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To: "Stephen Hoffman" <STH@nrc.gov>
Date: 08/14/2007 6:50:39 AM
Subject: Industry Position on License Renewal Scoping Boundary for SBO Recovery

Steve,

At our last conference call we committed to provide you the attached industry position on license renewal scoping boundary for station blackout recovery for discussion at the next joint Task Force/NRC meeting. Please have your staff review the attached and be prepared to discuss this in our September meeting.

I would like to make it clear that by submitting this paper we are not requesting a change to the guidance but we do believe that there has been a recent change by the NRC in how this guidance is being applied in that the guidance does not require inclusion of switchyard circuit breakers although that appears to be the NRC's recent position. We do recognize that this issue has not come up at all plants but it has been addressed in the past and the recently there appears to be a trend in that the NRC is currently taking the position that the inclusion of switchyard circuit breakers is required at two plants and it is expected that this position will continue to be taken by the NRC in the future. Since this is a change in the NRC implementation of generic guidance and this issue is likely to be repeated over time, we believe this should be addressed as an industry issue.

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Industry Position on License Renewal Scoping Boundary for Station Blackout (SBO) Recovery

Purpose

This paper provides a discussion of the issues associated with license renewal scoping, in accordance with 10 CFR 54.4(a)(3), electrical components required to demonstrate compliance with the regulations for station blackout (SBO), 10 CFR 50.63. Additional references specifically for license renewal are NUREG-1800, and ISG-2 [ML020920464].

Issue

The license renewal scoping boundary, which identifies the plant portion of the offsite power system for SBO recovery, must be based on the plant's current licensing basis (CLB) and design configuration. Scoping guidance provided in NUREG-1800 and ISG-2 does not constitute a requirement to include switchyard breakers or other specific components in the offsite power system within the scope of license renewal.

Background

The license renewal rule (10 CFR 54.4) provides the requirements for scoping equipment for license renewal. 10 CFR 54.4(a)(3) states:

All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

As stated in 10 CFR 54.4(a)(3) each applicant must include in the scope of license renewal the components required to perform a function that demonstrates compliance with 10 CFR 50.63 (SBO). 10 CFR 50.63(a)(1) states, "Each light-water-cooled nuclear power plant licensed to operate must be able to withstand for a specified duration and recover from a station blackout as defined in § 50.2." The item of concern is the recovery of offsite power following an SBO. The only other discussion of recovery from an SBO in the rule is 10 CFR 50.63(c)(1)(ii), which states, "A description of the procedures that will be implemented for station blackout events for the duration determined in paragraph (c)(1)(i) of this section and for recovery there from..." This statement is the requirement for plant procedures to address recovery from SBO. Neither 10 CFR 50.63 nor 10 CFR 50.2 provides a description or definition of recovery from SBO, offsite power, transmission grid, or the interface between the grid and plant systems. Regulatory Guide 1.155 and NUMARC 87-00 provide further guidance for SBO, but neither of these documents provides a description or definition of recovery from SBO, offsite power, transmission grid, or the interface between the grid and plant systems.

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The current licensing basis for SBO (10 CFR 50.63) is specified by the plant-specific UFSAR, and the latest plant-specific SBO safety evaluation report (SER) and supplemental NRC correspondence. To satisfy the license renewal rule (10 CFR 54.4(a)(3)), applicants provide information in the license renewal application (LRA) based on the current licensing basis. Because of requests for additional information (RAIs) on early applications regarding recovery from a station blackout, the NRC developed and the industry reviewed ISG-2, which was issued on April 1, 2002.

Evaluation

The purpose of ISG-2 was to provide additional guidance for identification of components to be included within the scope of license renewal for 10 CFR 50.63. An ISG cannot specify additional rules or requirements, but ISG-2 was generated to provide clarification of the statement in 10 CFR 50.63(a)(1), "Each light-water-cooled nuclear power plant licensed to operate must be able to withstand for a specified duration and recover from a station blackout as defined in § 50.2." ISG-2 provided guidance for the discussion of SBO recovery components that earlier license renewal applications (LRA) did not specifically address. When performing the 10 CFR 54.4(a)(3) scoping for SBO, the appropriate approach is to start with the SBO description in the plant's CLB, and the final SER for the plant's SBO requirements and commitments. Using the guidance provided in ISG-2 and NUREG-1800, these requirements and commitments should be reviewed to make the scoping determination.

A portion of the ISG- 2 guidance [ML020920464] reads as follows. (The SBO scoping guidance from ISG-2 is cited here because it is more complete than that in NUREG-1800, which includes only a portion of the original guidance provided in the ISG.)

The use of the offsite power system within 10 CFR 50.63(a)(1) as a means of recovering from an SBO should not be construed to be the only acceptable means of recovering from an SBO. A licensee could for example recover offsite power or emergency (onsite) power. It is not possible to determine prior to an actual SBO event which source of power can be returned first. As a result, 10 CFR 50.63(c)(1)(ii) and its associated guidance in RG 1.155, Section 1.3 and Section 2, requires procedures to recover from an SBO that include restoration of offsite and onsite power.

Based on the above, both the offsite and onsite power systems are relied upon to meet the requirements of the SBO rule. Elements of both offsite and onsite power are necessary to determine the required coping duration under 10 CFR 50.63(a)(1), and the procedures required by 10 CFR 50.63(c)(1)(ii) must address both offsite power and onsite power restoration. It follows, therefore, that both systems are used to demonstrate compliance with the SBO rule and must be included within the scope of license renewal consistent with the requirements of 10 CFR 54.4(a)(3). License renewal applicants are presently including the onsite

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power system within the scope of license renewal on the basis of the requirements under 10 CFR 54.4 (a)(1) (safety-related systems). They are also including equipment that is relied upon to cope with an SBO (e.g., alternate ac power sources) on the basis of the requirements under 10 CFR 54.4(a)(3). Only the addition of the offsite power system is therefore necessary to complete the required scope of the electrical power systems under license renewal.

The offsite power systems of U.S. nuclear power plants consist of a transmission system (grid) component that provides a source of power and a plant system component that connects that power source to a plant's onsite electrical distribution system which powers safety equipment. ***The staff has historically relied upon the well-distributed, redundant, and interconnected nature of the grid to provide the necessary level of reliability to support nuclear power plant operations.*** For purposes of the license renewal rule, the staff has determined that the plant system portion of the offsite power system that is used to connect the plant to the offsite power source should be included within the scope of the rule. This path typically includes the switchyard circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and transformer and onsite electrical distribution system, and the associated control circuits and structures. Ensuring that the appropriate offsite power system long-lived passive structures and components that are part of this circuit path are subject to an aging management review will assure that the bases underlying the SBO requirements are maintained over the period of the extended license. This is consistent with the Commission's expectations in including the SBO regulated event under 10 CFR 54.4(a)(3) of the license renewal rule.

The bolded passage from ISG-2 defines the grid as being well-distributed, redundant, and interconnected. It is this well-distributed, redundant, and interconnected grid that is referred to as the offsite power source in the next sentence. A key to performing the SBO scoping for license renewal is defining the boundary of the offsite power source or the grid. The interconnected nature of the grid is one of the bases relied on by the staff for concluding that the grid provides the necessary level of reliability to support nuclear plant operations. Therefore, the components that provide these interconnections are inherently part of the grid.

Additionally, recognizing that plant configurations are different, the guidance correctly used the word, "typically", when describing the components expected to be within the scope of license renewal. The guidance does not and cannot identify the specific components that should be included in scope for all plants. This determination is dependent on the plant CLB and design configuration.

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Additional Discussion

1. Plant design configuration

Switchyard design and the configuration of equipment used to connect a plant to the offsite power system vary from plant to plant. Based upon reviews of their design configurations, some licensees have included switchyard breakers, while others have concluded that switchyard breakers are not part of the plant portion of the offsite power system. V.C. Summer, Point Beach, Palisades, and Oyster Creek use disconnect switches to connect the plant to the offsite power system; whereas, Ginna set the SBO scoping boundary at circuit breakers that are not in the transmission system switchyard. Each of these scoping determinations was made after issuance of ISG-2, and in each case, the specific plant configuration did not match the "typical" configuration included in the industry guidance; but, after technical review, the NRC agreed with the scoping determination, as stated in the final license renewal SERs.

The correct scoping determinations were made by the respective licensees and the NRC in each of these cases, and this same philosophy should carry forward. The scoping determination should not be based on the typical components identified in guidance documents, but rather on a review of the specific plant configuration, the CLB and the SBO safety evaluation. Only those plant systems, structures and components required to accomplish the intended function of restoring offsite power to the plant should be included within the scope of license renewal.

Using the plant CLB as the starting point, the appropriate approach to determine what equipment is within the scope of license renewal for recovery of offsite power is to begin at the plant buses and move outward until reaching the interface between the plant and the transmission system (grid).

2. Other Considerations

Considerable attention has been given to defining the boundaries between power plants and transmission systems. The work that has been done in this area and the interfaces and control agreements between power plant operators and transmission system operators should be recognized in establishing the 10 CFR 54.4(a)(3) scoping boundary for license renewal.

- a. **Already Established Interfaces** - Much work has already been done in the industry to define responsibilities and interfaces between power plant operators and transmission system operators. Electric power industry deregulation, changes in ownership of power plants, corporate restructuring, and regulatory initiatives in response to events such as blackouts have contributed to better defined interfaces between power plant operators and transmission system operators.

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Recently, the Federal Energy Regulatory Commission (FERC) has made mandatory a number of bulk-power system reliability standards developed by the North American Electric Reliability Corporation (NERC). These mandatory reliability standards require bulk-power system owners and operators to establish formal interface agreements with power generators. These agreements clearly identify equipment for which the transmission system owner has responsibility (the grid) and for which the power generator has responsibility (the plant portion of the offsite power system). The interface, in many cases, is consistent with ownership and operational control boundaries.

One of these reliability standards, NUC-001-1, "Nuclear Plant Interface Coordination," addresses the special interface requirements between a nuclear power plant and the transmission system, and recognizes that a nuclear power plant's SBO coping duration evaluations are based in part on assumptions regarding restoration of offsite power (the grid).

These formal interface agreements establish practical boundaries and responsibilities for maintenance, operation and control of equipment between the power generator and the transmission system. The FERC reliability standards recognize the special nuclear plant interface requirements, and FERC already provides federal regulation and oversight of the activities on the transmission system side of the interface. By aligning the license renewal scoping boundary with the already established interface between the nuclear plant and the transmission system, a reasonable regulatory interface is established. Establishing the operational and regulatory interface at the same point ensures consistent definition of boundaries and responsibilities among all parties.

- b. Control - The transmission system operator has control of the existence of, or restoration of, power up to the defined interface point in the offsite recovery path. For SBO recovery, this point should be the scoping boundary for license renewal. Equipment utilized by the transmission system operator to restore power to this interface point is part of the grid. Equipment utilized by the plant to connect to this interface point is included in the "plant portion" of the offsite power system.

This approach is consistent with guidance provided in ISG-2, which states, "The staff has historically relied upon the well-distributed, redundant, and interconnected nature of the grid to provide the necessary level of reliability to support nuclear power plant operations." All equipment for which the transmission system operator has control over the existence of, or restoration of, power is part of the interconnected grid. Switchyard circuit breakers used to interconnect various power sources and power circuits within the switchyard are clearly part of the grid. It is the very ability to switch between various power sources that creates the "interconnected nature of the grid" identified in ISG-2.

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Unless there are compelling reasons to establish the license renewal scoping boundary at a different point, the previously established boundaries between the plant and the transmission system operator should be used. Having consistent definition of the boundaries and responsibilities among all parties involved is important to safety and accountability. Establishing a license renewal scoping boundary that is different from already established interfaces could contribute to confusion and dilution of responsibility.

3. Need for a breaker

The boundary of the SBO recovery source is not determined by the ability to isolate the conductor, or to interrupt current, but is based on plant design and configuration, as described above in Sections 1 and 2. A disconnect switch can be an acceptable boundary because it does not need to be capable of interrupting the circuit under load. Likewise, the interface between the grid and the plant may not be a device, but may be the connection point between the conductor supplying power to the plant and the grid conductor in the switchyard.

The device used to reconnect to the grid after an SBO event is not necessarily the same device that is the boundary with the grid. The plant onsite electrical systems are designed to switch or interrupt the power supply to safety buses at load using switchgear circuit breakers on the secondary (low voltage) side of the startup transformers. Circuit breakers used for this purpose are included within the scope of license renewal. Typically, the circuit breakers on the secondary side of the start-up transformers will automatically open when their protective relaying senses low voltage on the incoming power supply from the grid. These circuit breakers will be manually closed after the grid (i.e., switchyard power circuit) voltage is restored. Because these plant circuit breakers are relied upon to disconnect or reconnect the load, the devices used to connect the plant to the grid only need the capacity to switch the no load inrush current of the startup transformers. Therefore, the capability to switch buses at load or provide fault protection is not a requirement for the device used to connect the plant to the grid.