U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Licensee:	Indiana & Michigan Power Company (American Electric Power)
Facility:	Donald C. Cook Nuclear Generating Plant
Location:	1 Cook Place Bridgman, MI 49106
Dates:	August 16-20, 1999
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EXECUTIVE SUMMARY

D. C. Cook, Units 1 and 2
NRC Inspection Report 50-315/99025(DRS); 50-316/99025(DRS)

This was a special inspection to evaluate the adequacy of the procedures used to refurbish the 4.16kV and 600Vac circuit breakers, observe refurbishing activities, test methods and practices by ABB technicians and evaluate refurbishment records including documentation of as-found conditions, parts replacements and pre- and post-refurbishment test results. The inspectors also reviewed D. C. Cook condition reports generated by AEP personnel in conjunction with the breaker refurbishment project and corrective actions where applicable. A brief review of breaker technician training, breaker vendor manuals, and use of breaker-related industry operating experience information was also conducted. The inspectors concluded that:

- The licensee had not provided sufficiently detailed guidance to ABB technicians regarding AEP expectations in the areas of procedural compliance, test methods and practices, and standards for recording test results and other information. AEP relied too heavily on "skill of the craft". Consequently, the technicians were measuring and recording insulation resistance values incorrectly due to a procedural deficiency and lack of adequate guidance as to licensee expectations. (Section M1.2)

- The procedures used for refurbishment of breakers were inappropriate. A significant example was that breaker timing tests at full/nominal control voltage were being performed first to determine as-found/prior breaker operability. This test sequence was inconsistent with current industry practice in which closing and tripping functional tests at reduced or minimum control voltage are the principal indicators of breaker operability. Performing three timing tests at full voltage first as prescribed by the procedures preconditioned the breakers and could mask a degraded condition in which a breaker may not have operated on demand at minimum control voltage under worst-case design-basis conditions. A non-cited violation was identified regarding inadequate breaker refurbishment procedures. (Sections M3.1 and M3.2)

- The licensee had not determined the minimum expected control voltages at the breaker control devices to verify component performance under worst case accident conditions. Consequently, the licensee failed to translate this design basis information into breaker refurbishment and maintenance procedures. Therefore it was indeterminate whether the voltages selected for the breaker testing would be valid to demonstrate previous (as-found) or current breaker operability under worst case conditions. A non-cited violation was identified regarding inadequate design control. (Section M3.2)

- The reduced control voltage prescribed in the procedures for testing the tripping function of the breakers (180 Vdc) was arbitrarily the same as that used for closing and was not consistent with the breaker manufacturer's (ABB's) recommendation (140 Vdc). The licensee was not able to provide a sound engineering basis or satisfactory rationale for the deviation. (Section M3.2)

- Due to lack of sufficient guidance on the rigorousness and level of detail expected, the documentation in work packages of as-found conditions (including lubricant), parts

replaced and reasons for replacement, was weak and sometimes inconsistent with technicians' recollections. (Section M3.3)

- The basic, general training and indoctrination received by ABB technicians at D. C. Cook, was reasonably complete and the approach of having them qualify on Cook procedures and general work practices was sound. However, adequate guidance was not provided on the licensee's expectations in the areas of documentation of work activities, as-found conditions, replacement of parts, and taking and recording information or test data. (Section M5.1)

- Many of the deficiencies observed in the breaker procedures were attributable to inadequate engineering involvement and ineffective use of industry operating experience information. (Section M7.2)

- Terminology in breaker related condition reports was sometimes inconsistent with work documents and within the condition report itself. Condition reports did not always capture the root cause and/or extent of condition when required and did not always propose adequate corrective action and/or measures to prevent recurrence. (Section M7.4)

In response to the inspectors' findings, AEP directed ABB Service Company to discontinue breaker refurbishment until the procedures could be properly revised and training on the revised procedures conducted. These activities were dependent in part upon the completion of calculations to determine the most limiting worst-case minimum control voltages.

Report Details

Summary of Plant Status

During this inspection, the D. C. Cook Nuclear Generating Plant was in an extended outage while the licensee was in the process of correcting long-standing material deficiencies (including the comprehensive power distribution circuit breaker refurbishment project, which was the focus of this inspection) as well as programmatic and performance weaknesses, including the corrective action program. The NRC was monitoring this process under the provisions of *NRC Inspection Manual,* Chapter 0350, "Staff Guidelines for Restart Approval."

I. Operations

Operations were not observed within the scope of this inspection.

II. Maintenance

This was a special inspection originally intended to review on-site refurbishment by ASEA Brown Boveri (ABB) Service Company of ABB 4.16-kV Type "HK" and 600-volt "K-Line" circuit breakers at the Donald C. Cook Nuclear Generating Plant (D. C. Cook). The work was being performed by the Cleveland, Ohio, and Charlotte (Matthews), North Carolina, service shops of ABB Service Company under contract to the D. C. Cook licensee, Indiana & Michigan Power Company (I&M), a subsidiary of American Electric Power (AEP). However, after arriving on site, the inspectors determined that AEP furnished the procedures, the supervision, the quality assurance program and the spare parts (although procured through ABB Service Company, Cleveland). Therefore, except for the ABB labor, it was clearly an AEP-controlled project. Accordingly, as agreed upon in consultation with the NRC resident inspectors, the licensing project manager for D. C. Cook in the NRC Office of Nuclear Reactor Regulation (NRR), the inspectors own management in the Quality Assurance, Vendor Inspection, Maintenance and Allegations Branch of NRR, and NRC Region III management, the inspection was changed to an inspection of AEP's breaker refurbishment activities, including oversight of the contractor.

M1 Conduct of Maintenance

M1.1 History of ABB Circuit Breaker Performance at D. C. Cook

In 1989, AEP issued a notification to the NRC pursuant to 10 CFR Part 21 (Part 21 Log No. 89044) because several breakers had failed to close on demand (See NRC Inspection Report 50-315/89031 for additional information). As a result, 36 safety-related ABB 4-kV HK circuit breakers (18 in each unit) were refurbished at D. C. Cook by ABB Service Co. On May 16, 1989, ABB sent a letter to its customers and the NRC (treated as Part 21 notification 89043) clarifying the guidance in the ABB instruction bulletins (technical manuals) for its Type "HK" medium-voltage circuit breakers. The manuals stated that the breakers were factory lubricated and subsequent lubrication should not be required. The ABB letter of May 16, 1989, stated that relubrication should be performed if the lubricant was found to be contaminated or if parts were replaced.

Before 1989, AEP did not have a planned refurbishment program or a refurbishment procedure for 4-kV breakers. As a result of the 1989 failures, AEP initiated a program to refurbish its 4-kV breakers every 8-12 years. However, in 1992, before any additional refurbishment was completed, the Cook periodic refurbishment plan was replaced with a performance-based preventive maintenance (PM) program. To implement this program, AEP breaker maintenance procedures called for timing breaker opening and closing, measuring contact resistance and visually inspecting lubricant. However, access to the majority of key lubricated parts was limited because breakers were not disassembled. The procedures specified that if inspection or performance criteria were not met, the breaker lubricant would be refreshed or loosened with an approved aerosol lubricant (Anderol 732) and the breaker would be scheduled for refurbishment. If the aerosol treatment was ineffective or if other problems existed with the breaker, it was supposed to be replaced with a spare or immediately refurbished. Several attempts made thereafter to establish a plan to refurbish circuit breakers appeared to have been hampered by lack of managerial support as documented in CR P-98-0526.

NRC Information Notice (IN) 95-22, "Hardened or Contaminated Lubricants Cause Metal-Clad Circuit Breaker Failures," issued April 21, 1995, cited the degraded lubricant-related breaker problems at D. C. Cook among others. It also explained that in 1991, the Maintenance and Surveillance Manuals for ABB HK and K-Line switchgear and breakers (MS 3.2.1.9-1 and MS 3.1.1.9-2 respectively) were revised to recommend cleaning and relubrication of breaker operating mechanism every 10 years. The IN further explained that in response to the 1989 Part 21 from D. C. Cook, ABB issued the May 16, 1989, letter described previously and also that in subsequent letters to the NRC of September 29 and October 3, 1994, ABB stated that, on the basis of its refurbishment experience, the condition of breaker mechanism lubricant cannot be determined without complete disassembly.

M1.2 Observations of Circuit Breaker Refurbishment Work in Progress

a. Inspection Scope

The inspectors observed ABB technicians performing refurbishment work on D. C. Cook's ABB 4-kV Type HK and 600-V K-Line circuit breakers. The inspectors observed breaker testing and examination, directly examined breakers being worked on, including old removed parts, new parts, tools and test equipment, reviewed procedures and work documents and interviewed the ABB and AEP personnel involved.

b. Observations and Findings

AEP furnished the procedures, the supervision, the quality assurance program and the spare parts (although procured through ABB Service Co., Cleveland) for the breaker refurbishment project. Under contract to AEP, ABB Service Company, Charlotte, provided experienced technicians, technical support (including procedural review), and onsite ABB supervisory personnel to assist in work management and supervision and for liaison/coordination with AEP project oversight/management staff (primarily from the maintenance and performance assurance departments).

While observing work in progress, the inspectors identified questionable practices; some related to faulty procedures, as discussed in Section M3 below, and others involving

variations in experience among technicians and a lack of clear guidance by AEP as to their expectations for procedural compliance, level of detail in documentation, recording of test results, etc. For example:

Measuring, reading and recording of as-left primary insulation resistance was not being done in accordance with standard industry practice. The AEP procedure did not specify a standard time interval after application of test voltage (5000 Vdc) for observing and recording the reading on the insulation resistance instrument (a Biddle 5000-volt "Megger®" megohmeter). The reading is time varying due to several physical and electrical phenomena including polarization, capacitive charging and "drying out" of insulator surface moisture. The reading will begin to stabilize and is typically taken after some prescribed standard time for repeatability, typically 1 minute, but this was not prescribed in the procedure. Consequently, the technician was recording readings after various times. This should also have been covered during training to indoctrinate ABB technicians in work standards expected (or that should have been expected) by AEP.

In addition, the technician had not received any specific guidance on precisely how AEP expected the readings to be recorded. The technician was recording the readings observed by the inspector as ">70 gigohms" [sic] instead of as "70 gigohms", which was the actual reading, as confirmed by the inspector. The technician explained that he recorded the reading as "greater than" the observed reading rather than the actual stable reading because he thought it would go up. Again, the time varying behavior of insulation resistance readings was not handled using the standard practice of taking the reading at a specified time.

Although the inspector had confidence in the ability of this particular experienced technician to read the dial accurately and with reasonable accuracy visually to interpolate between increments on the dial's logarithmic scale, no guidance was given either in procedures, nor apparently in training for interpolation, logarithmic or otherwise. Nor, as an alternative, was there any guidance not to interpolate (perhaps more suited to a group of technicians with varying experience), but to record readings that fall between graduation marks as > next lowest dial increment (in this case 50 gigohms) and < the next highest increment (in this case, 100 gigohms and top of scale).

c. Conclusions

The inspectors concluded that AEP had not provided sufficiently detailed guidance to ABB technicians regarding AEP expectations in the areas of procedural compliance, test methods and practices, and standards for recording test results and other information. In short, AEP relied too heavily on so-called "skill of the craft"; and while the inspectors had no reason to doubt the skill of the ABB craftsmen, they had varying backgrounds and levels of experience. It was apparent that certain decisions and choices were being left up to the technicians' discretion instead of being made by supervisory or engineering personnel and/or instead of providing more detailed guidance in procedures and training.

M3 Maintenance Procedures and Documentation

M3.1 Circuit Breaker Refurbishment and Maintenance Procedures

a. Inspection Scope

The inspectors reviewed the procedures which AEP had developed, in consultation with ABB Service Company, to refurbish its ABB HK (4.16 kV) and K-Line (600 volt) circuit breakers. These circuit breakers were originally manufactured by the ITE-Imperial Company, which over the years, had become ITE/Gould, then ITE-Brown Boveri. Since about 1990, the switchgear manufacturer, whose circuit breaker factory is located in Florence, South Carolina, has been owned by ASEA Brown Boveri (ABB) and is currently called the Distribution Systems Division of ABB Power Transmission & Distribution (T&D) Company, Inc., which is an entirely separate entity from the ABB Service Company, with whose facilities in Charlotte, North Carolina, and Cleveland, Ohio, AEP regularly does business.

Procedures reviewed were the following:

12IHP5021.EMP.024, "ITE 4KV Circuit Breaker Refurbishment," Revision 3, Change 5, dated August 3, 1999

12IHP5021.EMP.023, "ITE K-Line Circuit Breaker Refurbishment (Electrically Operated)," Revision 4, Change 3, dated August 14, 1999

12IHP5021.EMP.030, "ITE K-Line Circuit Breaker Refurbishment (Manually Operated)," Revision 2, Change 3, dated August 7, 1999

12IHP5021.EMP.012, "ITE.4KV Circuit Breaker Maintenance," Revision 3, Change 7, dated September 29, 1998

b. Observations and Findings

The procedures had been developed in consultation with ABB Service Company using obsolete Cook procedures and procedures obtained from other licensees as references. The HK refurbishment procedure referenced Volume II, "Medium-Voltage Circuit Breakers," Part 1, "ABB HK Models," of *Circuit Breaker Maintenance*, Report NP-7410, of the Nuclear Maintenance Applications Center (NMAC) of the Electric Power Research Institute (EPRI), but the HK maintenance procedure did not; nor did the K-Line procedure reference NP-7410, Volume I, Part 1, "ABB K-Line Models." The procedures also did not reference the ABB breaker maintenance guidance documents developed by the ABB Low- and Medium-Voltage Circuit Breaker Users Groups sponsored by EPRI/NMAC. The licensee (at least the Cook Engineering Department) had these guidance documents, which superceded the relevant portions of the NP-7410 series. However, it was apparent to the inspectors, as evidenced by the observations below, that the licensee had not utilized them effectively because several key provisions from the user group guidance documents were not reflected in the Cook breaker maintenance and refurbishment procedures.

The inspectors also found that the procedures did not reference or apparently reflect certain other pertinent industry operating experience information, including a key Significant Operating Experience Report (SOER 98-2), "Circuit Breaker Reliability," published by the Institute for Nuclear Power Operations (INPO) and relevant NRC information notices (INs), including most notably IN 95-22, "Hardened or Contaminated Lubricants Cause Metal-Clad Circuit Breaker Failures." Ironically, IN 95-22 cited problems with ITE (ABB) Type HK and K-Line breakers as examples and had been issued largely as a result of a 10 CFR Part 21 notification to the NRC by D. C. Cook. Examples of other highly relevant NRC INs not referenced or reflected in the procedures that were applicable either specifically or generically to the types of breakers at D. C. Cook were:

> IN 99-13, "Insights from NRC Inspections of Low- and Medium-Voltage Circuit Breaker Maintenance Programs"
>
> IN 98-38, "Metal Clad Circuit Breaker Maintenance Issues Identified by NRC Inspections"
>
> IN 98-03, "Inadequate Verification of Overcurrent Trip Setpoints in Metal-Clad Low-Voltage Circuit Breakers" (specifically applicable to K-Line breakers)

The licensee was a member of EPRI and D. C. Cook representatives had attended the most recent annual meeting (June 1999) of the ABB Low- and Medium-Voltage Circuit Breaker Users Groups at which the latest revisions to the guidance documents mentioned above were discussed and distributed. The meetings were held at EPRI's NMAC facility in Charlotte with HK and K-Line tutorials conducted by ABB Service Company at their nearby breaker service shop (Matthews). The inspectors, who had made a detailed presentation at the meeting on the breaker maintenance inspection insights (as also discussed in IN 99-13 mentioned above) had met the D. C. Cook representatives there, one of whom was the Cook electrician who was assisting in the oversight of ABB Service Co. technicians who were performing the onsite refurbishment of Cook breakers. However, as was apparent also from the observations below, the licensee did not make effective use of the information its representatives had obtained at the ABB breaker user group meetings.

The approval pages of the procedures did not contain any review or approval signatures identified as D. C. Cook Engineering; although, the licensee stated that Engineering had been involved in the procedure's development.

As examples of the types of procedural deficiencies found, the inspectors' review of Procedure 12IHP5021.EMP.024 resulted in the following detailed observations:

> Step 4.7 stated that bags containing disassembled parts "may be labeled with the procedure step number", but the procedure did not specify marking parts bags or tagging parts with the breaker job order number and/or the breaker serial number.

The procedure did not require recording the breaker operations counter reading, a key piece of information to correlate with as-found conditions (would have been specified at Step 6.2 to be recorded on the data sheet).

Step 7.1.2 called for timing breaker closing and opening three times at 250 Vdc (full nominal control voltage) followed by timing three opening and closing operations at 180 Vdc. This was in inappropriate sequence using incorrect voltages as discussed in detail in Section M3.2 below.

The instructions for testing the anti-pump ("Y") relay in Step 7.1.3 did not verify that the relay could pick up and remain latched as long as required under degraded control voltage conditions.

The acceptance/rejection values or expected values for the tests specified in Steps 7.1.2B, .2C, .2D, .2E were not provided. There was no guidance for determining if as-found values were within the expected range or abnormal.

Steps 7.4.8 and 7.4.17 did not instruct the technician to record the identification of the leads lifted on Attachment 7 to the procedure, "Lifted Wire Log."

Step 7.4.16 directed closing the breaker manually, but Step 7.4.18 began with the initial condition "With the breaker open,..." without a step in between, neither Step 7.4.17, nor any other, directing that breaker be opened.

Step 7.4.20 directs removing mechanism mounting bolts and "noting spacer arrangement", but did not instruct technicians how and where to record the spacer arrangement to ensure they can be reassembled the same way.

The licensee could not explain why Step 7.4.20A prescribed checking the resistance of the motor leads to the motor case to check for grounded windings, because Step 7.1.2E measured insulation resistance of each secondary disconnect stab to the breaker frame with the breaker open and closed and for each breaker position, with the closing springs charged and discharged. With the springs discharged, the charging motor is connected to its secondary disconnect pins regardless of breaker main contact position. Therefore, in Step 7.1.2E a grounded motor winding should be detected twice; in both the spring-discharged/breaker-open and spring-discharged/breaker closed states.

Step 7.4.20A checked (but did not say record), resistance between motor leads. The data sheet has a place to record the measured value, but expected value(s) were not provided to detect shorted windings. Checking resistance instead between the charging motor secondary stabs should include the motor control switch and wiring as well any time the closing springs are not fully charged.

Step 7.6.4 stated "If parts are damaged or normal wear parts, replace." Step 7.6.5 has "Peer/QC recheck the same parts for damage/abnormal wear checked by technician in 7.6.3. Recheck by another individual is prudent, but checking by QC/PA (or supervisor or engineering) was not unambiguously required.

Step 7.7.10G did not contain acceptance/rejection criteria for the resistance of the close, trip, and "Y"(anti-pump relay) coils. The step directed replacement of open coils, but did not address low coil resistance (indicating shorted turns).

Step 7.7.11C stated that the "Administrative Limit" of the resistance between the auxiliary switch contacts should be 0.1 ohms or less without defining or explaining "administrative limit."

Step 7.7.14 required visual inspection of specific parts of the breaker frame, but provided only subjective evaluation guidelines. Frame alignment not checked.

Step 7.7.21 was a key step that prescribed the reassembly of moving contacts, yet unlike some of the other reassembly steps, it had no lubrication instructions.

Step 7.7.25, also a critical step, prescribed reinstallation of the jack shaft, but it too did not contain lubrication instructions.

Step 7.8.1 directed that component pivots be lubricated without reference to Attachment 4, "Cleaning and Lubricating Guidelines," which prescribes removal of old lubricants before applying the new lubricants.

Step 7.8.10 used the term "rebound springs" (part number 31 in the exploded parts diagram) which was not consistent with the term "anti-shock springs" (also noted as being part number 31) as used in Step 7.8.9.

Step 7.19.1 prescribed the as-left primary insulation resistance testing, but it did not specify a standard time interval after application of test voltage (5000 Vdc) for observing and recording the dial reading on the insulation resistance instrument (a Biddle 5000-volt "Megger®" megohmeter).

The inspectors found similar types of errors and omissions in the other procedures reviewed which were discussed in general with the licensee for the licensee's further review and correction. The licensee acknowledged the above discrepancies and initiated the revision of the procedures, documenting this in a condition report. The licensee also directed ABB Service Company to discontinue refurbishment work until the procedures could be properly revised.

c. Conclusions

The various errors and omissions in the breaker refurbishment procedures (which prescribed activities affecting quality) rendered the procedures inappropriate to the circumstances. Together, these deficiencies constituted a violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings." This violation was of concern because the use of the deficient procedures resulted in: (1) inadequate determination of as-found breaker conditions needed to analyze known degraded breaker performance; (2) inadequate assurance that refurbishment was being done satisfactorily; (3) insufficient determination of baseline performance data for evaluation of future performance trends; and, most safety significant, (4) inadequate demonstration of safety-related circuit breaker operability under worst-case design basis conditions.

This Severity Level IV violation is being treated as a non-cited violation (NCV) in accordance with Appendix C of the NRC Enforcement Policy. Appendix C requires that for Severity Level IV violations to be dispositioned as NCVs, they be placed in the licensee's corrective action program. Implicit in that requirement is that the violation has been appropriately characterized (including root cause(s) where appropriate), with acceptable corrective action and preventive measures committed to, and that the corrective action program itself is fully acceptable. While the licensee staff and the NRC have not yet concluded that the corrective action program is fully effective, the NRC determined that these issues have been appropriately captured and are to be appropriately dispositioned. In addition, the significant efforts by the licensee to improve the corrective action program are underway and are captured in the D. C. Cook Plant Restart Plan which is under the oversight of the NRC through the process prescribed in NRC Manual Chapter 0350, "Staff Guidelines for Restart Approval." Accordingly, no Notice of Violation will be issued (NCV 50-315/99025-01; 316/99025-01).

M3.2 Control Voltages Used to Test Circuit Breakers

a. Inspection Scope

The inspectors reviewed refurbishment procedures to determine if the correct control voltage was being used to test the breakers and if the sequences being used were appropriate to preserve and identify the true as-found condition.

b. Observations and Findings

Step 7.1.2 of 12IHP5021.EMP.024 which prescribed the determination of as-found conditions, called for checking the time taken to close and trip the breaker three times, first at 250 Vdc and then three times at 180 Vdc. The licensee explained that this sequence was based on the notion of operability being demonstrated by timing versus reduced control voltage tripping and closing function. However, testing at the nominal voltage first even once, let alone three times, exercises the breaker's tripping and closing mechanisms. This practice constitutes preconditioning because it could mask degraded performance in that it forces the breaker to operate at nominal control voltage when the breaker may have been in a condition in which it might not have operated at the minimum expected control voltage. The minimum expected control voltage is the lowest voltage that could be available at the breaker control device coils (trip coil/shunt trip, closing coil, or closing spring release coil) when the breaker is required to operate to perform its safety function(s) under worst-case, design-basis conditions. This voltage is determined by test or experiment and/or analysis and calculation. Because the breaker was being tested at the higher voltage three times instead of the lower voltage, the true as-found condition cannot be determined. As documented in previous licensee reports, the breakers at D. C. Cook had been known to operate sluggishly in the past. Therefore, one of the purposes of the as-found testing ostensibly was to determine whether the breakers would operate at the minimum control voltage or if not, then to determine at what voltage the breakers would trip and close. Pre-conditioning the breaker, defeated this purpose and this important information would be lost.

The industry (breaker users groups) and manufacturers (ABB and others), the NRC and INPO have agreed that the principal indicator of breaker operability is the ability to trip

and close at minimum expected (calculated) control voltage, and all these entities have promulgated this position in one form or another as discussed in Section M3.1 with regard to procedure references. Whereas, breaker timing may be useful in some breakers to diagnose sluggish operation, once the opening or closing sequence is initiated, the timing is primarily indicative of the condition of the main contact operating mechanism. However, the ability to initiate the operation at all (the area in which most failures to operate on demand occur) can only be effectively assessed by reduced control voltage testing. CR P-99-21065 was initiated on 08/18/99 to document the breakers are being "pre-conditioned".

In addition, the manufacturer's minimum rated voltages for the closing and tripping coils are 180Vdc and 140vdc respectively (for breakers fitted with control devices designed for 250-Vdc nominal control power). The voltages at which breakers in relative good mechanical condition are actually capable of tripping or closing are usually found to be lower than the manufacturer's published rated values. CR P-99-21065 was initiated on 08/17/99 to identify that breakers are being cycled at 250Vdc first and then tripped at 180Vdc instead of 140 Vdc as recommended by the manufacturer. The ABB onsite supervisor and senior technician stated that they had noted this discrepancy in the procedures during their review; although they could not satisfactorily explain the rationale that the licensee had reportedly given them for the acceptability of this non-standard practice.

Finally, AEP had not determined the minimum breaker control voltages available at the breaker control devices for closing and tripping the breaker under the worst-case design-basis conditions both in terms of the most limiting design-basis events for breaker operation, e.g., station blackout, or the worst-case electrical service conditions during those design-basis events (i.e., lowest station vital battery voltage, longest cable runs, limiting cable sizing, highest cable temperatures, and highest load conditions). A previous inspection had identified that the licensee had determined the worst-case low battery voltage, but had not calculated the further voltage drops suffered in distributing control power to remote plant equipment and control devices. The inspectors did not review the battery voltage calculations to confirm that all factors affecting this voltage, including capacity/size, aging factors, state of charge, temperature, specific gravity and level of electrolyte, and load profile/rate of discharge, had been properly accounted for. Licensee personnel acknowledged that the calculations for the worst-case control voltages available at the breaker had not been performed, and that the values currently being used may not be conservative, i.e., at least as low as the minimum expected control voltages that could be present at the breaker control devices when the breakers would be required to operate to perform their safety function(s). Therefore, the validity of the test voltages prescribed by the procedures to be used before and after refurbishment to demonstrate breaker operability (or to determine the margin to the minimum operable condition) was indeterminate.

NRC regulations require initial and periodic demonstration of continued operability of safety-related structures, systems, and components (SSCs) by testing (e.g., license technical specifications, the general design criteria of 10 CFR Part 50, Appendix A, and Criterion XI, "Test Control," of 10 CFR Part 50, Appendix B). Further, such testing is an activity affecting quality and Criterion V of 10 CFR Part 50, Appendix B, requires that

activities affecting quality be conducted in accordance with documented instructions procedures and drawings.

Criterion III, "Design Control," of 10 CFR Part 50, Appendix B, requires that applicable regulatory requirements and the design basis (as defined in 10 CFR 50.2) be translated into instructions, procedures and drawings. Section 50.2 defines design bases as that information which identifies the specific functions to be performed by a structure system or component (SSC) of a facility [i.e., those important to safety] and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. Section 50.2 further states that these values may be:. (1) constraints derived from generally accepted "state-of-the-art" practices for achieving functional goals; or (2) requirements derived from analysis (based on calculations and/or experiments) of the effects of a postulated accident for which an SSC must meet its functional goals.

Criterion III further requires that during design verification testing, prototype test specimens be subjected to the most adverse design conditions, but also that design control measures be applied to maintenance, repair, and the delineation of acceptance criteria for inspections and tests. And finally Criterion XI of 10 CFR Part 50, Appendix B, "Test Control," requires that test procedures used to demonstrate operability of SSCs incorporate acceptance limits from applicable design documents.

Therefore, insofar as the minimum calculated or worst-case control voltage expected to be available at circuit breakers at the time when the breakers must use this reduced control power to perform their safety function(s) constitutes part of the most adverse design conditions for the breaker, and insofar as this voltage is part of the design basis for switchgear, functional testing of circuit breakers at or below the minimum calculated available control voltage would need to be performed to satisfy the regulatory requirements to demonstrate current operability, or past operability for as-found tests.

Shortly before the end of the inspection, the licensee reported that its engineering contractor, Duke Engineering, had completed some preliminary calculations and had estimated that the worst-case control voltage for closing the limiting breaker at D. C. Cook (presumably, the emergency diesel generator output breaker at the end of a prolonged station blackout) was 180.2 Vdc. The inspectors did not review the Duke calculations during this inspection to verify their validity and accuracy. Nevertheless, assuming for the interim that this figure was reasonably accurate, the inspectors pointed out that testing a breaker closing function at 180 Vdc, even if done first could not be deemed conservative because it allowed insufficient margin to account for calculational error as well as error in setting/measuring the test voltage.

The cognizant Cook Engineering and Maintenance staff later stated that they were planning to adopt test voltages with ample margin below the minimum calculated voltages which would not only be more valid to demonstrate current or past operability as applicable, but also when used in as-left tests, to provide some measure of the breaker's "margin to minimal operable condition" for reasonable assurance of future operability until the next maintenance period.

c. Conclusions

The procedures used for refurbishment of breakers were inappropriate. A significant example was that breaker timing tests at full/nominal control voltage were being performed first to determine as-found/prior breaker operability. This test sequence was inconsistent with current industry practice in which closing and tripping functional tests at reduced or minimum control voltage are the principal indicators of breaker operability. Performing three timing tests at full voltage first as prescribed by the procedures preconditioned the breakers and could mask a degraded condition in which a breaker may not have operated on demand at minimum control voltage under worst-case design-basis conditions. The inappropriate test sequences and voltages described above are among the deficiencies that rendered the breaker refurbishment procedures inappropriate to the circumstances contrary to the requirements of, and therefore constituting a violation of Criterion V, "Instructions, Procedures and Drawings," of 10 CFR Part 50, Appendix B.

With respect to reduced control voltage functional testing, the fundamental deficiency was that AEP had not determined (calculated) the minimum expected control voltages that could be present at the breaker control devices when the breakers would be required to operate to perform their safety function(s). Therefore, this key design basis information as defined in 10 CFR 50.2 was not available to translate into breaker test procedures as required by Criterion III of 10 CFR Part 50, Appendix B. Hence, the failure to translate this design basis information into the breaker refurbishment test procedures in order to establish appropriate test values to demonstrate breaker operability under the worst-case, design-basis and electrical service conditions constituted a violation of Criterion III, "Design Control," of 10 CFR Part 50, Appendix B.

This violation was of concern because the use of the deficient procedures resulted in: (1) inadequate determination of as-found breaker conditions needed to analyze known degraded breaker performance; (2) inadequate assurance that refurbishment was being done satisfactorily; (3) insufficient determination of baseline performance data for evaluation of future performance trends, and, most safety significant; and (4) inadequate demonstration of safety-related breaker operability under worst-case design basis conditions.

This Severity Level IV violation is being treated as non-cited violation (NCV) in accordance with Appendix C of the NRC Enforcement Policy. Appendix C requires that for Severity Level IV violations to be dispositioned as NCVs, they be placed in the licensee's corrective action program. Implicit in that requirement is that the violation has been appropriately characterized (including root cause(s) where appropriate), with acceptable corrective action and preventive measures committed to, and that the corrective action program itself is fully acceptable. While the licensee staff and the NRC have not yet concluded that the corrective action program is fully effective, the NRC has determined that these issues have been appropriately captured and are to be appropriately dispositioned. In addition, the significant efforts by the licensee to improve the corrective action program are underway and are captured in the D. C. Cook Plant Restart Plan which is under the oversight of the NRC through the process prescribed in NRC Manual Chapter 0350, "Staff Guidelines for Restart Approval." Accordingly, no Notice of Violation will be issued (NCV 50-315/99025-02; 316/99025-02).

In addition, the reduced control voltage prescribed in the procedures for testing the tripping function of the breakers (180 Vdc) was arbitrarily the same as that used for closing and was not consistent with the breaker manufacturer's (ABB's) recommendation (140 Vdc). The licensee was not able to provide a sound engineering basis or satisfactory rationale for the deviation.

M3.3 Documentation of As-Found Conditions, Parts Replaced, As-Left Conditions

a. Inspection Scope

The inspectors reviewed selected completed refurbishment work documents as well as some for work in progress in order to assess the adequacy of documentation of as-found conditions (including damage; missing, broken or improperly installed parts, excessive wear, condition of lubricant, adjustments and as-found test results).

b. Observations and Findings

Sometimes, terminology used was inconsistent within the work document narratives and with the technician's recollection of the facts. The as-found condition of parts and grease and reasons for replacement of parts were not being adequately documented. Expected performance in this area was not adequately specified in procedures and apparently not adequately covered in training. In one instance, a discrepancy was described in the work document by AEP staff as "the cotter pin on the right hand side of the crank arm for holding the closing spring guide in place was not bent to prevent it from coming out." However, when interviewed, the ABB technician who had reported the discrepancy insisted that the cotter pin (discovered during his initial inspection) was not the one described in the work document, but rather the cotter pin that retains the crank arm to the crank shaft. Further, the ABB technician stated that the improperly bent cotter pin was, in fact, a re-used cotter pin. He stated his opinion that it was likely that the cotter pin had not been bent because it was re-used and sprung such that it probably would not come out without having to re-bend it fully and risk breaking off one or both of the ends.

However, a more insidious and fundamental problem that now arose was the implication that at some time in the past, cotter pins had been re-used or possibly were routinely being reused instead of replacing them in key locations on safety-related equipment. It was also now unclear whether the discrepancy described in the work document was an error or a different discrepancy, and whether it had been corrected. The ambiguity thus introduced also put into question whether the discrepancy that the ABB technician claimed to have observed and reported had been corrected, not to mention finding out why any important cotter pins had not been replaced and properly bent. These concerns were expressed to the cognizant AEP refurbishment project oversight staff for documentation in a condition report.

c. Conclusions

Personnel documenting work activities, as-found conditions, parts replaced and the reasons for replacement were not given sufficient guidance on the rigorousness and level of detail expected. Supervisory review in many cases failed to identify this

problem. Therefore, information documented may be insufficient to determine the root cause of any known, prior degraded operation of breakers, which could impugn the efficacy of corrective actions or measures to prevent recurrence in some cases.

M5 Maintenance Staff Training and Qualification

M5.1 Training and Qualification of ABB Technicians

a. Inspection Scope

The inspectors reviewed the training, qualification and experience of the ABB technicians refurbishing the ABB circuit breakers at D. C. Cook. The inspectors interviewed technicians and observed work on both 4.16-kV (Type "5HK250") and 600-V ("K-Line") circuit breakers.

b. Observations and Findings

In addition to general training and indoctrination for onsite contractors, the ABB technicians had received training on D. C Cook electrical safety procedures and practices and had "on the job training" in breaker refurbishment per the D. C. Cook refurbishment procedures. The inspectors learned that most of the seven ABB technicians at D. C. Cook had extensive (some over ten years) experience in ABB breaker maintenance and refurbishment at several ABB service centers and other nuclear power plants.

However, the inspectors did not find provisions to train or retrain plant operations personnel who will be involved in operating the breakers in their cubicles and in racking the breakers into and out of their cubicles. Such training would include, for example, measures to ensure when a breaker has been racked out, even if only to the test position, after racking it back in to the connect position, that all the breaker functions including cubicle mechanical and electrical interfaces and interlocks are fully restored. Also training would be needed in the area of actions to take and to avoid when breakers do not perform adequately. Such training would be helpful in preventing additional problems and, in case of failures, would facilitate preserving as-failed conditions and early recognition of key symptoms in order to enable effective and expeditious failure analysis.

c. Conclusions

The inspectors concluded that the basic, general training and indoctrination received by the ABB technicians at D. C. Cook was reasonably complete and the approach of having them qualify on Cook procedures and general work practices was sound. In addition, the ABB technicians were qualified by their extensive previous experience for the breaker refurbishment work assigned. However, as stated previously, the ABB technicians with their various levels of experience and backgrounds, and some Cook personnel as well, had not been given adequate detailed guidance in the procedures and/or during training regarding AEP's standards or expectations (or what should have been their expectations) in various aspects of the breaker refurbishment project

including documentation of work activities, as-found conditions (particularly including lubricants), replacement of parts, and taking and recording certain kinds of information or test data.

M7 Quality Assurance in Maintenance Activities

M7.1 Review of Breaker Refurbishment-Related Procurements

a. Inspection Scope

The inspectors reviewed AEP purchase order (PO) C10039, dated April 15, 1999, to ABB Service Company, Charlotte (Matthews), North Carolina, for technicians to refurbish switchgear onsite. Also reviewed were the following POs to ABB Service Company, Cleveland, Ohio, for spare parts to be used in the breaker refurbishment:

NU 04-000000437, dated February 15, 1999
NU 04 000000809, dated March 08, 1999
NU 04-000000877, dated March 11, 1999
NU 04-000001000, dated March 13, 1999
NU-04-000001057, dated March 18, 1999

b. Observations and Findings

D. C. Cook's Maintenance Planning department prepared purchase requisitions (PRs) listing the components required to support refurbishment. PRs were reviewed by Budgeting, Quality Assurance, and Procurement Engineering, for adequacy of the technical and quality requirements. However, the Cook Supplier Performance Department had not itself performed a technical quality assurance (QA) implementation audit to qualify the supplier, but rather had taken credit for an audit performed by member utilities of the Nuclear Procurement Issues Council (NUPIC).

Such an audit or surveillance would be expected to verify not only the technical qualification of the supplier and the effective implementation of the supplier's QA/quality control program, but also that the supplier had assured itself that its sub-tier vendors, from whom it procures material to be used ultimately in nuclear safety-related applications (some of which may be commercial-grade items) have a documented, effectively implemented quality program. In most cases, such assurance would be needed to support verification that the delivered material and parts meet all the technical and QA requirements, particularly if commercial-grade dedication is involved.

The use of a NUPIC audit is common practice and is considered acceptable, provided that the licensee verifies that the audit covered all the relevant technical and quality aspects of the particular materials and/or services being procured, including, as stated previously, adequate oversight of sub-tier suppliers. Where commercial-grade dedication is involved at any level in the supply chain, the audit would be expected to verify that any and all critical characteristics for the specific commercial-grade items being procured that are not directly verified by the user are adequately controlled and/or verified by one or more of the suppliers. However, there was no indication that the Cook

Supplier Performance Department had verified that the NUPIC audit report used to qualify ABB Service Company, Cleveland, for supply of breaker spare parts covered these key aspects of supplier performance.

The inspectors also found the Supplier Performance staff interviewed were not aware of the existence of NRC publication NUREG-0040, "Licensee Contractor and Vendor Inspection Status Report". The NRC publishes NUREG-0040 quarterly and distributes it to all licensees. NUREG-0040 contains inspection reports (and other associated public documents) issued during the previous quarter by the NRC's Quality Assurance, Vendor Inspection, Maintenance and Allegations Branch. NUREG-0040 is an important source of information to aid in the selection and qualification of suppliers, yet the inspectors learned that AEP simply filed its copies in the training library and had not distributed them to the appropriate Cook staff.

c. Conclusions

The procurement documents related to the breaker refurbishment project contained acceptable technical and quality requirements, but the NUPIC audit report used to qualify ABB Service Company, Cleveland, for supplying parts for the breaker refurbishment had not been adequately reviewed to ensure that the supplier exercised adequate control of its sub-suppliers and that any commercial-grade dedication involved was adequate. Further, the licensee did not make effective use of NRC information in the selection and qualification of suppliers. Thus, the licensee's implementation of the requirements of Criterion VII, "Control of Purchased Material, Equipment and Services," of 10 CFR Part 50, Appendix B, was weak for procurements related to the Cook circuit breaker refurbishment project.

M7.2 AEP Oversight of ABB Service Company

a. Inspection Scope

The inspectors assessed the AEP approach to vendor interface and oversight for the breaker refurbishment project and its implementation.

b. Observations and Findings

The inspectors found that breaker refurbishment work was continually observed by one or more Cook electrical maintenance staff, and at least one of the two (contractor) quality control inspectors assigned for this job in addition to supervision by ABB's onsite project manager and lead technician. In addition, there was regular oversight by Cook Performance Assurance as well as involvement of the Cook Maintenance supervisor responsible for the project and occasionally other maintenance or support personnel.

c. Conclusions

The inspectors concluded that the deficiencies in the procedures and weaknesses in implementation of the project plan were attributable to insufficient engineering involvement, insufficient attention to detail by maintenance management and ineffective use of industry operating experience information. Nevertheless, these weaknesses

notwithstanding, the licensee's overall approach to control of the breaker refurbishment project, especially with regard to coordination with and oversight of the vendor was a strength.

M7.4 Corrective Action

a. Inspection Scope

To determine the adequacy of the corrective action program on problems identified during the circuit breaker refurbishment activities, the inspectors reviewed related condition reports, compared them where applicable to documentation of problems in work records, and interviewed the personnel involved.

b. Observations and Findings

D. C. Cook has established an Electronic Corrective Action Program which requires adverse conditions to be documented in a condition report (CR). The tracking system established to document recommended corrective action, review the recommendations, and track the implementation appears to have been acceptable. The inspectors reviewed the following CRs in which conditions adverse to quality related to circuit breaker refurbishment were documented.

CR P-98-0526 was initiated on 09/28/98 to identify that there was no program to refurbish 4-kV and 600-Volt circuit breakers. It provided a summary of the history of problems experienced at D. C. Cook and the unsuccessful attempts to establish a viable program. The CR remains open.

CR P-99-21167 was initiated on August 18, 1999, to document that certain NRC publications called NUREGs have not been distributed to interested or affected licensee staff. The licensee was prompted to initiate investigation and corrective action when the inspectors discovered that Supplier Performance Department personnel were unaware of NUREG-0040, "NRC Licensee Contractor and Vendor Inspection Status Report," a quarterly publication containing NRC vendor inspection reports and related correspondence that would be very useful to the Supplier Performance staff in supplier selection, qualification and oversight. The inspectors determined that it was the licensee's practice to file NUREGs in the Training Department library for general access and not to ensure that interested or affected staff received copies. As discussed previously, the inspectors also observed that certain NRC information notices (INs) had not been referenced in the relevant circuit breaker refurbishment and maintenance procedures, nor had the pertinent information been incorporated. The inspectors found that similar to NUREGs, INs and some other similar documents were not being systematically reviewed and distributed to the cognizant licensee staff. Per the CR, the licensee undertook to review NUREGs and other such documents, distribute copies to the appropriate staff, and establish distribution lists to ensure appropriate distribution in the future.

CR P-99-08557 was not related to the HK and K-line breaker refurbishment project, but its disposition and that of similar CRs discussed below were noted because they were indicative of corrective action program weaknesses. This CR had been initiated on

04/16/99 to identify that maintenance had not been performed on molded-case circuit breakers (MCCBs) according to guidelines promulgated in EPRI/NMAC NP-7410, Volume III. However, the action proposed to correct this condition did not consider a program which would confirm operational availability, but instead, recommended to wait for the root cause analysis for the condition reported in CR P-98-526. The handling of CR P-99-08557 appeared effectively to circumvent the new corrective action program, one purpose of which was to improve correction of deficiencies expeditiously.

CR P-99-10884 had been initiated on May 5, 1999, to identify that over-current tests were not performed on all safety-related MCCBs to prove operational availability. Periodic over-current tests were being conducted as a surveillance pursuant to license technical specifications on certain MCCBs that are intended to provide protection to containment penetrations from thermal damage due to faults or sustained overloads in the cables that pass through them. These breakers were installed as a back up to the normal fault and overload protection devices provided (i.e., fuses, individual load breakers MCCBs, motor circuit protectors and starter overload relays, etc.). In addition, AEP was testing overload trip functions of MCCBs that feed non-safety-related loads from safety-related motor control centers (Class 1E isolation devices).

Action to correct this situation and periodically test all MCCBs important to safety to demonstrate operability appears to have been delayed because of an internal dispute over the applicability of and commitment to pertinent Institute of Electrical and Electronic Engineers (IEEE) standards which recommend such testing as opposed to basing the decision on the technical merit of the recommendations. For instance, IEEE Standard 338-1987, "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Safety Systems" discusses periodic testing. However, the opponents of the tests contended that IEEE standard was not applicable because D. C. Cook was not committed to it because the plant was licensed before the standard was issued.

The inspectors noted that in the development of the improved standard technical specifications, the overload testing requirement for containment penetration protection MCCBs did not survive the credibility review for falling under the criteria in 10 CFR 50.36(c)(2) and (c)(3) in that the NRC staff had determined that the occurrence of a fault or sustained overload condition on a cable (safety- or non- safety-related) passing though a containment penetration concurrent with a previously undetected failure of the normal circuit and load protective devices, concurrent with a design-basis event requiring immediate containment integrity, concurrent with the failure of the backup circuit breaker, was not a credible scenario for a limiting condition for operation requiring technical specification-mandated surveillance. Therefore, this TS surveillance was listed as one that may be moved to site-controlled procedures.

Nevertheless, regardless of lack of licensing commitments to the technically applicable IEEE standards, or the status of the affected technical specification, the inspectors found that there was a need for D. C. Cook to address the aging of all of its safety-related MCCBs (including those that serve as Class 1E isolation devices only), preferably by undertaking a program of testing and replacement of the oldest ones in the warmest environments. NRC IN 93-26, "Grease Solidification Causes Molded Case Circuit Breaker Failure to Close," IN 93-26, Supplement 1 and IN 93-64, "Periodic Testing and Preventive Maintenance of Molded-Case Circuit Breakers," are germane.

Some licensees have considered what amounts to refurbishment of their MCCBs; including cleaning; removing old, possibly dried-out grease; relubricating with an appropriate lubricant and re-verifying operability by tests. While AEP may be considering this course of action, almost all manufacturers of MCCBs strongly recommend against it. This position against user-maintenance of MCCB mechanisms and contacts is also reflected in MCCB-related publications of the National Electrical Manufacturers Association (NEMA) such as NEMA AB 1-1984, AB 3, and AB 4-1991. The technical basis for this position has been explained variously that users (licensees) do not have the technical knowledge, proprietary technical information, or special tools and equipment ostensibly required to open and repair/refurbish MCCBs. As a practical matter, with the exception of certain user-replaceable overload trip units and accessory devices, replacement parts are not available from the manufacturers. Additionally, opening a typically sealed MCCB case is said to invalidate the applicability of the Underwriters Laboratory design certification and production letter to the opened MCCB, not to mention what may remain of the manufacturer's warranty. Finally, MCCB refurbishment is highly labor intensive for a small, relatively inexpensive component, even given the cost of dedicating commercial-grade MCCBs for safety-related use. Therefore, most licensee have judged the practice not to be cost effective.

In the past, for all the reasons cited above, the NRC has taken a position in general discouraging user refurbishment of MCCBs as reflected in correspondence with certain licensees on the issue. Instead, as explained in the INs mentioned above, a more conservative preventive maintenance program that includes operational monitoring for overheating; periodic testing, using a test sequence that minimizes preconditioning; and with regular exercising of the MCCBs periodically in between testing periods, supplemented by replacement of very old MCCBs and unsatisfactory or marginal performers, has become the generally advocated practice by the industry and the NRC. The CR on this issue remained open.

The Project Manager - Electronic Corrective Action Program (ECAP) explained to the inspectors how the current program to initiate and dispose CRs is ideally supposed to work efficiently. However, she agreed that actions taken to correct the problems in CRs like P-98-0526, P-99-08557, and P-99-10884 were not typical and were overdue. She assured the inspectors that this would be brought to the attention of the ECAP director so that he can bring it to the attention of the cognizant and affected directors to improve and accelerate the CR review process.

c. Conclusions

D. C. Cook has established a viable ECAP, but in some instances, the system was not being effectively and consistently implemented.

Terminology in breaker related condition reports was sometimes inconsistent with work documents and within the condition report itself. Condition reports did not always capture the root cause and/or extent of condition when required and did not always propose adequate corrective action and/or measures to prevent recurrence.

V. Management Meetings

V1 Entrance Meeting

Due to the planned scope of the inspection, i.e., an inspection of ABB Service Company activities in the refurbishment of D. C. Cook circuit breakers, no formal management meeting was held initially with the licensee on Monday, August 16, 1999. However, during the course of the inspection, the inspectors kept licensee management and cognizant staff informed of their concerns through periodic briefings.

V2 Mid-Week Management Briefing

When it was finally determined that the inspection would become an inspection of AEP breaker refurbishment activities, a more formal and comprehensive briefing was held with the licensee on Wednesday, August 18, 1999.

As a result of the inspectors' concerns about the adequacy of the refurbishment testing practices and procedures, the licensee directed ABB Service Company to discontinue work until the procedures could be revised, which was dependent upon the completion by Duke Engineering of the required voltage drop calculations for AEP.

V3 Exit Meeting

A formal exit meeting was held with the licensee on Friday, August 20, 1999, at which the inspectors summarized the inspection scope, and their observations, findings and conclusions, including potential enforcement items (which had already been discussed in detail with cognizant licensee staff) for the benefit of D. C. Cook senior management. Licensee management appeared to understand and were receptive to the inspectors concerns and committed to place the concerns in the Cook corrective action program and take prompt and appropriate corrective actions.

PARTIAL LIST OF PERSONS CONTACTED

American Electric Power Company at D. C. Cook Nuclear Generating Plant

*+L. Cook, Maintenance
+R. Cook, Maintenance
*+R. Crane, Supervisor, Regulatory Affairs
+M. Finissi, Director, Plant Engineering
*+R. Gaston, Compliance Manager
+R. Godley, Director of Regulatory Affairs
P. Johns, Auditor, Supplier Performance
+V. Kanal, Production Engineer
S. Koshar, Shift Manager
* L. Weber, Manager, Operations
+J. Mehmandoost, Performance Assessment
+R. Meister, Senior Specialist, Regulatory Affairs
+J. Molden, Director, Maintenance
*+G. Truini, Production Engineering
+C. Vaderniet, Manager, Performance Assurance
*+J. Wallace, Supervisor, Electrical and I&C Production Engineering

ASEA Brown Boveri (ABB) Service Company

A. Brown, ABB Project Manager
E. Langlois, Lead Breaker Technician
+D. Leckey, Supervisor, Quality Assurance

* Denotes those individuals who attended the entrance meeting on August 18, 1999.
+ Denotes those individuals who attended the exit meeting on August 20,1999.

LIST OF PROCEDURES USED

IP 38701:	Procurement
IP 42700:	Plant Procedures
IP 62705:	Observation of Electrical Maintenance Activities

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

50-315,316/99025-01	NCV	Violation (SL IV): 10 CFR Part 50, Appendix B, Criterion V, Inadequate Circuit Breaker Maintenance and Refurbishment Procedures
50-315,316/99025-02	NCV	Violation (SL IV): 10 CFR Par 50, Appendix B, Criterion III, Failure to Translate Design Bases Into Procedures

Closed

None

Discussed

None