U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-266/89033(DRP); 50-301/89033(DRP)

Docket Nos. 50-266; 50-301 License Nos. DPR-24; DPR-27

Licensee: Wisconsin Electric Company
231 West Michigan
Milwaukee, WI 53201

Facility Name: Point Beach Unit 1 and 2

Inspection At: Two Rivers, Wisconsin

Dates: November 7 through December 22, 1989

Inspectors: C. L. Vanderniet

J. Gadzala

Approved By: I. N. Jackiw, Chief
Reactor Projects Section 3A

1-11-90
Date

Inspection Summary

Inspection from November 7 through December 22, 1989, (Reports No. 50-266/89033(DRP); No. 50-301/89033(DRP))
Areas Inspected: Special, unannounced inspection by resident inspectors of issues relating to the inadequate original design of the facility's DC electrical distribution system and the licensee's corrective actions.
Results: Two potential violations were identified regarding inadequate design of the DC electrical distribution system and failure to take prompt corrective action once the deficiency was identified.

DETAILS

1. Persons Contacted (30703) (30702)

*J. J. Zach, Plant Manager
T. J. Koehler, General Superintendent, Maintenance
G. J. Maxfield, General Superintendent, Operations
J. C. Reisenbuechler, Superintendent, Operations
W. J. Herrman, Superintendent, Maintenance
N. L. Hoefert, Superintendent, Instrument & Controls
R. J. Bruno, Superintendent, Technical Services
T. L. Fredrichs, Superintendent, Chemistry
J. J. Bevelacqua, Superintendent, Health Physics
R. C. Zyduck, Superintendent, Training
*J. E. Knorr, Regulatory Engineer
F. A. Flentje, Administrative Specialist

Other licensee employees were also contacted including members of the technical and engineering staffs and reactor and auxiliary operators.

*Denotes the personnel attending the management exit interview for summation of preliminary findings.

2. DC Electrical Distribution System Original Design

The Point Beach facility was originally designed with a DC Electrical Distribution System that included two 60 cell station batteries (D05 and D06) connected to two separate main DC distribution busses (D01 and D02). Each main DC bus was also connected to an independent battery charger (D07 and D08) and to a common battery charger (D09). The present plant configuration (see attachment) has battery D05 and battery charger D07 connected to main DC bus D01 and battery D06 and battery charger D08 connected to main DC bus D02. Battery charger D09 can be connected to both main DC busses D01 and D02, however, both of its output breakers are maintained in an open condition and can only be closed through manual breaker manipulations.

Main DC bus D01 provides DC power to DC distribution panels D11 and D12 and main DC bus D02 provides DC power to DC distribution panels D13 and D14. A turbine emergency lube oil pump (1P37D and 2P37D) is also connected to each main DC battery bus.

The original facility design utilized thermal-only trip breakers on the lines connecting the main DC busses (D01 and D02) to the DC distribution panels (D11, D12, D13, and D14); to the batteries (D05 and D06); and to the common battery charger (D09). The remaining lines to the independent battery chargers (D07 and D08) and to the turbine emergency lube oil pumps (1P37D and 2P37D) were equipped with breakers having thermal and magnetic tripping capabilities. These conditions are still present at the facility.

Two of the DC distribution panels (D11 and D13) have 32 breakers on each panel. Of the 32 breakers on each panel, 30 were equipped with thermal-only trip capability. The other two breakers on panels D11 and D13 and all the breakers on panels D12 and D14 were equipped with breakers having both thermal and magnetic tripping capabilities.

DC distribution panels D11 and D13 supply normal and alternate control power to several common loads via thermal-only trip breakers. These common loads include unit 1 and 2 4160V switchgears (1A01, 1A02, 1A03, 1A04, 1A05, 1A06, 2A01, 2A02, 2A03, 2A04, 2A05, and 2A06) and unit 1 and 2 480V switchgears (1B01, 1B02, 1B03, 1B04, 2B01, 2B02, 2B03, and 2B04). The selection of control power from D11 or D13 is done manually inside each of the switchgears through the use of a dual knife switch mechanism. The dual knife switches are contained on a single switch plate, one of the knife switches receives power from D11, the other from D13. Only one of the knife switches is closed at a time and that is considered the normal control power supply to that switchgear. The remaining open knife switch is considered to be the alternate control power source and must be manually closed if the normal source is not available. The position of the knife switches is controlled administratively.

Other loads receiving DC power from panels D11 and D13 via thermal-only trip breakers include: unit 1 and unit 2 "A" and "B" crossover steam dumps; emergency diesel generator G01 and G02 field flash; and DC power distribution panels D17, D18, D19, D21, and D22;

3. Identification of Original Design Flaw

The licensee contracted a Safety System Functional Inspection (SSFI) to be performed on the Emergency Diesel Generator System during the months of January and February of 1988. This inspection included an evaluation and assessment of the DC power systems that were used to support operation of the facility's two emergency diesel generators. One of the findings of the SSFI (Audit Finding Report (AFR) # SSFI WE-88-14), dated 1/22/88, stated that "DC distribution bus short circuit exceeds main breaker U.L. rating." This finding was based on the fact that a calculated fault current of 13,900 amps could occur on the main DC distribution bus D01 which was in excess of the 10,000 amp tripping capability of the thermal-only breakers on the bus. This presented the possibility that a fault on either of the main DC busses would have the potential of discharging the battery associated with that bus, thereby rendering that DC power train inoperable.

As a result of this finding the licensee contacted Westinghouse, the breaker manufacturer, and received verbal confirmation that the breakers in question were capable of interrupting fault currents up to 20,000 amps. This verbal information was confirmed in a letter dated 2/17/88 to the vendor representative at the site. It was further stated that test data was available to confirm this level of interrupting capability.

The Corrective Action for AFR No. SSFI WE-88-14, dated 6/20/88, stated that the licensee would obtain the Westinghouse test data that demonstrated the adequacy of the interrupting capability of the breakers in question. The anticipated completion date stated in the document is January 1, 1989.

On November 7, 1989, the plant staff was informed by the corporate Nuclear Engineering group that in the course of followup to obtain the Westinghouse test data, it was found that the data originally discussed was not applicable to the type of breakers installed at the facility. Through miscommunication the vendor assumed that the breakers in question had both magnetic and thermal tripping capabilities. Westinghouse stated that the originally installed thermal-only breakers were not capable of interrupting the possible fault currents.

Further analysis by the licensee's engineering group identified the possibility of generating a fault current on a nonsafety load commonly supplied by distribution panels D11 and D13 in excess of the tripping capability of the thermal-only breakers. A fault on one of these non-safety related circuits could result in currents which would not be interrupted by any of the breakers in the DC system. This could result in the fault current being sustained until one of the components in the DC system catastrophically fails or until both batteries supplying the system are discharged to a point where they can no longer provide sufficient energy for their safety-related functions.

4. Request for Enforcement Discretion

The condition discussed in the preceding paragraph caused the licensee to declare station batteries D05 and D06 technically inoperable, at 1600 hours, on November 7, 1989. Declaring both D05 and D06 inoperable placed the licensee outside of Technical Specification 15.3.7.B.1.f. This Limiting Condition for Operation (LCO) states:

> One of the batteries D05 or D06 may be inoperable for a period not exceeding 24 hours provided the other three batteries and four battery chargers remain operable with one charger carrying the DC loads of each DC main distribution bus.

The problem was exacerbated due to the removal from service of station battery D106, on November 6, 1989, at 2029 hours, for the performance of its five-year performance test. The removal of D106 from service placed the licensee in Technical Specification LCO 15.3.7.B.1.g which states:

> One of the batteries D105 or D106 may be inoperable for a period not exceeding 72 hours provided the other three batteries and four battery chargers remain operable with one charger carrying the DC loads of each DC main distribution bus.

With D05 and D06 now also technically inoperable, the licensee found itself also operating outside of Technical Specification LCO 15.3.7.B.1.g. These conditions required the licensee to enter Technical Specification LCO 15.3.0.A which states in part:

In the event an LCO cannot be satisfied because of equipment failures or limitations beyond those specified in the permissible condition of the LCO, the affected unit, which is critical, shall be placed in the hot shutdown condition within three hours of discovery of the situation.

At 1600 hours, on November 7, 1989, with unit 2 in cold shutdown due to a refueling outage and unit 1 operating at 100% power, the licensee requested enforcement discretion for Point Beach Nuclear Plant Unit 1 and 2 Technical Specification 15.3.0.A. This request was based on the following considerations:

The ability of the licensee to return station battery D06 to an operable condition in a matter of minutes through a reconfiguration of breakers on DC distribution panels D11 and D13.

The returning of station battery D106 to an operable condition within 24 hours due to the completion of the in-progress charging of that battery. During the testing and charging of D106, a fully qualified temporary battery was connected to D106's DC bus through a non-qualified temporary cable.

The returning of D05 to an operable condition within 24 hours following the replacement of several thermal-only breakers and the reconfiguration of breakers on DC distribution panels D11 and D13.

NRC granted enforcement discretion at 1800 hours on November 7, 1989, for a period of 24 hours expiring at 1600 hours CST on November 8, 1989.

5. Corrective Action Taken By the Licensee

The corrective actions taken by the licensee to restore all station batteries to an operable condition were detailed in a letter from the licensee to the NRC dated November 10, 1989. The basic corrective actions taken by the licensee were as follows:

All nonsafety-related loads were transferred from station battery D06 to D05.

Unit 1 was reduced to 92% power to allow the opening of supply breakers to the unit 1 crossover steam dumps.

Charging of station battery D106 was completed and the battery returned to service at 1007 hours on November 8, 1989.

Unit 2 nonsafety-related loads on station battery D05 were disconnected.

Breakers for unit 1 nonsafety-related loads on station battery D05 were replaced with breakers equipped with thermal and magnetic tripping capabilities returning D05 to an operable condition.

These actions were accomplished by 1557 hours on November 8, 1989 and the licensee exited Technical Specification 15.3.0.A. All corrective actions were monitored by the resident inspector and appeared to be adequate.

Further actions were taken to replace breakers for unit 2 nonsafety-related loads with breakers equipped with thermal and magnetic tripping capabilities. This allowed the reconnection of these loads to the DC busses and permitted the restart of unit 2.

6. Failure to Meet Single Failure Criteria

Due to the original design of the facility's DC Electrical Distribution System, the potential existed for a single failure to result in the failure of the DC electrical system to perform its intended safety function. This failure was identified by the licensee on November 7, 1989, and was determined to have existed since the initial operation of the facility.

The licensee identified two methods for this failure to occur both of which are related to nonsafety-related components supplied from DC distribution panels D11 and D13. The first method is a failure of the dual knife switch circuit for the commonly supplied nonsafety-related busses which could result in a simultaneous bus fault on both DC systems. This fault could cause a resultant failure of both DC system busses due to a lack of a breaker anywhere in the supply path capable of interrupting the fault current. The second method of failure is related to the possibility that cables to these commonly supplied nonsafety-related loads run in common raceways. A failure in one of these common raceways could also result in a simultaneous fault on both DC systems causing their ultimate failure.

The licensee's Final Safety Analysis Report, Section 8.1.1, Electrical Systems, Principal Design Criteria for Emergency Power states: An emergency power source shall be provided and designed with adequate independence, redundancy, capacity, and testability to permit the functioning of the engineered safety features and protective systems required to avoid undue risk to the health and safety of the public. This power source shall provide this capability assuming a failure of a single active component.

The licensee's onsite DC distribution system was not capable of providing sufficient independence assuming a single failure due to an original plant design deficiency regarding installed DC breakers. This failure to provide sufficient independence and separation for the DC distribution system in accordance with the applicable design documentation is an apparent violation of 10 CFR 50, Appendix A, Criterion 17 (266/89033-01 and 301/89033-01).

7. Failure to Take Prompt Corrective Actions

Problems associated with the original design of the facility's DC Electrical Distribution System were identified during a contracted Safety System Functional Inspection (SSFI) performed on the Emergency Diesel Generator System during the months of January and February 1988. One of the findings of the SSFI, dated 1/22/88, stated that "DC distribution bus short circuit exceeds main breaker U.L. rating."

As a result of this finding the licensee contacted Westinghouse, the breaker manufacturer, requesting information on interrupting fault current for the installed thermal-only breakers. Westinghouse verbally confirmed that the breakers in question were capable of interrupting fault currents up to 20,000 amps. This verbal information was confirmed in a letter dated 2/17/88 to both the vendor site representative and the licensee. The letter, however, did not specifically address the thermal-only trip breakers as requested by the licensee. The letter stated that test data was available to confirm this level of interrupting capability.

An Audit Finding Report (AFR) # SSFI WE-88-14 was initiated in accordance with Quality Assurance Instruction (QAI) 6, "Audit Preparation, Performance and Documentation", Revision 10, which tracked actions taken to correct this SSFI finding. The AFR also required that specific corrective actions be addressed and a response provided by 5/31/88. The licensee conducted a meeting in early May to discuss the adequacy of proposed corrective actions for all the SSFI findings. AFR SSFI WE-88-14 corrective actions were released in a document dated 6/20/88 and noted on the AFR itself. It stated that the licensee would obtain the test data from Westinghouse which demonstrated the adequacy of the interrupting capability of the breakers in question. The document further states the anticipated completion date for these action was January 1, 1989.

AFRs and other Quality Assurance audit findings are listed on a Monthly Open Item Status Report (MOISR) which is issued at the beginning of each month. AFR SSFI WE-88-14 was included on the MOISR and the Nuclear Systems Engineering and Analysis Section (NSEAS) was assigned as the organization responsible for corrective actions.

In response to previous NRC inspection findings and concerns, the NRC conducted a further inspection during the weeks of April 25-28 and May 10-12, 1989, to assess the licensee's efforts with regards to SSFI findings. The inspection report (266/89012; 301/89012) concluded that responses to contractor SSFI audit findings were, in some cases, untimely and inadequate.

Several internal licensee memos were written regarding the increased level of concern and attention that the SSFI audit findings had been receiving. One of these memos dated March 31, 1989, entitled "Verification of WESTEC and RHR Vertical Slice Audit Finding Reports", stated that several concerns had been raised about timeliness of and adequacy of corrective actions to the WESTEC audit. The memo announced the performance of detailed verifications to be conducted on the WESTEC SSFI AFRs and requested assistance from personnel responsible for specific AFRs.

Another memo dated April 28, 1989, entitled "SSFI Follow-up", requested that action taken on the SSFI items be revisited and evaluated to determine if the documentation is complete or if further actions need to be taken.

An internal licensee memo dated May 2, 1989, entitled "SSFI Vertical-Slice Audit Follow-up", identified audit findings with the highest priority and recommended a reevaluation of the proposed corrective actions for each. AFR SSFI WE-88-14 appeared as the fifth item listed in this memo and was redesignated as AFR #A-SP-88-02-016. The inspector reviewed the MOISR for the month of July and noted this AFR remained assigned to NSEAS and that it was listed as having corrective actions overdue.

A November 7, 1989, internal licensee document states that the documentation and supporting test data for the thermal-only breakers were not obtained from the vendor until after NRC reviews done in 1989 pointed out the inadequacies in the implementation of corrective action for SSFI type audits. This same document further states that subsequent discussions with the vendor resulted in a determination that the breakers are not capable of interrupting short circuit faults in excess of their rating.

On November 7, 1989 the plant staff was informed by NSEAS that in the course of followup to obtain the Westinghouse test data, it was found that the data originally discussed was not applicable to the type of breakers installed at the facility. This finding then resulted in the licensee requesting enforcement discretion at 1600 on November 7.

Enforcement discretion may not have been necessary if this problem had been identified earlier through prompt follow-up of the corrective action for this SSFI finding. Battery D05 or D06 could have been restored to an operable condition within the three hour Limiting Condition for Operation (LCO). As such, enforcement discretion was only needed because station battery D106, not otherwise affected by this problem, happened to be out of service due to testing at the time the problem was discovered. Inoperability of this third battery forced the licensee into a condition outside of normal Technical Specifications that could not be corrected before the LCO would have been exceeded.

The licensee failed to complete prompt corrective actions to a contracted SSFI audit finding regarding the potential failure of installed DC circuit breakers' ability to interrupt short circuit fault currents in excess of the breakers rating. This is an apparent violation of 10 CFR 50, Appendix B, Criterion XVI (266/89033-02 and 301/89033-02).

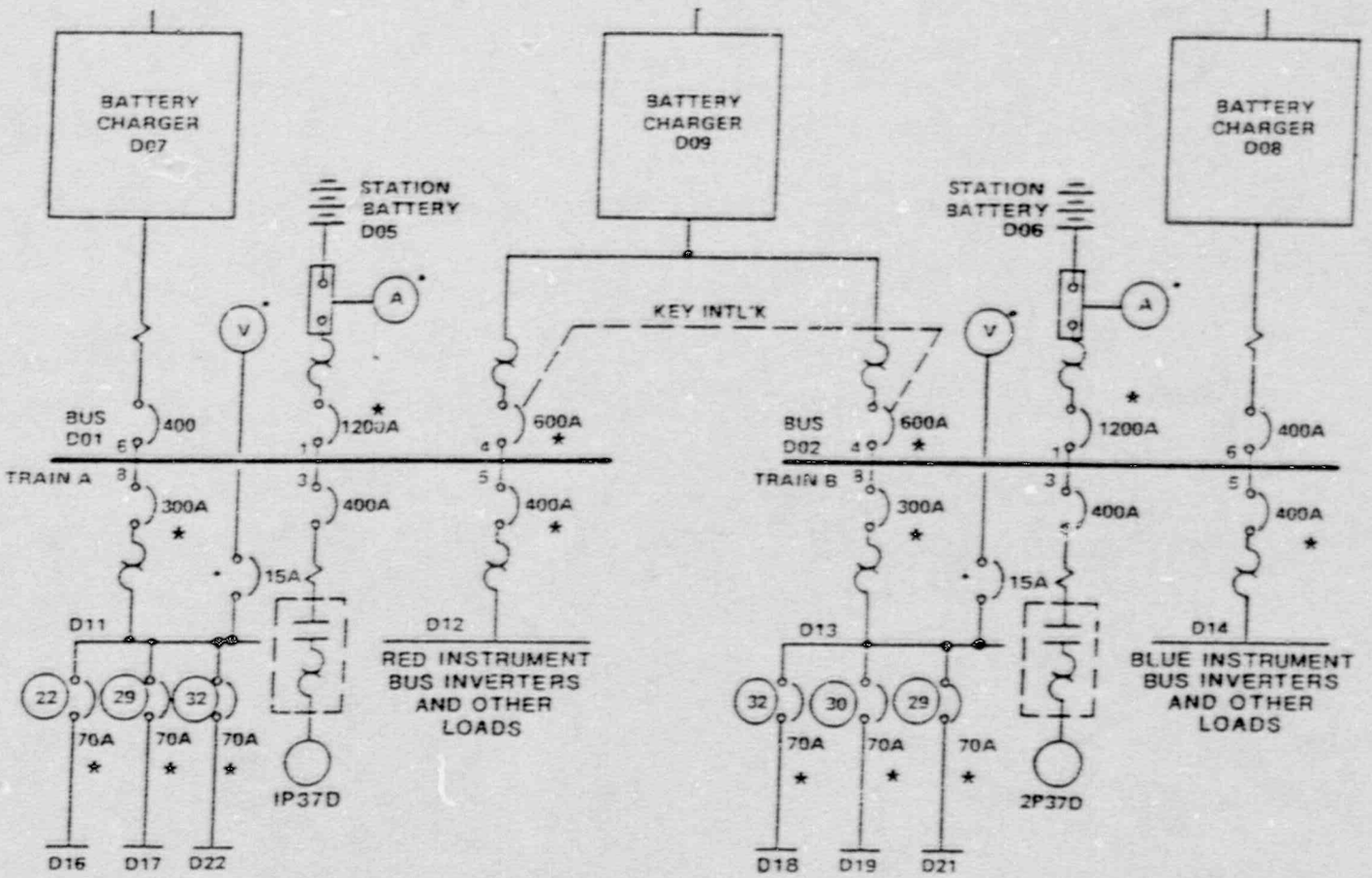
8. Exit Interview (30703)

A verbal summary of preliminary findings was provided to the licensee representatives denoted in Section 1 on December 22, 1989, at the conclusion of the inspection. No written inspection material was provided to the licensee during the inspection.

The likely informational content of the inspection report with regard to documents or processes reviewed during the inspection was also discussed. The licensee did not identify any documents or processes as proprietary.

Attachment: DC Electrical Distribution System

DC ELECTRICAL DISTRIBUTION SYSTEM



* Thermal Overload Only

ATTACHMENT