

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-315/91023(DRS); No. 50-316/91023(DRS)

Docket Nos. 50-315; 50-316

Licenses No. DPR-58; No. DPR-74

Licensee: Indiana Michigan Power Company
1 Riverside Plaza
Columbus, OH 43216

Facility Name: D. C. Cook Nuclear Power Station, Units 1 and 2

Inspection At: AEP Offices-Columbus, OH
D. C. Cook Site-Bridgman, MI

Inspection Conducted: September 4-6, 1991 (Corporate Office)
September 11-13, 1991 (Site)

Inspectors:

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9-30-91
Date

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Approved By:

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Date

Inspection Conducted

Inspection on September 4-6 and 11-13, 1991 (Reports
No. 50-315/91023(DRS); No. 50-316/91023(DRS))

Areas Inspected: Routine announced safety inspection of recently
implemented electrical system modifications and design changes
(IP 37700).

Results: Based on the modifications reviewed and field
inspected, the inspectors determined that some improvements have
been made in the licensee's overall modification control process.
Examples included improvements in the experience and competence
of responsible design modification engineers, some improved
interface and communication between corporate and field technical
staff, upgraded design procedures and the implementation of a new

post modification test policy. However, the inspectors identified several areas in which improvements are needed. Examples included quality of design reviews, documentation of post modification testing, and control of the quality and content of modification packages. No violations or deviations were identified.

DETAILS

1.0 Persons Contacted

Indiana Michigan Power Company (IM)

A. Blind, Plant Manager
*L. Gibson, Assistant Plant Manager
*E. Abshagen, General Supervisor, Design Changes
*S. DeLong, Supervisor, Project Engineering
*T. Langlois, Project Engineer
*T. Postlewait, Superintendent, Project Engineering
*J. Rutkowski, Assistant Plant Manager
*T. Slavens, Project Engineer
*B. Svensson, Licensing Coordinator
*G. Weber, Superintendent, Plant Engineering

American Electric Power Service Corporation (AEPSC)

E. Fitzpatrick, Vice President, Nuclear Operations
S. Brewer, Manager, Nuclear Safety and Licensing
M. Finissi, Engineer, Nuclear Engineering Department
*R. Kroeger, Division Manager, Nuclear Engineering
Department
*J. Kutys, Electrical Engineer, Nuclear Engineering
Department
J. Ruparel, Electrical Engineer, Nuclear Engineering
Department

U. S. Nuclear Regulatory Commission (NRC)

J. Isom, Senior Resident Inspector
*D. Passehl, Resident Inspector

*Indicates those attending the exit meeting on September 13, 1991.

Other licensee personnel were contacted as a matter of routine during the inspection.

2.0 Design Change Process Inspection

The purpose of this inspection was to assess the adequacy of the design control process for design change modifications, both in the corporate office and at the plant, and to determine if design modifications met applicable technical and regulatory requirements.

In order to evaluate the design control process, the inspectors selected nine electrical system modifications, Request for Change (RFC), that have been engineered and field completed in the last three years. The inspectors examined the use of design bases documentation, the



engineering design review and modification process, interface between corporate and plant engineers, safety evaluations, adequacy of drawings and procedures, completeness of modification packages, adequacy of field implementation, and post modification testing.

2.1 Review of Design Change Packages

The inspectors noted that three different sets of design change packages were retained within the AEP corporate offices (Engineering, Nuclear Safety and Licensing, and Quality Assurance). In general, the modification packages reviewed at the corporate offices were not complete and did not contain the same information as the official RFC packages maintained at the plant. In some instances, the corporate packages did not contain the affected drawing lists. In addition, several checklists and memoranda were duplicated. The inspectors informed the licensee that it would be prudent to maintain at least one complete RFC package at the corporate engineering offices for use by engineering, quality assurance and others.

The inspectors also reviewed completed RFC packages at the plant site. An index was included with each package; however, the index was difficult to follow. Each of these packages included the "Nuclear Safety and Licensing Section Safety Review Checklist Request for Change Notice" Form 7-1, Attachment 1, which was typically completed at the initial stages of RFC design. The form contained 25 data entry points which corresponded to 25 individual questions regarding the review process. For each of the forms reviewed, the entered data indicated yes, no, or not applicable. However, there was no mention in the package of what the questions were. In addition, no revision number was recorded on the attachment. Consequently, there was no apparent mechanism to assure that the safety evaluation/review contained in the packages was updated for major scope changes and changes to the procedure while the packages remained open for a number of years.

The following specific observations were made during the review of the completed modifications packages located at the plant site:

a. RFC DC-12-2382, Revision 0

This RFC modified RPS logic to require two out of four reactor coolant pump (RCP) breaker position indications to initiate a unit trip when the unit is above the P-8 power level. The "Design Change Overview" was very detailed containing a comprehensive safety review, installation instructions, post modification operability testing (PMT) requirements, and affected equipment and drawings. During the review, the team



noted the following deficiencies:

- (1) Request for Change Document List (RFCDL) 17, Sheet 106, dated April 30, 1990, specified the testing requirements for RFC-12-2382. The required tests included in process testing, functional testing, and operability testing. The functional testing required that a special test be conducted to verify the following:
 - With Permissive P-8, 1/4 RCP trips (2/3 loss of reactor coolant pump flow) will initiate a trip;
 - With Permissive P-8, 1/4 RCP breaker open signals will not initiate a reactor trip; and
 - With Permissive P-7, 2/4 RCP trips (2/3 loss of reactor coolant pump flow or RCP breakers open signal) will initiate a reactor trip.

The inspectors could not find documented evidence in the package to indicate that the functional test requirements had been performed.

RFCDL 17, Sheet 108, identified the functional test specifications including test objective, methods, acceptance criteria, prerequisites, precautions and reference drawings. However, the review and approval signatures of the system, lead and project engineers and supervisor were missing.

To address this concern, the licensee evaluated the scope of completed operability testing and determined that functional testing requirements had been satisfied during the performance of operability testing. DCAM 4.09, Attachment 4, "Functional Testing Requirements," dated September 13, 1991, was issued documenting in detail how the functional tests were satisfied.

- (2) PMP 5040, Mod.004, Attachment 1, "Design Change Tie-In and Testing Authorization," dated July 17, 1989, did not include the general supervisor's approval signature.
- (3) Unit 2 PMI-5040, Attachment 4, dated January 2, 1985, referenced Unit 1 procedures requiring revisions instead of Unit 2.

The above deficiencies should have been identified and corrected during the design review process. The

licensee indicated that appropriate action would be taken to resolve the above concerns.

b. RFC DC-12-2870, Revision 0

This RFC replaced ITE solid-state tripping devices, types SS-13 and SS-14, used on 480V and 600V switchgears. The replaced units may have contained a potentially defective capacitor that could inhibit proper tripping. The inspectors reviewed the design change documents included in the closed RFC package and the procedural requirements associated with the RFC process. In addition, the inspectors conducted a visual field inspection to determine the adequacy of field installations. During the review, the following observations were made:

- (1) Relay setting data sheets reflected the proposed relay settings and not the actual relay settings found in the field. Also, references to previous relay data sheet revisions that were written within the scope of the modification were omitted from revised data sheets. In addition, a number of data sheets did not have the "approved by" signature or date.
- (2) An error was identified in the relay setting table sheet for the solid state trip device associated with breaker 11BMC11. The table referenced a relay setting sheet which had an effective date of July 1975; however, the relay sheet showed that the data was changed in July 1984 to a different setting. The relay setting table sheet failed to reference the latest data.
- (3) As-left data values such as "short time pick up" and "long time pick up" were changed with a red pen for several circuit breakers on Work Sheet I of RFC 2870 RFCDL16. Project engineering personnel did not initial and date these changes as required by PMI-2010, Attachment 2, Section H. Also, the verified by block was not signed.
- (4) Job Order No. 00750, dated April 20, 1987, did not include the approved signatures sheet.

The above deficiencies should have been identified and corrected during the design review process. The licensee indicated that appropriate action would be taken to resolve the above concerns.

c. RFC DC-02-2922, Revision 0

This RFC added trips to the emergency diesel generator (EDG) during nonblackout or non-safety injection signal operation, when any diesel bearing thermocouple exceeds 195°F for at least two seconds. Special post modification testing was performed on both AB and CD diesels, as specified by the lead engineer. The normal operability tests were also conducted. Both sets of tests were satisfactory. However, the RFC packages contained a number of different checklists without specifying which one was the official checklist. This made it difficult to determine if a proper design review had been performed.

d. RFC 12-2927, Revision 0

This RFC covered replacement of the Unit 1 and 2 battery chargers. The installed chargers were unreliable and parts were difficult to procure. The inspectors reviewed the safety review, seismic considerations, construction/installation documentation, design verification checklist, and battery charger specification DCCEE-106-QCN. No deficiencies were noted. The inspectors determined that the associated equipment inspected was in good condition and the modification installation workmanship was above average. However, during the review of the post modification testing associated with the battery chargers, the following weakness was noted:

- The battery charger internal circuitry (alarm circuit boards, control interlocks, relays, etc.) was tested using station Procedure 12IHP6030IMP.059, Revision 0. This procedure was very general and did not specify the test methodology needed to verify that component specifications were met during testing. This resulted in a lack of supporting documentation needed to provide an auditable link between the specifications and the test results.

e. RFC DC-12-2934, Revision 0

This RFC removed open torque switches and the associated bypass limit switches from the open circuits on all MOVs. After the modifications, these valves were tested for stroke timing and for verification of limit switch settings, and found to be acceptable. No deficiencies were noted during the review of this modification.

f. RFC DC-12-2944, Revision 0

This RFC covered the replacement of the Units 1 and 2 4kV bus underfrequency relays. The original installed relays had a high failure rate and were considered obsolete. The inspectors reviewed the safety reviews, documentation of work, seismic considerations, design change overview, and post modification testing. No deficiencies were noted during the review of this modification.

g. RFC DC-12-2980, Revision 0

This RFC replaced Class 1E, 250Vdc Heinemann breaker panels with fuse type panels due to a concern generated by LER 97-020-0, "Lack of Isolation Between Balance of Plant and Essential Safety System Loads due to Potential Design Deficiencies."

The inspectors performed a walkdown of 20 installed 250Vdc fuse panels and observed three circuits (panels 1-CCV-AB Ckt.-20, 2-CCV-CD Ckts. -35 and -47) which had Gould Shawmut Class RK5 TR1-10R fuses installed instead of the specified Bussman Class FRN-R10 fuses. Site engineering subsequently evaluated the fuse characteristics for the respective applications and determined that the Gould Shawmut fuses were adequate.

The inspectors noted that the 250Vdc panel fuses were rated for 250Vac/200Vdc. The RFC package did not include an adequate justification for using the 200Vdc fuses instead of 250Vdc fuses. Per discussion with corporate engineering, it was determined that the 200Vdc rating of the fuses by the manufacturer was based on a harsh DC vendor test with a high X/R ratio which is not seen in the station's 250Vdc system. Corporate engineering provided calculations in report AEP:NRC 91-82 dated February 5, 1985, to support the use of the 200Vdc fuses for this application.

The inspectors also reviewed the design report, safety reviews, fuse coordination, construction documentation, load calculations and post-modification testing.

Post modification test "Operability after Maintenance" (Reference, Procedure PMI 50-70, Attachment 4) was performed for all valves which fell under the scope of this modification. The test results for Valve MRV-232 of 2.47 seconds "Time to Open," were documented as being outside the acceptance criteria limit of 2 seconds. A subsequent test was performed with a time

of 2.43 seconds which was also outside the acceptance criteria limits. No retest data for valve MRV-232 was provided in the modification package. The licensee subsequently provided a copy of test 2-OHP4030STP.018, which was used to retest valve MRV-232 following corrective maintenance. During this test, an acceptable stroke time of 1.48 seconds was observed.

h. RFC DC-12-3005 (Revision 0)

This RFC replaced the General Electric (GE) NGV undervoltage relays (18 relays in each unit) on the 4kV buses with Brown Boveri Company (BBC) ITE-27N relays. The GE relays were experiencing excessive drift.

The BBC ITE-27N relays used in the modification were rated for 250Vdc control power. However, the design package contained a BBC catalog which addressed relays suitable for only 125Vdc control power. The licensee subsequently obtained the correct copy of the vendor manual. Even though this design package was reviewed for closure, this error was not identified prior to closure of the design change package.

The design package included a requirement by the lead engineer that the relays be hi-pot tested. The design package did not include any information regarding these tests. The licensee subsequently produced a copy of the hi-pot tests conducted by the John E. Dolan Engineering Laboratory of AEP. The test results were satisfactory.

i. RFC-12-2739, Revision 0

This RFC corrected a potential problem with a Brown Boveri Electric, Inc., type HK circuit breaker. The potential problem was the inadvertent closing of the circuit breaker. The RFC added a spring to the breaker close latch to prevent the closed latch from slipping at the end of the breaker charging cycle. During the review of the RFC package, the following concerns were noted:

- (1) The RFCDL contained a list of 18 documents which were required to be completed prior to closure of the design package. The first eight were pre-typed; the last ten were subsequently added by the engineers based on their review of various procedures. The inspectors could not determine whether all required documents were completed and included in the package since a uniform all encompassing document list did not exist.

- (2) The "Design Change Installation Authorization" Form PMI-5040, Attachment 4, stated that maintenance installation procedures were required to accomplish field installation; however, no maintenance procedure numbers were specified. Therefore, the inspectors could not determine whether the proper maintenance procedure had been used.
- (3) The "Safety Review Memorandum" contained hand written notes such as "This is an open item and will be closed by lead engineer." The inspectors could not determine from this document whether the open items were subsequently closed.

The licensee indicated that appropriate action would be taken to resolve the above concerns.

3.0 Modification Control Process Improvements

During the review of the licensee's modification control process, the inspectors noted a number of improvements. The licensee has developed PMT Policy 4.09, "Design Change Administrative Manual," which was issued on April 29, 1991, to address weaknesses identified in the past in the post modification testing (PMT) area. This policy established administrative controls for the development of testing requirements and test specifications for design changes. It also provides control of the review of test results to ensure that modifications are properly tested. In addition, the PMT policy established clear responsibilities for determining the PMT requirements through the use of "Component Test Matrix" tables. The inspectors considered the PMT policy a positive development in improving the PMT process and in defining the responsibilities and interface between corporate and site engineering involved in determining the required PMTs.

The inspectors also noted that several Nuclear Engineering and Design Group procedures covering design activities have been upgraded to address previous design change process deficiencies. Training on the revised procedure has been given.

The inspectors noted that the engineers responsible for the design changes both in the corporate office and at the plant were competent and experienced in the areas assigned. The interface and communications between the engineering staffs at the corporate office and in the field appeared to be improving.

4.0 Licensee's Quality Verification of Design Changes

The inspectors reviewed the licensee's quality verification of the design change program and its implementation. The findings/recommendations of the following audits were reviewed:

a. QAVP 89-07

This audit was conducted by CYGNA Corporation on D. C. Cook design control activities. Among other findings, the report stated that the lead engineer's involvement, after the conceptual stage, varied from none to extensive and recommended that the lead engineer be much more closely tied to the modification process. During this inspection, the inspectors noted that the results of post modification testing were not being sent to the lead engineer on a regular basis.

b. QAVP 91-01

This QA audit reviewed the effectiveness of the implementation of the responses to the CYGNA findings in QAVP 89-07. The audit report noted that the lead engineer specified five functional tests for design change RFC-DC-4108; however, only three tests were performed and the system was declared operational without any authorization from the lead engineer. During this inspection, the inspectors noted that the required functional tests specified by the lead engineer for RFC DC-12-2382 were not conducted.

The Audit Summary Report for QAVP 91-01 stated that an RFC Task Force was created to reduce the as-built turnaround time, prioritize the RFC backlog, and establish a completion schedule. During this inspection, the inspectors noted that a large number of RFC packages were awaiting closeout due to a lack of as-built information to be provided by corporate engineering. In some cases, the modifications were completed several years ago. Continued licensee attention is needed to close out these RFC packages.

5.0 Conclusions

Based on the inspectors' review of the closed modification packages, the inspectors determined that the packages generally contained the documents shown on the Request for Change Document List. However, many duplicated documents such as drawing lists, checklists, copies of memoranda, and notes, were found in the packages. The RFCDL was not an all encompassing list and each engineer was required to review

various procedures prior to each modification and determine the needed checklists, etc. Also, a generic problem existed in the area of completeness of documentation such as post modification test documentation. In addition, notes requesting additional action by either the field engineer or lead engineer were found handwritten on documents. Documents were also found in closed out design change packages that had additions/changes in red pen but the changes were not initialed or dated as required by PMI procedures. The inspectors found it extremely difficult to audit the RFC modification packages because of a lack of uniform guidelines for maintaining the appropriate documentation, such as design verification checklists, EQ checklists, nuclear safety and licensing checklists. Some packages have been open for years without being reviewed for revised tests and other design requirements as required by the new referenced document revisions. The inspectors' ability to perform field verifications of completed modifications was limited as both units were in operation at the time of the inspection. No operability concerns were noted during the limited field inspections performed.

6.0 Exit Meeting

The inspectors met with the licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on September 13, 1991. The lead inspector summarized the scope and findings of the inspection. The licensee acknowledged the statements made with respect to the concerns/weaknesses identified. The lead inspector also discussed the likely information content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents/processes as proprietary.