UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

April 29, 1999

NRC INFORMATION NOTICE 99-13: INSIGHTS FROM NRC INSPECTIONS OF LOW- AND MEDIUM-VOLTAGE CIRCUIT BREAKER MAINTENANCE PROGRAMS

Addressees

All holders of operating licenses for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to summarize observations made and insights gained during inspections of licensee circuit breaker maintenance programs. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

Because of concerns about the reliability of safety-related medium-voltage (4-kV to 15-kV) and low-voltage (600-V and below) power circuit breakers, the NRC inspected the circuit breaker maintenance programs at eight nuclear power plant sites in 1998, using Temporary Instruction (TI) 2515/137, Revision 1, "Inspection of Medium-Voltage and Low-Voltage Power Circuit Breakers," issued on March 9, 1998. For more detailed information, the individual inspection reports are available through the NRC Public Document Room. Attachment 1 lists the inspection reports and their accession numbers.

The TI inspections confirmed that the programs were generally adequate. However, observations made at several of the plants inspected indicate that licensee programs have several areas in common in which improvement may be desirable. In addition, in a few instances certain aspects of programs did not meet NRC requirements, and violations were cited. Licensees for the inspected plants have already taken steps to address many of the areas of concern identified by the inspections. This notice was developed so that all licensees may take advantage of insights gained from the inspections when considering circuit breaker maintenance program improvements.

Discussion

Significant observations from the TI inspections are described below and have been categorized as follow: (1) general programmatic issues, (2) preventive maintenance,

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(3) licensee/vendor interface, (4) control voltage calculations, and (5) operating experience review. However, licensees are encouraged to review the inspection reports for detailed findings and their resolutions.

I. General Programmatic Issues

Licensee preventive maintenance procedures and practices did not always reflect all of the applicable vendor recommendations or industry operating experience, and when licensees deviated from such recommendations and operating experience there was often no documented basis or rationale given. Adherence to vendor recommendations is not a regulatory requirement, but a sound engineering basis for such deviations is important, and should be performed in consultation with the vendor when possible, to ensure that valuable vendor information is not overlooked.

Storage, shelf life, environment, segregation, and issuance of lubricants and cleaning materials were not well controlled. Some licensees had not identified shelf lives for circuit breaker lubricants and cleaning agents or solvents.

Individual breakers at some plants either did not come with or were not given unique identifiers. Some licensees were not aware that group or series identifiers, such as shop order numbers, were not unique. Some licensees did not record both the breaker serial number, when present, or the cubicle number in maintenance records to allow for tracking of breaker location, performance, and maintenance history.

At most plants, the racking of breakers in and out of the cubicle (and local operation when required) was the job of operations department personnel rather than circuit breaker maintenance personnel. However, operations department training and/or procedures did not always cover breaker position verification or functional testing in the connected position (closing the breaker and running load equipment, when permitted by plant conditions). Training operations department personnel to verify proper indications, closing spring recharging, and restoration of all electrical and mechanical interfaces and interlocks, and cycling the breaker after it is racked in, could result in fewer failures to close on demand.

II. Preventive Maintenance

Preventive maintenance was not always performed with the frequency recommended by the original equipment manufacturer (OEM), and licensees had no documented justification for deviating from that frequency.

Maintenance procedures sometimes did not cover inspection for specific problems identified in industry operating experience. Some licensees stated that they covered such items in training, but specific items in question were seldom explicitly addressed in lesson plans.

III. Licensee/Vendor Interface

The TI inspections revealed that circuit breaker and switchgear vendor manuals were often not kept current, and the programs for periodic recontact provided for in Generic Letter (GL) 90-03 were ineffective in obtaining revisions or updates to vendor manuals, or other pertinent technical information.

Some licensees identified areas in which improvements could be made to vendor interface programs, including (1) periodic review of plant equipment to ensure that lists of key safety-related equipment are current, (2) establishing organizational and procedural interfaces and links to ensure that vendor interface personnel are kept informed of equipment changes or modifications, (3) establishing personal contact with the appropriate vendor personnel, (4) substantial involvement in the process by technically knowledgeable personnel, and (5) periodic comprehensive reconciliation with the vendor of lists of equipment and related technical publications or documentation.

IV. Control Voltage Calculations

The TI inspections revealed that a few licensees had not performed the circuit breaker control voltage calculations based on as-built systems. In some cases where calculations were performed several discrepancies were identified, including (1) not starting with the minimum battery voltage; (2) using an incorrect minimum battery voltage that did not take into account loading, state of discharge, and/or aging factors; (3) using incorrect current paths, cable lengths, conductor sizes, and/or ohms/foot values to determine overall cable resistance; (4) calculation of cable conductor resistance using ambient temperature values, but neglecting temperature rise caused by heat from surrounding cables in a raceway or without having data to justify the non-conservative lower temperature assumption; and (5) using incorrect loading values in the final determinations of voltage drops. One licensee, had not translated this design basis information into test procedures to demonstrate breaker operability (NRC Inspection Report 50-266/98-13).

V. Operating Experience Review

At most of the plants inspected, weaknesses were observed in the review of operational experience documents related to low- and medium-voltage circuit breakers. These documents included NRC information notices (INs); INPO SEE-IN documents or Nuclear Network reports; and vendor information, such as service information letters, technical bulletins, or service advisory letters.

The TI inspections revealed instances of industry operating experience information erroneously determined to be not applicable because of narrowly focused and/or superficial reviews, and insufficient involvement by technically knowledgeable personnel. Problems generically applicable to several types of breakers were often not recognized because the plant's breakers did not have exactly the same model designation as the one used as an example in the information notice or the vendor technical bulletin.

TI 2515/137, Revision 1, lists 62 NRC information notices and bulletins that deal with problems with low- and medium-voltage power circuit breakers. As many as one-third of these were erroneously determined to be not applicable at one or more plants.

Related Generic Communications

IN 98-38, "Metal-Clad Circuit Breaker Maintenance Issues Identified by NRC Inspections," issued on October 15, 1998, alerted licensees to issues identified by reactive NRC inspections at plants that experienced problems concerning circuit breaker reliability in 1997. The events discussed in that information notice were the catalyst that prompted the TI inspections of licensee maintenance programs in 1998.

Conclusion

This information notice requires no specific action or written response. However, recipients are reminded that they are required to consider industry-wide operating experience (including NRC information notices) where practical when setting goals and performing periodic evaluations under Section 50.65, "Requirement for monitoring the effectiveness of maintenance at nuclear power plants," of Part 50 of Title 10 of the Code of Federal Regulations. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

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Attachments:
1. Table of NRC TI Inspection Reports
2. List of Recently Issued NRC Information Notices

TABLE 1 - Temporary Instruction 2515/137 Inspection Reports

PLANT	REPORT NUMBER	ISSUE DATE	ACCESSION NUMBER
Callaway	50-483/98-15	10/26/98	9810290263
Hatch 1 & 2	50-326/98-08	04/30/98	9805110181
Nine Mile Point 2	50-410/98-18	11/13/98	9811240071
Perry	50-440/98-11	07/16/98	9807220299
Point Beach 1 & 2	50-266/98-13	09/11/98	9809180178
Seabrook	50-443/98-07	09/28/98	9810050116
Sequoyah 1 & 2	50-327/98-05	06/12/98	9807070138
Waterford 3	50-382/98-13	11/17/98	9811240126

LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
99-12	Year 2000 Computer Systems Readiness Audits	4/28/99	All holders of operating licenses or construction permits for nuclear power plants
99-11	Incidents Involving the Use of Radioactive Iodine-131	4/23/99	All medical use licensees
97-15, Sup 1	Reporting of Errors and Changes inLarge-Break/Small-Break Loss-of-Coolant Evaluation models of Fuel Vendors and Compliance with 10 CFR 50.46(a)(3)	4/16/99	All holders of operating licensees for nuclear power reactors, except those who have permanently cease operations and have certified that fuel has been permanently removed from the reactor
99-10	Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments	4/13/99	All holders of Ols for nuclear power reactors
99-09	Problems Encountered When Manually Editing Treatment Data on The Nucletron Microselectron-HDR (New) Model 105.999	3/24/99	All medical licensees authorized to conduct high-dose-rate (HDR) remote after loading brachytherapy treatments
99-08	Urine Specimen Adulteration	4/1/99	All holders of operating licensees For nuclear power reactors and licensees authorized to possess or use formula quantities of strategic special nuclear material (SSNM)
99-07	Fire Protection Preaction Sprinkler System Deluge Valve Failures and Potentials Testing Deficiencies	3/22/99	All NRC licensees

OL = Operating License
CP = Construction Permit

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LBM

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