Vdc, but only the automobile battery will have the capacity and capability to start your car. Grid voltage capacity and capability can only be determined by the transmission operator and not by the nuclear plant operator. Senior management of NRR has also stated this statement of fact during public meetings on GL 2006-02. Using any voltage other than the minimum transmission system voltage will not ensure that the motors will have sufficient capacity and capability during starting. The transmission system operator uses their state estimator or other calculations to predict the lowest expected pre/post-event voltages for the preferred offsite power supply based on current system loading and the expected worst-case load demand by the nuclear station. Any voltage calculated to be less than those results in notification to the nuclear plant operator for evaluation of Tech Spec compliance and/or actions. This minimum expected grid voltage is always higher than or equal to the degraded voltage relay maximum reset value. However, due to lack of clear direction in the regulations and the

leeway for inspectors to interpret the criteria, has resulted in unreasonable violations for plants not demonstrating the ability to start motors at 1) the DVR dropout, 2) the DVR minimum reset value, or 3) at the DVR maximum reset, instead of the minimum expected grid voltage, which has sufficient capacity and capability to start motors. I have personally reviewed the degraded voltage schemes and analyses for 15 operating nuclear plants in all 4 regions as a part of their CDBI inspections. At all 15 plants, evaluation of operating (running) loads has been performed at the DVR dropout minimum setting. The evaluation of starting motors at all 15 plants has been at the minimum expected grid voltage. All 15 plants were in compliance with IEEE 741 Annex A for the voltage evaluations.

In 1997, IEEE 741, Annex A, Illustration of Concepts associated with Degraded Voltage Protection, was revised and was carefully developed with inputs from the original industry working groups established after the DVR letters and PSB-1 documents were issued. The 741 working group, which was a part of IEEE SC-4 subcommittee, was comprised of industry auxiliary power experts, and the primary NRR degraded voltage responsible engineer, N. Trehan. IEEE 741-1997 is referenced in NUREG-0800 BTP 8-6 and states the following: "IEEE Std. 741 provide the principal design criteria, design features, and testing requirements for protection of Class 1E power systems and equipment powered from those systems. This standard includes informative sections on degraded voltage protection". It would be beneficial if the NRC would endorse the concepts in IEEE 741-1997 Annex A, especially since the majority of the nuclear plants are in compliance with it and especially since it was developed with NRR participation on the working group. At this point, for the NRC to come out with a RIS that is totally inconsistent with the methodology widely accepted by the industry does not provide any value add and ensures that the DVR design concepts will become less reliable as the setpoints will have to be raised to a higher value to meet the new interpretations and is more likely to result in spurious separation from the grid which is in direct conflict with PSB-1.

2. It has been noticed that many plants have installed transformers in the offsite power supply circuits between the switchyard and safety-buses that have high speed automatic load tap changers capable of initiating tap changes within 1 second with subsequent steps also within 1 second or less. The reasons for this is the increasing load on the grid such that transmission operators are less willing to operate the grid out of economic order just to support the nuclear unit, which is very expensive to do. As a result, the nuclear plants installation of LTC transformers allows a much wider range of acceptable grid voltages. IEEE 741-1997 Annex A states that analyses may consider the effects of voltage compensating equipment, such as automatic load tap changing transformers and automatic switched capacitor banks, including their associated time delays, to ensure bus voltage recovery following expected voltage transients. In the RIS section of recent inspection findings for Peach Bottom, it was stated that since the load tap changers are not safety-related and are subject to operational limitations and credible failures, they cannot be relied on. This statement is totally nonsense since everything from the high side breaker on the safety-related boards up to the grid itself is also non safety-related. The load tap changer transformers are probably more reliable, as they are generally under the plant configuration control and maintenance programs, than the offsite power grid, which is in most cases not owned or operated by the utility. The RIS must re-consider the use of voltage compensating equipment to aid in bus voltage recovery following expected voltage transients as these are being used more

and more to enable the nuclear plants to be able to operate under widely varying offsite power voltages.

3. In the Offsite/Onsite Design Interface Calc section (C) it states: an accident in the unit being analyzed and *simultaneous shutdown* of all other units at the station. RG 1.81 state: The Regulatory staff has determined that, because of the low probability of a major reactor accident, a suitable design basis for multi-unit nuclear power plants is the assumption that an accident occurs in only one of the units at a time, with all remaining units proceeding to an orderly shutdown and a maintained cooldown condition; 10CFR50 App B Criterion 5 states: ...in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units; NUREG 0800 Section 8.2 states: .....in the event of an accident in one unit, with a simultaneous orderly shutdown and cooldown of the remaining units. Based on the above Regulatory positions, the RIS should consider rewording the "simultaneous shutdown" to "orderly shutdown".