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ASSESSMENT OF THE CORRECTIVE ACTION PROGRAM POINT BEACH NUCLEAR PLANT

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I. EXECUTIVE SUMMARY

An analysis of the corrective action program (CAP) was performed for the Point Beach Nuclear Plant (PBNP) by a team of individuals from Wisconsin Electric and from PI International (PII). The analysis included a program review for the various components of the prevention, detection and correction of problems, an analysis of the implementation and the effectiveness of the programs, and an interview of individuals who are the suppliers and the customers of the processes. At the completion of the analysis, conclusions and recommendations for improvements in areas that were found to be below the industry standard for these programs were proposed by the team. Recommendations are required to satisfy four overall criteria including:

- The solutions must be cost effective,
- Performance must be consistent with the best industry practices and experiences at other nuclear utilities so that PBNP CAP performance will be above the industry standard,
- The corrective action implementation must be within management control,
- Recurrence of past events will be prevented.

The purpose of this review was to identify the organizational, programmatic, and management issues that are the systemic root causes for deficiencies in the corrective action program. This collective analysis was based on:

1. an analysis of the organization and program structure using the OPIC technique and comparison to the programs currently being used at the highest performing nuclear utilities,

2. determining effective implementation through the use of measurements that are primarily based on the ability to prevent the problem from occurring or repeating (prevention), identification and reporting problems through the use of leading, lagging and real time performance indicators (detection), and correcting issues in a timely and effective manner (correction),

3. determining the effectiveness of the program structure (implementation) through interviews of the practitioners (suppliers) and the customers of the program.

The analysis data is summarized in the attachments to this report. In addition, the assessment methodology, conclusions, and recommendations are provided in detail in the body of the report.

Findings and Conclusions

1. The current corrective action program at PBNP contains significant weaknesses that prevent the thorough prevention, detection, and correction of events. The current program requirements are below the industry standard for the high performing corrective action programs.

2. The rate of condition reports is increasing significantly due to the lowering of the condition reporting threshold which allows for embedded problems to be identified. Many problems (potential root causes) existed previously, and are now being reported. The influx of reported problems on condition reports is overwhelming the OE Group assigned to deal with the CAP issues. This is further degrading the effectiveness of the CAP.

3. There is an insufficient level of investigation for reported problems, particularly for significant events involving organizational and programmatic (O&P) issues and management issues. Also, the quality, depth and timeliness of investigation for issues must be increased to identify pointers to O&P or management issues. Without this level of detail in investigation, the systemic causes for recurring issues will not be prevented. In addition, more investigation is required for threshold level condition report trends rather than attempting to resolve each issue at the specific level.

4. The majority of the issues identified during the CR analysis were caused by ineffective integration between responsible organizations and programs. These issues are exacerbated by the limited resources that are assigned to implement the administrative programs.

5. The inefficient transfer of information across organizational boundaries is a typical failure mode in the industry. Program design should facilitate the information transfer to prevent relying totally on the organizations. Based on a stream analysis of the problem reports, the PBNP programs are not strong nor efficient enough to prevent organizational pressure during periods of time pressure or stress (long hours, schedule pressure, long outage, low morale).

6. Monitoring and trending of condition reports associated with threshold trending is inadequate. Recent organizational changes have been made to improve monitoring and trending. This will not be fully effective until the programs are established and thoroughly implemented.

7. The number of resources allocated to the corrective action program are insufficient to prevent an increasing backlog of uncorrected problems. There are open corrective action items that do not have an assigned due date. The responsible department is required to respond via NUTRK with a due date. Without this response, there is no formal tracking of the item. In addition, there is no prioritization of the items in the backlog, and no comprehensive knowledge of the significance of the issues that are in the backlog.

8. The knowledge of the staff is lacking in the following areas:

   - Root Cause Determinations have not been fully effective in identifying true root causes and adequate corrective actions resulting in addressing symptom fixes and not fixing the true root cause. Therefore, events will recur.

- It is not entirely clear to individuals when to submit a CR, nor what information is required to complete the report. Improvements in the "front end" information provided on the CR will significantly lessen the burden on the root cause team, and will ensure the required individuals are contacted.

- Overview of the CAP is lacking, performance indicators are weak, and there is a lack of familiarity with the administrative procedure (CAP) requirements. However, most individuals agree that the program is necessary.

9. The system design is not user friendly. Much of the staff's time is spent interfacing with the database in order to administer the program. The CAP / OE database does not interface with other systems that are used to implement corrective actions.

10. Confidence in the CAP process is low. There is a perception that reviews are poor, the program is a punitive tool rather than a method to resolve problems, that the fixes will take the easiest approach, and they will not prevent recurrence of the condition or event.

11. Information flow associated with the Operating Experiences, both external and internal, is inconsistent. This includes feedback to the individual who submitted a CR.

Root Cause Determination

The root cause of the failure of the corrective action program at Point Beach is the absence of line ownership in the development and implementation of the corrective action program. This has resulted in a poor self-improvement culture, and a program in which lateral integration is almost non-existent. This has caused:

- a poor overall design of the process and a significant lack of integration of the procedures that are used to implement the program, for example:

  1. many steps included in the process are not assigned responsibility for completing the step,
  2. there is a lack of specific guidance in performing screenings of condition reports for significance and for trends,
  3. process steps in one procedure contradict steps in another procedure,
  4. process steps are assigned to an individual who does not have the authority to effectively complete the step,
  5. process steps are out of the proper sequence to ensure the actions are completed efficiently and adequately

- bad elements indicative of an inadequate corrective action program are present in the Point Beach program, for example:

  a) repeat events occur,
  b) corrective actions are not thorough or implemented effectively,
  c) outside observers (NRC, INPO) identify many of the problems,
  d) there is no mission or goal identification for the corrective action program,
  e) the knowledge and skills of the people who must use the program are lacking.

Contributing Factors

- The lack of lateral integration of the organizations and in the development of the procedures has caused a need for a greater number of personnel to implement the program. These resources are not available in sufficient numbers which places additional stress on the programs, and on the personnel who are responsible for implementing them.
- The lack of adequately designed procedures has caused personnel to implement actions that are outside the procedure and the organization interfaces which further exacerbate the program failure.
- The lack of line ownership of the program has caused a failure to recognize the need for additional resources, misunderstanding of the importance of the program, and the creation of a poor "self improvement culture".

The root cause and contributing factors determination is supported throughout the organizational/program interface charting (OPIC) analysis, the data analysis (lagging indicators), and the interview results (real time performance indicators). The low "self improvement culture" was identified during the December, 1996 Culture Survey (leading indicator).

Improvement Recommendations

NOTE: Attachment G provides suggestions for implementation of the following recommendations.

1. Enhancement of the "Self-improvement" Culture will improve the Corrective Action Program. Recommendations to support improvement include:

   a) Clear definition of Line Management roles and responsibilities delineated in program procedures.

   b) Line personnel to receive the appropriate skills and knowledge training on the Corrective Action Program.

   c) Establishment of a highly visible, publicized feedback loop with NPBU personnel that describes and reinforces "Self-Improvement" culture behaviors.

2. Establishment of the following Organizational foundation will support and promote a "self-improvement" culture and improve line ownership of the corrective action program.

   Create a "Corrective Action Program" Manager who reports to Senior Plant Management

   b. Establish an "Organization for Immediate Corrective Action Execution." This organization needs to consist of WE personnel assigned from each line group matrixed with present Operating Experience personnel and initially reporting to the corrective Action Program Manager.

   These individuals would be responsible for conducting investigations of events, determining root and contributing causes, managing the processing of condition reports to resolution, mentoring/leading team investigations, etc. and then return to the line group to perform the same functions but report directly to the line group leader.

3. Timely resolution of the CR backlog is key to the improvement of the "Self-Improvement culture.

   Each major line group (Engineering, Operations, and Maintenance) consider establishing a temporary "Organization for Addressing/Processing of the Condition Report Backlog." It is recommended that this temporary organization be staffed with contractor personnel proportionate to the size and complexity of each group's backlog under the leadership of a WE individual.

   Note: Several groups have this in place at this time.

4. Following specific Corrective Action Program elements are recommended for implementation.

   a. Specific Corrective Action Program "Mission" and "Values" that integrate with the NPBU plan for operational excellence and support the establishment of a laterally integrated self-improvement culture.

   b. A new, integrated set of administrative controls for the Corrective Action Program.

   c. A condition report categorization system that integrates evaluation requirements with due date and priority commensurate with safety significance.

   d. Prompt evaluation initiation and collection of event information for "Root Cause Evaluation" threshold events.

   e. Assessment of the effectiveness of corrective actions.

   f. Consistent communications, both laterally and vertically, of internal and industry Operating Experience, for the incorporation of "lessons learned" into daily activities.

II. INTRODUCTION

Wisconsin Electric, Point Beach Nuclear Plant, performed an assessment of the corrective action program with assistance from PI International. This assessment was in response to perceived weaknesses in the existing program and due to concerns expressed by the NRC. The corrective action program includes the prevention, identification, and correction of events or conditions. An effective corrective action program will eliminate root causes of events or conditions and over time, will reduce the frequency and significance of events. An ineffective corrective action program will result in an increasing number and increased significance of events. The team members assigned to complete this assessment included five PBNP individuals and two individuals from PII.

III. BACKGROUND

Corrective Action Programs (CAP) have been made highly effective at the highest performing utilities because of strong programs, in-depth training, and increased management focus. A strong CAP can reduce the overall costs of operating a nuclear plant by identifying and eliminating drivers to events or conditions that challenge the safe and economic performance of the plant. Of the three functions of a high performing CAP, the ability to prevent errors that can cause events or undesirable conditions, has been shown to have a cost savings factor of ten to one. That is, for every one dollar or one hour spent preventing an unwanted condition or event saves ten dollars or hours in detecting and correcting the event or condition. Therefore, an effective CAP must be forward looking to prevent problems rather than relying solely on past or lagging indicators.

A key factor in improving safety and economic performance is to prevent problems, or if the event or undesirable condition has already occurred, to prevent recurrence of the issues. If there is an event at another utility, there is an opportunity to prevent a similar problem through a highly effective industry operating experience program. If an event or unwanted condition occurs, the problem must be reported, thoroughly analyzed, and corrected. Issues must be raised to a high enough level in the organization to ensure that the plant resources are used most effectively and that the actions to prevent recurrence are scheduled to maximize cost effectiveness.

Management must make clear their expectations for clearly identifying and reporting deficiencies in the plant. A thorough knowledge based root cause program must be in place to examine these issues, not only to resolve the specific issue, but to also determine if there are systemic causes that arise from faulty organizational or program (O&P) interfaces or management issues. Finally, there must be a realization from management that fixing the root causes for individual problems does not prevent recurrence of problems if the true root cause was due to an O&P or Management issue.

IV. ASSESSMENT APPROACH AND METHODOLOGY

The methodologies used in this analysis reflect the rising industry standards in these areas. Therefore, corrective actions include provisions to raise performance to compliance, to above industry standards, and to excellence in that order.

This analysis of the CAP was conducted in three phases:

(1) An assessment of selected Condition Reports (CRs) and completed Root Cause Evaluation (RCE) reports issued during the previous two-year period was conducted. A sort of the current CR database for significant issues was performed to identify the threshold for root cause investigations.

(2) A study of the current program procedures and organizational structure was performed using the Organizational and Program Interface Process (OPIC).

(3) Interviews were conducted to gauge culture, to determine implementation of the programs, and to gather real time performance indicators.

Conclusions from these three areas were analyzed using PII's Human Error Inappropriate Action (HEIA) chart, the Organizational and Program (O&P) Failure mode chart, and the Executive Management Failure Mode Chart (EMFMC). These diagnostic charts assist the reviewer in understanding root causes for failures that transcend the individual root causes for specific events or issues. This approach is essential for the identification of systemic causes that must be corrected to prevent recurrence of individual or specific events.

The analysis of individual CRs and RCEs was based on the information provided in these documents including the investigation of the root causes and corrective actions. The data collected from the organization and program review and the interviews correlated strongly, with a high level of confidence in the conclusions and recommendations. Finally, Stream Analysis was utilized to consolidate the data, determine the causes of the recent problems, and to develop improvement recommendations.

V. ANALYSIS

A. Program Analysis

An analysis of the procedures that are intended to implement the corrective action program were reviewed to determine if there is adequate credibility, usability, and understandability (CUU). The procedures are identified in the following paragraphs with the conclusions for each. The Organization Program Interface Charting (OPIC) technique was used to analyze major process steps. The OPIC plots are provided in Attachment A.

A stream analysis was also performed to validate and verify that the lateral integration (hand-offs) between procedures and programs is a problem as mentioned during the interviews. Lateral integration is a cultural value which was measured by the culture index. There is a direct correlation between the number of hand-offs and the number of errors that occur. High performing utilities minimize the number of hand-offs of information to minimize the effects of ineffective lateral integration. At PBNP, the information exchanges should be simplified to ensure effective lateral integration.

1. NP 5.3.1, Condition Report System

The requirements for initiating a CR are clearly defined in the procedure, but there has been a lack of training, particularly for the represented individuals, on when and how to write a CR. This was confirmed during the interviews. (O&P Failure Mode: OP2)

Condition Report response dates are required to be submitted for newly assigned issues to each department. If there is no response from the department, there is no specific due date assigned. The issue will not be overdue until this date is assigned. There are many open items without a specific due date assigned in the CR database. (O&P Failure Mode: P1)

There are steps in the process that identify RES as the responsible group, but the actions that are required to complete the step are not clearly defined or assigned. (O&P Failure Mode: OP2)

The definition of significance (SCAQ or non-SCAQ) is too limiting. The industry standard is to have at least three levels of significance thresholds. For example, Level 1 CRs would be the most significant and would require a team root cause evaluation. Level 2 CRs would be significant and would require an individual root cause evaluation. Level 3 CRs would require an apparent cause evaluation that would provide enough information to correct the apparent cause and trend the CR for potential common cause analysis.

Trending and screening criteria is not clearly provided in the procedure. The industry standard is to provide checklists that, when used, provide a consistent approach to identifying threshold issues. (O&P Failure Mode: P4).

In general, far too much of the CR process is assigned to the RES group rather than to the line organizations. Fundamentally, this encourages a "hands-off" approach by the line groups to the design and implementation of the process. This is an organization to program interface failure mode. The industry standard for corrective action programs is to specifically identify roles and responsibilities of the line groups. (O&P Failure Mode: OP2)

2. NP 5.3.2, Operating Experience Review Program

There is no specific mechanism to ensure personnel are advised of industry operating issues that are pertinent to their areas. (O&P Failure Mode: P2)

In-house operating experiences (LERs, RCEs, SCAQ CRs, NOVs, etc.) are not included in this program. (O&P Failure Mode: P2)

Survey interviews indicated (>100 supervisor surveys) that their knowledge of in-house and industry events is significantly weak. (O&P Failure Mode: OP1)

There is no specific procedure requirement for OE input to pre-outage plans or to significant first-time evolutions. (O&P Failure Mode: P1)

There is no specific mechanism provided for PBNP personnel to request OE information that may be required for problem solving, benchmarking, or preventative actions in their areas of responsibilities. (O&P Failure Mode: P1)

Training requirements are not required to be placed in NUTRK. (O&P Failure Mode: P1)

Management interface with the program is not consistently prescribed by the procedure. Management interface is established through the OE coordinator position. Without a systematic approach to establishing management interface, the program will lack management support. (O&P Failure Mode: OP4)

3. NP 5.3.3, Post Incident Critique and Investigation

There is no specific approval authority outlined for the corrective actions to prevent recurrence when the II report is completed. The procedure requires concurrence by the MSS. There is no specific requirement for line management input to the CATPR unless (by default) the line manager who would normally implement the actions is present during the MSS meeting. (Management Failure Mode: OP1)

There is no specific guidance provided for how to identify and determine the corrective actions to prevent recurrence (CATPR). (O&P Failure Mode: P1)

CATPR require senior management approval or concurrence to ensure the actions are consistent with the mission and goals of PBNP, and to ensure the resources required are appropriate and available. This is not a specific requirement in the procedure. (Management Failure Mode: C6)

CATPR verification of completion is allowed (by procedure) to be accomplished by a "designee." The verification action should only be allowed by the II team leader or a member of the II team. (O&P Failure Mode: C5)

Too much of the responsibility for forming the II team and managing the results of the team investigation is assigned to the Manager-RES. Line participation in these functions establishes ownership of the problem and eases implementation of the most effective corrective action. RES should interface with the process to provide support to the line organizations. The current procedure/process design is below industry standard. (Executive Management Failure Mode: P4; O&P Failure Mode: OP4)

This procedure should be revised to require more line ownership and representation in the II process. In addition, a line manager (group head) should be the only authority for assignment and/or managing resources except for their immediate managers (plant manager or site VP). MSS should not have this authority.

4. NP 5.3.4, Root Cause Evaluation Reporting

This procedure applies to human error events with few integration steps to the post-incident critique and investigation. (O&P Failure Mode: P2)

Very little definition of responsibilities and authorities is provided. (O&P Failure Mode: OP4)

Some specific steps in the post incident critique and investigation procedure contradict. (O&P Failure Mode: P3)

This procedure should be incorporated into NP 5.3.3 and then deleted. (O&P Failure Mode: P3)

Improper procedure integration allowed new procedures with clearer guidance to be implemented without superseding older procedures. This leads to confusion and in some cases, contradiction in management expectations. (Executive Management Failure Mode: M3) (O&P Failure Mode: P3)

5. NP 5.3.6, 10 CFR 21 Reviews and Reporting

This procedure can be integrated into another procedure to simplify the administrative controls associated with reporting. (O&P Failure Mode: P3)

The procedure does not clearly specify recognition awareness of potential 10 CFR 21 issues. If personnel are not specifically trained to recognize potential issues, they will not be identified on the CRs. (O&P Failure Mode: P2)

Potential 10 CFR 21 issues must be evaluated by an active SRO licensed individual. This step assumes that an active licensed SRO has the training or knowledge to make this decision appropriately and consistently. A more prudent approach is to assign this responsibility to the regulatory assurance personnel with input, as needed, from Operations to evaluate the potential effect of the failure of a "basic component." (O&P Failure Mode: OP4)

There are two critical steps in the process that are not assigned to an organization or an individual (by title) for responsibility. (O&P Failure Mode: OP4)

Revision to the process is required to clarify the NP 5.3.6 issues cited above.

6. NP 5.3.7, Operability Determinations

Assignments to individuals in the organization is not clearly described in the procedure. (O&P Failure Mode: OP4)

The procedure allows for operability determinations to be given to an "active licensed SRO." The industry standard for any operability determination is that the duty shift superintendent or duty operating supervisor is responsible for making that determination. There is an inherent responsibility of the SRO license that requires the on-shift SRO to be aware of all potential issues that could affect the safe operation of the plant. The procedure step allows for an individual other than the licensed, on-shift supervision, to determine these potentially significant issues, then relies on communication to the duty personnel. If communication of these issues breaks down or is not clear, that results in an unawareness of significant issues by the duty shift superintendent, and the 10 CFR 50 license responsibilities could be violated.

This procedure should be rewritten.

B. Implementation Analysis

An effective corrective action program must not only be capable of detecting problems, but also of finding the true causes and determining adequate corrective actions. Serious incidents require a Root Cause Evaluation (RCE).

RCEs for the years 1995 and 1996 were reviewed to assess the overall quality of the investigations. A goal of this assessment is to determine if the evaluations are determining the real causes of events and prescribing appropriate corrective actions. Thirty-seven RCEs were analyzed as follows:

Corrective Actions

Corrective actions for all 37 RCEs were binned into categories to assess the types of corrective actions being utilized. Corrective actions were classed as one of the following types:

- 41.6% - Procedure revision, change, development, or any type of written instruction
- 28% - Evaluations such as studies or analysis to determine the adequacy or need for an action
- 16% - Training of any type including classroom, briefing, or presentation
- 11% - Counseling of an individual whether in a discussion or open forum for several personnel
- 3% - Signs or Labels

Three of the most abused corrective actions in the industry are procedures, training, and counseling. Inappropriate use of any of these three types of corrective action can lead to poor, complex, or burdensome procedures, excessive time in training and poor training

quality; and poor morale due to perceived punishment for failures that may be programmatic. The PBNP corrective actions show a high reliance not only on procedures, but also on evaluations to determine the adequacy of corrective actions. These evaluation corrective actions are normally directed at the groups that will have to take action if the evaluation shows a need for the change. A high percentage of evaluation type corrective actions may be symptomatic of the evaluator passing the responsibility of the corrective action determination to the responsible group or as a means of gaining acceptance of the report to allow closure. In RCE 95-12, all of the corrective actions were evaluation type corrective actions.

The first definite consideration of organization or management systems problems (other than procedural) occurred in RCE 95-14 which was initiated in July 1995. In addition, the RCE prescribed corrective actions that were attempts to correct the programmatic problems. An example of an RCE that did not consider the management or O&P issues was RCE 95-02. In this RCE, an electrician was tasked with removing the Unit 2 19 kV bus grounds and install the six 19 kV PT fuses. This was a first-time evolution for the electrician and also for the Electrical Supervisor who was called for help. Assumptions were made by management on-site concerning the appropriate actions and the installation was performed. Later, during turbine startup, the generator did not indicate voltage output. The installation was improper. This is an example of the failure of supervision and management to recognize a first time evolution and to take extra precautions to ensure a proper installation.

Overall, the RCEs do not adequately address the Organization & Programmatic nor Management Systems causes. A heavy emphasis is placed on adding, revising or changing procedures. This reliance on procedure changes leads to complex and burdensome procedures which also leads to more rule-based errors by plant personnel.

Similar Events:

A standard rule for RCE performance is the consideration of similar events that may have occurred. If this event has been preceded by other similar occurrences, then these events should be considered in the analysis and, possibly, a common cause analysis performed to determine the common causes. Searches of the NUTRK database for similar previous events is not consistently demonstrated in the RCEs. RCE 96-05 does consider a previous event with Health Physics barriers (RCE 95-20), but RCE 95-20 did not consider any previous events. RCE 96-7 concerned a Status Control event, but did not address previous status control events, while RCE 96-08 does consider previous status control events.

Guidance in NP 5.3.4, Root Cause Evaluation Reporting, does not mention the review of similar events, but NP 5.3.1, Condition Reporting System, Attachment C indicates that NUTRK should be searched for similar or related occurrences. Researching for similar events is a common industry practice for all investigations and should be a requirement for both CRs and in all RCEs. When previous events are found, there should be an

analysis of the previously prescribed corrective actions to determine why the previous corrective actions did not help eliminate this event.

Time to Implementation:

When an incident occurs that requires a root cause evaluation, information and data gathering must occur as soon as possible to ensure information is not lost or corrupted. A common standard is to begin the investigation within 48 hours of the incident. Studies have shown that an average person forgets as much as 50% of the information about an event in the first 24 hours, and they may forget as much as 75% of the data after 48 hours. Two methods for immediately gathering this information is either immediate interviews or the use of witness Statements. Witness statements are established forms that an individual involved in or witness to an event or condition of interest fills out. These written statements gather information from each individual immediately after an incident and minimize the loss or corruption of information.

An assessment of the time required to start a RCE was obtained from the NUTRK database by comparing the CR and RCE initiation dates. It was found that 22 of the 33 RCEs (66%) were initiated greater than 2 days following the initiation date of the CR. In the first half of 1995 the average delay time was 7 days with 21 days for the latter half of 1995 and 6 days for the whole of 1996. This amount of delay in the initiation of a RCE can cause a degradation in the quality of information gathering and a lower quality analysis.

None of the reports had any witness statements included and information discussions with PBNP personnel indicated that this form of information gathering is not normally utilized. The quality of information gathered cannot be immediately determined, but with the normal loss and corruption of information following any event, there is an opportunity for improvement by utilizing witness statements.

Consideration of all Facts:

When an investigation is performed, an evaluator should not only consider all the available facts, but also analyze the noted failures and gather additional data as necessary. Unless all relevant facts are considered, the validity of the analysis will not be adequate. In the review of the RCEs there were several examples where the analysis may have considered all relevant facts, but they were not represented in the reports. Therefore, completeness of the evaluations cannot be substantiated.

In RCE 95-07 it was found that the Loss of Voltage relays were not set in accordance with technical specifications. This event text indicates that supervision did not consider the first time performance of this process by the assigned engineers and a the co-dependency that existed between the supervisors and engineers which resulted in inadequate reviews by the supervision. Conclusions by the RCE were "Lack of Accountability" and setpoint document detail. There was no pursuit of the failure of the supervision and inadequate reviews.

In RCE 95-08, an assumption is made that the increase in contamination events is due to the movement of the PCM monitor to a location where HP personnel can observe personnel alarming the monitor. No justification is provided for this assumption nor the assumed one contamination per day increase that the report assumed.

In RCE 96-10 the mini-sub was damaged while monitoring the reactor vessel internals while removing the reactor vessel head. The analysis concluded that the procedure lacked detail and the work package was less than adequate. One fact that was indicated in the report was the change in how the inspection was performed before and during this incident. An effort should have been expended to assess whether the change or failure to include the changes in the original process could have been factors.

RCE 96-08 utilized facts associated with each cause (this is a plus). When conclusions are reached in a report, the author must list the facts associated with each conclusion to provide proof of the cause determination.

As can be seen on Attachment D-1, the number of Condition Reports has been rapidly increasing, but the number of Root Cause Evaluations (RCEs) has decreased. An industry standard is that approximately 10% of CRs should receive a RCE for more thorough analysis of the problem. The fourth quarter of 1996 had 928 CRs generated, but only two RCEs were performed. There were 2556 CRs generated during 1995 and 1996. However, there were only a total of 37 RCEs. This represents only about 1.5% of the CRs receiving a significant investigation. Even a 5% RCE performance rate should have resulted in approximately 127 RCEs. This indicates that the threshold for initiation of an RCE is very likely too high.

Several reports that were ranked as Significant Conditions Adverse to Quality (SCAQ) did not receive formal root cause investigations. In 1995 and 1996, there were 60 CRs that were ranked as SCAQ. However, there were only 37 RCEs performed in that time period. 13 of those 37 RCEs had a non-SCAQ CR as the parent document. Consequently, 38 SCAQs did not have a RCE performed. Discussions with RES personnel indicated that some CRs are classed as a SCAQ, but are problems that will not benefit form a formal Root Cause Evaluation (e.g. a flaw from a 25 year old design problem). If this is true, then the method for determination of significant conditions is deficient.

Repeat Occurrences

When the appropriate corrective actions for an event are implemented, the event should not recur. There were two investigations of barrier violations, but several HP barrier violations have occurred since these investigations. Status control events are continually occurring. RCE 95-08 was an investigation of several contamination events. However, since this investigation, there have been several more contamination events.

Open Corrective Actions:

One aspect of a good corrective action program is the timely investigation of problems and implementation of corrective actions. A review of the NUTRK database shows that the number of 'OPEN' CRs is increasing with time, and the backlog is growing in not only CRs, but also actions generated by those CRs. Attachment D-2 shows the growing backlog of open CRs. Attachment D-3 shows that the number of CRs being written is surpassing the number closed. Attachment D-4 illustrates the growing population of open CRs. The number of condition reports generated each month has grown, and consequently the number of action items has also grown. However, as illustrated by Attachment D-4, the gap between the number of CRs being created and the number closed is growing which also has created a growing population of open action items generated from these CRs. There has been an increased emphasis to write CRs to correct plant problems, but the resources allocated to address these problems has not been adequate.

As part of the condition reporting process, the group assigned an action also assigns priority and due dates to the action. When an action item is sent to the group, it is automatically assigned a priority of -100 with no due date. In researching the NUTRK database it was found that the percentage population of corrective actions without a due date has grown (Attachment D-5) and the percentage of the population of action items with a priority of -100 (the lowest priority) is becoming larger (Attachment D-6). Priority is assigned to an action in accordance with NP 10.1.2, Work Prioritization. To arrive at a priority, five factors are weighed: Public Safety, Personnel Safety, Plant Economic Performance, Regulatory, and Personnel Productivity. Each factor can be assigned a score of +5 to -5. Each factor has a weighting factor that is multiplied by its score. The scores of all factors are factored together to determine an overall priority.

Conclusions

- RCEs lack the thoroughness to address all the relevant facts and possible causes. In most of the evaluations, there is no consideration for O&P or management system type failures.
- RCEs do not consistently look at previous incidents and consider the failure of previous corrective actions to minimize recurrence.
- RCEs are started too late. If an investigation is not started within 24 hours after an incident, there is an extensive loss of information.
- Corrective actions are shallow. Too often corrective actions follow the prescribed formula of procedures, training and counseling. In addition, evaluations are prescribed as a means of determining a course of action. There is not enough consideration for O&P and management system type corrections.
- Condition Reports classified as SCAQ, the highest level of problem, are not routinely given a RCE. There were 38 SCAQs that did not receive a formal RCE.
- Not enough RCEs are being performed. The level of CR activity should generate more evaluations. The 1.5% RCE generation rate is well below the industry standard of 10%.

- The backlog of open CRs is increasing, including the number of open SCAQ level CRs. CRs from previous years back to 1992 are still open, including SCAQ level CRs from 1994.
- The percentage of -100 level (lowest priority level) CR actions is growing larger.
- The closure of CRs by correction of the problems is not keeping pace with the generation of new CRs.

C. Interviews

The following comments represent a summary of the management and represented responses to the questions that were developed by the team.

Role/Program Understanding

Most people are familiar with the condition reporting process, but not with the associated functions of the corrective action program. The management role is fairly well understood, but the role of the represented personnel is not clearly understood. There was unilateral support for the need for having a corrective action program and the need to have sufficient support to implement it correctly. There was consensus among the management personnel that the resources are inadequate for the implementation of the program.

Training / Assigned Missions

There was a consensus that overview training of the entire corrective action program, with emphasis on initiating Crs is needed. The training needs to be targeted to each level in the organization.

Root Cause Evaluations

The interviewees felt that the RCEs attack symptoms in the majority of cases, not the root causes. It was also stated that implementation of corrective actions that are selected following evaluations are based on cost/time rather than on correcting the root cause.

Databases

It was stated that the database is not user friendly for trending and searches and that the systems are not integrated (WOs, ECRs, CHAMPS). This increases the administrative burden on the OE staff.

Event Information Gathering

There is too much time between the time the event occurs and when the interviews of personnel are initiated. This creates clear memory concerns. In addition, shift unavailability introduces time delays and results in interviewing the wrong personnel in some cases. Interviewees also expressed the need to ensure correct team makeup and leadership.

Implementing Corrective Actions

Interviewees indicated a concern over the growing backlog and not having enough resources to address it. They felt we have a tendency to do the "quick fix" rather than the correct fix.

On-site management indicated the presence of a good feedback loop. Milwaukee personnel stated feedback was absent. Represented indicated little involvement in the feedback loop.

Corrective Action Program a Burden

Interviewees were split in their response to this question. All individuals agreed that the program is necessary, regardless of whether or not it is a burden.

Industry Events

There is no consistency in the communication of information.

Program Adequacy/Organizational Adequacy

Half of the interviewees knew of the procedures and had read some of them. The other half had never read the procedures.

Sufficient Reviews

There are enough onsite reviews, but the offsite reviews are not clearly understood.

Are surprised by NRC / INPO Findings

Approximately 70% of the interviewees said they were not surprised. They believe we might identify the issue, but we do not correct the problems.

Repeat Events

The interviewees felt that most corrective actions implemented would not prevent recurrence. However, the absence of a feedback loop for many people made them unaware of repeat events.

Confidence in the Program to Identify/Implement Solutions?

Approximately 60% of the interviewees felt that with the resources and tools, problems would be identified and solutions implemented.

VI. CONCLUSIONS

1. The current corrective action program at PBNP contains significant weaknesses that prevent the thorough prevention, detection, and correction of events. The current program requirements are below the industry standard for the high performing corrective action programs.

2. The rate of condition reports is increasing significantly due to the lowering of the condition reporting threshold which allows for embedded problems to be identified. Many problems (potential root causes) existed previously, and are now being reported. The influx of reported problems on condition reports is overwhelming the OE Group assigned to deal with the CAP issues. This is further degrading the effectiveness of the CAP.

3. There is an insufficient level of investigation for reported problems, particularly for significant events involving organizational and programmatic (O&P) issues and management errors. Also, the quality, depth and timeliness of investigation for issues must be increased to identify pointers to O&P or management issues. Without this level of detail in investigation, the systemic causes for recurring issues will not be prevented. In addition, more investigation is required for threshold level condition report trends rather than attempting to resolve each issue at the specific level.

4. The majority of the issues identified during the CR analysis were caused by an ineffective integration between responsible organizations and programs. These issues are exacerbated by the limited resources that are assigned to implement the administrative programs.

5. The inefficient transfer of information across organizational boundaries is a typical failure mode in the industry. Program design should facilitate the information transfer to prevent relying totally on the organizations. Based on the stream analysis of the condition reports, line ownership and the PBNP programs are not strong nor efficient enough to mitigate organizational pressure during periods of time pressure or stress (long hours, schedule pressure, long outage, low morale)

6. Monitoring and trending of condition reports associated with threshold trending is inadequate. Recent organizational changes have been made to improve monitoring and trending. This will not be effective until the programs are established and thoroughly implemented. In order for monitoring and trending to be effective, the effective use of "real-time" and "lagging" performance indicators is required. Real time performance indicators include the results of field surveillances performed by supervisors, oversight groups or regulatory agencies. Lagging indicators include problem reports, industry operating experience reports, NRC violations, LERs, etc. Based on discussions with

personnel involved with establishing the monitoring and trending programs, some of these concepts were unknown. These approaches are typically the current industry standard. Benchmarking or additional training during the formative stages of monitoring and trending programs will help ensure the maximum cost effectiveness of these programs.

7. The number of resources allocated to the corrective action program are insufficient to prevent an increasing backlog of uncorrected problems. There are open corrective action items that do not have an assigned due date. The responsible department is required to respond via NUTRK with a due date. Without this response, there is no formal tracking of the item. In addition, there is no prioritization of the items in the backlog, and no comprehensive knowledge of the significance of the issues that are in the backlog.

8. The knowledge of the staff is lacking in the following areas:

   - Root Cause Determinations have not been fully effective in identifying true root causes and adequate corrective actions resulting in addressing symptom fixes and not fixing the true root causes. Therefore, events will recur.

     It is not entirely clear to individuals when to submit a CR, nor what information is required to complete the report. Improvements in the "front end" information provided on the CR will significantly lessen the burden on the root cause team, and will ensure the required individuals are contacted.

   - The overview of the CAP is lacking, performance indicators are weak, and there is a lack of familiarity with the administrative procedure (CAP) requirements. However, most individuals agree that the program is necessary.

9. The system design is not user friendly. Much of the staff's time is spent interfacing with the database in order to administer the program. The CAP / OE database does not interface with other systems that are used to implement corrective actions.

10. Confidence in the CAP process is low. There is a perception that reviews are poor, the program is a punitive tool rather than a method to resolve problems, that the fixes will take the easiest approach, and they will not prevent recurrence of the condition or event.

11. Information flow associated with the Operating Experiences, both external and internal, is inconsistent. This includes feedback to the individual who submitted a CR.

Root Cause Determination

The root cause of the failure of the corrective action program at Point Beach is the absence of line ownership in the development and implementation of the corrective action program. This has resulted in a poor self-improvement culture, and a program in which lateral integration is almost non-existent. This has caused:

- a poor overall design of the process and a significant lack of integration of the procedures that are used to implement the program, for example:

  1. many steps included in the process are not assigned responsibility for completing the step,
  2. there is a lack of specific guidance in performing screenings of condition reports for significance and for trends,
  3. process steps in one procedure contradict steps in another procedure,
  4. process steps are assigned to an individual who does not have the authority to effectively complete the step,
  5. process steps are out of the proper sequence to ensure the actions are completed efficiently and adequately

- ***elements indicative of an inadequate corrective action program are present in the Point Beach program, for example:***

  a) repeat events occur,
  b) corrective actions are not thorough or implemented effectively,
  c) outside observers (NRC, INPO) identify many of the problems,
  d) there is no mission or goal identification for the corrective action program,
  e) the knowledge and skills of the people who must use the program are lacking.

Contributing Factors

- The lack of lateral integration of the organizations and in the development of the procedures has caused a need for a greater number of personnel to implement the program. These resources are not available in sufficient numbers which places additional stress on the programs, and on the personnel who are responsible for implementing them.
- The lack of adequately designed procedures has caused personnel to implement actions that are outside the procedure and the organization interfaces which further exacerbate the program failure.
- The lack of line ownership of the program has caused a failure to recognize the need for additional resources, misunderstanding of the importance of the program, and the creation of a poor "self improvement culture".

The root cause and contributing factors determination is supported throughout the organizational/program interface charting (OPIC) analysis, the data analysis (lagging indicators), and the interview results (real time performance indicators). The low "self improvement culture" was identified during the December, 1996 Culture Survey (leading indicator).

VII INDUSTRY COMPARISONS

A comparison of the corrective action program at Point Beach to the corrective action programs being used at high performing utilities was performed. The basis for the industry comparison was comparing the PBNP program to programs in use at several high performing nuclear utilities. The benchmarking of these utilities was performed by PII and is provided in the referenced technical paper 94-581. The principles outlined in this technical paper are summarized in Attachment F, "Principles of Corrective Action Program." The comparison was done during the OPIC analysis on a step-by-step basis. If there were areas where the Point Beach process deviated or was well below the industry standard, this area was highlighted and included in the conclusions section.

From an overall standpoint, the corrective action program is missing some critical elements that places it well below the industry standard. In order for PBNP to performance to improve, the corrective action program must be strengthened and used as a part of the self-improvement culture. The historical weakness in this program is evidenced by the backlog of open issues in the condition report database. This backlog potentially contains significant and unanswered issues.

VIII. IMPROVEMENT RECOMMENDATIONS

NOTE: Attachment G provides suggestions for recommendation implementation.

1. Enhancement of the "Self-Improvement" Culture will improve the Corrective Action Program. Recommendations to support improvement include:

   a. Clear definition of Line Management roles and responsibilities delineated in program procedures.

   b. Line personnel to receive the appropriate skills and knowledge training on the Corrective Action Program.

   c. Establishment of a highly visible, publicized feedback loop with NPBU personnel that describes and reinforces "Self-Improvement" culture behaviors.

2. Establishment of an Organizational foundation that supports and promotes a "self-improvement" culture and establishes line ownership of the corrective action program is recommended as follows.

   a. Assign a "Corrective Action Program" Manager who reports to senior plant management.

   b. Establish an "Organization for Immediate Corrective Action Execution." This organization needs to consist of WE personnel assigned from each line group matrixed with the operating experience personnel and initially report to the Corrective Action Program Manager.

These individuals would be responsible for conducting investigations of events, determining root and contributing causes, managing the processing of condition reports to resolution, mentoring/leading team investigations, etc. and then return to the line group after a period of time to continue to execute the same responsibilities as above and report to the line group manager.

3. Timely resolution of the CR backlog is key to the improvement of the "Self-Improvement culture.

Establish a temporary "Organization for Addressing/Processing of the Condition Report Backlog" in each of the major line groups (Engineering, Operations, Maintenance). Staff this temporary organization with contractor personnel proportionate to the size and complexity of each group's backlog led by a WE individual.

It is extremely important that the condition report backlog be reviewed, prioritized, with significant issues receiving immediate attention for pursuit of resolution.

4. Implementation of specific Corrective Action Program elements is recommended as follows

a. Specific Corrective Action Program "Mission" and "Values" that integrate with the NPBU plan for operational excellence and supports the establishment of a laterally integrated self-improvement culture.

b. A new, integrated set of administrative controls for the Corrective Action Program.

c. A condition report categorization system that integrates evaluation requirements with due date and priority commensurate with safety significance.

d. Prompt evaluation initiation and collection of event information for "Root Cause Evaluation" threshold events.

e. Assessment of the effectiveness of corrective actions.

f. Consistent communications, both laterally and vertically, of internal and industry Operating Experience, for the incorporation of "lessons learned" into daily activities.

IX. REFERENCES

1. "Human Error & Inappropriate Actions Diagnostic Chart", FPI International (1991)

2. "Organizational & Programmatic Diagnostic Chart", FPI International (1991)

3. "Commonly Seen Mistakes in Common Cause Analyses", FPI Application Note 93-74 (1993)

4. "Monitoring Repeat Events -- An Effective Means to Prevent Significant Events", FPI Application Note 94-17 (1994)

5. "Case Study of Monitoring Program Effectiveness", FPI Report 94-533 (1994)

6. P. S. Rose, "Money and Capital Markets, Richard D. Irwin Inc. (1989)

7. "Organizational & Programmatic Root Cause Analysis Training Course", FPI International (1991)

8. "Lessons Learned From Other Regulated Industries About Human Error Rate Reduction -- From a Management Perspective", FPI International Technical Paper 94-581, (1994)

9. "Culture Index Determination", FPI Application Note 93-76, (1993)

10. "Cultural Differences", FPI Application Note 93-82, (1993)

11. "Cultural Index of NRC Watch List Plants" FPI Application Note 93-50, (1993)

12. J. Kotter and J. Heskett, "Organizational Culture", Harvard Press, 1992

Organizational and Program Interface Charts (OPIC)

ATTACHMENT A

ATTACHMENT B

PROGRAMS AND DOCUMENTS REVIEWED

Condition Reporting System	NP 5.3.1
Operating Experience Review Program	NP 5.3.2
Post Incident Critique and Investigation	NP 5.3.3
Root Cause Evaluation Reporting	NP 5.3.4
10 CFR 21 Reviews and Reporting	NP 5.3.6
Operability Determinations	NP 5.3.7
Open Items Tracking Systems	NP 5.4.1

Personnel Interview Response Summaries

ATTACHMENT C

CORRECTIVE ACTION PROGRAM ASSESSMENT QUESTIONNAIRE
Represented Personnel - Summary

Role & Understanding of Program

- Majority unfamiliar with the term "corrective action program"
- Majority listed role as identify problems and initiate Condition Reports; however, didn't know the complete process beyond the initiation
- Majority felt role not clearly defined
- Majority stated that there is a need for it & the support; however, not clearly stated

Training on Assigned Mission

- Majority had question of what is my mission (same as role?)
- Majority never had any training at all (Condition Reports or entire CA process)
- Needed: How & when to write Condition Reports (format, content, brief vs detailed, including use of form on g:\drive)
- Needed: Brief overview of entire corrective action program, focusing more on CR process from start to closeout - What is Mission/Vision?
- Needed: Few said understanding of RCE process would help to generate better CRs and a better end product
- Suggested: NUTRK overview for searches & viewing closeouts
- Suggested: General Plant Systems Overview as refresher
- Question: How to do anonymous CRs if must be hand-delivered to SRO?
- Question: Who should write the CR? Represented or Supervisor? Varies.

Root Cause Investigation

Two worked on teams (one trained in TapRooT, one not trained)

Current Databases - Administrative/Investigation

- Five track E-mail conference on CRs received
- Feel system is being overloaded with CRs that maybe aren't CRs
- Are unaware if conference is at front end or back end of process
- Two-three dabble in NUTRK, just to check on a specific CR status
- Administration/Investigation time spent not applicable

Gather Information for Events - Program/Organization Provisions

- Difficulty talking to necessary people due to varying shifts, by the time they were interviewed, had forgotten some details
- Time delays from event to start of investigation caused memory problems
- No ideas on program or organization provisions to make easier

Management Support

- Ten answers were simple Yes, Two answers included "in writing CRs"
- One "didn't know"
- One "No support"
- One "at times"
- Remaining had varying responses per below (black hole, Catch-22, blame)

Difficult to Implement CAs

- Six not applicable or no answer
- Four dependent on procedure or simple process change (easy) or charge in methodology, equipment or not reaching problem in first place (difficult),
- Two "no if given emphasis from top down" or "need total group communication"

CAs Thorough/Complete - Reports Adequate/Clear - Diagnose all Possible Avenues - Some Better than Others

- Appear to be intertwined with Work Order system - Several didn't know if there was a driving CR behind work they were performing - Unsure
- 50% Adequate/50% Inadequate - 2/3 to 3/4 is accurate
- Just don't know *or* No response to CRs written (several felt due to qty generated & time allowed)
- Several felt need to have individual with Operations experience or nuclear plant background for a thorough investigation/understanding
- Answers vary (incorrect people, prioritization, investigation process, black hole)

Implementable - Modify

- Three "decided at higher level"
- Five-Six - Not applicable or simple "yes"
- Six felt direct involvement could have resulted in better end product or eliminated need to modify, 2nd CP generated to modify eliminated 1st initiator from loop

Program a Burden

- Seven Yes, but a necessary burden (~1/2)
- Five No's or Not my level
- Three varying comments (data going in, politics of words to lessen significance)

Aware of Final Resolution

- Ten get final closeout form (majority would like input during process to ensure quality end resolution)
- Four "no" or "unsure"

Industry Events

- Several people track E-mail conference on industry events - Bring forward issues they see concerning group - Not on consistent basis
- Seems to be inconsistent answers within groups if messages getting out or not & how they are appearing

Common Concerns

Condition Reports tend to fall into black hole after initiation, never to be seen again
Initiated it, never had additional verbal input/clarification on it initially or during closeout process, never saw final closeout of it

Concern of gray areas on when to write. Example, something occurs on one shift and determined not necessary to write a CR, next shift comes on & looks at log & feels a CR was necessary, writing one up - Is it an NRC catch-22 for the shift that didn't write it up? What is the threshold???

Some cultural problems where feel need to rationalize or place blame vs solve the problem. No focus on continuous improvement for the process and concept of "Let's change because it could be better!"

Corrective Actions- Changing procedure/doing training not always the answer but is broadbrushed there in lots of areas - Not reaching root cause of problems on many CRs

Several felt incorrect people are assigned to develop CAs & closeout

- Writing a CR because couldn't resolve verbally, assigned to individual with conflict & closed out with problem encountered in verbal process initially.
- Write a CR - Assigned to System Engineer "Territory" - Plugs in their "theory" - Problem Still There
- Not researched to resolve problem, "glossed" over & given quick closeout vs solving problem
- Dependent on interest taken or "paper to be moved"

Always should talk to the initiator & the people involved by CR

Prioritization/Followup on CAs lacking, not timely

Lots of administrative CRs burdening system - Feel CRs may have lost clout & meaning

E-mail conference - Would like to know final results of higher, pertinent RCEs/CRs, perhaps not see all of the up front CRs that are minor

Interesting Comments

- "Where can Blame be put" is still out there
- "Shouldn't be Punitive" and/or "Confusion with Punitive Messages Being Sent"
- "Lack of Management Internal Focus - Afraid of What You'd Find"
- "Complacency within Individual Groups - Desensitized to Day-to-Day Activities"
- "Why Write Them... Nothing's Ever Done"
- Several people made reference to the "black hole" concept of initiating a CR & never seeing it again

15 Interviewed:

3-AOs	2-COs
2-HP	1-CHM
2-I&C	1-NSS
2-MEE	2-MEM

CORRECTIVE ACTION PROGRAM ASSESSMENT QUESTIONNAIRE
Management Personnel - Summary

Note: This summarizes the responses of 35 individuals which included the Senior Team, Group Heads, Other MSSM members, first line supervision, DSS, DOS, SRO, and RES team members.

Role and Understanding of Program

- Majority felt their role in the program was to ensure that condition reports were written for conditions adverse to quality and deficiencies, and they also had role in the assurance that the condition was fixed.
- Several commented that their role was not clearly defined, especially in the applicable NP.
- Majority indicated that they understood the CR process but understanding of associated processes was dependent on the amount of use. There was a very high awareness of the CR system displayed.
- Majority stated there was a need for it and it needed their support - most also stated that they were resource constrained which adversely impacted their ability to get their job done - they also displayed a universal desire to get the job done right and to be able to catch up on the growing backlog.
- We continue to struggle with the CR threshold. (three people)
- Some people use the system as a way to push their agenda. (two people)

Training and Assigned Mission

- Majority felt that they were sufficiently trained on the CR process - there was an indication that there may be a need for training in how all of the different systems interrelate (e.g. DCN, ECR, etc.) and how to get usable trending info.
- Statement made that some groups feel that all CRs are the same priority - they are trying to do them all with the same effort.
- Majority stated that they were to ensure that CRs were written for adverse conditioned and deficiencies and part of their mission was to get item corrected. Strongly indicated the need for adequate resources to do that.

Root Cause Evaluation

- Majority had not participated on a RCE team.
- Majority of onsite personnel felt that whenever they had provided information or had written a CR there was a complete feedback loop with RES on the issue to closure.
- Majority of the personnel from Milwaukee indicated that the feedback loop with them was inadequate.
- There was a split on the quality of RCEs. Some felt they were well done, complete and thorough. Some felt that the RCEs concentrate on quick fixes (e.g. training, procedures, etc.) and don't get at the programmatic issues. This actually increases barriers to proper accomplishment of work.
- The PII training has helped me to recognize that the RCEs done did have not been getting at the root cause. They have been getting at the symptom. (two people)

Current Databases - Administration/Investigation

Majority said that they contacted RES for support when needed information from the CR database - the NUTRK database is perceived to not be user friendly to the general populous and also people are not adequately trained in its use.

Gather Information for Events - Program/Organizational Problems

Only 3-4 people were on a RCE team. Of these, all commented that there was too much time between event and data collection. Also, the shift unavailability introduced additional time delays.

Management Support

- Majority said that there was management support in the groups and outside the groups except for getting more resources.
- There is not adequate support by the senior team. (two people)

Difficult to Implement CA's

Almost all indicated difficulty due to the growing backlog and the inability to get additional resources. Majority indicated we are doing better on the front end but we are poor on the back end with the actions not resolving the issues.

CA's Thorough/Complete - Reports Adequate/Clear - Diagnose all Possible Avenues - Some Better than Others

Responses mixed - Depends on level of training, the team, individuals involved, who leads the team. Tend to leave out management controls. Some felt to be very good.

Implementable - Modify

- Mixed response - Felt mostly implementable because they shy away from the people/accountability issue. Said normally bought into prior to the final report.
- Basically, all felt they had the ability to modify the Corrective Actions prior to report issuance.
- Hit or Miss - we don't have a process that follow up to assess if the action(s) correct the problem. (two people)
- Yes, if adequate staff to complete. (three people)
- Never felt that a CA modification was welcomed by the overseers of the process. (two people)
- Some denial on the part of groups to believe in the corrective action. (three people)

Program a Burden

- Majority said yes due to the large and growing backlog of work, the timeliness of issues and the need for resources to do it right.
- Majority said no because we need to be able to correct our problems.

- CR meeting is too long.
- People not working together - some finger pointing and not accepting ownership.
- Yes, but it is necessary.

Aware of Final Resolution

- Majority said yes - feel that there is a good feedback loop and RES personnel are in the plant and talking with personnel.
- Milwaukee personnel indicated that they did not have a good feedback loop with the system.

Industry Events

- Almost all stated were made aware of industry events from many directions.
- Several Milwaukee personnel stated that they did not receive as much Industry Event information as they thought they should and often it was not timely.
- There is not a consistent means of communicating information (hit-or-miss).

Program Adequacy/Organizational Adequacy

- 50% had read or were familiar with the CAP procedures (unsure if they read it all)
- 50% never read the procedure.

Sufficient Reviews

- Onsite, there are enough reviews, but there are some comments of inadequate reviews.
- Offsite, reviews are not clearly understood.

Are surprised by NRC / INPO Findings

Approximately 70% say they were not surprised, 30% yes.

Repeat Events

- We're not typically aware of repeat events.
- Most corrective actions would not prevent recurrence.

Do we have Confidence in the Program to Identify/ Implement Solutions?

- 60/40 yes, if we had the resources, tools.
- People not working together - some finger pointing and not accepting ownership.
- Yes, but it is necessary.

Common Concerns

- Lack of resources in the line groups to adequately address issues. Recognize the need for the line groups to own resolution.
- Growing backlog
- Still some finger pointing
- We are better on the front end but need to improve the timeliness of resolution - then need to have a method to follow-up and ensure the resolution hits the mark.
- Resolution tends to focus on easy, quick fixes. We shy away from management and accountability resolutions.
- PII training has made me aware that we have not done good diagnosis prior to going to the resolution phase.
- Reviews don't tie to corrective action implementation.
- On-site and off-site reviews are not effective because they should have been effective enough for us not to be in the situation we are in.
- All significant issues need to have an issue manager.

Implementation Data/Graphs

ATTACHMENT D

Team Charter

ATTACHMENT E

TEAM CHARTER

Corrective Action Program Assessment

Purpose: Use Common Cause Analysis techniques to perform an assessment of the following corrective action process requirements. Based on the assessment results provide recommendations for improvement.

1. Conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified.

2. Conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly corrected.

3. Significant conditions adverse to quality are promptly identified and measures shall assure that the cause of the condition is determined.

4. Corrective action taken in regards to significant conditions adverse to quality is adequate to preclude recurrence.

5. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

Note: Above requirements taken directly from 10 CFR 50, App. B, Criterion XVI.

Key Indicators of Inadequate Performance:

1. Although condition report initiation has increased based on numbers of condition reports received there continues to be equipment nonconformances that are not identified through this system. In addition, we continue to be cited by the NRC for not initiating condition reports for nonconforming conditions.

2. We have data in our condition reporting system that indicates ineffective and untimely completion of corrective actions.

3. Feedback from various sources indicate the presence of some resistance to writing condition reports, especially by members of the represented group.

4. We have continued to be cited by the NRC for failure to complete corrective action in a timely manner and for failure of our corrective actions to prevent event recurrence.

Corrective Action Program Assessment

Scope: Evaluate Relevant data from the last two years and perform personnel evaluations to determine:

a. The method of event discovery and station personnel participation.

b. Event identification threshold levels and subsequent level of analysis.

c. Adequacy of guidance, both procedural and verbal, to the expected participants (e.g. SCAQ Criteria).

d. Condition report prioritization and trending.

e. Integration of internal and external operating experience into the CR process.

f. Quality of investigations.

g. Quality of in-house reviews.

h. Adequacy of the present program/organization to support the Corrective Action Program including On-site/Off-site reviews and Management.

Team: Terry Guay, Regulatory Services Manager (Co-Team Lead)
Steve Eisenhart, Performance Improvement International (Co-Team Lead)
Renee Milner, Acting Root Cause Evaluation Coordinator
Scott Pfaff, Internal Operating Experience Coordinator
Jim Comeaux, Performance Improvement International
Tom Jessessky, Lead Engineer - Electrical Engineering Section
Donna Flanagan, Specialist - Emergency Planning

Schedule:

Data Gathering/Interviews:	March 17 - 25, 1997
Data Analysis:	March 26 - 27, 1997
Draft Report:	April 1, 1997
Final Report:	April 11, 1997
Action Plan for Improvement:	April 15, 1997

Assessment Methodology

ATTACHMENT F

A. Determine effectiveness of the current program.

1. Identify repeat condition reports. Number, significance, reasons for the repeat occurrences.
2. Operating Experiences- Incorporation of lessons learned into station practices. Has the industry event prevented occurrence of an in-house event?
3. Identify threshold CRs that evolve into significant events. Has the station identified the significant occurrence from an analysis of the precursor events?
4. Determine the ratio of significant events to threshold events. The ratio for an effective reporting system is approximately 1 to 10.
5. Determine the number of root cause evaluations performed for the number of significant events.
6. Identify outstanding corrective actions from previous corrective actions- number and length.
7. Do corrective actions follow the criteria for good corrective actions.
   - Fix the problem and prevent recurrence
   - Within management control to implement
   - Cost effective
   - Restore performance in the subject area to above industry standard.
8. Identify events that could have been prevented if adequate corrective actions had been implemented.
9. Identify NRC violations or INPO findings that could have been prevented by an analysis of CRs and the implementation of appropriate corrective actions.

B. Reporting

1. Review logs, work plans, or records of activities for events that should have been reported using the CR system, but were not reported.
2. Review the CRs for the assignment of significance. Compare the significance to the industry standard.
3. Review completed CRs for correctness of the level of reportability assigned, the completion of the required reports, and a recognition of the impact of the event or condition.
4. Determine if management notifications were made according to the level of significance of the events or conditions identified.

C. Oversight Effectiveness

1. Review the minutes of the oversight groups. Determine if the required issues are thoroughly discussed related to events or conditions.
2. Verify that the on-site review group meets the Technical Specification requirements.
3. Determine if the on-site and off-site reviews add value to the corrective action program.

D. Suggested Survey Questions

These questions are to assist in the diagnosis of problems associated with the current corrective action program. The organization or programmatic problems that currently exist must be revealed so that the corrective actions resolve the correct issues. Personnel who are the suppliers (investigators, OE, administrators, on-site and off-site reviewers), customers (implementers of corrective actions), and management should be included in the survey.

1. Suppliers in the Corrective Action Program

- Is your job related to the corrective action program implementation clearly defined? (Mission & Goals)
- Have you had enough training to complete your assigned mission? What other training do you need to complete this mission? (Knowledge and Skills)
- Have you ever performed a root cause investigation with a team? (Knowledge and Skills)
- Does the current information data bases support the identification of repeat events easily? Do you spent more time in administration or in investigation? (Work Processes)
- Is it difficult to gather information related to events? What program or organization provisions would make this effort easier? (Lateral Integration)
- Do you have management support for the implementation of the corrective action program in your area? (Lateral Integration)
- Are corrective actions difficult to implement? Why? (Self Improvement Culture)

2. Customers of the Corrective Action Program

- Is your role in the corrective action program clearly defined? Do you understand the purposes of the program and the need for your strong support? (Mission and Goals)
- Have you had enough training to complete your assigned mission? What other training do you need to complete this mission? (Knowledge and Skills)
- Have you ever performed a root cause investigation with a team? (Knowledge and Skills)
- Are the corrective actions from root cause investigations thorough and complete? Is the report from the investigations or the CR reviews adequate and clear? (Work Process)
- Do the root cause or CR review personnel take time to diagnose all possible avenues of the causes? Are some investigators better than others? (Work Process)
- Are corrective actions from root cause investigations or CR reviews implementable? Do you have the opportunity to modify the corrective actions after the investigation is completed? (Work Process)
- Is the corrective action program a burden? (Self Improvement Culture)
- After your input, are you made aware of the final resolution of the issues raised by the RCE or the CR review? (Self Improvement Culture)
- Are you aware of industry events in a timely manner? What happens if the industry event is pertinent to your area? (Self Improvement Culture)

3. Management

- Do you have a role in the corrective action program? What is it? (Mission and Goals)
- Have you ever performed a root cause investigation with a team? (Knowledge and Skills)
- Are you aware of significant issues in a timely manner? (Self Improvement Culture)
- Have you read the corrective action program documents? Are the program and organizational aspects of corrective actions manageable? (Work Processes)
- Do the on-site and off-site reviews add value to the corrective action program?
- Are there sufficient reviews required to implement corrective actions? If not, who else should be involved in the issue reviews? (Lateral Integration)
- Are you unaware (surprised) by issues raised by the NRC or INPO? Does the in-house corrective action program raise similar issues prior to these issues being identified by the NRC or INPO? (Self Improvement Culture)
- Are you aware of repeat events when they occur? Does the current corrective action program identify corrective actions, that when implemented, will prevent recurrence of the issues? (Self Improvement Culture)
- Do you have confidence that the suppliers and customers of the corrective action program will be able to identify and implement the correct solution to issues?

D. Principles of the Corrective Action Process

- The corrective action program is intended to eliminate root causes for conditions or events that are inherent in organizations, programs, and personnel errors caused by external factors.

- The effectiveness of this program in accomplishing the intended purpose can be measured in the following ways:

1. Repeat events are prevented- In order to measure this, the data base of past events must allow for the easy retrieval of events, and support the comparison of past to current events. Therefore, there must be enough information in the data base to allow this comparison.

2. Corrective actions are implemented- There should be a low number of corrective actions awaiting implementation. The backlog should consist of corrective actions that are awaiting an outage for implementation or long term design modifications. Otherwise, the actions should not be longer than 30 days.

   Also, if there are any significant issues awaiting implementation due to the above reasons, the program should require the implementation of compensatory measures that are equivalent to the final solution until the permanent fix is made.

3. Issues identified prior to outside observer identification- There should be no issue identified that has not been identified by internal mechanisms. Event will occur that

have not been predicted. However, there should be no program or organization issue that relates to noncompliance to rules or regulations or to accepted industry practice.

The on-site and off-site review groups mission is to ensure industry standards are reflected in the corrective action program.

In addition, the Operating Experience portion of the program is to identify issues that are pertinent to Point Beach, corrective action prevent the manifestation of these problems, or that lessons learned from other events are used to solve similar problems at Point Beach.

- In order to accomplish the mission of a Self Improvement Culture, the following values must be shared throughout the organization:

Mission and Goals- Personnel at the station must have a clearly defined mission, and the goals necessary to accomplish this mission as it relates to their job function and responsibilities.

Knowledge and Skills- Personnel must be trained effectively, have the inherent investigation skills, and should have participated in a team root cause investigation. This is important for managers and the review group personnel.

Lateral Integration- A cooperative culture must exist to ensure the events or conditions are reported, actions are taken to investigate (diagnose) issues, teams are supported, and corrective actions are implemented.

Work Process- The corrective action program should be complete enough to ensure the lateral integration occurs, but not so complex that efficiency is lost. The typical inefficiencies involve unneeded reviews, excessive organizational interchanges, lack of clear ownership for implementation, and lack of management support.

Self Improvement Culture- Everyone at the station should feel responsible for reporting issues or conditions to ensure management has an opportunity to prevent the repeat of the event or condition. Reporting should not be punitive, nor should the issue identifier be the same person as the investigator. Resolution of issues should be objective and should provide feedback to the identifier.

Specific Details for Corrective Actions

ATTACHMENT G

Specific Suggestions for Recommendation Implementation

Organization

- Establish a corrective action program manager with the appropriate level of authority.

- Increase the staffing with personnel who are trained in root cause analysis and integrate them into the line groups. These resources should be matrixed to the corrective action manager for direction, but with close ties to their line group, and will act as in-group administrators and "*root cause experts*." Utilize the existing OE/RES group on-site to perform monitoring, trending, feedback, performance assessment of the entire corrective action process in addition to supporting root cause evaluations.

  Participation by every line group is recommended so CAP expertise can be integrated back into all parts of the organization following training and a period of time to gain experience in enhanced root cause evaluation. Resource needs may vary dependent on volume of applicable issues.

Program

The organization program interface charting (OPIC) resulted in many items for improvement. Recommended corrective actions are:

- Clarify the responsibilities of individual steps in the CAP procedures to have individuals with the appropriate level of authority responsible for decision making. Revise NP 5.3.1 to address the identified deficiencies specified in this report.

- Require due dates to be assigned commensurate with the category of the Condition Report.

- Formally fold external OE into the corrective action program. Individuals need to be kept up to date on industry OE that affects their area of interest. In-house operating experience should be regularly discussed and reinforced. A mechanism needs to be established for requesting OE info from the OER group. First-time and infrequently performed work evolutions need to consider OE prior to performance.

- Improve/integrate Corrective Action Program procedures to explicitly describe duties and responsibilities of personnel in the corrective action program (ex: NP 5.3.7 Operability Determinations). Responsibility for task performance should be at an authority level commensurate with the significance of the task. Specific guidance should be developed on how to identify and determine corrective actions to prevent recurrence.

- Develop issue manager responsibilities and requirements (ex: oversight of all corrective actions, verification of corrective actions, etc.) and implement this concept.

- Implement senior management approval for significant event CATPR to ensure corrective actions are consistent with PBNP mission and goals and ensure adequate resource availability.

- Establish more line ownership of the Incident Investigation Process.

- Initiate root cause evaluations (RCEs) and post incident reviews within 24 hours of significant events. The DSS must be responsible for identifying the need for an investigation and have the authority to initiate one. The highest priority items need to be evaluated for root causes by a team (priority 1) or by an individual (priority 2). Apparent root cause evaluation should be performed for priority 3 items. Within the suggested 4 tiered CR priority system, priority 4's will normally go directly to trending/tracking.

- Management expectations for identification and reporting requirements of part 21 issues need to be clearly delineated and communicated to NPBU personnel. The part 21 procedure (NP 5.3.6) should be combined into another procedure.

- Improve the thoroughness of root cause evaluations. This should be accomplished by clarifying responsibilities, developing standards for performance, and by developing trained individuals to perform them.

- Establish Performance Indicators need. Tracking and trending of CRs, causes, and operating experience information needs to be improved and routine feedback to line groups provided.

- Increase amount of RCEs performed by better trained personnel.

- Disseminated and reinforce individual roles in the corrective action program. Operability Determinations need to be reviewed/approved by the on-shift DSS.

- Overcome the temptation to do the quick fix. It can only be overcome when line management supports the entire corrective action process.

- Rebuild the corrective action process from the ground up. Management interfaces should be built into the program to ensure long-term involvement (ex. morning CR review meeting attended by managers). All of the corrective action procedures should be rewritten to incorporate the recommendations of this report.

Mission/Culture Changes

The mission and culture of the corrective action program at the NPBU needs improvement. This team recommends three areas to concentrate on for improvement: *Leadership, Expectations, and Training*. A visible champion of the corrective action program is recommended and detailed above as the corrective action manager. The reporting relationship to senior site management emphasizes the importance of the position. Expectations of corrective actions must be communicated and reinforced by management. This reinforcement and clarification of the expectations is only possible if the management staff is trained in and sees the value of proactive corrective actions. Training is also recommended for the line organization on what constitutes a condition adverse to quality, what the expectations of the CR process are, what is needed in completing a condition report, how the program works, and why their input is important.

Backlog

The CR backlog must be reviewed and prioritized based on the new categorization process to be implemented and then worked in accordance with the priority.

Resources

Dedicating resources from the working groups to address corrective action administration, root cause determination, and actions to prevent recurrence verification, will cause the need to augment staff at least temporarily in the work groups. It is essential that WE resources be developed to *seed* the organization with a developed group of people ready and prepared to act as "*root cause experts*".

Improvements in Corrective Action Program (Rev. 1)				May 1, 1997
Focus Area: *Organization/Resources*				
Action	**Reason**	**Owner**	**Target Date**	**Status**
Assign CAPM of Matrixed CAP Group	Focused Management of this program to ensure effectiveness	Manager-RES/LIC	5/15/97	
Define Matrixed CAP Group Staffing Plan	Develop Staffing Plan and use to justify 1997 hiring plan	T. C. Guay	5/15/97	

Improvements in Corrective Action Program			May 1, 1997	
Focus Area: *Program and Administrative Controls*				
Action	**Reason**	**Owner**	**Target Date**	**Status**
Develop CR Categorization System (Industry standard)	Current 2 tiered system, inadequate for increased CR volume	T. C. Guay	4/20/97	Proposed 4 tiered system (CAT A,B,C,D) accepted by MSS on 4/10/97
Develop new CR handling process	Upgrade with Industry. Improve process effectiveness.	T. C. Guay w/ MSS concurrence	5/15/97	
Develop Guidance & Implement CR Categorization System (Update Procedures, Training)	Current 2 tiered system, inadequate for increased CR volume	T. C. Guay w/ MSS Concurrence	5/30/97	
Integrate and revise CAP Procedure(s). CR Process, Operability Determination, Event Evaluation Process, etc.	Implement recommendation of CAPCC Analysis. Procedures not presently integrated well and new CR categorization system	CAPM	6/15/97	

Improvements in Corrective Action Program			May 1, 1997	
Focus Area: ***Program and Administrative Controls***				
Action	**Reason**	**Owner**	**Target Date**	**Status**
Develop CAP support forms and Implement (Witness Statement, CR Screening Guide, etc.)	Improve timeliness of information gathering for events. Provide guidance that facilitates expedient screening of CRs.	CAPM	5/30/97	
Implement new CR handling process	Upgrade with Industry. Improve process effectiveness.	CAPM	5/30/97	
Implement Issue Manager Function	Improve NUTRK process effectiveness.	CAPM w/ MSS concurrence	6/15/97	

Improvements in Corrective Action Program			May 1, 1997	
Focus Area: *Training*				
Action	**Reason**	**Owner**	**Target Date**	**Status**
CAP Group - Evaluation Training, RCEs, Mini RCEs, Common Cause Apparent Cause, NUTRK, etc., Trending and reports	Ensure consistency and that all understand new roles/responsibilities and need to support CAP	CAPM Manager-Training	5/30/97	
CAP Group - New Program Elements	Ensure consistency and that all understand new roles/responsibilities and need to support CAP	CAPM	6/15/97	
NPBU- New program elements-Process, CR threshold guidance, etc. Issue Manager Implementation	Ensure consistency and that all understand new roles/responsibilities and need to support CAP	CAPM Group Heads	6/30/97	

Improvements in Corrective Action Program			May 1, 1997	
Focus Area: *Tracking System*				
Action	**Reason**	**Owner**	**Target Date**	**Status**
Upgrade NUTRK - CR Categorization system and due dates (Est. 30 hrs)	Support new categorization and due date system	D. R. Stevens CAPM	5/30/97	
Upgrade NUTRK - Macros for design reports	Effective Report input to all groups on CAP status	D. R. Stevens CAPM	6/15/97	

Improvements in Corrective Action Program				May 1, 1997
Focus Area: *Communication*				
Action	**Reason**	**Owner**	**Target Date**	**Status**
Develop report needs for NPBU customer groups	Improve communications of to NPBU personnel with CAP responsibilities	CAPM w/ OE Coordinators	5/15/97	
Develop Milwaukee personnel feedback loop for all reports and documents	Presently inadequate	CAPM w/ OE Coordinators	5/30/97	

POINT BEACH UNIT 2 RESTART COMMITMENT
INDEPENDENT REVIEW RESULTS

Commitment ID Number 32

Commitment Description

Implement interim improvements for the Condition Reporting process, based on a review of assessments and identified recommendations for improving that process.

Review Methodology

Review the Condition Reporting process.

Discuss results of WE reviews with Responsible Person.

Review the WE assessment documentation and compare to independent review results.

Provide recommendations.

Review Results

Reviewed the Condition Report procedure (NP 5.3.1, Revision 4) for Condition Report (CR) requirements.

Reviewed NP 5.4.1 "Open Item Tracking Systems" for NUTRK requirements.

Attachment B of NP 5.4.1 gives guidance for extending due dates. Based on a review of many CRs from Restart Commitments 20 and 23, this guidance is not being followed in many cases. Examples include SER 94-10, Action No. 3 and EWR 94-147.

Section 4.3.1 of NP 5.4.1 describes work activities that are required to resolve a parent record (i.e., child record). These items are called work requests and work orders. While these are accurate descriptions, they should be called out as Action Items or action numbers as called out in NUTRK. This will prevent confusion with Work Orders Processing per NP 8.1.1.

NPBU Quality Assurance Issue 96-5 was generated during the steam generator replacement project by site QA, which noted deficiencies in the timely closeout of CRs, including timely CR assignment, due dates assigned far in the future, and CRs being in a closeout status for an extended period of time. These concerns are to be addressed in the Corrective Action Process Assessment.

POINT BEACH UNIT 2 RESTART COMMITMENT
INDEPENDENT REVIEW RESULTS

Commitment ID Number 32

For tracking CRs, often the CR is closed to a planned work order or other planned activity. This does not allow tracking of actual closure of the CR. This was noted in the Independent Review of Restart Commitment No. 23 where the CR was closed in 1995 or 1996 but the work order had not been issued. This again is related to closure (resolve or fix the issue) rather than close the CR. NP 5.4.1 does not allow closing of parent records (including CRs) designated as SCAQ (significant condition adverse to quality) or Commitments until items tracked in other systems are closed.

Energetic engagement with and managing of the CR system is critical. This includes filtering out the low priority issues, ensuring adequate resources are available, and stressing problem solution rather than problem identification. Generally, the person that identifies a problem is involved in the issue and probably has the best understanding of the real cause and needed fix. Ownership and resolution at the lowest level possible should be the goal. The person filtering out the low priority issues is vital, not only in the experience and wisdom to properly categorize it, but also the leadership to minimize the first hand-off of a Condition Report.

The threshold for generating CRS has been decreased. There are benefits to this, but too low of a threshold is equally damaging, due to the difficulty in managing the system. The result could be that the number of issues becomes overwhelming, and the visibility of the high priority issues becomes diluted. This effect includes not only managers and CR system administrators, but also individuals responsible for CR resolution. Another tendency is that excessive time may be spent on low priority items (which generally can be resolved in less time) to improve the status, resulting in concentrating on numbers rather than tackling the big issues.

There should be a graded approach to generating Condition Reports. Each individual should be challenged to resolve the issue at their level, rather than taking the easier route by initiating a CR. The graded approach must be endorsed at all levels of the organization. Management expectations should provide guidance to individual workers to decide what is important enough to warrant a CR, and to retain ownership of the CR, not just submit it.

The resources to resolve the open CRs must match the generation rate. With the lower threshold, additional resources (primarily Regulatory Services, Engineering, Operations, and Maintenance) need to be provided to assure timely closeout and prevent the "overwhelmed" effects described above. The expectation of timely closeout can only be done if the tools are in place to allow meeting the expectation. With a higher threshold, the resources are equally important. Then the challenge to keep the slate clean for the individual's system/equipment can be instilled. This should be more satisfying to the workers resolving the CRs.

Reviewed WE report of the interim Condition Report improvements that have been implemented. These actions are appropriate for the lower threshold Condition Report process, and these actions are felt to adequately address this Restart Commitment.

POINT BEACH UNIT 2 RESTART COMMITMENT
INDEPENDENT REVIEW RESULTS

Commitment ID Number 32

Recommendations

The interim Condition Report process implemented is felt to be appropriate. The recommendations noted above should be considered in the long-term Corrective Action Process improvement plan.

Reviewer: Larry W. Dair 5-1-97

Summary - U-2 Restart Issue # 32 5/1/97

1. The Common Cause Assessment of the Corrective Action Program was completed with the final report submitted 4/15/97. The report was approved on 4/29/97 by the Site V P.

2. The approval of the above referenced report (copy attached) concludes the period of interim improvements. The improvements from this point forward will be the permanent changes.

3. Following is a summary of the interim improvements that were put in place:

NOTE: These interim improvements will likely remain as permanent improvements.

* Emphasis and Reinforcement of the use of the CR system to capture all conditions adverse to quality and if in doubt to submit a condition report began in August of 1996 and have continued to date. This has resulted in the threshold being lowered and an approximate 5 - 8 fold increase in CR generation rate which projects out to an anticipated total generated for 1997 of 4000.

* The RES operating experience section began augmenting staff in 1996 as the CR generation began to increase to a present staff that includes three NPTS contractors and a "Loanee" former SRO from the Operations group. In addition, the Regulatory Services group currently is in the process of filling 2 Quality Specialist - Operating Experience positions, looking for 2 Operating Experience engineers, and completing the posting language for a Quality Specialist - Regulatory Support which will replace a position vacated near the first part of the year.

* The operability determination process was upgraded in November of 1996 and again in February of 1997 with improvement noted.

* A daily staff review, by a group that includes a representation of station group managers and senior station management, of Condition Reports was started in early January of 1997 and has continued to present.

4. An action plan for permanent improvement of the Corrective Action Process has been assembled. (See copy of draft plan attached)

5. These actions close out U-2 Restart item number 32.

****
* Trkid: U2R22 RESTART *
* Action Number: 57 *
****

Responsible Person:
Urgency: DONE
Work Priority: 99

Activity Pending is: DONE ASSOCIATED WITH A COMMITMENT

----------TITLE AND TASK DESCRIPTION----------

Unit 2 Refueling 22 Startup Commitments

Ensure modification MR 96-069 that replaces four breakers (1Y-06-01, 1Y-06-03, 1Y-06-05 and 1Y-06-11) associated with instrument bus 1Y-06 is complete.

----------DATES----------

Source Record: 01/10/97	******* Evaluation *********	****** Correction ******
Commitment:	Eval Due:	Corr Act Due: 03/03/97
Action Create: 01/13/97	Orig Eval Due:	Orig CA Due: 02/11/97
Action Closed: 05/01/97	Eval Done:	Corr Act Done:04/30/97

----------PEOPLE----------

Responsible for Overall Action: EIS
Responsible for Current Pending Activity:
Issue Manager:
Initiator:
Punchlist Administrator:

----------UPDATE----------

(01/28/97) Work is scheduled to be performed during the third week of February. WOs are written, 50.59 needs to be written, MOD package needs to be put together, workplans need to be written, and parts are onsite. Please extend due date to after scheduled work date and prior to criticality.

(02/03/97 Requested Due Date: 03/03/97

(02/03/97) Changed the Due Date from: 02/11/97 to 03/03/97
Please extend due date to allow work to be performed during the last week of February 97. The outage has shifted to a later online date and pushed the window of when we plan to perform this work.

Approved.

(03/23/97) Passed to acceptance of work.

(03/24/97) Returned to for additional work.

(04/22/97) Passed to for acceptance of work.

(04/23/97) Returned to for additional work.

(04/30/97 Passed to for acceptance of work.

(04/30/97 TJJ) Passed to for Verification.
This work is complete. The MOD package is with MOD engineer for paperwork close out. The MDB is updated. 03-23-97 Work was performed under MOD 96-069 with WOs 9612056, 9612057, 9612072, and 9612073. No DCNs required - breaker sizes are not reflected on any drawings. The breaker are in service. The PMT was performed under the WO and is satisfactory for all breakers. This item can be closed out. 04-30-97

(04/30/97) Passed to for Final Close Out.
Verified DSS signature and date on the Work Orders. This item is ready for closeout.

(05/01/97) PLA Closure of Item.

----------REFERENCES----------

SER 97-032
MR 96-069*A
MR 96-069*B
WO 9612072
WO 9612073
WO 9612057
WO 9612056

----------MISCELLANEOUS----------

Originating Agency: System: XX
NRC Open Item Number: NRC Status:
Related Outages: U2R22
Engineering Work Type: None Specified
Person Hours: Original Estimate =
Current Estimate =
Actual Hours =

DESIGN CHANGE PACKAGE COVER SHEET	MR No. 96-069 * A (WO if non-mod design change)

Initiation:

Title: Replace breakers on 1Y05/08

CHAMPS System Code: Y

LER: LER 266/96-007 #1 CR 96-539

Priority: 99 Cost Estimate: $560

Project Objectives: Replace breakers on 1Y05 that do not adequately protect the circuit per the NEC.

Proposed Scope: Breakers 1, 5, 6, 22 and ~~26~~ PIF need to be replaced with 15amp breakers. REPLACE BREAKERS Z4-06-01, 03, 05, 11

Initiated By: _____ Date: 10/14/96

FDGH: (Ref. NP 7.2.1 Commentary Section 4.2 for completion of this section.)

☑ Modification Request (PBF-1605) ☐ Non-Mod Design Change (Work Order)

Check Applicable Design Controls:	Clarifications / Basis:
☒ Design Checklist (PBF-1584)	
☒ DVS (PBF-1606)	
☑ Design Verification (PBF-1583)	
☐ Working Drawings	
☑ ECRs	
☑ Calculations	
☐ Specifications	
☑ Design Documentation (PBF-1585)	or equivalent
☐ _____	

Check Applicable Project Controls:	Clarifications / Basis:
☐ Project Team Required (Indicate minimum groups to request)	
☐ Conceptual Package Required	
☐ Budget Project #	
☐ Detail Schedule Required	
☑ IWP Required	WORK ORDER WORK PLANS
☐ FDGH Release for Construction Required (non-mod)	

FDGH: _____ Date: 10/23/96

Reference(s): NP 7.2.1, PBF-1583, PBF-1584, PBF-1585, PBF-1606

NUCLEAR POWER BUSINESS UNIT MODIFICATION REQUEST	MR NUMBER: 96-069*A

TITLE: REPLACE BREAKERS IN 14-06

UNIT 1 [X] UNIT 2 [ ] COMMON [ ]

FINAL DESIGN GROUPHEAD - INITIALIZATION

Assigned Project Manager: _____

PROJECT MANAGER - ESTABLISH PROJECT TEAM

Group Represented	Assigned Team Member	Group Represented	Assigned Team Member
SEN			
SEN			

PROJECT MANAGER

Indicate all design package information, if any, for the modification:

THIS MODIFICATION WILL INCLUDE TWO DESIGN PACKAGES. THE SCOPE OF THE PACKAGES IS AS FOLLOWS:

*A: REPLACE 14-06 BREAKERS 14-06-01, 14-06-03, 14-06-05, 14-06-11

*B: REPLACE 14-05 BREAKERS 14-05-01, 14-05-05, 14-05-06, 14-05-22

PROJECT MANAGER/FDGH:

Indicate any clarifications or changes to design controls or project controls from Design Change Package Cover Sheet:

N/A

PROJECT MANAGER - CONCEPTUAL DESIGN [Check here if not required: ☒]

Provide a concise description of the conceptual design. List all attached documents which define the conceptual design. See commentary in NP 7.2.1 for additional guidance.

Conceptual Design Complete: N/A / N/A
Project Manager Date

GROUPHEAD CONCEPTUAL DESIGN REVIEW AND ACCEPTANCE

Review conceptual design. Attach comments on NPBU Document Review Comment Sheet (PBF-1622)

Group	Acceptance Signature	Date	Comments	
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached

FINAL DESIGN REVIEWS

Review final design. Attach comments on NPBU Document Review Comment Sheet (PBF-1622)

Group	Acceptance Signature	Date	Comments	
SEN	PFF FOR PES (PER TELECON)	2/20/97	☒ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached

FDGH - RELEASE

All design controls have been properly implemented and the project has been appropriately reviewed. All necessary documents are approved. Materials are on-site and QA-released. This project is released for installation. Comments regarding release of this project are noted below.

FDGH: _____ Date: 2/27/97

PROJECT MANAGER - CLOSEOUT

MR is complete, including submittal of all document updates in the Document Update and Closeout Checklist (PBF-1606).

List all Work Order(s) used for installation:

_____ _____ _____

_____ _____ _____

_____ _____ _____

Project Manager: _____ Date: _____

NUCLEAR INFORMATION MANAGEMENT

Microfilm the entire modification package.

MR 96-069*A
Final Design Description

Purpose

The purpose of this modification is to replace the existing 30-ampere circuit breakers for four circuits in non-safety-related 120 VAC instrument panel 1Y-06. The specific breakers which will be replaced are:

Breaker	Trip Rating (Amperes)	CHAMPS Load Description
1Y-06-01	30	PWR TO 1MOB-91/123-126/128/129
1Y-06-03	30	PWR TO 1MOB-71 AND 1MOB-90
1Y-06-05	30	PWR TO U1 MOISTURE PRESEPARATOR SYSTEM
1Y-06-11	30	PWR TO COMP/SCC PULSE TOTALIZER/INTERPOSING RLY OUTPUTS

Action item #1 of condition report CR 96-539 identifies that the existing breakers do not provide adequate short-circuit protection for the #12 AWG and #14 AWG main control board (MCB) conductors in the circuits. This inadequate protection creates the potential for a short-circuit fault in one of the circuits to cause damage not only to the circuit conductors themselves, but also to adjacent conductors in redundant safety-related circuits.

Description

The existing breakers for the four circuits affected by this modification were installed in 1995 under the PBNP molded-case circuit breaker replacement program. Each breaker is a single-pole, Westinghouse type EHD. The replacement breakers will be identical in manufacturer and type, but will have reduced trip ratings to provide better protection for downstream MCB conductors. Trip ratings for the replacement breakers were selected based upon a number of factors, including expected circuit load current and size of downstream conductors. These trip ratings are as follows:

Breaker	Existing Breaker Trip Rating (Amperes)	Replacement Breaker Trip Rating (Amperes)
1Y-06-01	30	15
1Y-06-03	30	15
1Y-06-05	30	15
1Y-06-11	30	15

This design description will consider the acceptability of the replacement breakers for this application. For each replacement breaker, the following specific characteristics will be considered for acceptability: physical dimensions and mounting configuration, interrupting capability, ability to carry circuit load current, conductor protection, and selective coordination. Each of these characteristics will be considered individually below:

1. Physical Dimensions and Mounting Configuration

The replacement breakers must be installable in the 1Y-06 panel without any significant modifications to the panel, since the replacements will be performed with the panel energized. As previously mentioned, the replacement breakers will be identical in manufacturer and style (type) to the existing breakers. All case dimensions, panel bus connections, and mounting hardware will therefore be identical to those for the existing breakers. 1Y-06 is not classified as QA, safety-related, or seismic class 1. However, for conservatism, all breakers and mounting hardware utilized will be QA-scope.

2. Interrupting Capability

The replacement breakers must be capable of safely interrupting the maximum fault currents which they could potentially experience. WE calculation 97-0024, "Short-Circuit Currents Available at 1Y-05 and 1Y-06 Instrument Panels and Main Control Boards," calculates the maximum short-circuit current available at the 1Y-06 panel as 8,099 amperes. Per the 1995 Westinghouse/Cutler-Hammer Quick Selector Catalog (Page CC-51), the rated interrupting capability of the type EHD1015 circuit breaker is 14,000 amperes at voltages up to 277 VAC. Since this rating exceeds the maximum fault current available at 1Y-06, the interrupting capability of the replacement breakers is adequate for the application.

3. Ability to Carry Circuit Load Current

The replacement breakers must be capable of carrying the maximum possible loads on their associated circuits without tripping. WE calculation 96-0245, "Loading of Selected Circuits on 1/2Y-05 and 1/2Y-06 Instrument Panels," determined the maximum continuous loading possible on these circuits. The values determined in the calculation are listed below with the trip ratings of the replacement breakers:

Breaker	Maximum Circuit Load Current (Amperes)	Replacement Breaker Trip Rating (Amperes)
1Y-06-01	7.08	15
1Y-06-03	2.73	15
1Y-06-05	4.34	15
1Y-06-11	0.20	15

In all cases, the trip rating of the replacement breaker exceeds the calculated maximum load current for the associated circuit by a substantial margin. The replacement

breakers are therefore capable of carrying the maximum load currents on their associated circuits without tripping.

4. Conductor Protection

The replacement breakers must provide adequate overload and short-circuit protection for downstream field cable and main control board conductors.

- Field Cables

CARDS was used to obtain the following information about the field cables downstream of the four breakers which will be replaced under this modification:

Breaker	Field Cable ID	Basic Cable Designation	Conductor Size (AWG)	Minimum Ampacity (Amperes)	Replacement Breaker Trip Rating (Amperes)
1Y-06-01	1Y0601A 1Y0601B	B12 B13	8 10	30.00 20.00	15
1Y-06-03	1Y0603A	B12	8	35.00	15
1Y-06-05	1Y0605A	G03H	12	15.00	15
1Y-06-11	1Y0611A	B13	10	20.00	15

In each case, the field cable(s) ampacity calculated by CARDS equals or exceeds the trip rating of their associated replacement breaker. The replacement breakers therefore provide adequate overload protection for the field cables. Figure 2 in Attachment A plots the tripping characteristics for the replacement breaker type against the thermal damage characteristics for #12 AWG conductors. This figure indicates that, for all fault currents below approximately 5,500 amperes, the replacement breaker type will clear the fault prior to the conductor temperature rising above its rated short-circuit value of 250 degrees Celsius. WE calculation 97-0024 calculates the maximum potential short-circuit current available at the main control boards as 1,890 amperes for the 1Y-06 circuits affected by this modification. The replacement breakers will therefore provide adequate protection for the #12 AWG (or larger) conductors in the downstream field cables for all possible main control board short-circuit faults.

- Main Control Board Wiring

Field walkdowns were performed to determine the minimum sizes of the main control board conductors downstream of the four breakers which will be replaced under this modification. The walkdowns determined that the circuits contain a mixture of #12 AWG and #14 AWG type SIS conductors in the main control boards.

Since CARDS does not calculate ampacities for internal wiring, the National Electrical Code (NEC) must be used to determine the acceptability of overload protection for such wiring. Table 310-16 shows the rated ampacity for #14 and #12 AWG type SIS conductors to be 25 and 30 amperes, respectively. These values must be adjusted for ambient temperature and for number of conductors in the raceways through which the conductors are routed. Per Design Guideline DG-E09, the design ambient temperature for the control room is 24 degrees Celsius. The 1996 NEC permits an ampacity adjustment factor of 1.04 for this ambient temperature. Since many non-safety-related main control board conductors are not contained in CARDS, it is not possible to obtain an accurate estimate of the number of conductors routed through main control board raceways. Thus, the number (43 or more) resulting in the maximum ampacity derating factor of .50 will be assumed. Applying the ampacity correction factors for ambient temperature and for number of conductors, final rated ampacities of (25)(1.04)(0.50) = 13 amperes for #14 AWG and (30)(1.04)(0.50) = 15.6 amperes for #12 AWG are obtained. Since these values do not correspond to standard breaker trip ratings, Article 240-3(b) of the 1996 NEC permits use of the next-larger standard size to protect these conductors (i.e. 15 amperes for #14, and 20 amperes for #12). The trip rating of the replacement breakers (15 amperes) is therefore adequate to provide overload protection for the main control board conductors in the four affected circuits.

As previously mentioned, some of the four circuits affected by this modification utilize #14 AWG conductors in the main control boards. Figure 1 in Attachment A plots the tripping characteristics for the replacement breaker type (Westinghouse EHD1015) and the thermal damage characteristics for #14 AWG conductors. This figure indicates that, for all fault currents below approximately 3,500 amperes, the EHD1015 breaker will clear the fault prior to the #14 AWG conductor temperature rising above its rated short-circuit value of 250 degrees Celsius. WE calculation 97-0024 calculates the maximum potential short-circuit current available at the main control boards as 1,890 amperes for the 1Y-06 circuits affected by this modification. Thus, the replacement breakers will provide adequate short-circuit protection for their associated main control board conductors over the entire range of potential main control board fault currents.

5. Selective Coordination

Design Guideline DG-E04, "Selection of Molded-Case Circuit Breakers," establishes selective coordination requirements for molded-case circuit breakers. This Guideline requires that a breaker selectively coordinate with its associated upstream device(s) in the following cases:

- The breaker serves as an isolation device between non-safety-related and safety-related circuits.

- The breaker serves as a connection between safety-related source and safety-related load.
- Coordination is necessary to demonstrate conformance to Appendix R.

Neither the 1Y-06 panel nor any of its associated loads are classified as safety-related or are required for Appendix R. Thus, the selective coordination requirements given in DG-E04 do not apply to any of the breakers in the panel, including those to be replaced by this modification.

↖ DG-E04 will not apply if adequate justification is provided for not Coordinating.

References and Design Inputs

CARDS Database
CHAMPS Database
Condition Report CR 96-539
Cutler-Hammer Catalog #25-000, "Quick Selector," July, 1995
Design Guideline DG-E04, "Selection of Molded-Case Circuit Breakers," Revision 00
Design Guideline DG-E09, "Cable Ampacity Calculations," Revision 01
National Electrical Code, 1996 Edition
WE Calculation N-93-056, "Battery D05 DC System Calculation," Revision 01
WE Calculation 96-0245, "Loading of Selected Circuits on 1/2Y-05 and 1/2Y-06 Instrument Panels," Revision 00
WE Calculation 97-0024, "Short-Circuit Currents Available at 1Y-05 and 1Y-06 Instrument Panels and Main Control Boards," Revision 00

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MR 96-069*A
ATTACHMENT A

...B DE-ION Circuit Breakers

...ypes EHD, FD and HFD 15 Amperes

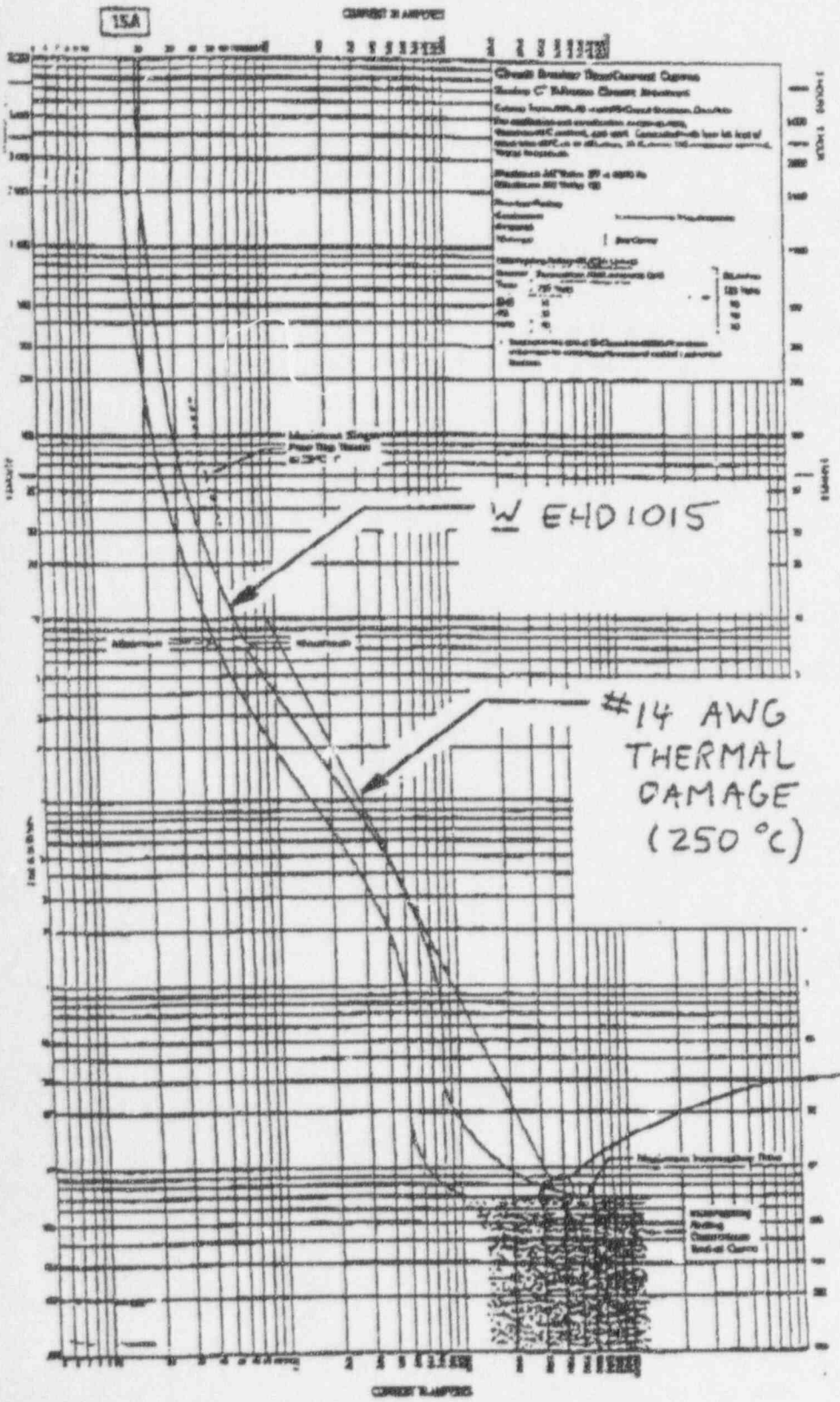

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FIGURE 1

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ATTACHMENT A

B DE-ION Circuit Breakers

Types EHD, FD and HFD 15 Amperes

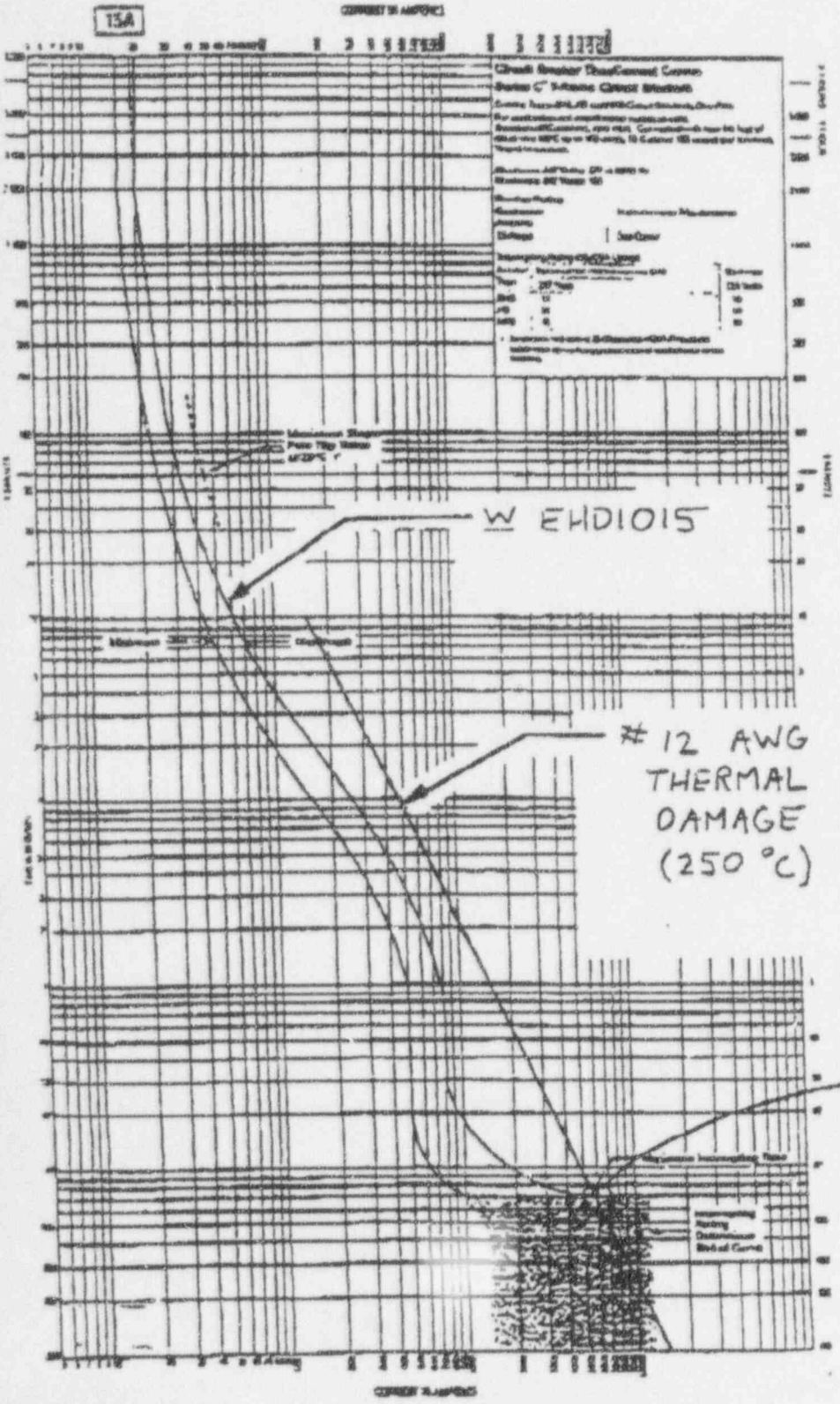

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FIGURE 2

DESIGN CHANGE PACKAGE COVER SHEET	MR No. 96-0098 (WO if non-mod design change)

Initiation:

Title: Replace breakers on 1Y05/06

CHAMPS System Code: Y

LER 266/96-007 #1
CWR: CR 96-539

Priority: 99

Cost Estimate: $560

Project Objectives: Replace breakers on 1Y05 that do not adequately protect the circuit per the NEC.

Proposed Scope: Breakers 1, 5, 6, 22 and ~~26~~ PIF need to be replaced with 15amp breakers. REPLACE BREAKERS 24-06-01, 03, 05, 11

Initiated By: ___ Date: 10/14/96

FDGH: (Ref. NP 7.2.1 Commentary Section 4.2 for completion of this section.)

☑ Modification Request (PBF-1605) ☐ Non-Mod Design Change (Work Order)

Check Applicable Design Controls:	Clarifications / Basis:
☒ Design Checklist (PBF-1584)	
☒ DDS (PBF-1606)	
☑ Design Verification (PBF-1583)	
☐ Working Drawings	
☑ ECRs	
☑ Calculations	
☐ Specifications	
☑ Design Documentation (PBF-1585)	OS equivalent
☐ ___	

Check Applicable Project Controls:	Clarifications / Basis:
☐ Project Team Required (Indicate minimum groups to request)	
☐ Conceptual Package Required	
☐ Budget Project #	
☐ Detail Schedule Required	
☑ IWP Required	WORK ORDER WORK PLANS
☐ FDGH Release for Construction Required (non-mod)	

FDGH: ___ Date: 10/23/96

Reference(s): NP 7.2.1, PBF-1583, PBF-1584, PBF-1585, PBF-1606

NUCLEAR POWER BUSINESS UNIT MODIFICATION REQUEST	MR NUMBER: 96-069 *B

TITLE: REPLACE BREAKERS IN 14-05

UNIT 1 ☒ UNIT 2 ☐ COMMON ☐

FINAL DESIGN GROUPHEAD - INITIALIZATION

Assigned Project Manager: —

PROJECT MANAGER - ESTABLISH PROJECT TEAM

Group Represented	Assigned Team Member	Group Represented	Assigned Team Member
SEN	—		
SEN			

PROJECT MANAGER

Indicate all design package information, if any, for the modification:

THIS MODIFICATION WILL INCLUDE TWO DESIGN PACKAGES. THE SCOPE OF THE PACKAGES IS AS FOLLOWS:

*A: REPLACE 14-06 BREAKERS 14-06-01, 14-06-03, 14-06-05, 14-06-11

*B: REPLACE 14-05 BREAKERS 14-05-01, 14-05-05, 14-05-06, 14-05-22

PROJECT MANAGER/FDGH:

Indicate any clarifications or changes to design controls or project controls from Design Change Package Cover Sheet:

N/A

PROJECT MANAGER - CONCEPTUAL DESIGN [Check here if not required: ☒]

Provide a concise description of the conceptual design. List all attached documents which define the conceptual design. See commentary in NP 7.2.1 for additional guidance.

Conceptual Design Complete: N/A / N/A
Project Manager Date

GROUPHEAD CONCEPTUAL DESIGN REVIEW AND ACCEPTANCE

Review conceptual design. Attach comments on NPBU Document Review Comment Sheet (PBF-1622)

Group	Acceptance Signature	Date	Comments	
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached
			☐ None	☐ PBF-1622 Attached

FINAL DESIGN REVIEWS

Review final design. Attach comments on NPBU Document Review Comment Sheet (PBF-1622)

Group	Acceptance Signature	Date	Comments	
SEN	FOR PES (PER TELECON)	2/20/97	☒ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached
			☐ None	☐ Attached

FDGH - RELEASE

All design controls have been properly implemented and the project has been appropriately reviewed. All necessary documents are approved. Materials are on-site and QA-released. This project is released for installation. Comments regarding release of this project are noted below.

FDGH: _____ Date: 2/27/97

PROJECT MANAGER - CLOSEOUT

MR is complete, including submittal of all document updates in the Document Update and Closeout Checklist (PBF-1606).

List all Work Order(s) used for installation:

_____ _____ _____

_____ _____ _____

_____ _____ _____

Project Manager: _____ Date: _____

NUCLEAR INFORMATION MANAGEMENT

Microfilm the entire modification package.

MR 96-069*B
Final Design Description

Purpose

The purpose of this modification is to replace the existing 20-ampere, 30-ampere, and 40-ampere circuit breakers for four circuits in non-safety-related 120 VAC instrument panel 1Y-05. The specific breakers which will be replaced are:

Breaker	Trip Rating (Amperes)	CHAMPS Load Description
1Y-05-01	20	PWR TO 1C-39/1POS-2026/2027 TURB STOP IND/TEST
1Y-05-05	30	PWR TO 1C-03 TURBINE SUPERVISORY INSTRUMENT
1Y-05-06	40	PWR TO 1MOB-72-77 AND 1MOB-92-94
1Y-05-22	20	PWR TO 1MOB-95 THROUGH 1MOB-99

Action item #1 of condition report CR 96-539 identifies that the existing breakers do not provide adequate short-circuit protection for the #12 AWG and #14 AWG main control board (MCB) conductors in the circuits. This inadequate protection creates the potential for a short-circuit fault in one of the circuits to cause damage not only to the circuit conductors themselves, but also to adjacent conductors in redundant safety-related circuits.

Description

The existing breakers for the four circuits affected by this modification were installed in 1995 under the PBNP molded-case circuit breaker replacement program. Each breaker is a single-pole, Westinghouse type EHD. The replacement breakers will be identical in manufacturer and type, but will have reduced trip ratings to provide better protection for downstream MCB conductors. Trip ratings for the replacement breakers were selected based upon a number of factors, including expected circuit load current and size of downstream conductors. These trip ratings are as follows:

Breaker	Existing Breaker Trip Rating (Amperes)	Replacement Breaker Trip Rating (Amperes)
1Y-05-01	20	15
1Y-05-05	30	15
1Y-05-06	40	20
1Y-05-22	20	15

This design description will consider the acceptability of the replacement breakers for this application. For each replacement breaker, the following specific characteristics will be considered for acceptability: physical dimensions and mounting configuration, interrupting capability, ability to carry circuit load current, conductor protection, and selective coordination. Each of these characteristics will be considered individually below:

1. Physical Dimensions and Mounting Configuration

The replacement breakers must be installable in the 1Y-05 panel without any significant modifications to the panel, since the replacements will be performed with the panel energized. As previously mentioned, the replacement breakers will be identical in manufacturer and style (type) to the existing breakers. All case dimensions, panel bus connections, and mounting hardware will therefore be identical to those for the existing breakers. 1Y-05 is not classified as QA, safety-related, or seismic class 1. However, for conservatism, all breakers and mounting hardware utilized will be QA-scope.

2. Interrupting Capability

The replacement breakers must be capable of safely interrupting the maximum fault currents which they could potentially experience. WE calculation 97-0024, "Short-Circuit Currents Available at 1Y-05 and 1Y-06 Instrument Panels and Main Control Boards," calculates the maximum short-circuit current available at the 1Y-05 panel as 12,307 amperes. Per the 1995 Westinghouse/Cutler-Hammer Quick Selector Catalog (Page CC-51), the rated interrupting capability of type EHD1015 and EHD1020 circuit breakers is 14,000 amperes at voltages up to 277 VAC. Since this rating exceeds the maximum fault current available at 1Y-05, the interrupting capability of the replacement breakers is adequate for the application.

3. Ability to Carry Circuit Load Current

The replacement breakers must be capable of carrying the maximum possible loads on their associated circuits without tripping. WE calculation 96-0245, "Loading of Selected Circuits on 1/2Y-05 and 1/2Y-06 Instrument Panels," determined the maximum continuous loading possible on these circuits. The values determined in the calculation are listed below with the trip ratings of the replacement breakers:

Breaker	Maximum Circuit Load Current (Amperes)	Replacement Breaker Trip Rating (Amperes)
1Y-05-01	2.15	15
1Y-05-05	1.27	15
1Y-05-06	15.31	20
1Y-05-22	4.40	15

In all cases, the trip rating of the replacement breaker exceeds the calculated maximum load current for the associated circuit by a substantial margin. The replacement

breakers are therefore capable of carrying the maximum load currents on their associated circuits without tripping.

4. Conductor Protection

The replacement breakers must provide adequate overload and short-circuit protection for downstream field cable and main control board conductors.

- Field Cables

CARDS was used to obtain the following information about the field cables downstream of the four breakers which will be replaced under this modification:

Breaker	Field Cable ID	Basic Cable Designation	Conductor Size (AWG)	Minimum Ampacity (Amperes)	Replacement Breaker Trip Rating (Amperes)
1Y-05-01	1Y0501A	B13	10	17.00	15
1Y-05-05	1Y0505A	B12	8	30.00	15
1Y-05-06	1Y0506A	B12	8	30.00	20
1Y-05-22	1Y0522A	B13	10	20.00	15

In each case, the field cable(s) ampacity calculated by CARDS exceeds the trip rating of their associated replacement breaker. The replacement breakers therefore provide adequate overload protection for the field cables. Figures 2 and 3 in Attachment A plot the tripping characteristics for the two replacement breaker types against the thermal damage characteristics for #12 AWG conductors. These figures indicate that, for all fault currents below approximately 5,500 amperes, each replacement breaker type will clear the fault prior to the conductor temperature rising above its rated short-circuit value of 250 degrees Celsius. WE calculation 97-0024 calculates the maximum potential short-circuit current available at the main control boards as 2,168 amperes for the 1Y-05 circuits affected by this modification. The replacement breakers will therefore provide adequate protection for the #12 AWG (or larger) conductors in the downstream field cables for all possible main control board short-circuit faults.

- Main Control Board Wiring

Field walkdowns were performed to determine the minimum sizes of the main control board conductors downstream of the four breakers which will be replaced under this modification. The walkdowns determined that all circuits except 1Y-05-06 contain #14 AWG type SIS conductors in the main control boards. 1Y-05-06 was determined to contain both #12 and #14 AWG conductors. However, further investigation revealed that the location of the #14 conductors in this circuit precludes any possible short-circuit damage to these

conductors from affecting redundant, opposite-train safety equipment*. Protection of the #14 AWG conductors in this circuit will therefore not be addressed.

Since CARDS does not calculate ampacities for internal wiring, the National Electrical Code (NEC) must be used to determine the acceptability of overload protection for such wiring. Table 310-16 shows the rated ampacity for #14 and #12 AWG type SIS conductors to be 25 and 30 amperes, respectively. These values must be adjusted for ambient temperature and for number of conductors in the raceways through which the conductors are routed. Per Design Guideline DG-E09, the design ambient temperature for the control room is 24 degrees Celsius. The 1996 NEC permits an ampacity adjustment factor of 1.04 for this ambient temperature. Since many non-safety-related main control board conductors are not contained in CARDS, it is not possible to obtain an accurate estimate of the number of conductors routed through main control board raceways. Thus, the number (43 or more) resulting in the maximum ampacity derating factor of .50 will be assumed. Applying the ampacity correction factors for ambient temperature and for number of conductors, final rated ampacities of (25)(1.04)(0.50) = 13 amperes for #14 AWG and (30)(1.04)(0.50) = 15.6 amperes for #12 AWG are obtained. Since these values do not correspond to standard breaker trip ratings, Article 240-3(b) of the 1996 NEC permits use of the next-larger standard size to protect these conductors (i.e. 15 amperes for #14, and 20 amperes for #12). These sizes correspond directly to the trip ratings of the replacement breakers. The replacement breakers will therefore provide adequate overload protection for the main control board conductors in the four affected circuits.

As previously mentioned, three of the four circuits affected by this modification utilize #14 AWG conductors in the main control boards, while the fourth circuit (1Y-05-06) utilizes #12. Figure 1 in Attachment A plots the tripping characteristics for the replacement breaker type to be used in all circuits except 1Y-05-06 (Westinghouse EHD1015) and the thermal damage characteristics for #14 AWG conductors. This figure indicates that, for all fault currents below approximately 3,500 amperes, the EHD1015 breaker will clear the fault prior to the #14 AWG conductor temperature rising above its rated short-circuit value of

* The wires in circuit 1Y-05-06 which were verified by walkdown to be #14 AWG are the line-side jumpers from 1MOB-077 to 1MOB-092 through 1MOB-094. A review of the As-Built MCB photos shows that these #14 AWG jumpers are routed adjacent only to other line-side jumpers and wiring for MOBs 1MOB-078, 079, 091, and 095. Any damage occurring on the #14 jumpers because of a short-circuit fault would have the potential to damage any or all of these adjacent wires, which could, in turn, result in a trip of the associated upstream breaker (D-17-08), and a loss of power to all associated MOBs and loads. However, a review of Wolfe & Mann drawing E-1602E-A shows that all loads which would be lost in such a case are either Train A safety-related loads, or non-safety-related loads. Thus, a fault on the potentially inadequately protected jumpers from 1MOB-077 to 1MOB-092 through 1MOB-094 would not have any potential to result in simultaneous damage to opposite-train circuits, and would therefore have no potential to affect redundant safety functions.

250 degrees Celsius. Figure 3 in Attachment A plots the tripping characteristics for the replacement breaker type to be used in circuit 1Y-05-06 (Westinghouse EHD1020) and the thermal damage characteristics for #12 AWG conductors. This figure indicates that, for all fault currents below approximately 6,000 amperes, the EHD1020 breaker will clear the fault prior to the #12 AWG conductor temperature rising above its rated short-circuit value of 250 degrees Celsius. WE calculation 97-0024 calculates the maximum potential short-circuit current available at the main control boards as 2,168 amperes for the 1Y-05 circuits affected by this modification. Thus, the replacement breakers will provide adequate short-circuit protection for their associated main control board conductors over the entire range of potential main control board fault currents.

5. Selective Coordination

Design Guideline DG-E04, "Selection of Molded-Case Circuit Breakers," establishes selective coordination requirements for molded-case circuit breakers. This Guideline requires that a breaker selectively coordinate with its associated upstream device(s) in the following cases:

- The breaker serves as an isolation device between non-safety-related and safety-related circuits.
- The breaker serves as a connection between safety-related source and safety related load.
- Coordination is necessary to demonstrate conformance to Appendix R.

Neither the 1Y-05 panel nor any of its associated loads are classified as safety-related or are required for Appendix R. Thus, the selective coordination requirements given in DG-E04 do not apply to any of the breakers in the panel, including those to be replaced by this modification.

References and Design Inputs

CARDS Database
CHAMPS Database
Condition Report CR 96-539
Cutler-Hammer Catalog #25-000, "Quick Selector," July, 1995
Design Guideline DG-E04, "Selection of Molded-Case Circuit Breakers," Revision 00
Design Guideline DG-E09, "Cable Ampacity Calculations," Revision 01
National Electrical Code, 1996 Edition
WE Calculation N-93-056, "Battery D05 DC System Calculation," Revision 01
WE Calculation 96-0245, "Loading of Selected Circuits on 1/2Y-05 and 1/2Y-06 Instrument Panels," Revision 00
WE Calculation 97-0024, "Short-Circuit Currents Available at 1Y-05 and 1Y-06 Instrument Panels and Main Control Boards," Revision 00
Wolfe & Mann Drawing E-1602E-A, Revision 03

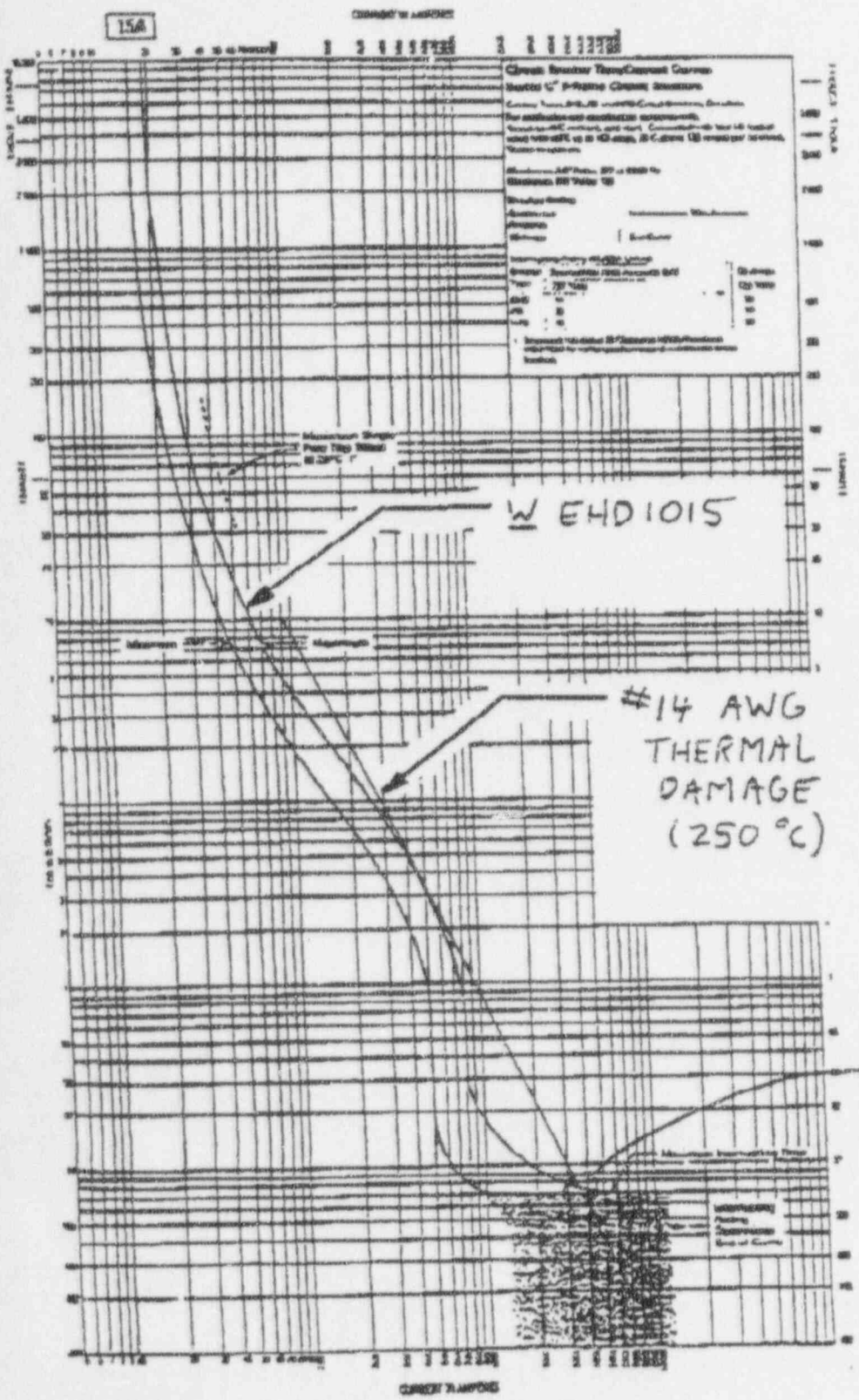
MR 96-069*B
ATTACHMENT A

Application Data
23-167F

Page 7

AB DE-ION Circuit Breakers

Types EHD, FD and HFD 15 Amperes



Curve No. SC-4423-8&A

May 1994

FIGURE 1

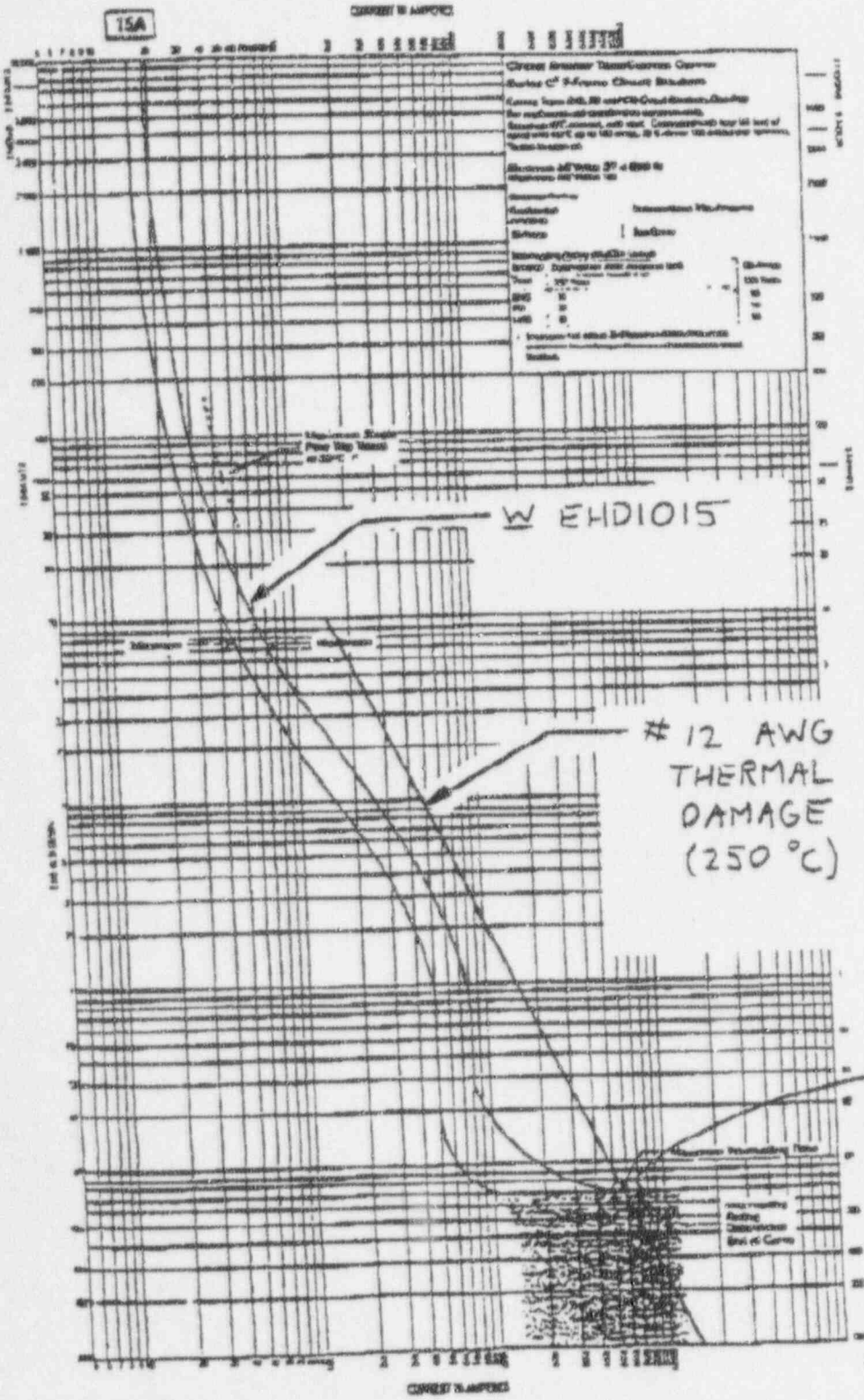
ATTACHMENT A

Application Data
29-187F

Page 2

AB DE-ION Circuit Breakers

Types EHD, FD and HFD 15 Amperes



Curve No. SC-4423-88A

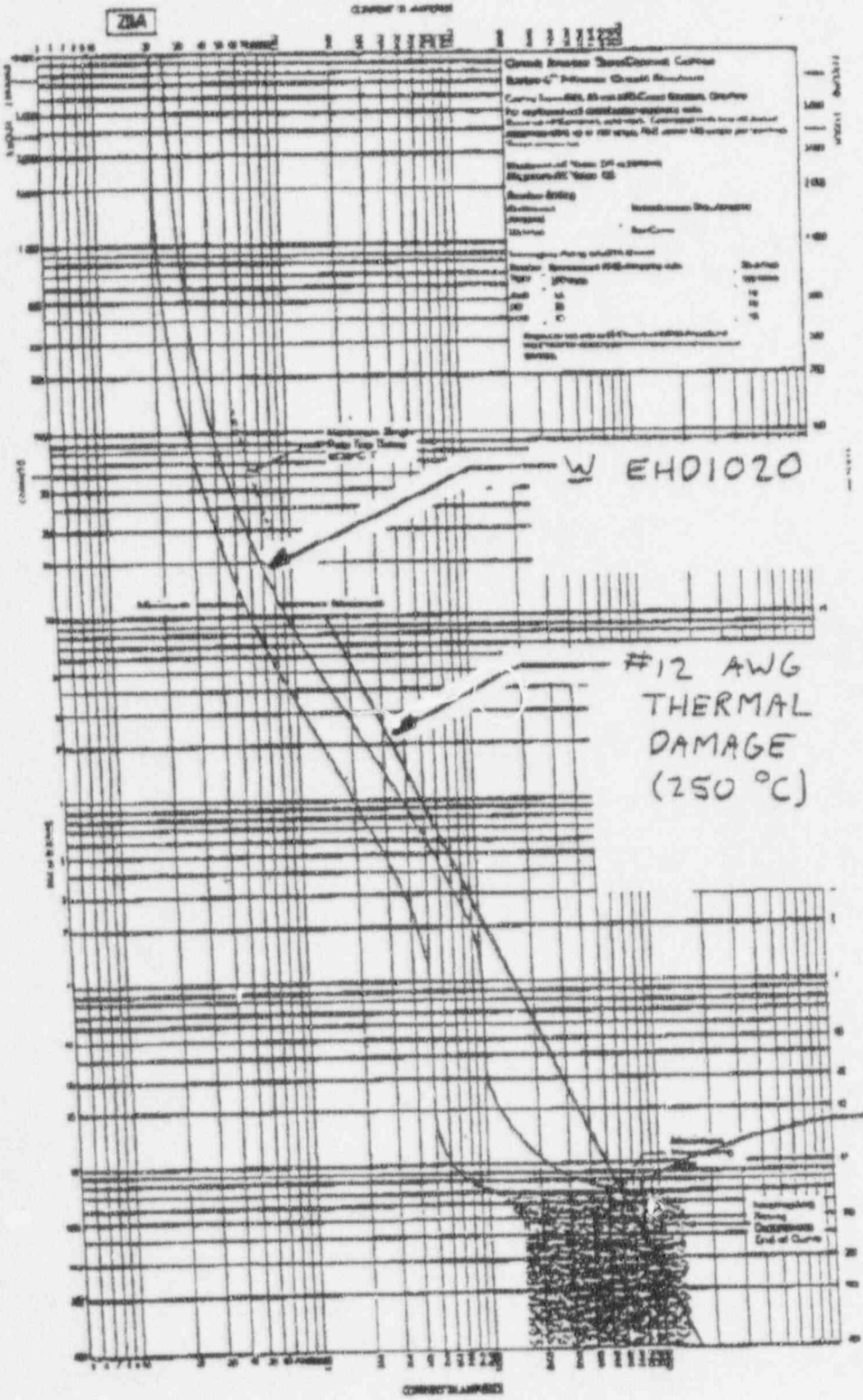
May 1994

FIGURE 2

ATTACHMENT A

AB DE-ION Circuit Breakers

Types EHD, FD and HFD 20 Amperes



Curve No. 3C-6424-66A

May 1994

FIGURE 3