U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Licensee:	Wisconsin Electric Power Company
Facility:	Point Beach Nuclear Plant, Units 1 and 2
Location:	6610 Nuclear Road Two Rivers, WI 54241
Dates:	June 8-12 and July 15-16, 1998
Inspectors:	T. Tella, Reactor Engineer, Team Leader, RIII Z. Falevits, Reactor Engineer, RIII S. Mitra, Electrical Engineer, NRR B. Rogers, Reactor Engineer, NRR
Approved by:	Ronald N. Gardner, Chief, Engineering Specialist Branch 2 Division of Reactor Safety

EXECUTIVE SUMMARY

Point Beach Nuclear Power Plant
NRC Inspection Reports 50-266/98013; 50-301/98013

A team inspection was conducted using the guidance of Temporary Instruction (TI) 2515/137, Revision 1, "Inspection of Medium-Voltage and Low-Voltage Power Circuit Breakers," issued March 1998. The purpose of this inspection was to verify the adequacy of licensee programs, procedures, training, equipment and supporting documentation for the maintenance of medium-voltage and low-voltage power circuit breakers. The inspection team was composed of Region III and Headquarters personnel. The following observations were made:

- Adequate design controls were not in place to verify that the voltages available at the close and trip coils of medium and low-voltage circuit breakers would be adequate to safely operate the breakers in accident conditions. The team concluded that the original calculation of circuit breaker control voltage lacked the rigor normally seen in safety-related calculations. As a result, the breaker test procedures used a control voltage that was much higher than the vendor design data. A no-response violation was cited. (Sections E2.1 and E2.2)

- The team determined that adequate measures were not established to ensure that only approved and authorized cleaning compounds and lubricants were used to clean/lubricate safety-related electrical breaker components. Consequently, unapproved and non-standard cleaners/lubricants were used. A no-response violation was cited. (Section M3.4 and M8.3)

- Failure to properly implement significant portions of the breaker maintenance requirements in maintenance procedures was not consistent with vendor recommendations and was not a proactive approach to good breaker maintenance. A no-response violation was cited. (Section M3.2)

- The team concluded that adequate maintenance and failure history of breakers was not maintained. The plant engineers were not performing any root cause evaluations or trending of breaker failures. The team considered this a significant weakness. (Sections M2.1 and E2.3)

- NRC Information Notice IN 97-53, "Circuit Breakers Left Racked Out in Non-Seismically Qualified Positions," issued on July 18, 1997, had not been adequately evaluated. The team identified some racked out breakers, without prior seismic evaluation, and considered this an unresolved item. (Sections M2.1 and M8.2)

- The team reviewed the data concerning disassembly of six Westinghouse 4.16 kV type DH breakers and concluded that the condition of the lubricant and various moving parts was minimally acceptable. The results revealed indications of deteriorated lubrication on various breaker internal components which indicated poor maintenance practices. (Section M3.3)

- The team noted that adequate training was not provided to the technicians on correct lubrication practices. The team also noted a weakness that Point Beach Nuclear Power Plant (PBNP) did not provide training to the technicians on any revisions of the breaker maintenance procedures even when revisions were substantial. (Section M5)

- Previous self-assessments and quality verification audits did not identify the problems identified during this inspection. (Section M7.1)

- The team concluded that PBNP had participated in user groups relating to breakers. PBNP had a number of technical personnel involved in the Westinghouse and ABB User Groups that resulted in good access to vendor technical information. (Section M8.4)

Report Details

II. Maintenance

M1. Conduct of Maintenance

M1.1 General Comments

The team reviewed a population of electrical breakers at the Point Beach Nuclear Power Plant (PBNP). The 4.16kV breakers included in this population were Westinghouse types DH and VR, and Asea Brown Boveri (ABB) type 5HK. In addition, there were Westinghouse type DB 480 Volt breakers, used for safety and non-safety related applications, that were included in the review.

M2. Maintenance and Material Condition of Facilities and Equipment

M2.1 Walkdown of Switchgear Areas

a. Inspection Scope

The team performed a walkdown inspection of the plant electrical areas, including several switchgear areas.

b. Observations and Findings

During the walkdown inspection of the safety and non-safety related 13.8 kV, 4.16 kV and 480 Vac switchgear, the team observed that the switchgear and surrounding areas were adequately maintained with no broken or missing parts. However, the team observed that safety related breakers in 480 Vac safeguard load centers 1B-04 and 2B-04 were in their racked-out position. The team questioned the licensee concerning NRC Information Notice (IN) 97-53, "Circuit Breakers Left Racked Out in Non-Seismically Qualified Positions," issued on July 18, 1997, which documented several industry problems with seismic qualification of breakers in a racked out position. IN 97-53 emphasized that Class 1E switchgear may not function as required for a design-basis earthquake with the breakers in any position other than the seismically qualified position. Therefore, the plant was in a condition outside its design basis. The team determined that the licensee's initial evaluation of IN 97-53 was incomplete. In response, the licensee initiated Condition Report (CR) 98-2367 and removed the racked-out breakers from their cubicles. However, removal of breakers from their cubicles may result in another unanalyzed condition. The resulting mass redistribution of the switchgear may change the switchgear dynamic response during a seismic event and may invalidate the original seismic qualification of the switchgear. Pending further

actions by the licensee to determine the affects of the as-found conditions on the seismic qualification of the affected switchgear, this item remains unresolved. (50-266/98013-01 (DRS); 50-301/98013-01 (DRS))

During the maintenance shop walkdown, the team observed maintenance activities on 480 volt safety related breaker No. B52-33C and found it extremely dirty, and had corrosion and an apparent hairline crack in a component in the operating mechanism. In addition, this breaker had no documented history of previous maintenance since it was installed around 1970. The team was concerned that this breaker, which was in a bad condition, could have been swapped and used in other safety related applications.

c. Conclusions

The team concluded that the switchgear and the surrounding areas were adequately maintained. The team identified an unresolved item concerning the lack of a specific seismic evaluation for racked-out breakers and for switchgear with breakers removed. In addition, adequate maintenance records were not maintained for some breakers in the plant. The team considered this a weakness.

M3 Maintenance Procedures and Documentation

M3.1 Review of Maintenance Procedures for Low-voltage Power Circuit Breakers

a. Inspection Scope

The team reviewed the maintenance procedures for the low-voltage power circuit breakers to assess the quality of breaker maintenance. The procedures were compared to the maintenance section of the manufacturer's instruction manuals, compared to good industry practices for breaker maintenance, as well as specific guidance in TI 2515/137.

b. Observations and Findings

The team made the following observations:

- The current maintenance procedures developed in 1993 generally followed the instructions of the vendor's manual. From the start of commercial operation (Unit 1 began on 1970 and Unit 2 on 1972) until 1993, the licensee used a one page breaker inspection and maintenance form (MT-12) which did not reference or follow the vendor manuals or instructions. The team was concerned whether maintenance was adequate on breakers over this long period, because of the previous lack of formal procedures.

- The 480 Vac breakers, except for the reactor-trip breakers, were in service for over 20 years without being refurbished.

The team reviewed several recently completed maintenance procedures for the 480 Vac breakers and noted that these procedures were clear, detailed, and incorporated appropriate sign-offs for critical maintenance activities. Data sheets provided a good record of the results obtained. The team reviewed the completed maintenance procedure of Westinghouse type DB-50 safety related breaker 1B52-10C, completed on November 1, 1996. The team was concerned that during the replacement of the breaker's ampactor, that safety related hardware was replaced with commercial grade hardware without an engineering evaluation or proper dedication. In response to the team's concern, the licensee issued CR 98-2372 to address this issue. The licensee's engineering evaluation indicated that the hardware, which included a screw, a nut, a lockwasher and a wire bundle wrap, were not subject to any large seismic loads, and were acceptable for this application.

c. Conclusions

The team considered the preventive maintenance procedures for low voltage breakers that were developed within the last five years were of a type appropriate to the circumstances and included appropriate qualitative and quantitative acceptance criteria. However, breaker maintenance procedures prior to 1993 were poor and lacked details of the maintenance performed. The team was also concerned that commercial grade hardware was used on a safety related breaker without an adequate engineering evaluation or proper dedication.

M3.2 Review of Maintenance Procedures for Medium Voltage Power Circuit Breakers

a. Inspection Scope

The team reviewed several preventive maintenance procedures and vendor manual recommendations for medium voltage breakers.

b. Observations and Findings

The procedures reviewed contained several discrepancies when compared to the vendor recommended maintenance activities. The most significant area of conflict noted was related to lubrication requirements. The following specific concerns were noted:

(1) The licensee did not have adequate procedures to control the use of lubricants/greases in the maintenance of electrical breakers. It was not clear to the team from reviewing the maintenance procedures which lubricants and cleaners were applied to specific breaker components. The maintenance procedures used to perform the preventive maintenance activities on the breakers did not document, in detail, which lubricants were used on specific breaker parts. In addition, a comprehensive list of approved lubricants and cleaners were not included in the maintenance procedures. The procedures were inconsistent with the lubrication data specified in the Computerized History and Maintenance Planning System (CHAMPS) program. Consequently,

non-quality approved lubricants were used. For example, maintenance procedures specified the use of light machine oil, however, it was not clear in the records reviewed what type of machine oil was approved and actually used.

(2) Routine Maintenance Procedure (RMP) 9325, Revision 6, dated April 21, 1998, "50-DH-350 4.16 kV Breaker Maintenance with Solenoid Operating Mechanism," Attachment B, "Lubrication Guide," specified LPS #1 or TRI-FLO for minor maintenance and graphite grease (Westinghouse 1022-1) for major operating mechanism components maintenance. There was no documentation available to show that these lubricants were approved for safety related applications. Section 7.4 of the procedure stated "perform breaker routine inspection, cleaning lubrication and adjustments." Specific details on removing old lubricants and application of new lubricants was not delineated. In addition, documentation was not available for review to indicate which parts were cleaned/lubricated and what type of spray/lubricant was used on what component. Also, no stock numbers were given for the lubricants listed in lubrication guide.

(3) The team reviewed breaker inspection and maintenance procedures and records which documented preventive maintenance activities performed on January 26, 1993, on 4.16 kV safety related type DH 350E breakers located in cubicles 1A52-66 and 1A52-67. The entire maintenance activity on each breaker was documented on one page which was not in sufficient detail to document all vendor recommended actions. Section 2.1, "General Appearance," documented that the breakers were very dusty. However, the maintenance records for the two breakers reviewed did not include specific cleaning and lubrication methods used to clean and lubricate the breaker's components nor were the types of sprays and lubricants used recorded. The team was concerned since unapproved lubricants were available in the storeroom and maintenance shop and were used on the breakers.

(4) The team examined completed maintenance procedure RMP 9325, Revision 5, dated January 15, 1997, "50-DH-350 4.16 kV Breaker Maintenance with Solenoid Operating Mechanism". The procedure was used in October 1997 to perform routine maintenance activities on breaker 1A52-66, (EDG G02 output breaker). The team noted that significant portions of the procedure requirements for breaker preventive maintenance activities, such as operating mechanism checks and internal breaker adjustments and lubrication requirements have been marked N/A (not applicable) and the N/A sections were not performed.

Sections 7.3, 7.4, and 7.5 of the procedure were marked N/A. The team noted that this was routinely done if the breaker did not operate sluggishly during initial steps of the procedure. Section 7.2 directed the technician to perform an as-found inspection of the breaker. A note at the end of Section 7.2 stated, "Further disassembly is not required to perform detailed inspection unless abnormalities such as sluggishness or binding is detected. N/A Section 7.3, 7.4, and 7.5 if disassembly is not required." Section 7.3 directed the technician to perform routine breaker inspection, cleaning, lubrication and adjustments.

Section 7.4 directed the technician to perform final assembly and post maintenance mechanical checks. Section 7.5 specified as-left resistance checks and wiring insulation checks and Section 7.6 specified electrical post maintenance testing requirements. This provision of not performing several important steps in a safety related procedure makes this procedure ineffective. Due to the fact that the technicians were not trained in the lubrication process, and that timing tests were not performed, it would be difficult for the technicians to determine whether the breakers were sluggish.

The practice of not completing significant portions of the breaker maintenance requirements in the procedure was not consistent with vendor requirements and recommendations and was not a proactive approach to good breaker maintenance. Also, breaker maintenance where the majority of procedure requirement steps were N/A'd could mask a declining trend in breaker condition and could result in breaker failures on demand. The team also noted that the same concern applied to maintenance performed using this procedure on other safety related 4.16 kV breakers. Failure to accomplish several activities affecting quality in procedure RMP 9325, Revision 5, during performance of routine maintenance on breaker 1A52-66, (EDG G02 output breaker) in that significant portions of the procedure requirements were inappropriately marked N/A (not applicable) and were not performed is considered a violation of 10 CFR 50, Appendix B, Criterion V. (50-266/98013-02(DRS); 50-301/98013-02(DRS))

No response to this violation is required. since the licensee issued condition report CR 98-2342 on June 11, 1998, to evaluate and implement corrective actions. The proposed corrective actions included revision of breaker maintenance procedures RMP 9325 and MWP 142. This item remains open, pending further NRC review of the licensee's corrective actions.

(5) The licensee was in the process of developing the Component Maintenance Program (CMP) to improve the reliability of breakers at Point Beach by optimizing programs and procedures. This was considered a positive initiative.

c. Conclusions

The licensee did not have adequate procedures to control the use of cleaners and lubricants in the maintenance of electrical breakers. The maintenance procedures used to perform the preventive maintenance activities on the breakers did not document, in detail, which lubricants were used on which parts of the breaker. In addition, a comprehensive list of approved lubricants and cleaners was not included in the maintenance procedures. The procedures did not list specific lubrication lot numbers to be used, consequently non-quality approved lubricants were used. Also, due to an inadequate procedure, the lack of completion of significant portions of the breaker maintenance requirements in maintenance procedures was not consistent with vendor recommendations and was not a proactive approach to good breaker maintenance. A no-response violation was cited.

M3.3 Disassembly of Westinghouse type DH Breakers and Review of Recently Issued Condition Reports Related to Breaker Problems

a. Inspection Scope

The team reviewed the results of the licensee's disassembly of six Westinghouse type DH breakers (that have not been overhauled since 1970) to investigate the condition of breaker lubricants and various moving parts.

b. Observations and Findings

Lubrication of medium voltage breakers has been an industry concern for an extended period of time. Failure of breakers to operate on demand due to lack of overhauling and inadequate lubrication practices have been reported in the industry. The licensee's safety related 4.16 kV DH breakers were installed in 1970 and have never been overhauled. Some portions of the breakers have not been lubricated since installation. In some instances, industry standards indicate breakers should be overhauled every 10 years.

The licensee was concerned about the condition of lubricants on the Westinghouse DH breakers installed on buses 1/2A01, -02, -03, -04 and -05. During the last quarter of 1997, the licensee disassembled six installed spare DH breakers to investigate the condition of the lubricant and various moving parts. The team examined pictures taken by the licensee of some of the disassembled parts. An engineering document evaluating the condition of the disassembled breakers was not available for review until the end of the team inspection. The results of the disassembly, revealed lubrication deteriorated on various breaker internal components and indicated that some lubricants had thickened. Some of these components had never been re-lubricated since original installation. Pins and joints exhibited the most wear. In some cases wear was noticed in the moving parts. The licensee stated that no sign of imminent breaker failure was found during the disassembly, and that the condition of the breakers disassembled could be considered representative of the rest of the DH breakers installed in the plant.

The team reviewed some of the CRs issued in March 1998 to document the findings noted during the disassembly.

- CR 98-0930, initiated March 9, 1998, documented that differences in lubrication were found during the disassembly inspection of the 4.16 kV breakers. One breaker was found with no lubricant, one with a lot of lubricant and two with marginal amount of lubricant, but with seemingly different types. There were signs of grease drying but all parts moved freely. There were no signs of excessive wear on any pivot point or surfaces requiring lubrication. The CR also stated that lack of lubrication consistency could cause breaker failure.

- CR 98-0931, initiated March 9, 1998, stated that during disassembly of one 4.16 kV, DH50-350, 3000 amps breaker, the roller bearing race on the crank shaft arm was found broken in two pieces. Further inspections revealed that this is a common condition of the 3000 amp stored energy breakers.

- CR 98-0936, initiated March 9, 1998, identified that breakers did not end up in the cubicles identified by their nameplates. Licensee practice was to swap breakers in cubicles to minimize outages during breaker maintenance. The CHAMPS program tracks maintenance history by breaker cubicle number rather than breaker serial number. This resulted in the loss of individual breaker maintenance failure history and may result in inadequate configuration management controls.

The licensee was in the process of addressing the concerns noted in the CRs. The team was informed that the DH breaker line was discontinued by Westinghouse and parts were difficult to obtain to accomplish overhauls. Therefore, the licensee decided to replace the remaining DH breakers with vacuum type breakers during the next refueling outages in 1999.

c. Conclusions

Based on review of data and CRs issued to document concerns noted during disassembly of six 4.16 kV DH breakers, the team concluded that the material condition of the lubricant and various moving parts was minimally acceptable. The results revealed indications of deteriorated lubrication, or in some cases, thickened lubricant on various breaker internal components. The team noted that the licensee found no sign of imminent failure of any breaker during the disassembly. The licensee plans to replace the remaining DH breakers with vacuum type breakers during the next refueling outages in 1999.

M3.4 Breaker Lubrication Process/Program

a. Inspection Scope

The team examined the licensee's maintenance program that covers lubrication of the breakers and their operating mechanisms to determine whether it was adequate and in accordance with vendor recommendations. In addition, the team examined the licensee's control and use of lubricants.

b. Observations and Findings

(1) The team noted during review of RMPs, Maintenance Work Procedures (MWPs) and interviews with licensee technical and maintenance staff that various unapproved cleaners and lubricants were specified in maintenance procedures, purchased as Commercial Grade consumables and used in the past by maintenance technicians to clean and lubricate safety-related and BOP electrical breaker components. The licensee had no documentation to show that the cleaners or lubricants used on these components had been evaluated, authorized, and approved for use in these applications. The following concerns were identified by the team:

Some of the following lubricants and sprays were specified in the maintenance procedures for use during performance of preventive maintenance (cleaning and lubrication) on 480 Vac ABB breakers, 4.16 kV safety related breakers types 50-DH-350 and 50-VCP-WR350 and Augmented Quality 13.8 kV breakers:

(a) LPS #1
(b) Light Machine Oil
(c) Molybdenum Disulfide Grease
(d) Graphite Grease (Westinghouse 1022-1)
(e) TRI-FLO
(f) NO-OX-ID, and
(g) Anderol 757.

The team visited the store room to determine QA classification, availability, shelf-life and control of these lubricants. The following observations were made:

- Lubricants (a), (f) and (g) were purchased as Commercial Grade (non-QA) consumables and were stocked and available in the storeroom. These lubricants were used on safety related breakers.
- Lubricants (b), (c) and (d) had no designated storeroom lot number and it was not clear what was used for breaker lubrication when called for in the procedures.
- Lubricant (e) was not being stocked in the storeroom and records were not available for review to show when and on which breaker components it was used.
- Licensee had no designated shelf-life for most lubricants noted above which were stored in the storeroom and in the maintenance shop cabinet.

Because the licensee's maintenance program and procedures did not provide appropriate guidance on cleaning and lubricating breaker components and the licensee failed to provide training/guidance to the technicians on how to identify and properly remove degraded grease before new sprays and lubricants are applied, the team was concerned that there is a potential that grease mixtures could exist in the installed 4.16 kV breakers that have not yet been refurbished or replaced.

The team reviewed various related industry data and determined that based on industry experience, some lightweight lubricants and penetrating oils accelerate the degradation of grease. Use of unapproved solvents on grease contributes to the degradation of grease into gummy material and hardened grease.

To address the team's concern, the licensee issued condition reports 98-2361 and 98-2362. CR 98-2362 documented the use of LPS #1 spray. The engineering evaluation in the CR concluded that the breakers were operable but degraded or nonconforming based on past failure history and testing. The breakers were considered degraded because of "the potential for, as-yet unseen, long term degradation due to the use of non-qualified or mixture of lubricants".

(2) On June 10, 1998, the team visited the storeroom to determine how adequately lubricants were controlled and disseminated to the technicians. Most of the lubricant and sprays located in the storeroom were purchased as commercial grade (non-QA) and had no designated shelf life. The maintenance mechanic informed the team that not all lubricants were located in the Storeroom, but were kept in an unlocked cabinet located in the maintenance shop. The team was informed that whenever a technician needed lubrication to perform breaker maintenance, he could obtain it from either of the locations. The team examined the lubricants located in the unlocked cabinet and noted on the shelf, among other lubricants, various non-QA sprays and greases without shelf life expiration dates. The team noted that there was a potential for technicians to use the wrong lubricants/sprays stored in the cabinet. For example, LPS #1, LPS #2 and LPS #3, which were not approved for breakers, were located on the same shelf, next to each other, and during interviews with the technicians, it was apparent that any spray in the cabinet could have been used since there were no controls and checks in place.

Failure to establish adequate measures to prevent the use of unapproved cleaning compounds or lubricants, such as LPS #1 and other non-QA lubricants on safety-related breaker components is considered a violation of 10 CFR Part 50, Appendix B, Criterion XV (50-266/98013-03(DRS); 50-301/98013-03(DRS)).

No response is required to this violation, since the licensee issued condition reports 98-2361 and 98-2362 to evaluate the nonconforming conditions and to determine appropriate corrective actions. The proposed corrective actions included discussions with the breaker vendors for advice regarding the use of the lubricants. This item remains open pending further NRC examination of the licensee's corrective actions.

c. Conclusions

The team determined that adequate measures were not established to ensure that only approved and authorized cleaning compounds and lubricants were used to clean/lubricate safety-related electrical breaker components. Consequently, unapproved and non-standard cleaners/lubricants were used on safety-related electrical breaker components which could have resulted in inadequate grease in the breakers. Poor preventive maintenance practices, and use of unapproved lubricants could result in potential breaker materiel condition problems when called upon to function. The team concluded that as a result of poor maintenance practices, and use of unapproved lubricants, the materiel condition of the safety related breakers that have not been refurbished or replaced was in question. A no-response violation was cited.

M5 Maintenance Staff Training

a. Scope of Inspection

The team reviewed the training provided to the electrical maintenance staff.

b. Observations and Findings

The team discussed the training program with the electrical maintenance instructor and reviewed the training program for electrical breakers. The class room and on the job training provided was generally satisfactory. However, the team reviewed a few work requests and root cause evaluations regarding adequacy of training and noted that Root Cause Evaluation 98-035 included a statement that specific training was not provided on Westinghouse Vacuum breakers. This root cause evaluation was for a mechanical interlock that failed to discharge on February 18, 1998, while the technicians were racking out breaker 1A52-17 from the cubicle. The evaluation stated, in part, that maintenance personnel have not received any specific training on the Westinghouse type 50 DH-VR350 vacuum breakers. The team learned that training on Westinghouse Vacuum breakers was included in subsequent revisions for DH type breakers.

As mentioned in Section M3.4, the licensee did not provide training to the maintenance staff on correct lubrication practices for the breakers.

The team also determined that no specific training was provided when breaker maintenance procedures were revised. The technicians were informed about the procedure changes only during pre-job briefings. This appeared to be a generic problem.

c. Conclusions

The team determined that the overall training provided to the maintenance staff was adequate. However, the team noted that adequate training was not provided on correct lubrication practices. The team also noted that PBNP did not provide training to the technicians on any revisions of the breaker maintenance procedures even when revisions were substantial. The team considered this a weakness.

M7. Quality Assurance

M7.1 Self-Assessments, Audits & Surveillances

a. Inspection Scope

The team reviewed the licensee's quality verification audits, surveillances and self-assessments.

b. Observations and Findings

The team reviewed several recent licensee Quality Verification (QV) audits, surveillance reports and self-assessment reports. The team discussed the quality verification programs with the site QV and self-assessment personnel. The team considered that the recent self-assessment program was good and the most recent self-assessment in the area of breakers a good example. However, the team was concerned that none of the previous QV audits or self-assessments identified any of the breaker issues identified by this NRC inspection.

c. Conclusions

Previous self-assessments and QV audits did not identify the problems identified during this inspection.

M8 Miscellaneous Maintenance Issues

M8.1 Treatment of Circuit Breakers Under 10 CFR 50.65, Maintenance Rule

a. Inspection Scope

The team reviewed the licensee's treatment of circuit breakers under the Maintenance Rule.

b. Observations and Findings

The team reviewed the scope of the Maintenance Rule with respect to circuit breakers in the plant. The team discussed with the Maintenance Rule Coordinator and reviewed the proceedings of the expert panel regarding the circuit breakers. The expert panel included representatives of maintenance and engineering. The team noted that all electrical breakers were included under the scope of the Maintenance Rule. The 4.16 kV type DH breakers were included in category a(2), while the safety related 480 Volt breakers were included in category a(1). The system engineers monitored the performance criteria and the goals, as specified.

c. Conclusions

The team determined that all the power circuit breakers were placed within the scope of the Maintenance Rule and that the Maintenance Rule was adequately implemented with regard to the electrical breakers.

M8.2 NRC Generic Communications and Industry Operating Experience Items

a. Inspection Scope

The team reviewed procedures and documentation, and interviewed personnel to determine if NRC generic communications, licensee specific correspondence, and lessons learned from industry experiences had been reviewed, appropriate actions had been taken, and the information had been incorporated into the licensee's programs and procedures.

b. Observations and Findings

The team reviewed PBNP procedure NP 5.3.2, "Industry Operating Experience Review Program," Revision 6, dated April 29, 1998, that was the licensee's guidance for evaluation of NRC generic correspondence and industry experience items. NP 5.3.2 provided instructions on the processing of a variety of external items including NRC Information Notices (IN), Generic Letters (GL), and Bulletins (BUL).

The team noted that PBNP used an electronic data management system, the Nuclear Tracking System (NUTRK) to electronically document and track the resolution of issues. NP 5.3.2 required that the Operating Experience Coordinator (OEC) ensure that the external items be entered into the NUTRK system. The OEC did the initial screening and assigned items to the appropriate technical group for evaluation. OEC indicated that NUTRK, which had a typical entry rate of ten to fifteen items per day, had increased in size to include approximately 4600 open items by May of 1998. As a result, PBNP had instituted a program which had reduced the number of open items to approximately 4000 by June of 1998. The team reviewed the NUTRK open items relating to circuit breakers. The team estimated that at the current rate of disposal, this backlog of open items would take about 10 months to clear.

In addition, the team reviewed several Information Notices, Bulletins, and INPO operating experience (OE) items to assess PBNP's evaluation for applicability and the adequacy of actions assigned. In general, PBNP had evaluated the IN's, Bulletins, and INPO OE items applicable to the circuit breakers which PBNP had installed in safety-related applications. The team noted that for a number of IN's, including those applicable to circuit breakers, the length of time between initiation and closure was significantly longer than the due date recommended by NP 5.3.2 (45 days). The OEC group indicated that the time periods specified in NP 5.3.2 were guidelines and that the actual due dates were established by the technical groups responsible for evaluation and assigning actions.

The team identified one Information Notice, IN 97-53, "Circuit Breakers Left Racked Out In Non-Seismically Qualified Positions," dated July 18, 1997, that had not yet been completely evaluated to determine whether any PBNP actions would be required to address the situation discussed in the IN. The team considered the review of the situation to be important and applicable to PBNP since, during the plant walkdown, the

team had identified safety-related circuit breakers racked-out in a potentially non-seismically qualified position. This issue was discussed earlier in section M2.1 of this report.

c. Conclusions

The team concluded that PBNP had established an adequate program and procedures to evaluate NRC Information Notices, Generic Letters, and Bulletins, and INPO Operating Experience items, however, a weakness was noted in the timeliness of processing these items which resulted in a large number of open items within the system.

M8.3 Manufacturers' Generic Communications

a. Inspection Scope

The team reviewed procedures and documentation, and interviewed personnel to determine if manufacturers' generic communications have been adequately reviewed and recommendations and requirements are incorporated in the licensee's programs and procedures.

b. Observations and Findings

The team reviewed PBNP procedure NP 5.3.8, "Vendor Technical Information Program," Revision 1, dated January 28, 1998, which provided instructions for reviewing Vendor Technical Information (VTI) for applicability to PBNP and to determine if actions were required. VTI was defined to include vendor technical bulletins, service alerts, service advisory letters, 10 CFR Part 21 notifications, and technical data solicited by PBNP. The VTI Program Coordinator assigned the responsibility for evaluation to the appropriate technical group, ensured the item was entered and tracked in the NUTRK system, and provided a guideline of 60 days for evaluation.

The team reviewed the following Westinghouse Technical Bulletins, which were applicable to the safety-related Westinghouse DB and DH circuit breakers, to verify that they had been received, evaluated, and incorporated into the PBNP procedures:

(1) NSD-TB-83-02, "UVTA Lubrication Recommendations on RTB's Using Molybdenum Disulfide and Iso-propyl Alcohol," Rev. 01, dated September 13, 1983.
(2) NSD-TB-91-03, "DB Breaker Secondary Contact Failure," Rev. 0, dated April 22, 1991.
(3) NSD-TB-92, "DB Breaker Maintenance," Rev. 0, dated May 18, 1992.

The team verified that the above Bulletins were applicable to PBNP and had been incorporated into PBNP procedures as applicable. However, as mentioned earlier, the team noted several discrepancies regarding the incorporation of unapproved lubricants/sprays in the maintenance procedures and use on the breakers.

c. Conclusions

The team concluded that PBNP had received the circuit breaker vendors' generic communications, had adequately reviewed the recommendations and requirements, and had incorporated those applicable into the PBNP's programs and procedures. However, the team was concerned that several lubricants/sprays incorporated into the PBNP procedures and used on these breakers were not approved by the vendors.

M8.4 Licensee Participation in Vendor Users Groups

a. Inspection Scope

The team reviewed documents and interviewed personnel to determine that the licensee had adequately participated (including meeting attendance, working group, and tutorial activities) in one or more of the medium-voltage and low-voltage circuit breaker vendors Users Groups.

b. Observations and Findings

The team determined that circuit breakers used by PBNP in safety-related applications were manufactured by two vendors, Westinghouse and ABB. PBNP had participated in the Westinghouse Users Group and was involved in the formation of a subcommittee dedicated to users of the DH circuit breaker line. PBNP indicated that the Westinghouse meetings had enabled PBNP to establish a broader relationship with the Cutler-Hammer representatives who also participated in the Westinghouse Users Group. The PBNP personnel involved in the Westinghouse Users Group included System and Component Engineers, Quality Assurance, and Mechanic-Electricians.

In addition, PBNP had participated in the ABB Users Group, including the applicable subcommittees, which PBNP indicated had provided PBNP with a substantial amount of operating experience information. Participation in the ABB Users Group had allowed PBNP to establish a working relationship with ABB Service and to obtain information to address PBNP maintenance concerns. The PBNP personnel involved in the ABB Users Group included System and Component Engineers and Quality Assurance.

c. Conclusions

The team concluded that PBNP had adequately participated in user groups relating to breakers. PBNP had a number of technical personnel involved in the Westinghouse and ABB User Groups that resulted in good access to vendor technical information.

M8.5 Licensee's Periodic Communication with Vendors

a. Inspection Scope

The team reviewed procedures and documentation, and interviewed personnel to determine if there is periodic communication with the vendors to assure that all

information has been received, evaluated, and appropriate actions have been taken including consideration of the information contained in the NRC Generic Letter 90-03.

b. Observations and Findings

The team reviewed PBNP procedure NP 5.3.8, "Vendor Technical Information Program," Revision 1, dated January 28, 1998. NP 5.3.8 provided instructions for maintaining periodic technical contact with the supplier of key safety-related products in accordance with NRC Generic Letter 90-03, "Relaxation of Staff Position In Generic Letter 83-28 and specified that the Vendor Technical Information Program (VTIP) Coordinator was responsible for the periodic contact. The team reviewed a printout of the VTIP data base and verified that the safety-related circuit breakers were listed as key safety-related equipment. In addition, the team verified that the circuit breaker manufacturers were included in the vendor periodic contact and reviewed the 1997 letters to the manufacturers. PBNP indicated that the information concerning circuit breakers was typically provided to PBNP in the form of technical updates, such as the Westinghouse Technical Bulletins, at the time of publication.

c. Conclusions

The team determined that PBNP had adequately performed periodic communications with the circuit breaker vendors and that the information (typically in the form of technical bulletins) had been received, evaluated, and the appropriate actions had been taken. The team concluded that PBNP was performing acceptably in this area of vendor communications.

M8.6 Commercial Grade Dedication

a. Inspection Scope

The team reviewed procedures and documentation, and interviewed personnel to determine if commercial grade procured components, used during breaker refurbishing by the licensee or contractors, have been dedicated properly for use in safety-related applications.

b. Observations and Findings

The team reviewed PBNP procedures NP 9.3.1, "Procurement of Goods and Services," Revision 2, dated April 25, 1995; NP 9.3.2, "Commercial Grade Dedication of New and Replacement Items," Revision 2, dated April 26, 1996; and NP 9.3.3, "Spare Parts Equivalency Evaluation," Revision 1, dated April 25, 1995. NP 9.3.1 provided instructions for the procurement of goods and services to be used by the Nuclear Power Business Unit (NPBU). These procurements included safety-related (QA) items and commercial grade items.

The team interviewed Procurement Engineering Group personnel who indicated that the majority of items purchased for use in safety-related circuit breakers were purchased as

QA (safety-related) with a few items purchased as commercial grade and subsequently dedicated. The dedications were performed in accordance with the requirements of NP 9.3.2. The team reviewed the documentation for the dedication of a secondary disconnect for a 480 Vac circuit breaker, a dummy 4.16 kV buswork piece, which was dedicated for seismic considerations, and a shunt trip kit for a 480 Vac circuit breaker. The team did not identify any concerns with the dedication packages reviewed. However, as noted earlier in Section M3.1, commercial grade hardware were used on a safety related breaker, without a prior engineering evaluation or dedication.

The team noted that NP 9.3.1 stated that QA-scope, safety-related items would normally be procured as basic components from a fully qualified Appendix B supplier unless adequate dedication was determined to be possible. NP 9.3.1 also stated when a parent component, such as a circuit breaker, had been scoped as QA, a failure modes and effects evaluation was to be performed and documented to determine if sub-component items could be determined to be non-QA. During the inspection, the team observed that there were a variety of uncontrolled lubricants present in the area where work was performed during the maintenance of the safety-related circuit breakers. PBNP further determined that several non-safety related lubricants had been used during the maintenance of the safety-related 4.16 kV circuit breakers. Two of the lubricants used on ABB HK circuit breakers, NO-OX-ID and Anderol 757, had been mis-scoped and purchased as commercial grade items without subsequent dedication. Several lubricants, used on the Westinghouse DH and VCP circuit breakers, were determined to not have a Procurement Engineering assigned lot number and were considered uncontrolled. The use of unapproved lubricants on safety related breakers was discussed in sections M3.2 and M3.4 of this report.

c. Conclusions

The team concluded that the procedures established by PBNP provided acceptable instructions on the dedication of commercial grade items for use in safety-related applications and that the dedication packages reviewed were acceptable. However, the team determined that certain lubricants had been mis-scoped as non-safety related without the appropriate evaluation having been performed and that other lubricants, although used on safety-related circuit breakers, had been procured outside of the Procurement Engineering process.

E2 Engineering Support of Facilities and Equipment

E2.1 Breaker Control Power Issue

a. Inspection Scope

The team reviewed the licensee's calculations to determine whether satisfactory breaker operation was assured at minimum operating voltage as specified in the vendor's manual or minimum calculated voltage, whichever is the lowest.

b. Observations and Findings

The team requested the licensee to provide the calculations for voltage drop of DC control circuits, to verify that electrically operated breakers (both medium and low-voltage) were designed and tested to operate at the calculated minimum available voltage at the close and trip coils. The licensee provided Calculations N-92-100 Revision 0, dated December 9, 1992, DC system Master Calculation and N-93-056, dated May 2, 1997. The team asked for the calculations showing minimum voltages available at the close and trip coils of the breakers under the worst case conditions. The Licensee showed a table where voltages available at the switchgear terminals were tabulated. The team pointed out to the licensee that these calculated voltages were not at the close and trip coils of the breakers and were not calculated at the battery minimum discharge voltage of 105 Vdc, as specified in the PBNP FSAR. The licensee issued several condition reports to address these concerns.

The team noted that PBNP maintenance procedures of both medium and low-voltage power circuit breakers required testing of close and trip coils of the circuit breakers at 125 Vdc nominal voltage. This voltage level was not supported by any calculations. In addition, this voltage is substantially higher than the worst case voltages, as indicated by the preliminary calculations subsequently performed by the licensee. The vendor design minimum control voltages specified for Westinghouse DH and VR type breakers were 100 Vdc for closing coils and 70 volts for trip coils. The vendor's design minimum control voltages for ABB 4.16 type 5HK and Westinghouse 480 Vac type DB breakers were 90 Vdc for closing coils and 70 Vdc for trip coils. The PBNP control voltage testing at 125 Vdc did not demonstrate that the breakers would operate satisfactorily at substantially lower voltage available under worst case accident conditions.

The licensee initiated calculations to determine the lowest voltages available to the close and trip coils under the worst case scenarios. At conclusion of this inspection, these calculations were still being reviewed/approved. However, the licensee has concluded that in some instances, the voltage at the Westinghouse close coils would be less than the manufacturer's rated minimum voltage.

The team requested the licensee to provide documentation to verify whether the safety related breakers were tested by the vendors or at the plant since their original installation to verify whether these breakers could be satisfactorily operated at the lowest available control voltages. No such documentation was provided. The team also requested the licensee to confirm whether the coils on the safety related breakers were qualified to operate at the lowest design conditions (90/100 Vdc for close coils, and 70 Vdc for trip coils) during a seismic event. The licensee could not provide any documentation to verify such qualification, except for the ABB 4.16 kV breakers. The seismic qualification for the ABB breakers was performed with a control voltage of 100 Vdc. Westinghouse also specified an acceptance criteria that the 4.16 kV type VR breaker shall close or trip on command at 105 Vdc during and after a seismic qualification test.

The licensee's failure to determine the lowest voltages available at the breaker close and trip coils since the original installation and failure to translate this design basis into applicable maintenance procedures to demonstrate by testing that all the safety related electrical breakers will operate satisfactorily at the worst case during design basis accidents is considered a violation of 10 CFR 50, Appendix B, Criterion III, "Design Control". (50-266/98013-04 (DRS); 50-301/98013-04 (DRS))

No response to this violation is required, since the licensee issued condition reports 98-2454 and 98-2628 to address this violation and to initiate corrective actions. The licensee initiated calculations to determine the lowest available voltages at the close and trip coils. The licensee also started testing the 4.16 kV breakers at 90 Vdc. Several 480 Vac breakers were also tested at 96 Vdc. This item remains open pending further NRC review of the licensee's corrective actions.

c. Conclusions

The team concluded that the original calculation of circuit breaker control voltage lacked the rigor normally seen in safety-related calculations and did not calculate the lowest control voltages available at the breaker close and trip coils under accident conditions. As a result, the breaker test procedures used a control voltage of 125 Vdc which was not in conformance with the Point Beach design basis. Design controls were not in place to verify that the voltages available at the closing and trip coils would be adequate to safely operate the breakers in accident conditions. A no-response violation was cited.

E2.2 Breaker Testing

a. Inspection Scope

The team reviewed the licensee's breaker testing practices and the breaker maintenance procedures.

b. Observations and Findings

As a result of the team's concerns about the adequacy of the breaker testing, the licensee issued a Condition Report No.98-2357 on June 11, 1998. The licensee initiated testing the breakers initially at 96 Vdc and 94 Vdc, and later at 90 Vdc. The licensee is yet to complete testing of several safety related breakers at the lowest calculated voltages. Pending further actions by the licensee to demonstrate that all the safety related breakers will operate satisfactorily at the lowest control voltages available in case of accident conditions, the breaker testing issue will remain as an Inspection Follow up Item. (50-266/98013-05 (DRS); 50-301/98013-05 (DRS))

The team reviewed the licensee's maintenance procedures to determine whether adequate acceptance criteria were specified. The team noted that the procedure RMP-9353, "ABB 5-HK- 350 4.16 KV Breaker Routine Maintenance", Revision 1, included an acceptance criteria of 5 Megohms for the primary and secondary insulation resistances. The team considered this low when compared with the industry

recommendation of 1000 Megohms. Similarly, procedure RMP 9303 (Revision 9), for Westinghouse DB 50 breakers included an acceptance criteria of 1.6 Megohms for the primary and secondary insulation resistances, while the industry recommendations were 100 Megohms for each of these insulation resistances. The team felt that, pending further studies needed to evaluate these acceptance criteria, this item remains an Inspection Follow up Item. (50-266/98013-06 (DRS); 50-301/98013-06(DRS)).

c. Conclusions

The team was concerned that all the electrical breakers were not yet tested at the substantially lower minimum calculated voltages for accident conditions. The team considered that the acceptance criteria for insulation resistances used in Point Beach maintenance procedures for ABB 4.16 kV and Westinghouse DB 480 volt breakers were much lower than the industry recommendations and needed further review. These were considered as Inspection Follow Up Items.

E2.3 Root Cause Evaluation and Corrective Action for Low Voltage Circuit Breaker Failures

a. Inspection Scope

The team requested from the licensee, documents containing circuit breakers' maintenance history and breaker failures. The team also requested to see whether any root cause analyses were done for breaker failures and corrective actions taken.

b. Observations and Findings

The licensee was unable to locate documentation that would allow the team to evaluate whether the licensee has an adequate program for breaker maintenance history and trending of breaker failures. No documentation was presented for root cause analyses and comprehensive corrective action plans for previous breaker failures. It appeared that this information was not readily retrievable or available.

The team interviewed system and component engineers to determine the extent of their involvement in breaker maintenance and trending activities. The team determined based on review of documents and interviews that trending of breaker failures or maintenance identified problems was not being performed by engineering to determine root causes for breaker related problems. The team determined that until 1997, condition reports were not being generated to document breaker failures. Also, the technicians would not always document breaker problems including failures noted during breaker maintenance activities. This contributed to the lack of breaker failure history data.

c. Conclusions

The team concluded that the licensee failed to document an adequate maintenance and failure history of breakers. The team also concluded that the plant engineers were not performing any root cause evaluations of breaker failures, and were not trending the breaker performance. The team considered this a significant weakness.

V. Management Meetings

X1 Exit Meeting Summary

On June 12, 1998, the preliminary results of the team inspection were presented to the Licensee. On July 16, 1998, the final inspection results were presented to the Licensee Management. The licensee acknowledged the findings presented. The licensee did not identify any material provided to the team during the inspection as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Patulski, Site Vice President
*M. Reddemann, Plant Manager
R. Behnke, Maintenance Training Specialist
R. Callahan, Nuclear Specialist, Quality Assurance
*D. Dahleen, Supervisor, Procurement Engineering
W. DeBoer, Electrical Maintenance Supervisor
F. Flentje, Senior Regulation & Compliance Specialist
W. Fromm, Maintenance Manager
F. Hennessy, Corrective Action Program Manager
N. Hoefert, Continuous Safety & Performance Assessment Manager
T. Jessessky, Project Engineer, Electrical Systems Engineer
D. Johnson, Regulatory Services and Licensing Manager
*P. Klingert, Senior Engineer, Component Engineering
S. Kloss, Mechanic-Electrician
*J. Knorr, Manager, Regulation and Compliance
S. Morrison, Manager, Maintenance Support
C. Peterson, Director, Engineering
*J. Schweitzer, Site Engineering Manager
G. Shorewood, Manager, Maintenance Field Services
P. Snyder, Senior Engineer, Electrical Systems Engineering
J. Thorgersen, Manager, Quality Verification
*R. Sier, System Engineer, Electrical Systems Engineer
*J. Wilson, Project Engineer, Component Engineering

NRC

R. Gardner, Branch Chief, NRC
*P. Louden, Acting Senior Resident Inspector, NRC

The above persons were present at the June 12, 1998 preliminary exit meeting. Persons marked with an *, were also present at the July 16, 1998 exit meeting.

INSPECTION PROCEDURE USED

TI 2515/137	Inspection of Medium-Voltage and Low-Voltage Power Circuit Breakers
IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving and Preventing Problems.

ITEMS OPENED, CLOSED AND DISCUSSED

Items Opened

50-266/301/98013-01;	URI	Several safety related breakers were stored in a racked-out position, without adequate seismic evaluation, as suggested IN 97-53.
50-266/301/98013-02;	VIO	Failure to implement procedures during routine maintenance of breakers in that significant procedure requirements were inappropriately marked "N/A" (not applicable), and were not performed.
50-266/301/98013-03;	VIO	Failure to establish adequate measures to ensure that only approved and authorized cleaning compounds and lubricants were used on safety related breakers.
50-266/301/98013-04;	VIO	Adequate design control measures were not established to ensure that adequate control voltage would be available to the close and trip coils of the safety related breakers
50-266/301/98013-05;	IFI	Inadequate breakers testing with a control voltage substantially higher than the design values and the preliminary calculated voltages that would be available at the breaker close and trip coils under accident conditions.
50-266/301/98013-06	IFI	Acceptance criteria specified IN procedures for insulation resistances were much lower than industry recommendations.

LIST OF ACRONYMS USED

ABB	Asea Brown Boveri
AC	Alternate Current
BOP	Balance Of Plant
CFR	Code of Federal Regulations
CHAMPS	Computerized History and Maintenance Planning System
CMP	Component Maintenance Procedure
CR	Condition Report
DC	Direct Current
EDG	Emergency Diesel Generators
EPRI	Electric Power Research Institute
IFI	Inspection Follow up Item
IN	Information Notice
INPO	Institute of Nuclear Power Operation
kV	kilo Volts
MR	Maintenance Rule
MWP	Maintenance Work Procedure
NMAC	Nuclear Maintenance Applications Center
NRC	Nuclear Regulatory Commission
NUTRK	Nuclear Tracking System
OER	Operating Experience Reports
PBNP	Point Beach Nuclear Power Plant
PM	Preventive Maintenance
QA	Quality Assurance
QV	Quality Verification
OEC	Operating Experience Coordinator
RMP	Routine Maintenance Procedure
SBO	Station Blackout
TI	Temporary Instruction
URI	Unresolved Item
Vac	Voltage in alternating current
Vdc	Voltage in direct current
VTIP	Vendor Technical Information Program
VIO	Violation