

OPERATIONAL READINESS OF OFFSITE POWER

CORNERSTONE: INITIATING EVENTS
MITIGATING SYSTEMS

APPLICABILITY: This Temporary Instruction (TI) applies to all holders of operating licenses for nuclear power reactors, except nuclear power reactors that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

2515/163-01 OBJECTIVE

The objective of this TI is to confirm, through inspections and interviews, the operational readiness of offsite power (OSP) systems in accordance with NRC requirements prescribed in General Design Criterion (GDC) 17, "Electric power systems ; "Plant Technical Specifications for OSP systems; 10 CFR 50.63, "Loss of all alternating current power;" and 10 CFR 50.65(a)(4), "Requirements for monitoring the effectiveness of maintenance at nuclear power plants."

2515/163-02 BACKGROUND

The loss of all alternating current (AC) power at nuclear power plants involves the loss of offsite power (LOOP) combined with the loss of the onsite emergency power supplies (typically emergency diesel generators (EDGs)). This is also referred to as a station blackout (SBO). Risk analyses performed for nuclear power plants indicate that the loss of all AC power can be a significant contributor to the core damage frequency. Although nuclear power plants are designed to cope with a LOOP event through the use of onsite power supplies, LOOP events are considered to be precursors to SBO. An increase in the frequency or duration of LOOP events increases the risk of core damage.

The NRC has been evaluating the reliability of offsite power for nuclear power plants over the last several years as a result of the changes in the operation of the surrounding electrical power grids due to deregulation and other legislative and economic forces. The switchyard degraded voltage condition at the Callaway nuclear plant on August 11, 1999, was attributed to the deregulated wholesale market that has contributed to conditions in which higher grid power flows are likely to occur. The NRC staff has been working with the

nuclear power industry on concerns as detailed in NRC Regulatory Issue Summary 2000-24 regarding offsite power voltage inadequacies and grid reliability challenges due to the electric power industry deregulation. Subsequently, the August 14, 2003, U.S. - Canadian power outage has given rise to additional concerns that all licensees may not be in full compliance with certain NRC regulations. NRC Regulatory Issue Summary 2004-05 and NRC Draft Generic Letter 2005-XX, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power," express the staff's concerns regarding the requirements of various regulations as they relate to the offsite power system.

2515/163-03 INSPECTION REQUIREMENTS

The inspector shall review licensees' procedures and determine that the procedures address the following areas to ensure the operational readiness of OSP systems in accordance with NRC requirements such as 10 CFR 50, Appendix A, GDC 17; Plant Technical Specifications for OSP systems; 10 CFR 50.63, and 10 CFR 50.65(a)(4).

03.01 Offsite Power Operability

The operating procedures that the control room operator uses to assure the operability of the OSP have the following attributes:

- (1) Identify the required control room operator actions to take when notified by the transmission system operator (TSO) that post-trip voltage of the OSP at the NPP will not be acceptable to assure the continued operation of the safety-related loads without transferring to the onsite power supply.
- (2) Identify the compensatory actions the control room operator is required to perform if the TSO is not able to predict the post-trip voltage at the NPP for the current grid conditions.
- (3) Identify the notifications required by 10 CFR 50.72 for an inoperable offsite power system when the nuclear station is either informed by its TSO or when an actual degraded voltage condition is identified.

03.02 Maintenance Rule

The procedures to ensure compliance with 10 CFR 50.65(a)(4) have the following attributes:

- (1) Direct the plant staff to perform grid reliability evaluations as part of the required maintenance risk assessment before taking a risk-significant piece of equipment out-of-service to do maintenance activities.
- (2) Direct the plant staff to ensure that the current status of the OSP system has been included in the risk management actions and compensatory actions to reduce the risk when performing risk-significant maintenance activities or when LOOP or SBO mitigating equipment are taken out-of-service.

(3) Direct the control room staff to address degrading grid conditions that may emerge during a maintenance activity.

(4) Direct the plant staff to notify the TSO of risk changes that emerge during ongoing maintenance at the nuclear power plant.

03.03 SBO

The procedures to ensure compliance with 10 CFR 50.63 have the following attribute:

1. Direct the control room operators on the steps to be taken to try to recover offsite power within the SBO coping time.

2515/163-04 INSPECTION GUIDANCE

General Guidance

Offsite Power Operability

10 CFR 50, Appendix A, General Design Criterion (GDC) 17-Electric Power Systems, requires an offsite electric power (OSP) system to permit functioning of structures, systems, and components important to safety to shutdown the plant under normal and emergency conditions. The capability of the OSP to provide adequate voltage and capacity have to be verified in light of the varying power flow conditions on the grid including the unit trip. The safety function shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. GDC 17 also requires that provisions be included to minimize the probability of losing electric power from the offsite power system as a result of, or coincident with, the loss of power generated by the nuclear power unit.

Plant Technical Specifications require at least two offsite power supplies when in plant operating modes 1, 2 or 3. 10 CFR 50.72 requires notification to the NRC of the occurrence of any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to shutdown the plant under normal and emergency conditions.

In order to accomplish these requirements, the OSP must provide sufficient voltage to the safety-related loads both during normal operation, post-trip conditions and accident conditions.

Maintenance Rule

10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Section 50.65(a)(4) requires that licensees assess and manage the increase

in risk that may result from proposed maintenance activities before performing the maintenance activities. These activities include, but are not limited to, surveillances, post-maintenance testing, and corrective and preventive maintenance. The scope of the assessment may be limited to structures, systems, and components (SSCs) that a risk-informed evaluation process has shown to be significant to public health and safety.

The offsite power system is required to support the operation and safe shutdown of the nuclear power plant by being the preferred power supply for the safety-related equipment. Loss of offsite power is a transient initiator. The likelihood of LOOP and station blackout (SBO) should be considered in the maintenance risk assessment, whether quantitatively or qualitatively. If the grid reliability evaluation indicates that marginally adequate grid conditions may exist during maintenance activities, the licensee should consider rescheduling maintenance activities that tend to increase the LOOP frequency or reduce the capability to cope with a LOOP or SBO.

In NRC Regulatory Guide (RG) 1.182, the NRC endorsed the February 22, 2000, revision to Section 11 of NUMARC 93-01, Revision 2, as providing methods that are acceptable for meeting 10 CFR 50.65(a)(4). The revised Section 11 addressed grid stability and offsite power availability in several areas. Section 11.3.2.8 states:

Emergent conditions may result in the need for action prior to conduct of the assessment, or could change the conditions of a previously performed assessment.

SBO

10 CFR 50.63, Loss of All Alternating Current Power, requires that each NPP licensed to operate be able to withstand an SBO for a specified duration and recover from the SBO.

Specific Guidance

04.01 thru 04.03 - No specific guidance is provided.

2515/163-05 REPORTING REQUIREMENTS

The responses to the inspection requirements specified in Sections 03.01, 03.02, and 03.03 including applicable licensee procedure numbers and titles should be submitted electronically and forwarded to NRR/DE, to the attention of Kimberley A. Corp via e-mail to KAR1@nrc.gov no later than June 01, 2005.

Document inspection results in a resident inspectors' routine inspection report (i.e., quarterly integrated inspection report). At a minimum, the inspectors should be able to briefly describe the areas reviewed and any findings in Section 4OA5, "Other," of the integrated inspection report.

Any findings identified during this inspection will be processed and documented in accordance with NRC IMC 0612. Significance of inspection findings should be evaluated

in accordance with applicable appendices of IMC 0609, "Significance Determination Process." Any noncompliance resulting from this inspection will be evaluated and documented in accordance with NRC Enforcement Policy (NUREG -1600) and Section 3.12 of the NRC Enforcement Manual.

2515/163-06 COMPLETION SCHEDULE

This TI will be completed no later than June 01, 2005.

2515/163-07 EXPIRATION

This TI will expire on April 30, 2006.

2515/163-08 CONTACTS

For technical support regarding the performance of this TI and emergent issues, contact George Morris at 301-415-4074 or Ronaldo Jenkins at 301-415-2985. For administrative/reporting/documentation questions, contact Kimberley Corp at 301-415-1091 or Roy Mathew at 301-415-2965.

2515/163-09 STATISTICAL DATA REPORTING

All direct inspection effort expended on this TI is to be charged to 2515/163 for reporting by the STARFIRE/HRMS system with an IPE code of SI.

2515/163-10 ORIGINATING ORGANIZATION INFORMATION

10.01 Organizational Responsibility

This TI was initiated by the Electrical and Instrumentation & Controls Branch (NRR/DE/EEIB).

10.02 Resource Estimate

The estimated direct inspection effort to perform this TI is estimated to be 8-12 hours per site.

10.03 Training

No specialized training is needed to perform inspection requirements in this TI beyond basic training for inspectors (specified in IMC 1245, "Inspector Qualifications"). However, if technical support is needed during the inspection, contact EEIB technical contact stated in this TI.

NRC Regulatory Issue Summary 2004-05, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power" (ADAMS Accession No. ML040990550)

NRC Regulatory Issue Summary 2000-24, "Concerns about Offsite Power Voltage Inadequacies and Grid Reliability Challenges Due to Industry Deregulation" (ADAMS Accession No. ML003695551)

Information Notice 2000-06, "Offsite Power Voltage Inadequacies" (ADAMS Accession No. ML003695551)

NUREG-1784, "Operating Experience Assessment - Effects Of Grid Events On Nuclear Power Plant Performance"

NRC Draft Generic Letter 2005-XX, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power" (ADAMS Accession No. ML050810504), dated April 12, 2005

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