
Issue 128: Electrical Power Reliability (Rev. 2)

DESCRIPTION

Following the NRR reorganization in November 1985, EIB/DSRO was responsible for resolving three issues that were directly related to onsite electrical systems: Issue 48, "LCO for Class 1E Vital Instrument Buses in Operating Reactors"; Issue 49, "Interlocks and LCOs for Class 1E Tie Breakers"; and Issue A-30, "Adequacy of Safety-Related DC Power Supplies." In an effort to provide a more integrated approach to resolving these

three issues, DSRO formulated a program to combine the issues into one generic issue.¹ In addressing this issue, the staff was to consider NRC endorsement of IEEE Standards 603 and 308 with possible revisions to the related Regulatory Guides. Any revisions to Regulatory Guides resulting from this issue could impact future plants.

Issue A-30 was initiated because of concerns regarding the reliability of nuclear plant DC battery systems and the ability of plants to safely shut down in the event of a common mode failure or multiple failures of redundant systems. This concern resulted in a study of the safety-related DC power supplies at operating nuclear power

plants. The results of this study were presented in NUREG-0305² which recommended that a quantitative reliability assessment of DC power systems be performed to identify and provide a basis for any changes in licensing criteria.

A reliability assessment was performed and documented in NUREG-0666.³ The dominant failure modes identified in this study involved: (1) the inability of batteries to provide sufficient power to Class 1E instrumentation and controls buses upon loss of AC power to the battery chargers; and (2) operational, test, or maintenance errors that could result in the loss of multiple DC divisions. Monitoring provisions and procedures for preventing these occurrences were developed by the staff and presented in NUREG reports, Information Notices, Bulletins, and STS. Two of these provisions were adopted in industry standards: IEEE-450, "IEEE Recommended Practice for Maintenance, Testing and Replacement of Large Lead Storage Batteries for Generating Stations and Substations," and IEEE-946, "Recommended Practices for the Design of Safety-Related DC Auxiliary Power Systems for Nuclear Power Generating Stations."

Issue 48 was identified when it was found that some nuclear power plants lacked administrative controls or TS governing operational restrictions for their Class 1E 120V AC vital instrument buses. These restrictions are required to ensure compliance with GDC 17, 21, 34, and 35 of 10 CFR 50, Appendix A. During repair or

maintenance activities on bus power sources or inverters, one or more of the normal or alternate vital instrument bus power sources could be removed from service indefinitely. This condition could lead to the loss of more than one vital instrument bus in the event of a single failure or loss of offsite power.

Issue 49 was identified as a result of an incident at the Point Beach Nuclear Plant. The licensee reported to the NRC that a manually-operated tie-breaker between redundant safety buses, which had been closed during a plant outage in order to facilitate maintenance without interrupting power to affected systems, remained closed for a period of 5 weeks after the plant returned to operation.

¹ Memorandum for H. Denton from T. Speis, "Integration of Electrical Power Issues into Proposed Generic Issue 128, 'Electrical Power Reliability,'" November 28, 1986. [8612080528]

² NUREG-0305, "Technical Report on DC Power Supplies in Nuclear Power Plants," U.S. Nuclear Regulatory Commission, July 1977.

³ NUREG-0666, "A Probabilistic Safety Analysis of DC Power Supply Requirements for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, April 1981.

In the event of a loss of normal AC power, the diesel generator output breakers would have been prevented from closing, as a result of the tie-breakers being closed.

CONCLUSION

This issue was given a high priority ranking and resolution was pursued based on the separate evaluations of Issues 48, 49, and A-30.

To address Issue A-30, Generic Letter No. 91-06⁴ was issued to request licensees to respond to 9 questions that were developed to facilitate staff determination of licensee implementation of existing recommendations.

These recommendations included provisions for monitoring DC systems, test procedures, and operating procedures. The recommendations were identified from a number of previous and ongoing actions including industry standards, INPO recommendations,

STS, and existing licensing practices. In the generic letter, the option was provided for licensees to supply information as part of the IPE. The actions described in the letter were not considered to constitute a backfit but only involved information gathering, in accordance with 10 CFR 50.54(f). Follow-up NRC actions, if necessary, were to be pursued on an individual plant basis.

Issues 48 and 49 were addressed in Generic Letter No. 91-11,⁵ issued to licensees to certify that they either have implemented TS or administrative controls conforming to the guidelines in the letter, or to justify why such controls may not be required. Any modification (e.g., procedural changes) performed to complete implementation would be considered a backfit to be performed as a compliance matter. This precluded evaluation of the need

for controls as part of the IPE as an acceptable alternative to responding to Generic Letter No. 91-11.⁶ However, the option to further evaluate certain aspects (such as the optimum length of time for allowing outage of equipment) as part of the IPE was still provided.

The staff's technical findings were published in NUREG/CR-5414.⁷ Thus, this issue was RESOLVED and requirements were issued.⁸ In an RES evaluation,⁹ it was concluded that consideration of a 20-year license renewal period did not affect the resolution.

⁴ Letter to All Holders of Operating Licenses from U.S. Nuclear Regulatory Commission, "Resolution of Generic Issue A-30, 'Adequacy of Safety- Related DC Power Supplies,' Pursuant to 10 CFR 50.54(f) (Generic Letter 91-06)," April 29, 1991. [[ML031200665](#)]

⁵ Letter to All Holders of Operating Licenses from U.S. Nuclear Regulatory Commission, "Resolution of Generic Issues 48, 'LCOs for Class 1E Vital Instrument Buses,' and 49, 'Interlocks and LCOs for Class 1E Tie Breakers' Pursuant to 10 CFR 50.54(f) (Generic Letter 91-11)," July 18, 1991. [[ML031200668](#)]

⁶ Letter to All Holders of Operating Licenses from U.S. Nuclear Regulatory Commission, "Resolution of Generic Issues 48, 'LCOs for Class 1E Vital Instrument Buses,' and 49, 'Interlocks and LCOs for Class 1E Tie Breakers' Pursuant to 10 CFR 50.54(f) (Generic Letter 91-11)," July 18, 1991. [[ML031200668](#)]

⁷ NUREG/CR-5414, "Technical Findings for Proposed Integrated Resolution of Generic Issue 128, Electric Power Reliability," U.S. Nuclear Regulatory Commission, November 1989.

⁸ Memorandum for J. Taylor from E. Beckjord, "Resolution of GI-128, Electrical Power Reliability," September 12, 1991. [[9312220229](#)]

⁹ Memorandum for W. Russell from E. Beckjord, "License Renewal Implications of Generic Safety Issues (GSIs) Prioritized and/or Resolved Between October 1990 and March 1994," May 5, 1994. [[9406170365](#)]

