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February 20, 2003

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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: NUREG 1801, Generic Aging Lessons Learned (GALL) Report
Aging Management Program XI.E2 Proposed Changes

Dear Dr. Kuo:

On February 13, 2003 the NEI License Renewal Task Force met with the staff to review the status and implementation of a number Interim Staff Guidance documents. During the course of our dialogue NEI committed to forward industry's approach to the enclosed proposed revision to NUREG 1801, Generic Aging Lessons Learned (GALL) Report, Aging Management Program XI.E2, Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits. The purpose of these changes is to incorporate lessons learned since NUREG 1801 was first issued. This proposed revision incorporates input provided by a special meeting of the IEEE Working Group 3.4 and by the industry. Final review was performed by the License Renewal Electrical Working Group, which has endorsed this revision. The following is a summary of the proposed changes.

- Reference to plant technical specifications has been removed from the "Parameters Monitored/Inspected." Many plants do not have technical specification driven surveillance tests for the circuits of interest.
- The phrase "instrumentation loop" has been replaced with "instrumentation circuit" since surveillance and calibration testing may not involve an "instrumentation loop."



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- A discussion was added to recognize that NUREG 1801 aging management program XI.E1 is not required to address cables addressed by this program.
- Clarification was provided that this program performs reviews of calibration documentation to identify anomalies that may provide indication of cable degradation.
- Calibrations performed at a "frequency specified in the plant technical specifications" has been replaced with "periodic reviews" of calibration or surveillance test results.
- The operating experience discussion was modified to identify calibrations and surveillances as a "possible indication" of cable degradation rather than "one indication" of cable degradation.

Revisions to the program are identified in the enclosure by underlining new text and striking through deleted text.

Once the staff has had an opportunity to review the industry approach we would like to schedule a meeting. If you have any questions, please call me (202) 739-8110 or by e-mail (apn@nei.org).

Sincerely,

A handwritten signature in black ink, appearing to read "Alan Nelson", written over a horizontal line.

Alan Nelson

Enclosure

XI.E2 ELECTRICAL CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS

Program Description

In most areas within a nuclear power plant, the actual ambient environments (e.g., temperature, radiation, or moisture) are less severe than the plant design environment. However, in a limited number of localized areas, the actual environments may be more severe than the plant design environment for those areas. Conductor insulation materials used in electrical cables may degrade more rapidly than expected in these adverse localized environments. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cable. An adverse variation in environment is significant if it could appreciably increase the rate of aging of a component or have an immediate adverse effect on operability.

Exposure of electrical cables to adverse localized environments caused by heat or radiation can result in reduced insulation resistance (IR). Reduced IR causes an increase in leakage currents between conductors and from individual conductors to ground. A significant reduction in IR is a concern for circuits with sensitive, low-level signals such as radiation monitoring and nuclear instrumentation since it may contribute to inaccuracies in the instrument loop circuits.

The purpose of the aging management program described herein is to provide reasonable assurance that the intended functions of electrical cables that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are used in instrumentation circuits with sensitive, low-level signals exposed to adverse localized environments caused by heat, radiation or moisture will be maintained consistent with the current licensing basis through the period of extended operation. This program considers the technical information and guidance provided in NUREG/CR-5643, IEEE Std. P1205, SAND96-0344, and EPRI TR-109619.

In this aging management program, ~~routine calibration tests performed as part of the plant surveillance test program~~ calibration results or findings of surveillance testing programs are used to identify the potential existence of aging degradation. For example, when an instrumentation loop circuit is found to be significantly out of calibration during routine surveillance testing, trouble shooting is performed on the loop, additional evaluation of the circuit is performed.

This aging management program applies to high-range-radiation and neutron flux monitoring instrumentation cables in addition to other cables used in high voltage, low-level signal applications that are sensitive to reduction in insulation resistance. An overlap exists between this program and program XI.E1 in that XI.E1 can be

applied to all instrumentation cables, but is not applied to high-range-radiation and neutron flux monitoring instrumentation cables if the XLE2 program is applied.

As stated in NUREG/CR-5643, "The major concern with cables is the performance of aged cable when it is exposed to accident conditions." The statement of considerations for the final license renewal rule (60 Fed. Reg. 22477) states, "The major concern is that failures of deteriorated cable systems (cables, connections, and penetrations) might be induced during accident conditions." Since they are not subject to the environmental qualification requirements of 10 CFR 50.49, the electrical cables covered by this aging management program are either not exposed to harsh accident conditions or are not required to remain functional during or following an accident to which they are exposed.

Evaluation and Technical Basis

1. *Scope of Program:* This program applies to electrical cables used in circuits with sensitive, high voltage, low-level signals such as radiation monitoring and nuclear instrumentation that are within the scope of license renewal.
2. *Preventive Actions:* ~~This is a surveillance testing program and~~ No actions are taken as part of this program to prevent or mitigate aging degradation.
3. *Parameters Monitored/Inspected:* The parameters monitored are determined from the specific calibrations or surveillances performed ~~plant technical specifications and~~ are based on the ~~are specific to the instrumentation loop circuit under surveillance or being calibrated, as documented in plant surveillance test procedures.~~
4. *Detection of Aging Effects:* Review of calibration results or findings of surveillance programs can ~~provides sufficient~~ indication of the need for corrective actions by monitoring key parameters and providing ~~trending~~ data based on acceptance criteria related to instrumentation loop circuit performance. Periodic reviews of results obtained during ~~The normal calibrations or surveillances~~ frequency specified in the plant technical specifications provides reasonable assurance that severe aging degradation will be detected prior to loss of the cable intended function. The first tests reviews for license renewal are to be completed before the period of extended operation.
5. *Monitoring and Trending:* Trending actions are not included as part of this program because the ability to trend test results is dependent on the specific type of test chosen. Although not a requirement, test results that are trendable provide additional information on the rate of degradation.
6. *Acceptance Criteria:* Calibration readings results or findings of surveillances are to be within the ~~loop-specific~~ acceptance criteria, as set out in the ~~plant technical specifications~~ surveillance test procedures.

7. **Corrective Actions:** Corrective actions such as recalibration and circuit trouble-shooting are implemented when calibration or surveillance results or findings of surveillances do not meet the acceptance criteria an instrument loop is found to be out of calibration. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address corrective actions.
8. **Confirmation Process:** As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process.
9. **Administrative Controls:** As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address administrative controls.
10. **Operating Experience:** Changes in instrument calibration data can be caused by degradation of the circuit cable and are a possible one indication of potential electrical cable degradation.

References

EPRI TR-109619, Guideline for the Management of Adverse Localized Equipment Environments, Electric Power Research Institute, Palo Alto, CA, June 1999.

IEEE Std. P1205-2000, IEEE Guide for Assessing, Monitoring and Mitigating Aging Effects on Class 1E Equipment Used in Nuclear Power Generating Stations.

NUREG/CR-5643, Insights Gained From Aging Research, U. S. Nuclear Regulatory Commission, March 1992.

SAND96-0344, Aging Management Guideline for Commercial Nuclear Power Plants - Electrical Cable and Terminations, prepared by Sandia National Laboratories for the U.S. Department of Energy, September 1996.