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CONNECTICUT YANKEE

PLANT DESIGN CHANGE TASK GROUP

FINAL REPORT

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DESIGN CHANGE PROCESS

TABLE OF CONTENTS

	Section	Page
	Executive Summary	1
1.0	INTRODUCTION	6
2.0	CY PDCTG Review Method	8
	2.1 Method - Discussion	8
	2.2 Method - Plant Design Change Screening	8
	2.3 Method - Plant Design Change Detailed Evaluations	11
	2.4 Method - Plant Design Change Process Review	14
	2.5 Method - Work Order/Permit Review	17
3.0	Results	20
	3.1 Results of Plant Design Change Screening	20
	3.2 Results of Plant Design Change Detailed Evaluations	20
	3.3 Results and Specific Recommendations of the Plant Design Change Process Review	21

	Page
4.0 Conclusions/Recommendations	38
4.1 Conclusions - Screening Review	38
4.2 Conclusions - Detailed Evaluations	39
4.3 Conclusion/Recommendations - Review of the Plant Design Change Process	43
4.4 Conclusion/Recommendations - Work Permits/ Automated Work Orders	45
4.5 Conclusions/Recommendations - Summary	46

DRAFT

INDEX - Figures, Tables, Appendices and Attachments

Figures

3-1 Proposed Processing of Plant Design Changes

4-1 PDCRs Requiring Detailed Review - Categorization By Approval Date

Tables

2-1 Process Review Matrix

*3-1 Listing of Plant Design Change Requests

3-2 PDCRs Requiring Detailed Evaluation

3-3 Listing of Jumpers/Bypasses/Lifted Leads

3-4 Deficiencies in Specific Plant Design Changes

3-5 Design Change Process Recommendations

3-6 Procedure Deficiencies

4-1 Categorization of Concerns from the Screening Review

APPENDICES

*A-1 CY PDCTG Procedure 1.01, Rev. 1, Administration

*A-2 CY PDCTG Procedure 1.02, Rev. 0, Plant Design Change Screening

*A-3 CY PDCTG Procedure 1.03, Rev. 0.A, Review of the Plant Design Change Evaluations

*A-4 CY PDCTG Procedure/1.04, Rev. 1.A, Review of the Plant Design Change Process

DRAFT

*A-5 CY PDCTG Procedure 1.05, Rev. 0.A, Vendor Liaison

*A-6 Summaries of Detailed Evaluations of PDCRs

*A-7 Process Review - Comparison with INPO Good Practice

*A-8 Integrated Evaluation of PDCR Deficiencies

*A-9 Connecticut Yankee - "Report on Work Permit/Order Review," July 1985, Impell Corporation, Volume 1.

A-10 CYPDCTG Disposition of Impell's Recommendations and Observations

Attachments

*B-1 Volumes 2 thru 7 of Appendix A-9.

*Not included with draft version of final report.

EXECUTIVE SUMMARY

On December 13, 1984, the NRC issued an Order Modifying License to CYAPCo to Require, 1) a review of plant design changes since January 1, 1979, and; 2) an evaluation of the plant design change process and recommendations for improvement. In January 1985, the Connecticut Yankee Plant Design Change Task Group (CYPDCTG) was chartered to perform this review. The CYPDCTG completed the required evaluations in July 1985. This final report presents the methods, results and conclusions of the CYPDCTG.

The CYPDCTG first developed the review methodology necessary to ensure the intent of the order would be met. Five procedures were written to implement the review methodology. The CY PDCTG used these procedures to administer its work and review the following:

1. Plant Design Change Requests (PDCR's)

   All 355 PDCR's approved during the period January 1, 1979 through December 31, 1984 and not subsequently cancelled were reviewed by the task group. The initial review phase consisted of screening all 355 PDCR's to determine those design changes which should be evaluated in detail, primarily because of their potential safety significance. Thirty five (35) PDCR's were determined to require a detailed evaluation and are listed in Table 3-2. Detailed evaluations were performed and 39 deficiencies requiring further evaluation or corrective action were identified. These deficiencies are summarized in Table. 3-4.

2. Jumpers, lifted leads and bypasses.

There were 12 jumpers, lifted leads or bypasses that were approved prior to January 1, 1985 and were still in effect as of April 15, 1985. All 12 were screened and none were determined to require a detailed review because of a lack of safety significance.

3. Work permits and Automated Work Orders

Early in the project the Task Group determined that design changes were implemented via work permits/automated worked orders without corresponding PDCRs or safety reviews. Impell Corporation was contracted by the CY PDCTG to review the approximate 9100 work permits and 11,200 automated work orders approved during the period 1-1-79 through 12-31-84. Impell identified 65 Work Permits/Orders which involved design changes of potential safety significance. Safety evaluations were completed by Impell on 56 of these and no deficiencies or safety concerns were identified. The CY PDCTG reviewed and approved the Impell evaluations. The remaining 9 require further evaluation by CYAPCo. An additional 24 potential design changes must be evaluated during the next refueling outage due to accessibility limitations during operation.

4. Design Change Process

The CYPDCTG evaluated the design change process by reviewing: a) Causes for specific design deficiencies identified during detailed reviews, b) design change process concerns identified during screening and detailed reviews, c) the design change process itself as used in selected design changes, d) CYAPCo design change procedures, e) comparisons to other programs including INPO Good Practices and f) comments from Impell and the External Review Group. These reviews resulted in 18 recommendations for process corrections and improvements, which are summarized in Table 3-5.

In general, the CYPDCTG concludes that throughout the period of review, design changes have been made with concern for both quality and safety. In several instances, the identified deficiency was not related to the change itself, but to the original design basis of the system being modified.

The most frequent source of identified deficiencies was the seismic qualification of equipment. The most significant deficiencies identified in the evaluation are: a) incomplete consideration of charging system outleakage in accident analyses and Technical Specifications, b) lack of seismic qualification of the service water system and portions of CVCS; c) potential degradation of containment isolation under certain conditions, and d) inability of the plant to achieve cold shutdown utilizing only seismically qualified equipment.

Also, the CYPDCTG concludes that existing procedural controls over the design change process are effective. Only a few deficiencies that occurred in past design changes have not been addressed adequately in current design change procedures. A significant improvement in PDCR packages with time has been noted.

The CYPDTG recommendations for improvements in the design change process are primarily in the areas of:

1. Control of design basis information.
2. Training of engineers on the design change process
3. The definition of "Plant Design Change"
4. The documentation of activities that may not been be controlled under PDCR's.
5. The need for a more integrated review process.
6. Specific procedure improvements for clarity and consistency.

The CYPDCTG performed its activities under the oversight of an External Review Group (ERG). The ERG has reviewed and concurred with this report. This report will be incorporated into the ERG's final report to the NRC. The order requires that within 2 months after the date of issuance of the ERG's Final Report, CYAPCo must submit a plan for improvements based on an evaluation of the CYPDCTG findings and recommendations, as summarized in Tables 3-4 and 3-5.

In conclusion, the CYPDCTG has reviewed both design change and the design change process as ordered by the NRC. Although a number of deficiencies have been identified, the CYPDCTG found no reason to immediately modify plant operation or the controls for plant design changes. The CYPDCTG expects that its concerns will be resolved satisfactorily by the plan that is prescribed in the Order.

1.0 INTRODUCTION

This report presents the findings of the Connecticut Yankee Plant Design Change Task Group (CYPDCTG). The CY"DCTG was chartered to review plant design changes in response to the NRC Order of December 13, 1984, modifying the license of the Connecticut Yankee plant.

Consistent with the Order and the Connecticut Yankee Atomic Power Company (CYAPCO) response to the Order, this review was conducted in three phases:

1. An initial review to identify the plant design changes with potential public safety significance. This review was termed "screening".

2. A detailed evaluation of those identified plant design changes to assess the significance of any deficiencies in the change. This included a review for unanalyzed failure modes.

3. A review of the process employed to implement plant design changes. This phase involved the review of past deficiencies and current procedures, to produce recommendations on the correction and/or improvement of the current design change process.

This review addressed plant design changes that were approved from January 1, 1979 through December 31, 1984. The activities that were reviewed wi:hin this time frame are 1) Plant Design Change Requests b) Jumpers, Lifted Leads and Bypasses and c) Work Permits and Automated Work Orders. The last item required a major effort and was assigned to a contractor.

This report consists primarily of a compilation of the Milestone Reports issued during the course of the study. However, some minor changes or additions have been made to the findings and conclusions of the Milestone Reports. Therefore, the recommendations as presented in this final report should be used to develop follow-up action.

2.0 CYPDCTG REVIEW METHOD

2.1 METHOD - DISCUSSION

The activities of the CYPDCTG were performed in accordance with controlled procedures developed by the task group. These procedures addressed 1) administrative matters 2) screening 3) detailed evaluations 4) process review and 5) vendor liaison. CYPDCTG procedures were concurred with by the External Review Group and approved by the Vice President, Nuclear and Environmental Engineering. Appendices A-1 through A-5 contain copies of these procedures. The methods used for the three phases of Task Group activity are discussed in the following sections.

The method used to review work permits/orders is also discussed.

2.2 METHOD - PLANT DESIGN CHANGE SCREENING

Screening of PDCR's and jumpers was performed through the use of CY PDCTG Procedure 1.02 (Appendix A-1). The basic review logistics incorporated by this procedure included the following:

1. A lead screening reviewer was assigned from the group for each design change. The lead reviewer would obtain the design change package as well as any other material necessary to adequately evaluate the change. The lead reviewer would then

evaluate the change against the criteria established in the CYPDCTG procedure for determining safety significance and document his evaluation.

2. The lead screening reviewer's evaluation would then be routed to each individual in the PDCTG for independent evaluation. This was an important step as it gave each individual the time to review the package in detail independently rather than just discussing the change in a group forum where one might have limited time to consider the change in detail. Any questions or comments an individual may have were recorded on the form for discussion at a subsequent group meeting.

3. After each individual had reviewed the change, the lead screening reviewer would present the change to the group for discussion and final determination. The group discussion was important since these discussions provided new insights and new questions which may have been overlooked during the independent reviews. Often, PDCR's were put on hold to resolve outstanding concerns noted during the group meeting. A subsequent group meeting would be held to make a final determination.

4. Concurrence of all 6 members was required for a "No Further Evaluation" determination. Any one member could dictate a detailed review.

Three screening criteria were established in the CYPDCTG procedure. However, these criteria were generally worded to avoid a regimented and perhaps limited thought process. The criteria required an evaluation of the design change against the following three general concerns:

1. Potential loss of a boundary designed to contain radioactivity (cladding, pressure boundary, containment). If the change itself, or a credible failure of the change could result in an increased probability of failure or a previously unanalyzed failure mode of a boundary, then the change would require detailed evaluation. Additionally, a change which could increase the consequences of a previously analyzed failure required review. Secondary effects (e.g. flooding, falls, etc.) were considered in this evaluation; and hence, even changes to non-safety-related systems could have an effect on safety systems or boundaries.

2. Thoroughness of the change package for safety related changes. If the change affected safety related equipment, but the package did not appear thorough (e.g. did not address seismic issues, involved 3 specific changes but only 2 were addressed in the design review and safety evaluations) then it would require a detailed evaluation.

3. Adequacy of the safety evaluation. The written safety evaluation (and backup documentation) was reviewed against

the complexity and safety significance of the change. If inadequate (e.g. safety significant change involving multi-disciplines but only the mechanical aspects were evaluated) the change may require detailed evaluation.

A form documenting the lead screening reviewers evaluation, independent review questions and comments, a summary of the group discussion, and the bases for the final determination was completed and filed with each design package. For those design changes which were determined to require additional review, the appropriate concerns which arose during the screening process were documented on the screening form to ensure their resolution during the detailed evaluation.

Each potential process design deficiency noted during screening reviews were documented on Figure 7.2 of CYPDCTG Procedure 1.04 (APP A-4). This information was subsequently factored into the overall Process Design Review performed after the detailed evaluation phase.

2.3 METHOD - PLANT DESIGN CHANGE DETAILED EVALUATIONS

Detailed evaluations of the 35 PDCRs selected from the screening process were conducted in accordance with CYPDCTG Procedure 1.03 (Appendix A-3). The basic review process outlined by this procedure required the following:

1. A Scope Review was conducted to outline the areas requiring detailed evaluation and assign lead/support reviewers. One of the reviewers was designated as lead reviewer to write a final summary of the detailed evaluation. The Scope Review considered three primary phases for evaluation:

   A. Impact on the Plant Design Basis.

   B. Confirmation of Proper Implementation.

   C. Provisions for Continued Safe Operation.

2. Detailed evaluations were performed based on the concerns identified in the screening and scoping reviews and any additional facts which surfaced in the conduct of the detailed evaluation.
   In performing the detailed evaluations the PDCTG members used the available documentation. Personnel involved or knowledgeable in the specific change, were often contacted for information. Where new technical input was required, a discipline liaison was typically charged with producing this information.

   In a number of instances, on site inspections and walkdowns were conducted. These were used to assess the adequacy of the changes and to verify that the implementation of the change is consistent with the available documentation.

3. If a member of the task group was instrumental in the implementation of the original PDCR, arrangements were made for

assignment of an alternate evaluator with similar technical experience prior to the Scope Review.

4. All evaluations, with a Summary Evaluation, were routed to each member (or alternate) in the PDCTG for independent review. This provided each member an opportunity to review the package for completeness and accuracy. Questions or comments raised during independent review were recorded on the Summary Evaluation (Fig. 7.5 of Appendix A-3). A resolution was reached between the originator of the comment and the lead evaluator. The resolution was also documented on the Summary Evaluation forms.

5. A PDCTG meeting was held to discuss the results of the evaluation. The Lead Evaluator would present a summary of the detailed evaluation and a discussion of the resolution of comments. Additional comments could be raised at this time.

6. If all six members concurred on the evaluation, the evaluation was approved and documented by signature.

7. Each deficiency noted in the evaluation was included as an input to the process review by using Figure 7.1 of Procedure 1.04 "Review of the Plant Design Change Process". In addition, some process deficiencies were discovered in the detailed evaluation that did not result in a safety concern. These deficiencies were also factored into the process review using Figure 7.1 or Figure 7.2 as appropriate.

2.4 METHOD - PLANT DESIGN CHANGE PROCESS REVIEW

The CYPDCTG performed this review in accordance with CYPDCTG Procedure 1.04, "Review of the Plant Design Change Process", which is included in this report as Appendix A-4. The effectiveness of this review depended heavily upon the CYPDCTG members' insight into the design change process, recognition of potential deficiencies, and follow through.

During the entire tenure of the CYPDCTG, members identified concerns or deficiencies in the design change process for follow-up. There were generally three opportunities to identify such items:

1. During detailed evaluations of PDCRs. This phase required members to identify project deficiencies and any causative process deficiencies. Process deficiencies that did not result in project problems were also identified. A specific form (Figure 7.1 of Procedure 1.04) was used to evaluate deficiencies and to facilitate group dispositions.

2. By a structured review of the design change process. This structured review of selected design changes sought to assess the effectiveness of seven steps in the design change implementation process: 1) engineering 2) design 3) construction 4) inspection 5) preoperational testing 6) turnover and 7) training. The effectiveness of interfaces between

aspects was also evaluated. Again, specific forms (Figure 7.1 or 7.2 of Procedure 1.04) were employed when deficiencies were identified in the summaries of these reviews.

For this review, the CYPDCTG recognized that the PDCRs selected for detailed evaluations did not provide an optimum sample for an assessment of the design change process. Those PDCRs very often were selected to review a specific technical shortcoming. Many were of limited scope and/or performed under obsolete procedures, making them unlikely projects for a review to reveal improvements in the process. Therefore, the CYPDCTG performed a structured review of a broader sample. A matrix was developed (see Table 2-1) to produce the sample used. The collective judgment of the CYPDCTG was applied to this matrix to include projects with meaningful distributions of origin, age, and technical discipline.

3. Upon recognition at any time. When a concern was identified by an individual or in group discussion, a specific form (Figure 7.2 of Procedure 1.04) was completed and entered in the file for later evaluation and group disposition. This method was most effective during the screening review, when all PDCRs were investigated. Additionally, it provided a means to document process concerns that resulted from interaction with the contracted consultant in Work Permits/Orders.

In accordance with Procedure 1.04, all deficiencies identified by these approaches were reviewed and dispositions specified. All determinations received independent reviews and subsequent concurrence of all CYPDCTG members, through signature at group meetings. Deficiencies were further evaluated to identify areas of significant weakness in the process.

The CYPDCTG also reviewed other available documents to identify additional process improvements. These documents included design change procedures from two other utilities and References 1 and 2. The External Review Group also identified areas of improvement. When deficiencies or improvements were noted, the appropriate forms were initiated for further consideration.

The CYPDCTG was not chartered to assess the thoroughness of design change documentation from a quality assurance standpoint. At times, however, a lack of documentation meant that little evidence was available to assess the performance of a specific aspect. In this case, discussions with key individuals in the process provided input. In some cases, the effectiveness of an aspect could be deduced. For instance, when hard-copy evidence of a turnover package was lacking but the operations, maintenance and training groups had sufficient information, it was concluded that a turnover process had occurred.

The CYPDCTG was also not chartered to assess the adequacy of setpoint changes since setpoint changes are not design changes. Setpoints are specified in calibration procedures and in some cases in Technical Specifications. The current procedures provide for the appropriate evaluation of procedure and Technical Specification changes.

2.5 METHOD - WORK ORDER/PERMIT REVIEW

Early in the project, the CYPDCTG identified the possibility of plant design changes being made using processes other than the PDCR process. The two other processes identified were the use of jumper/lifted leads/bypasses, discussed in Section 2.2 and the use of work permits/orders. The CYPDCTG performed a quick survey to determine if plant design changes were made using work permits/orders. The survey identified several possible plant design changes. Based upon this finding, it was concluded that a review of all the work permits/orders performed between January 1979 and December 1984, was required.

Because of the number of documents involved, the PDCTG acquired the services of a contractor to perform this task. Impell Corporation was selected because of its technical expertise and its familiarity with the Haddam Neck Plant. The personnel assigned to this task by Impell Corporation had participated in the fire protection review of the CY design to meet Appendix R criteria.

The CYPDCTG worked closely with Impell Corporation in developing the procedures to perform the review of the work permits/orders. As much as possible, the methods used in evaluating PDCRs were used to review the WP/AWOs. It was recognized, that in order to review the 9100 work permits and 11,200 automated work orders, a streamlined process was necessary. However, no compromise was made on the evaluation of the impact on safety. The CYPDCTG reviewed and approved the Impell procedures prior to implementation.

During the screening of the work order/permits, the CYPDCTG performed audits of the work performed by Impell. The audits confirmed that the procedure was being applied properly. Following initial screening, Impell performed further investigations, including interviews with CY personnel and on-site inspections, to determine the changes that may have an impact on safety. During this period, frequent meetings were held between the CYPDCTG and Impell personnel for monitoring progress and factoring CYPDCTG input into the review.

The safety evaluations of the 65 work permits/orders with safety significance were reviewed by the CYPDCTG. A meeting was held with the CYPDCTG and Impell, in which Impell presented a discussion of the change and the basis for the safety determination. At that time, questions raised by CYPDCTG members were resolved. The approval of each safety evaluation was indication by signature of

each CYPDCTG member on each safety evaluation. The final report developed by Impell from this task has been incorporated into this final report as Attachment A-9.

3.0 RESULTS

3.1 RESULTS OF SCREENING REVIEW

The PDCRs approved between January 1979 and December 1984 were evaluated under the screening process. There were 413 candidates, ranging from PDCR No. 282 through PDCR No. 694. Of these, 58 were cancelled or are still not PORC approved. Thus, 355 PDCRs were evaluated during screening. Of these, 35 were selected for detailed evaluation. This corresponds to 10% of the PDCR's evaluated in screening. A listing of the determination (Yes or No) for detailed evaluation for each PDCR is given in Table 3-1.

Table 3-2 provides a separate listing of the 35 selected for detailed review.

In addition, all jumpers/bypasses/lifted leads initiated prior to January 1, 1985 and still in effect as of April 15, 1985 were screened for detailed evaluations. The twelve items screened are shown in Table 3-3. No safety concerns were identified for these jumpers and none were identified for detailed evaluation.

3.2 RESULTS OF PLANT DESIGN CHANGE DETAILED EVALUATIONS

Detailed evaluations were completed on the 35 PDCRs listed in Table 3-2. Thirty-three (33) of the PDCRs were reviewed for "Impact on the Plant Design Basis", eleven (11) were reviewed for "Confirmation of Proper Implementation" and eighteen (18) were reviewed for "Provisions for Continued Safe Operation".

Eleven of the PDCRs reviewed resulted in no identified deficiencies. The remaining 24 PDCRs resulted in a total of 39 deficiencies requiring further evaluation or corrective action. Appendix A-6 provides a summary for each of the 35 PDCRs. Each summary gives a brief description of the change, the area(s) evaluated, the conclusions of the evaluation and a listing of the identified deficiencies. The deficiencies are listed in Table 3-4.

3.3 RESULTS AND SPECIFIC RECOMMENDATIONS OF THE PLANT DESIGN CHANGE PROCESS REVIEW

3.3.1 Introduction

The CYPDCTG identified deficiencies in the design change process at Connecticut Yankee and then developed a disposition for each deficiency. The results of this effort are addressed in two aspects:

1. Process Corrections. When deficiencies in a specific design change resulted from a shortcoming in the existing process, a process correction is warranted.

2. Process Improvement. These recommendations may not be the result of specific deficiencies or failures in the implementation of a design change. Typically, they result from a recognized weakness in a particular phase of the process or the recognition of a more effective method.

To assist follow-on actions, a summary listing of process-related recommendations is presented in Table 3-5.

3.3.2 Process Corrections

Discussion

To assess the effectiveness of the current design change process, the CYPDCTG evaluated 56 deficiencies that were identified on specific PDCR evaluations. This review assessed the adequacy of the current CYAPCo plant design change procedures in light of past failures. The basic question asked here was "Would adherence to the current procedures prevent a recurrence of this deficiency?" Where the answer was negative, a process correction was deemed warranted.

The CYPDCTG debated the wisdom of modifying procedures for each deficiency in an attempt to prevent recurrence. While a procedure change could address each specific instance of deficiency, this approach is not effective. Such procedure modifications would add to the length and complexity of procedures, with little likelihood of averting similar future deficiencies. This is particularly the case when a deficiency results from a lack of thoroughness in the design change process, such as faulty or incomplete engineering. A number of deficiencies resulted from apparent non-compliance to procedures.

On this basis, most PDCR deficiencies were not resolved with recommendations to revise procedures. More fundamental reasons were sought by the CYPDCTG, and it was concluded that many such deficiencies could be avoided with improved

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reference documents and training. These reasons are summarized below:

1. In reviewing the PDCRs, the PDCTG has identified a number of short comings associated with the documentation of the current plant design and functional requirements for the system and its components. For example:

   a. Drawings are not updated in a timely manner.
   b. Boundaries between safety/non-safety equipment, QA, or pressure classifications (ASME class) are not clearly specified.
   c. Design basis information is not collected into a single controlled document. The FDSA has not been updated.
   d. Normal valve positions are not clearly specified. The current P & IDs are not an accurate source for this information.
   e. Original specifications are not available for comparison when developing new specs.
   f. While the valve list is used as a source for controlled documentation, it is not a controlled document.

   These shortcomings hindered the development of the PDCRs and contributed to the deficiencies identified in the detailed evaluations.

2. In reviewing the PDCR packages, a number of documentation deficiencies have been noted that appear to be the result of procedural non-compliance. Additionally, some deficiencies are the result of faulty or incomplete engineering. These deficiencies are correctable by improved training.

3. Also, some deficiencies involved PDCR packages that were non-specific in their scope description, as is sometimes unavoidable when working in normally inaccessible areas. Other PDCRs were closed out without the completion of all work. These deficiencies warrant procedure changes.

In accordance with CYPDCTG Procedure 1.04, all deficiencies found in PDCRs were reviewed collectively to determine if programmatic deficiencies exist. This review is summarized in Appendix A-8, with its recommendations incorporated into the body of this report.

Recommendations

1. Controlled documentation should be expanded to include the following as a minimum:

   a. Current design basis analysis, including positions on current regulatory criteria, system/component design basis criteria, and licensing bases/commitments.
   b. Seismic and QA classification (possibly in PMMS).
   c. Clear specification of boundaries between QA and safety classifications (possibly in P & IDs and one line diagrams).
   d. Normal and failure valve positions (current P & IDs are not accurate).
   e. Equipment history, including all specifications used to purchase the equipment (possibly in PMMS).
   f. Valve list (possibly in PMMS).

Item (a) could be performed by the updating and controlling of the FDSA.

Consideration should be given to maintaining original plant specifications as controlled documents, much like original plant drawings. For plant design changes, these specifications would be updated and revised, as necessary.

2. Controlled documentation, especially drawings should be updated in a timely manner. In particular, generation of verified "As Built" drawings should be performed as soon as possible and not delayed until the close out of the project. This is especially important for projects which extend beyond one refueling outage.

3. Training should be provided to give guidance for content and wording requirements in the PDCR package. This training should emphasize the need for thoroughness and technical excellence. The NEO procedure familiarization training course is too generalized for training in the design change process. Detailed training is required on all NEO procedures. Training should highlight some of the deficiencies identified by the CYPDCTG, such as a) the importance of seismic requirements, b) consideration of secondary effects, c) when a PDCR is required, and d) the need to avoid unsupported qualitative statements. To ensure uniformity in the process it is recommended that the training should be performed by the training department.

Management should work to improve on-the-job training through work assignments. To obtain training and avoid errors, new engineers should

work more in support of experienced engineers, rather than assuming direct project responsibility.

4. For cases where a PDCR scope statement must be generalized, NEO 3.03 should require the PDCR package to be revised when the work scope is more specifically determined based upon field inspections, or define an alternate means of review and approval. NEO3.03 should also specify that if a PDCR is closed out without the completion of all work, the completed work must be identified, and the impact on the safety evaluation assessed.

5. The implementation of NEO8.04 "Safety Evaluation of Proposed Changes to Station Procedures" should be expedited to ensure adequate technical review of proposed changes to safety related procedures.

6. The effectiveness of the Quality Assurance Program to ensure compliance with the design change process procedures should be evaluated. The number of deficiencies resulting from procedural non-compliance indicates a potential need to increase the QA involvement in this area.

3.3.3 Process Improvement

In the process improvement area, identified deficiencies were quite varied in type and scope. To permit a better assessment of the CYPDCTG findings in the design change process, the following categories have been established:

1. Definition Deficiencies - deficiencies that result from a lack of a clear definition of work scope or requirements.

2. Interface Deficiencies - deficiencies that result from inadequate interactions of groups or individuals.

3. Completeness Deficiencies - deficiencies that result from a lack of thoroughness.

4. Process/Procedure Deficiencies - deficiencies that specifically relate to the overall process or specific procedures.

A number of the recommendations presented below deal with the concept of an integrated review. This concept consists of a detailed multi-discipline process where experienced discipline individuals with broad oversight evaluate the change to consider such things as safety significance, system interactions, technical requirements, special requirements, cumulative effects, location dependent issues, procedure requirements, etc. This type of review could occur at both the conceptual stage and the approval stage of a design change. It could be performed by a new group, a subcommittee of the NRB, or possibly through the current line organization. Appropriate procedure changes would be necessary to implement the preferred approach.

The following presents the results of the CYPDCTG review by category.

3.3.3.1 Definition Deficiencies

Summary

In reviewing the PDCRs, Work Permits (WPs) and Automated Work Orders (AWOs,) a number of deficiencies related to the definition of plant design

changes have been identified. These are as follows:

a. A number of activities were performed as maintenance that should have been processed as a PDCR.

b. In reviewing the PDCRs, a number of PDCRs have been identified in which the description of the change was not clearly provided.

Discussion

1. There are several contributing factors in the misuse of work permits/work orders to make plant design changes:

   a. It is becoming difficult if not impossible to replace plant components with identical models. Some original equipment is no longer manufactured and is obsolete. Some changes were a result of an attempt to replace obsolete or unavailable equipment with comparable equipment.

   b. Some changes are so minor and remote to safety that the PDCR process is not necessary.

   c. Some activities fall into a "gray" area between plant design change and maintenance activities (e.g., SG tube plugging and Fermaniting).

   d. The current definition of a plant change in NEO Procedure 3.03 does not appear to be encompassing enough. The "design documents" mentioned in the definition are not clearly specified.

   e. Sufficient training or guidance on the meaning of the definition has not occurred.

2. Since the PDCR process is a lengthy and time consuming one, it is difficult to use the PDCR process for changes that require a tight schedule. This is a particular problem for changes that require a survey or walkdown prior to definition of the PDCR. By necessity, this has lead to approval of PDCRs with a general definition rather than a detailed definition of the change. Another undesirable practice is the use of one PDCR to cover a number of seemingly unrelated changes (e.g., PDCR 461, Reactor Cavity Pool Seal and Neutron Shield). This practice appears to dilute the overall review of each change.

Recommendations

1. A better definition of a plant design change should be developed. It is recognized that any definition is subject to interpretation, but the current definition is too vague to conclude whether a PDCR is necessary for areas such as:

    a. Heat exchanger (including steam generator) tube plugging.
    b. Fermaniting.
    c. Replacement with equivalent components.
    d. Insignificant changes that are remote to safety (i.e., changing telephones, adding air conditioners).
    e. Modifications to vendor owned and maintained equipment.

The CYPDCTG recommends that the definition of a plant design change be plant changes that 1) require a change in design documents (the current definition) or 2) changes in the form, fit, material, or function of plant equipment.

2. To ensure that all work that results in a plant change is properly identified, it is recommended that a technical review of AWO's be performed to determine if a plant change is being proposed. AWO's that specify activities such as surveillance or calibration, need not be included in the technical review.

3. In order to reduce the time consuming reviews required for plant changes having no safety significance, a streamlined process is recommended for these types of changes (see Figure 3-1). A plant design change would be determined to be in one of three categories:

   a. change requires a PDCR (i.e., the current PDCR process), or
   b. change is "remote to safety" (requires only justification for this categorization), or
   c. change is a replacement with an equivalent component (requires only justification for this categorization).

   The AWO can be used to identify the above category of work being performed.

The documentation for a change "remote to safety" can be simply the following:

a. a description of the change, and
b. a conclusion that the change has no functional impact.

This documentation constitutes the safety evaluation.

The definition of a "functional change" given in NEO 5.11 can be supplemented as required to determine functional impact. That is, a change is "remote to safety" if it does not cause any of the following:

a. Alteration of mechanical or structural integrity for safety related systems.
b. Alteration of seismic qualification.
c. Alteration of physical and electrical separation requirements for safety related systems.
d. Alteration of intended electrical circuit design function for safety related systems.
e. Introduction of materials not specifically qualified for the given application or environment.
f. Alteration of the plant fire hazards analysis.
g. Alteration of the control, operation, performance, maintainability, or accessibility for test or inspection for safety related systems.
h. Alteration in plant flood protection.

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i. Generation of a missile, means, etc., of disabling or rendering inoperable a safety-related component, structure, electrical circuit, etc. (secondary effects).

j. Generation of a potential environmental impact.

k. Alteration of the plant security system.

4. The current PDCR process appears to be complex and time consuming. It is recommended that an evaluation be made to identify ways of streamlining the process. For example, if a system integration group is created, it may be possible to use such a group to allow a streamlined process by combining technical reviews.

5. Revise NEO3.03 to prohibit a single PDCR being used to cover several unrelated changes. Instead, several PDCRs should be used, one for each change.

3.3.3.2 **Interface Deficiencies**

Summary

Several deficiencies have been noted in the selection of the disciplines involved in reviewing a given PDCR. Without proper selection of the disciplines involved, a complete safety review for multi-discipline issues and secondary effects cannot be accomplished.

Discussion

1. The integrated safety evaluation performed by the Safety Analysis Branch is not a multi-discipline review. As such, the term "integrated safety evaluation" is a misnomer. The "integrated safety evaluation" is in fact a discipline evaluation where only the impact of the change on the accident analysis is assessed. It is only an integrated review in that the accident response is the result of the combination of effects of the various systems and components. The integrated safety evaluation requires as an input, the results of multi-discipline reviews. It is not a means of identifying secondary effects, multi-discipline issues or for replacing Failure Mode and Effects Analyses (FMEAs).

2. The NRB is a multi-discipline review board that has the appropriate expertise and the means for performing multi-discipline reviews. However, the NRB has not performed the depth of review to identify system interaction and secondary effects in all instances. In addition, the NRB reviews usually occur after the PDCR process. This is very late for identifying safety concerns.

3. Licensing has, in some instances, performed an integration function for coordination of changes to meet major licensing issues. However, this is the exception rather than the rule.

Recommendations

1. An improvement is required in the performance of integrated multi-discipline reviews. The emphasis of these reviews is the identification of system interactions and secondary effects of changes. A possible way of improving the integrated reviews, for example, is to establish a system integration group responsible for these functions.

2. Guidance is required to assure that all of the appropriate disciplines are selected to be involved in the review and development of PDCR documents. Training for project and plant engineers would improve the selection of disciplines.

3.3.3.3 Completeness Deficiencies

Summary

In reviewing the PDCRs, the PDCTG has identified a number of generic issues that do not always receive the depth of review that is required. For example:

a. The cumulative effect of a number of changes that have taken place over the years is not always addressed. While each individual change may not be significant, the cumulative effect of many changes may have an impact.

b. Secondary effects are not always completely addressed, especially in assessing the impact of already existing equipment in an area where new safety-related equipment is being added.

c. Qualification of equipment has not been performed on a consistent basis. In some instances, qualified equipment is added to existing non-qualified systems. Taking credit for the upgrade on a system basis is questionable.

These deficiencies point to a need for an improvement in the integrated approach in the development and review of plant changes.

Recommendations

1. An improvement is required in the review and coordination of multi-discipline and system interaction issues. A possible way of effecting an improvement is the establishment of a system integration group responsible for these functions.

2. Some controlled documentation should be developed that can be used to determine the impact of location dependent issues (e.g., - fire protection, seismic, flooding, EEQ, etc.). The effects of new equipment on previously existing equipment in that location must be evaluated. Likewise the potential effects of previously existing equipment in the area on the new equipment being added must be addressed. This could be incorporated in an updated FDSA or a data base system.

3. A method for evaluation of the cumulative effect of a number of minor changes should be developed. For example, when core boring a structural wall, the effects of previous core boring on the same wall should be considered. Also, the cumulative effects of small components added to the Main Control Board may be important whereas individually they are qualitatively analyzed away.

3.3.3.4 Procedures Deficiencies

Summary

These comments address deficiencies in the current NEO and GEC procedures. The actions required to correct these deficiencies fall into two categories:

a. Development of new NEO procedures.

b. Revision of current NEO procedures.

Recommendations

1. Most engineering and design functions occur under a project assignment. The only NEO level procedure that controls activities under a project assignment is NEO3.04. This is more of an administrative rather than a process control procedure. A specification of discipline functions performed under a plant design change is required to determine how the detailed design will proceed. A NEO procedure is required in this area. Important areas for consideration are:

a. Overall design requirements.

b. Conceptual design review.

c. Interface specifications.

d. Integration and multi-discipline requirements.

e. Design documentation requirements.

Current GE & C procedures may be adequate to address these concerns. They should be elevated to the NEO level and integrated into the design process. One good candidate is GEC2.07, Project Description.

2. Specific procedure revisions have been identified as shown in Table 3-6.

4.0 CONCLUSIONS/RECOMMENDATIONS

4.1 CONCLUSIONS - SCREENING REVIEWS

In reviewing the PDCRs identified for detailed evaluations, some trends have been noted. As expected, approximately half of these PDCR's were approved prior to 1981. This tends to confirm the improvement in the PDCR packages as experience, training and improved procedures have been developed. This is shown in Figure 4.1. Nine PDCR's approved in 1984 have been selected for detailed evaluations. This does not represent a decline in the quality of the design process, but reflects the increase in the number of PDCR's processed. In addition, several of these PDCR's were selected because of questions on seismic classification, QA qualification and testing requirements for systems already in place prior to the change and unaffected by the change itself. This is further supported by the increase in thoroughness of the PDCR packages for the changes approved in 1983 and 1984.

The questions raised about the PDCR's that lead to the requirement for detailed review have been categorized as shown in Table 4-1. By far the most predominant issue to be addressed is seismic qualification of equipment, having been identified as a question on approximately half of the PDCR's. Some of them are simple issues such as the addition of a component to the main control board, whereas others involve the seismic design of an entire system such as service water or boric acid.

Of these questions raised during screening, none have been determined to require immediate corrective action. Identified concerns are addressed in the detailed evaluation section.

During the screening process a number of concerns related to the design process itself were also identified. The appropriate forms were completed to ensure these concerns are addressed during the CY PDCTG's review of the design process.

4.2 CONCLUSIONS - DETAILED EVALUATIONS

The review of the PDCRs approved over the six year time frame has demonstrated that changes have been made with concern for both quality and safety. This is supported by the fact that deficiencies have been identified in only 24 PDCRs. This represents only 7% of the PDCRs reviewed in this project. In addition, in several instances, the identified deficiency is not related to the change itself, but related to the original design basis or components not changed by the PDCR. Some deficiencies have been identified through other programs already in place at NU such as the Integrated Safety Assessment Program. As such, some of the deficiencies identified by the CYPDCTG are not new or unknown within the NU organization.

Of the identified deficiencies, one was deemed significant enough to warrant immediate action. The deficiency was associated with PDCR 380 "RC Pump Component Cooling Water and Seal Water Return Isolation Modification".

Charging system components may be used for the post LOCA recirculation mode. However, leakage from the charging system components is not accounted for in the Technical Specification or calculations. Since thyroid dose calculations show little margin to the 10CFR100 limits, the addition of leakage from the charging system components may be a serious problem. This concern was identified by the CYPDCTG to the Vice President of Nuclear and Environmental Engineering on July 2, 1983. A copy of this letter is included in Appendix A-6.

It is important to note that this deficiency was not caused by the PDCR itself. The use of charging pumps for post-LOCA recirculation is not directly related to removal of RC pump support systems from containment isolation. However, the deficiency was identified through an extension of the review to include the entire containment isolation system.

Another contributing factor to the deficiencies identified with this PDCR, is that this change was one of a number of immediate changes required after the TMI accident. The requirement for immediate implementation and the heavy demand on manpower resources at the time, appear to have had an impact of the thoroughness of the review of the PDCR. Perhaps, too much reliance was placed on NRC guidance and generic reviews by the Industry Owners Groups.

While not identified as an immediate concern, two major areas have been identified that may require extensive evaluation and corrective action.

1. An evaluation is necessary to clearly identify the components and system boundaries necessary to allow cold shutdown following a

design basis earthquake. The evaluation must consider protection of the required equipment from the impact of non-seismically qualified equipment, the primary and secondary system water requirements and the cooldown capability. An evaluation of the seismic qualification of the service water system is required.

2. An evaluation of the containment isolation system is required. A number of deficiencies have been identified with respect to the valves and piping in the isolation system. An integrated study of the isolation of the RC pump support systems is necessary to resolve the conflict in requirements for the availability of RC pumps and containment isolation.

The above discussion highlights the deficiencies that the CYPDCTG has deemed as most important. All deficiencies from the detailed evaluations are shown in Table 3-4. Process deficiencies have not been included in this table. The deficiencies have been collected into the following categories:

a. Design - questions about the adequacy of the design of a system or component.
b. Design/Seismic - questions about the seismic qualification of system or component. While a design area, this aspect has been singled out due to the number of occurrences.
c. Design/Safety Analysis - questions about the impact of the change on the design basis analysis and documentation.
d. Testing - questions about testing to confirm proper implementation of the change.

e. Procedural - questions about implementation of the change into Station Procedures to assure continued safe operation.

The results of the categorization are shown below:

Classification	Number of Deficiencies	Percentage of Total Deficiencies
Seismic	13	33%
Procedural	8	21%
Design	7	18%
Testing	5	13%
Safety Analysis	6	15%
	39	100%

The most common area of deficiency is in the engineering/design area and in particular seismic qualification of components. The three design categories, including seismic and safety analysis account for 66% of the deficiencies.

Table 3-4 also indicates deficiencies that had been identified through other programs currently in place in the NU organization, such as the Integrated Safety Assessment Program and the CY FDSA Chapter 10 Reanalysis Program. Eleven of the 39 deficiencies fall into this category. Thus, only 28 of the deficiencies may require the establishment of new projects or studies. Current programs related to the eleven other deficiencies should consider CYPDCTG findings because additional considerations have been developed in some cases.

4.3 CONCLUSIONS/RECOMMENDATIONS - REVIEW OF THE DESIGN CHANGE PROCESS

The conclusion of the CYPDCTG are assessments of the significance of the results presented in the previous section. Our conclusions are:

1. The current plant design change process, as defined by plant, Generation Engineering and Construction, and Nuclear Engineering and Operations procedures, is effective. The system has sufficient controls over the plant modification process.

   This conclusion is firmly supported by the CYPDCTG review of the INPO Good Practice document (Reference 1). In that review, no significant shortcomings in the CYAPCo process were identified. Similarly, reviews of design change programs from two other utilities found the CYAPCo program to be strong. A comparison of the INPO Good Practice and the CY design change process is presented in Appendix A-7.

2. While the process framework is effective, compliance with the requirements either through ignorance or lack of concern has been inadequate, at times. Staffing levels may be contributing to the degree of compliance. The task group found a correlation between the work load during the period just after TMI and the number of deficiencies. The company is now in a work force stabilization period with restrictions on new hiring. At the same time construction of Millstone Unit 3 has removed a significant number of experienced people from the operating units support organizations. These two

forces have had a dramatic effect on some groups, causing significant increases in individual workloads. This inevitably affects the thoroughness of some projects.

3. Recent revisions to the NEO Procedures have improved the controls on the design change process. The process, however, is cumbersome. Some CYPDCTG recommendations intend to streamline the process, but their impact is probably small. Some of the procedures appear to be disjointed, apparently due to parallel development and revision. Some modifications for consistency are needed.

4. As stated in the recommendations, a number of deficiencies should be corrected in the process. These deficiencies do not have a significant adverse impact on the effectiveness of the entire program.

5. Certain activities already in process within NU address some of the CYPDCTG recommendations. Specifically, a proposed configuration control program will establish an adequate compilation of updated design information, if it meets its goals. The CYPDCTG is concerned, however, about the timely completion of such a project. Additionally, the current effort to correct P&IDs is a necessary activity.

6. As stated in the recommendations, numerous improvements can be made to the plant design change process. A summary of all process recommendations is presented in Table 3-5. A concerted effort

should be made to ensure all procedures interrelate effectively. Confusion results when one procedure offsets the requirements of another procedure. Care must be taken during procedure revisions to eliminate such conflicts.

7. The numerous instances of "non-compliance" to procedural requirements can be reduced by more effective training. Training in specific procedures should be conducted by the Training Department and be mandatory for all project engineers, NUPOC engineers and supervisors.

4.4 CONCLUSIONS/RECOMMENDATIONS - WORK PERMITS/AUTOMATED WORK ORDERS

The CYPDCTG concludes that Impell performed a very competent review of WPs and AWOs. Their review was thorough, probing and unbiased. CYPDCTG audits of the Impell effort found that their work was complete and good judgment was exercised.

The Impell final report is provided in Appendix A-9. In that report, Impell made eleven (11) recommendations and observations. The CYPDCTG's disposition of the Impell recommendations and observations is provided in Appendix A-10.

Although a few work permits/orders have been identified for further evaluation, no negative safety consequences or deficiencies have been identified to date.

4.5 CONCLUSIONS/RECOMMENDATIONS - SUMMARY

The reviews ordered by the NRC were completed by the CYPDCTG as required by its charter. As presented in the Executive Summary, the CYPDCTG review found that past plant design changes and the current design change process contain some deficiencies. As a whole, however, the CYPDCTG findings do not reflect any major problems in these areas.

The results of the CYPDCTG are summarized in two tables in the report:

1) Table 3-4 lists 39 deficiencies that were identified in past plant desgin changes. Deficiency 14 on that table has already been reported as an immediate safety concern.

2) Table 3-5 lists 18 recommendations for corrections or improvements in the current design change process.

FIGURE 3-1 - Proposed Processing of Plant Design Changes

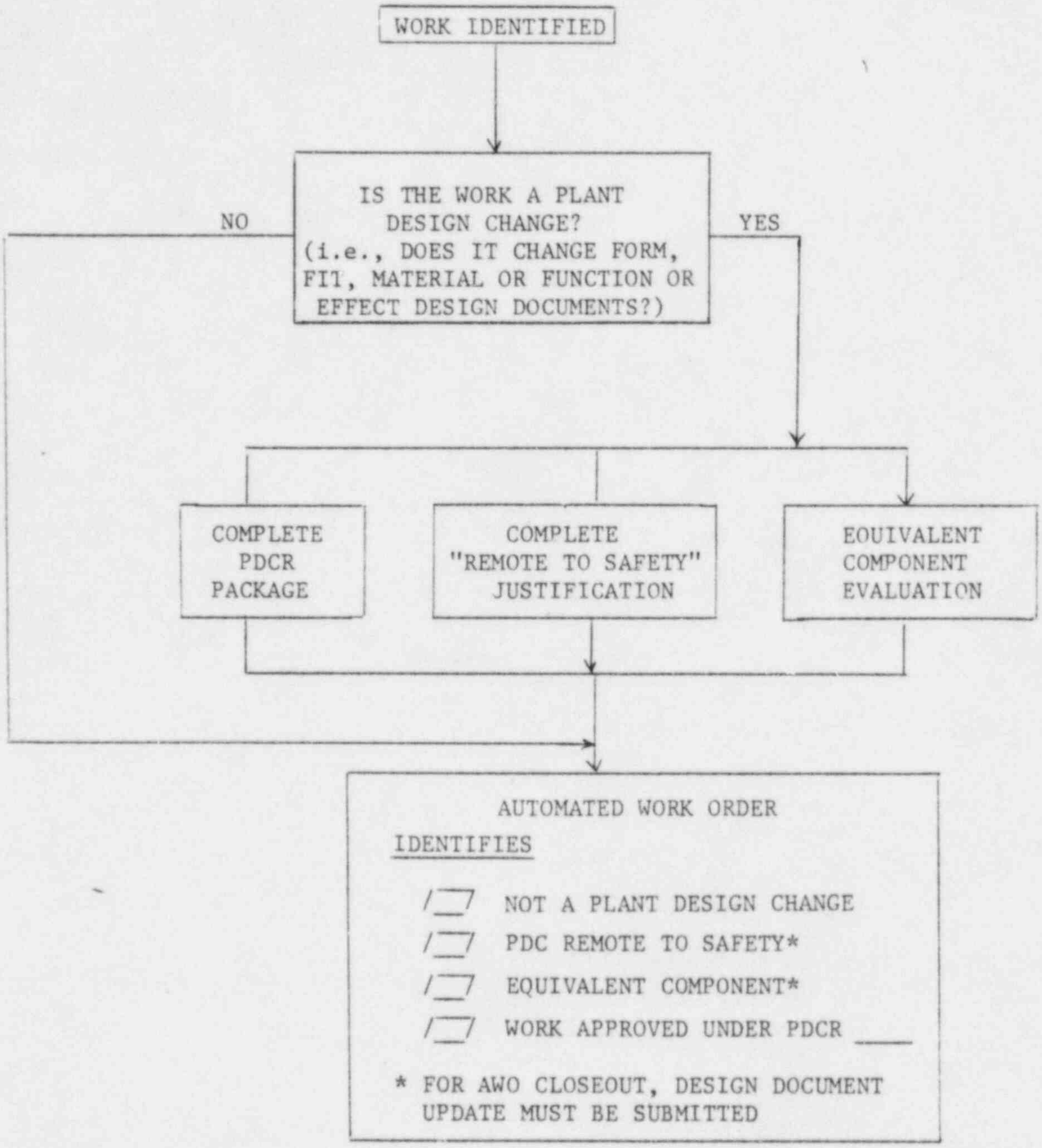

FIGURE 4-1

PDCR's Requiring Detailed Review

Categorization by Approval Date

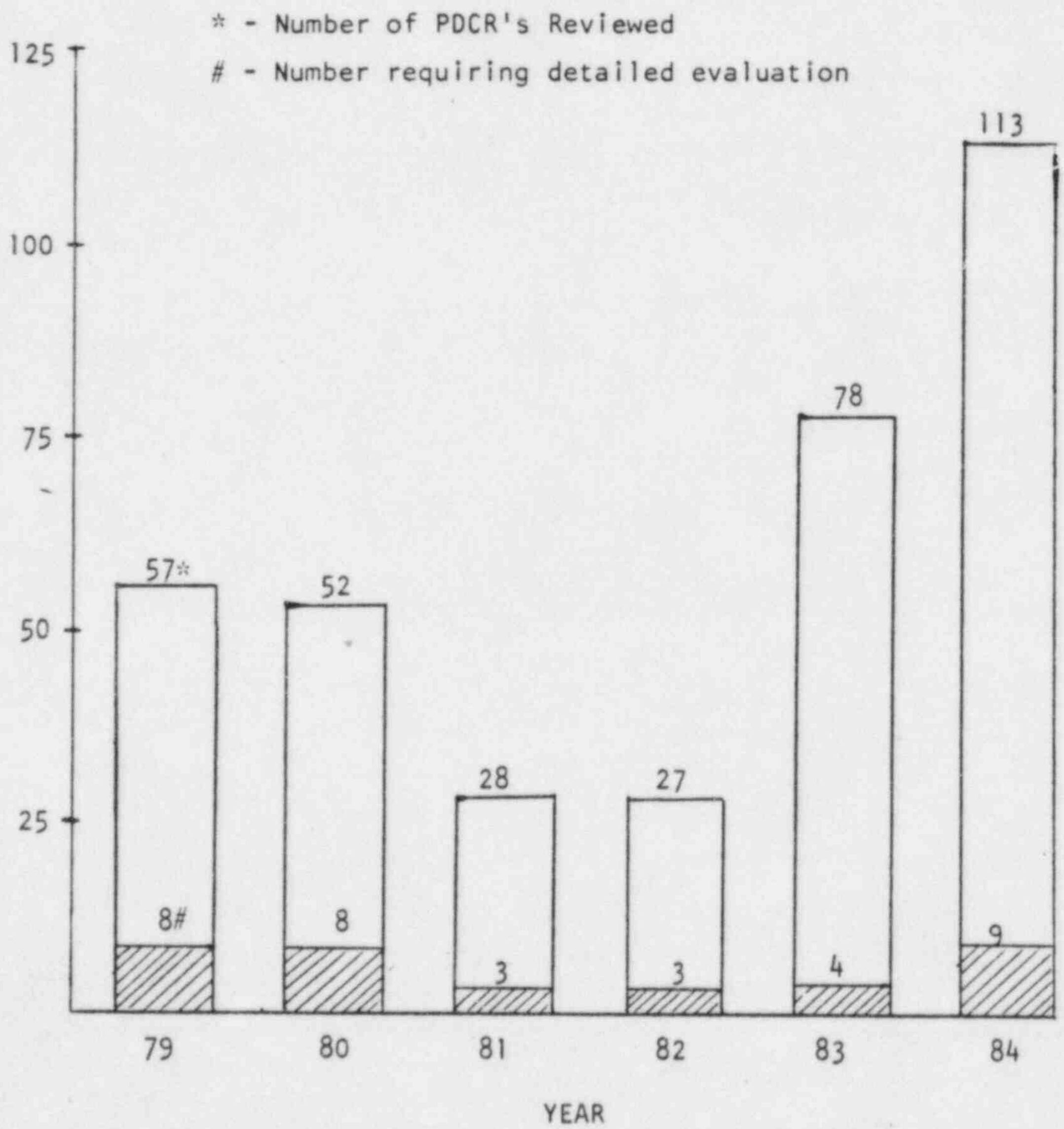

TABLE 2-1

PROCESS REVIEW MATRIX

OBS	PDCRNO	TITLE	LEAD	ENG	DESIGN	CONSTR	INSP	TEST	TURNOVER	TRAINING
1	290	REROUTE OF CHARGING PUMP POWER SUPPLY	GEC	N	N	N	N	N	N	N
2	294	RHR PURIFICATION FLOW CONTROL VALVE	GEC	N	N	N	N	N	N	N
3	300	DIESEL SEQUENCING TIMERS	BAT	N	N	YES	YES	YES	N	N
4	306	CONTAINMENT FAN FILTER TIMERS	RAC	N	N	N	N	N	N	N
5	314	VITAL AREA PROTECTION OF CONTROL ROOM	DGD	N	N	YES	N	N	N	N
6	326	FIRE SUPPRESSION SYS ADDITONS & MODS	MSK	N	N	N	N	N	N	N
7	332	AUX FEEDPUMP BEARING OIL COOLING SYS	MSK	N	N	YES	N	N	N	N
8	333	COMBUSTIBLE GAS DETECTION SYSTEM	RAC	YES	YES	N	N	YES	YES	N
9	344	CONTAINMENT ISOLATION RESET MOD	BAT	YES	YES	YES	YES	YES	YES	YES
10	347	RCS VENTING SYSTEM	RAC	YES	YES	N	N	YES	N	YES
11	368	RCP SEAL WATER SUPPLY	RAC	N	N	N	N	N	N	N
12	371	H2O LEVEL/H2%/PRESS IN CONT TMI 2.1.8	RAC	N	N	N	N	YES	N	YES
13	380	RCP CCW AND SEAL WATER RETRN ISOLATION	RJS	YES	YES	YES	YES	YES	YES	YES
14	384	AUTOMATIC INITIATION AUX FEEDWATER	MSK	YES	YES	N	N	YES	N	YES
15	388	PRIMARY VENTILATION STACK SPRAY RING	GEC	N	N	N	N	N	N	N
16	397	PAM AUX MAIN CONTROL BOARD	DGD	N	N	YES	N	N	YES	N
17	401	SAFETY GRADE AUTO INITIATION AUX FW	MSK	N	N	N	N	N	N	N
18	406	BUILDING MODIFICATION PROJECT	DGD	N	N	N	N	N	N	N
19	418	PORV AND BLOCK VALVE LOGIC MOD TO 2/3	RAC	N	N	N	N	N	N	N
20	436	UPGRADE OF SFB NORTH CRANE (CR-5-1A)	GEC	N	N	N	N	N	N	N
21	443	FLOOD PROTECTION MODS	DGD	N	N	N	N	YES	N	N
22	459	REEVALUATION OF SAFETY RELATED PIPING	GEC	YES	YES	N	N	N	N	N
23	460	HACSS	RJS	YES	YES	YES	YES	N	N	N
24	461	NEW RX CAVITY POOL SEAL & NEUT SHIELD	RAC	YES	YES	N	N	N	N	N
25	486	TERRY TURBINE STEAM CONTROL VALVES	MSK	N	N	YES	YES	YES	YES	YES
26	513	BORIC ACID LINE RELOCATION	GEC	N	N	N	N	N	N	N
27	592	CHARGING PUMP MODIFICATIONS	BAT	YES	YES	YES	YES	YES	YES	YES
28	604	WASTE GAS/H2-N2 SUPPLY	BAT	N	N	N	N	N	N	YES
29	626	REPLACE FOXBORO 613DM FW FLOW TRANSMIT	RJS	N	N	YES	N	N	N	N
30	634	REPLACE FOXBORO PRESS TRANS PT403 & 404	MSK	N	N	N	N	N	N	N
31	652	SG PRIMARY MANWAY COVER STUD TENSIONER	DGD	N	N	N	N	N	N	YES
32	653	VITAL INVERTER CABINET VENTILATION	RJS	YES	YES	YES	YES	N	N	N
33	660	SFP HEAT EXCHANGER RELIEF VALVE	ALT	N	N	N	N	N	N	N
34	671	STORAGE OF SPARE CRD'S IN CONT SUMP	GEC	N	N	N	N	N	N	N
35	684	REPLACEMENT OF RCS LOOP RTD'S	BAT	N	N	N	N	YES	N	N
36	422	INSTALL POST ACCIDENT SAMPLING SYSTEM	RAC	YES	YES	YES	YES	YES	YES	YES
37	544	TANK HEATING SYSTEM MODIFICATION	GEC	YES	YES	YES	YES	YES	YES	YES
38	547	TANK HEATING SYSTEM MODIFICATION	GEC	YES	YES	YES	N	YES	N	N
39	622	CORE COOLING USING PORV'S (FEED/BLEED)	RJS	YES	YES	N	N	YES	N	N
40	597	RHR VALVES INTERLOCK	MSK	YES	YES	YES	YES	YES	YES	YES

TABLE 3-2

PDCRs REQUIRING DETAILED EVALUATION

OBS	PDCRNO	TITLE
1	290	REROUTE OF CHARGING PUMP POWER SUPPLY
2	294	RHR PURIFICATION FLOW CONTROL VALVE
3	300	DIESEL SEQUENCING TIMERS
4	306	CONTAINMENT FAN FILTER TIMERS
5	314	VITAL AREA PROTECTION OF CONTROL ROOM
6	326	FIRE SUPPRESSION SYS ADDITONS & MODS
7	332	AUX FEEDPUMP BEARING OIL COOLING SYS
8	333	COMBUSTIBLE GAS DETECTION SYSTEM
9	344	CONTAINMENT ISOLATION RESET MOD
10	347	RCS VENTING SYSTEM
11	368	RCP SEAL WATER SUPPLY
12	371	H20 LEVEL/H2%/PRESS IN CONT TMI 2.1.8
13	380	RCP CCW AND SEAL WATER RETRN ISOLATION
14	384	AUTOMATIC INITIATION AUX FEEDWATER
15	388	PRIMARY VENTILATION STACK SPRAY RING
16	397	PAM AUX MAIN CONTROL BOARD
17	401	SAFETY GRADE AUTO INITIATION AUX FW
18	406	BUILDING MODIFICATION PROJECT
19	418	PORV AND BLOCK VALVE LOGIC MOD TO 2/3
20	436	UPGRADE OF SFB NORTH CRANE (CR-5-1A)
21	443	FLOOD PROTECTION MODS
22	459	REEVALUATION OF SAFETY RELATED PIPING
23	460	HACSS
24	461	NEW RX CAVITY POOL SEAL & NEUT SHIELD
25	486	TERRY TURBINE STEAM CONTROL VALVES
26	513	BORIC ACID LINE RELOCATION
27	592	CHARGING PUMP MODIFICATIONS
28	604	WASTE GAS/H2-N2 SUPPLY
29	626	REPLACE FOXBORO 613DM FW FLOW TRANSMIT
30	634	REPLACE FOXBORO PRESS TRANS PT403 & 404
31	652	SG PRIMARY MANWAY COVER STUD TENSIONER
32	653	VITAL INVERTER CABINET VENTILATION
33	660	SFP HEAT EXCHANGER RELIEF VALVE
34	671	STORAGE OF SPARE CRD'S IN CONT SUMP
35	684	REPLACEMENT OF RCS LOOP RTD'S

TABLE 3-3

LISTING OF JUMPERS/BYPASSES/LIFTED LEADS

OBS	JUMPNO	APPRL	SCREEN	LEAD	FIND	TITLE
1	7	71084	42385	RAC	N	REMOVE RMS-23
2	8	71084	42385	RAC	N	REMOVE RMS-23
3	35	103184	42685	RAC	N	RECORDER FOR PRT LEVEL
4	36	40883	42385	RAC	N	LIFTED LEAD - LOSS OF AC TEST
5	38	90983	42385	RAC	N	EG2A DIESEL ANNUN ALARM RELAY
6	40	122184	42685	RAC	N	ADJUST LEAD & LOG OF PM417
7	42	100184	42385	RAC	N	UPS STATIC INVERTER
8	43	111684	42685	RAC	N	COMBUSTIBLE GAS DETECTORS
9	44	111684	42685	RAC	N	COMBUSTIBLE GAS DETECTORS
10	45	111684	42685	RAC	N	COMBUSTIBLE GAS DETECTORS
11	113	90684	42685	RAC	N	OIL LEVEL ON AIR COMPRESSOR
12	116	81984	42385	RAC	N	OIL LEVEL ON AIR COMPRESSOR

Table 3-4

DEFICIENCIES IN SPECIFIC PLANT DESIGN CHANGES
(Consult Appendix A-6 and CYPDCTG Files for Details)

Deficiency Number	PDCR No. and Title	Deficiency	Category	
1	294 RHR Purification Flow Valve Reach Rod	Piping is not seismically qualified.	Seismic	*
2	300 Diesel Sequencing Timers	Seismic Evaluation of the sequencing timers.	Seismic	
3	306 Containment Fan Filter Timers	No procedure to ensure continued proper functioning of the timers.	Procedural	
4	326 Fire Suppression System	Seismic evaluation of fire suppression system located above safety related equipment.	Seismic	
5		Impact of fire suppression fluids sprayed on safety related equipment.	Design	
6	333 Combustible Gas Detection System	No procedures to establish maintenance and calibration of the system.	Procedural	*
7	344 Containment Isolation Reset Modification	Inadequate training plan and procedures to adequately identify all steps necessary to clear SI/HCP block.	Procedural	
8	347 Reactor Coolant System Venting System	Uncertainty of ability of valves to function with water.	Design	
9		Failure to test valves against full differential pressure.	Testing	

Deficiency Number	PDCR No.	Deficiency	Category	
10	347	Failure of AOP 3.2-22 to utilize revised calculations on venting times.	Procedural	
11	347	Failure to verify actual plug movement in surveillance tests.	Procedural	
12	368 RCP Seal Water Supply Valves	Uncertainty of seismic qualification of the RCP seal water system.	Seismic	
13	371 TMI 2.1.8 Additional Equipment to Follow Course Accidents	Inconsistent procedures as related to calculations.	Procedural	
14	380 RCP Component Cooling Water and Seal Water Isolation Modification	Inadequate dose analysis and Tech. Spec. treatment of charging system outleakage.	Safety Analysis	
15	380	Unevaluated impact of modification as related to reduced containment integrity.	Safety Analysis	
16	380	Inadequate procedures to assure prompt manual valve closure.	Procedural	
17	380	Seismic qualification of isolation valves and associated piping.	Seismic	
18	380	Faulty logic for activation of valve FCV-608.	Design	
19	380	Potential release path from containment via seal return line and relief valve CH-RV-332.	Design	*
20	380	Resolution of CYPDCTG Report "Containment Piping Penetrations".	Design	*

Deficiency Number	PDCR No. and Title	Deficiency	Category	
21	384/401 Automatic Initiation of Aux. Feedwater	Questionable Design Basis Analysis of the AFW system.	Safety Analysis	*
22	388 Primary Vent Stack Ring	Evaluate the means of accomplishing cold reactor shutdown following a seismic event utilizing only seismically qualified and protected equipment.	Seismic	*
23	418 PORV and Block Valve Logic Mod.	Failure to seismically qualify relays and mounting.	Seismic	
24	436 Upgrade of Spent Fuel Building North Crane CR5-1A	Upgrade both fuel handling cranes equipment and QA classifications and refueling manipulator to QA Category I.	Seismic	*
25	443 Flood Protection Modifications	Failure to test or verify adequacy of cooling of service water pumps with flood protective covers in place.	Testing	
26	459 Re-evaluation of Safety Related Piping	Re-evaluate scope of project to ensure safe reactor shutdown to cold conditions following a seismic event.	Seismic	*
27	486 Terry Turbine Steam Control	Inadequate consideration of operability with loss of control air.	Design	
28		Incomplete consideration of error analysis in verifying the capacity of the system.	Testing	
29	592 Charging Pump	Failure to assess impact of change of pump curve on Design Basis Analysis	Safety Analysis	

Deficiency number	PDCR No.	Deficiency	Category	
30	592	Failure to assess degraded voltage operability of main lube oil pump motor.	Design	
31	592	Failure to upgrade several procedures.	Procedural	
32	626 Replacement of Foxboro Feedwater Flow Transmitters	Failure to establish the uncertainty of flow measurement.	Testing	
33	626	Failure to determine seismic adequacy of the Hagen flow transmitters.	Seismic	
34	634 Replacement of Foxboro Pressure Transmitters PT403 & PT404	Failure to seismically qualify instrument tubing.	Seismic	
35	634	Failure to clarify Reg. Guide 1.97 submittal.	Safety Analysis	
36	653 Vital Inverter Cabinet Ventilation	Failure to conduct seismic analysis on cabinets with actual component locations.	Seismic	
37	660 Relief Valve for Spent Fuel Pool Heat Exchanger	Failure to perform complete seismic analysis of service water system.	Seismic	
38	684 Replacement of RCS Loop RTDs	Incomplete review of acceptance limits for the RTDs.	Safety Analysis	*
39	684	Failure to conduct response time tests.	Testing	*

* Identified as action items within the framework of current NU programs prior to CYPDCTG Review.

TABLE 3-5

DESIGN CHANGE PROCESS RECOMMENDATIONS

Number	Type	Recommendation	Page Reference
1	Corrective	Expand scope of controlled documentation to include design bases, classifications, and other information.	
2	Corrective	Improve timeliness and quality of "as built" documentation updating.	
3	Corrective	Provide training on the plant modification process.	
4	Corrective	Revise NEO3.03 to address PDCRs of general scope and PDCRs not completed.	
5	Corrective	Expedite the implementation of NEO8.04.	
6	Corrective	Evaluate the effectiveness of the QA program to ensure compliance with process procedures.	
7	Definition	Develop a more effective definition of "plant design change".	

Number	Type	Recommendation	Page Reference
8	Definition	Perform a technical review of specified categories of Automated Work Orders.	
9	Definition	Develop a simplified means to document plant design changes that are "remote to safety" or "equivalent component".	
10	Definition	Attempt to streamline PDCR process.	
11	Definition	Revise NEO3.03 to prohibit unrelated changes on a single PDCR.	
12	Interface	Provide improved multi-discipline reviews and integration.	
13	Interface	Provide guidance/training on the interface needs/reviews on technical documents.	
14	Completeness	Improve incorporation of system interaction criteria and secondary effects in design changes.	

Number	Type	Recommendation	Page Reference
15	Completeness	Develop controlled documentation for evaluating the impact of location dependent issues (e.g., seismic, fire protection, flooding, EEQ).	
16	Completeness	Develop means to evaluate the cumulative effects of a number of minor changes (e.g, core boring, control board additions).	
17	Procedures	Develop an NEO-level procedure on project descriptions, perhaps elevating GEC Procedure 2.07.	
18	Procedures	Address the recommendations in Table 3-6 on specific procedure changes.	

TABLE 3-6 - PROCEDURE DEFICIENCIES

Procedure	Deficiencies
NEO7.01	Add requirement for the appropriate QC group and the Design group to be responsible for verification of "As Builts".
NEO5.05	Design verification can be performed using independent review, alternate calculation or testing. The procedure should be revised to require a decision and indication of the method of design verification.
NEO7.03	1. Revise to include review and approval of test procedures.
	2. Revise as necessary to include NUSCO managers/supervisors in the Instruction Section to reflect the Responsibility Section.
	3. Clarify the definitions for Retest, Pre-Operation Test, Phase I Test and Phase II test to indicate the distinction between the terms.

Procedure	Deficiencies
	4. Reorder as necessary the substeps in Step 6.3.
	5. Clarify the term "ultimate acceptance".
NEO7.02/3.03	Step 6.2.2.2 of 7.02 specifies walkdown criteria be determined in the PDCR. However, this is not specified in NEO 3.03. Revise either 7.02 or 3.03 to be consistent.
NEO7.02	Define the requirements for a pre-construction meeting that is shown in the flow chart.
NEO7.01	1. Resolve conflict between parallel review specified in step 6.16 and sequential review shown in the flow chart for OUES and QC.
	2. Reword step 6.2.4 to clarify the timing of inspection requirements. The wording implies that inspection is completed prior to approval of work order.

Procedure	Deficiencies
	3. Define Unit Engineer as indicated in step 6.4.
	4. Step 6.16 is performed by the Job Supervisor while the flow chart shows that it is performed by the originator. Resolve this conflict.
NEO7.01,7.02 and 7.03	Resolve conflicting definition of when turnover occurs.
NEO5.15	Develop and release in a timely manner.
NEO5.11	Add documentation indicating whether or not there is an impact on the safety or environment reviews on Figure 7.2.
NEO5.05	Some items do not seem appropriate for the checklist, Figure 7.1. For example, 31, and 32 appear to address questions raised after the document review has been completed. Review each item on the list for appropriateness and revise as necessary.
NEO5.05/3.03	Clarify the application of the design input documentation requirements. For example, refer to NEO5.05 in step 6.2.3.4 of NEO3.03.

TABLE 4-1

Categorization of Concerns from the Screening Review

Category	No.	PDCR #
Seismic	17	290, 294, 306, 326, 332 368, 388, 406, 418, 436 459, 460, 461, 513, 634, 653, 660
Procedures/Testing	4	344, 347, 371, 652
Fire protection/ H_2 Generation and Monitoring	4	314, 333, 604, 671
Aux Feedwater System Design Basis	3	384, 401, 486
Environmental Qualification	2	300, 626
Miscellaneous	5	380, 397, 443, 592, 684
Total	35	

Appendix A-10

Note: The CYPDCTG plans to revise this appendix R J Schmatt 7/26/85

CYPDCTG Disposition of Impell's Recommendations and Observations

1. Safety Classification of Systems and Components

It was observed that there was a lack of safety classification boundaries on the P&IDs. Although the Material, Equipment and Parts List (MEPL) provides a detailed description and listing of safety class equipment, it is extremely difficult to describe a drawing in words. The people who developed the MEPL worked off P&IDs to develop their equipment listing. If P&IDs were marked-up with safety boundaries it would ensure that all required components (except structures) and boundary valve are properly classified. This is especially true with components which interface with several different systems.

Impell Recommendation:

The P&IDs serve as the "basis" for determining component classification, and also serve as a permanent record. When design changes are being contemplated, the P&ID's should provide a reference for the safety classification. For this reason, Impell recommends that safety class boundaries be indicated on all P&IDs.

CYPDCTG Disposition:

The CYPDCTG concurs with Impell recommendation. Included in CYPDCTG Final Report in Section 2.3.2.

2. PMMS

The Project Management Maintenance System is a useful system to plan and schedule equipment checks and preventive maintenance tasks. It is extremely useful for those tasks which are repetitive in nature.

Impell's only concerns with the system are:

a. How the information needed by the system, such as safety class and QC requirements, are input and controlled; and,

b. For non-repetive tasks, or tasks which deviate from the original scope, does the PMMS tend to become a substitute for a PDCR?

Impell Recommendation:

Concern a is further addressed in the AWP Nuclear Indicator, Paragraph 5.4, while concern b is addressed in Paragraph 5.3, AWO versus PDCR.

CYPDCTG Disposition:

a. The CYPDCTG understands that appropriate control procedures are being developed by PMMS program to ensure accurate quality assurance data is inputted into PMMS. The PMMS computer program will be modified such that the QA data cannot be revised without specified controls.

b. The CYPDCTG recommends that PMMS AWD's be utilized in lieu of PDCR's for (a) surveillance and calibration activities and (b) modifications to components remote to satisfy. Criteria for (6) has been conceptualized by the CYPDCTG.

3. AWO Versus PDCR

During our review of the AWOs, it was noted that Station Personnel have varying options of when work should be performed under an AWO or PDCR.

The confusion over what is or is not a maintenance item and what should be treated as a PDCR can be seen in the Maintenance Department. Many of the personnel in the Maintenance Department views the AWO as the authorization to perform a task. In effect, any activity required to complete the task or correct the problem described is authorized by the AWO. The AWO may identify a task to be performed that can obviously be performed under an AWO. However, when the work begins, complications may arise which require some modifications to complete the task. These modifications may have resulted in a design change; however, possible to stop work to issue a PDCR especially if the need for a PDCR is not

perceived under an AWO, even though the AWO does not adequately address the safety and documentation requirements associated with design changes.

This variance supports the need for a "mini" engineering and station review of all design changes and procedures for documentation.

It is our understanding that the purpose of the PDCR is two fold. First, the PDCR serves to ensure that the modification to a system or component does not degrade the margins of safety of the station. Second, it serves to ensure station documents are kept in an up-to-date and as-built status. This second function does not always require the use of a PDCR, if another means is available for this purpose, however, the PDCR does ensure that the documentation changes are prepared early, and receive an adequate review.

INPO Recommendation:

Impell recommends that a detailed procedure be developed to ensure the proper review of the actual work performed and documentation update expected. It should also describe what work can and cannot be performed under an AWO.

CYPDCTG Disposition:

The CYPDCTG concurs with the Impell recommendation. Criteria for use

of AWO's versus PDCR's has been outlined by the CYPDCTG in Section 3.3.3.1. Current NEO procedures provide the mechanism to keep design documentation current.

4. AWO Nuclear Indicators

The AWOs have a section which indicates whether the subject equipment is covered by various plant programs, inspection requirements, or quality assurance programs. There were several instances where Impell felt that the information provided by Nuclear Indicators was incorrect and could result in improper or insufficient Quality Assurance or engineering coverage. These areas have been identified on documentation update sheets.

A more important issue is whether the Nuclear Indicators are used as the basis for determining how a task is to be performed, (i.e. PDCR vs AWO), and whether the information in the Nuclear Indicators is controlled and correct.

Impell Recommendation:

Impell recommends that a review be performed to ensure that the information contained in the Nuclear Indicator Section is correct.

CYPDCTG Disposition:

The CYPDCTG concurs with the Impell recommendation. The CYPDCTG understands that such a verification effort is in progress.

5. PDCR Implementation

The use of PDCRs as a method of ensuring that station modifications will not degrade the safety of the station appears to be quite good. The only problem that was noted was that a once PDCR has been issued for construction, the process for documenting and providing feed-back of field changes to the original design is not always provided. The feed-back mechanism appears to be in place, but the mechanism or responsibility to ensure feedback is not clear and/or not followed.

Impell Recommendation:

Impell recommends that a review of the PDCR procedure be made to focus on the requirements for providing feed-back on field changes. This will become even more important as a result of recent concerns relating to Appendix R, Environmental Qualification, and the P&ID Update Program.

CYPDCTG Disposition:

This feedback is required by NEO 5.11, "Design Change Notices" and the CYPDCTG has recommended that this feedback mechanism also evaluate the impact of the change on the safety evaluation. (See Table 3-6).

6. Equipment and/or Component Replacement

Many Work Permits and Automated Work Orders concerns the maintenance or repair of equipment. Many of these repairs required total replacement or partial replacement of equipment. It was concluded, after investigation and discussion with plant maintenance personnel, that a clear guideline for replacement components is needed. This is most evident in those WPs and AWOs which were written to replace components with non-identical ones. In most cases, the reason for not using an identical item was that it was not in stock and that it could not be obtained in time.

The replacement items are frequency selected based on the following criteria:

a. Availability

b. Physical acceptability for the job. (Proper pressure/temperature rating and can the item be installed with little or no modifications?)

c. Operational experiences. Has this item been reliable? (This is based on direct and indirect experiences)

Some of the engineering concerns are given less review (i.e. seismic, environmental qualification etc). This may be quite reasonable under unanticipated repair conditions, but is not acceptable from the viewpoint of safe operation.

An example of this concern is the safety class steam generator level instrumentation isolation valves. (Note that this information was obtained from the valve list and may not be up to date, but is indicative of the concern). All four valves serve an identical function, one per steam generator.

FW-V-148-1 is a 1" 800#, 850° Vogt globe valve

FW-V-148-2 is a 1" 1500#, 1020° Hancock globe valve

FW-V-148-3 is a 3/4" 600#, 910° Hancock gate valve

FW-V-148-4 is a 3/4" 800#, 850° Vogt gate valve

Impell Recommendation:

The ideal solution is to replace original components with identical components. This would require an extremely large and costly material inventory. However, component inventories are being expanded to meet equipment qualification requirements. Therefore, we recommend that a procedure be developed to identify to plant engineering when other components may be substituted for the existing components. This procedure should address qualification requirements and outline a review and reporting process. Commonly used components, such as welded bonnet valves which may be suitable for replacement of bolted bonnel valves should be qualified prior to their being needed.

CYPDCTG Disposition:

The CYPDCTG concurs with the Impell recommendation. The CYPDCTG has recommended improved controlled documentation of C4 Design Data. This will facilitate the identification of suitable replacement components.

7. Plant Drawing and Document Update

During our review and subsequent physical inspections it became apparent that drawings and supporting documents were not correct and/or up to date. Where we noticed discrepancies, these were recorded and have been turned over the NUSCO. It was noticed, particularly on non-Category I systems, that Work Permits/AWOs sometimes added components such as valves in the service air systems, which were not reflected on the drawings.

Impell Recommendations

A procedure should be developed which will ensure that required documents are updated or as-built for all sources of design changes (AWO, PDCR, etc). This procedure should address both headquarters and station personnel and should establish the appropriate authority for changes or modifications. The procedure should also provide the method for reporting the change and a detailed description of those activities which must be considered a reportable change. Documents that should be covered under this procedure include station drawings, valve and line lists, the MEPL, and the environmental qualification master list.

CYPDCTG Disposition:

The CYPDCTG concurs with the Impell recommendation. Current NEO procedures provide the means to update design documentation. The CYPDCTG has also recommended increased training to ensure procedure requirements are implemented.

8. Furmaniting

Recommendation:

Although Furmaniting has been considered a Category I maintenance task, Impell recommends that a formal technical review be done each time a safety class component is modified for Furmaniting. A review similar to that required by the Furmanite Quality Assurance Manual would be an adequate method. Once a valve has been analyzed for Furmaniting, re-Furmaniting would only require a second technical review if additional holes were drilled.

For items such as feedwater regulatory valves, a conservative analysis could be performed once and any cases within the bounds of the analysis would only require a review which shows that the bounds are not exceeded. All reviews should be documented.

CYPDCTG Disposition:

The CYPDCTG concurs with the Impell observation. The CYPDCTG

recommends the development of a procedure to cover furmaniting.

9. Component Cooling System Classification

The Component Cooling (CC) System is not classified as a Category I system. Our review was based on this fact. Section 3.2.6 (page 2) of the MEPL indicates that the "cooling water and seal water systems or portions of these systems that are required for functioning of reactor coolant system components important to safety, such as reactor coolant pumps," are Category I. However, the detailed system listing in the MEPL does not include the CC System.

The classification of the CC System becomes an issue if RCP seal injection is or becomes a requirement. The ability of the charging pumps to provide continuous seal injection must then be investigated, since the pumps would have to function at low flow conditions (to prevent the RCS from going solid), while recirculation flow cooling (provided by CC) is unavailable.

Impell Recommendation:

Impell recommends that NUSCO review the requirements for seal injection and reactor coolant pump cooling, and determine whether the CC System should be Category I.

Also NUSCO should review the In-Service Inspection Requirements on the CC system since In-Service Inspection Dwg. No. 16103-26045 indicates that

major portions of the CC System are either Safety Class 2 or 3.

CYPDCTG Disposition:

The CYPDCTG concurs with the Impell recommendation. The CYPDCTG has recommended that a review of the component cooling water system be performed in light of reactor coolant pump operation requirements.

10. Primary Water Classification

The Primary Water (PW) System is not classified as a QA Category I system. Our review was based on this fact. The MEPL correctly classifies the auxiliary feedwater system, and demineralized water storage tank (DWST), as Category I. During the Systematic Evaluation Program, the NRC and their consultants performed cooldown calculations which indicated that the plant can be cooled down to the RHR initiation point before the minimum Technical Specification limit of 130,000 gallons of water in the DWST and primary water storage tank (PWST) is expended. Note that PWST water is required to cool down.

Impell Recommendation:

Impell recommends that NUSCO review the design basis of that portion of the PW System which supplies suction to the Auxiliary Feedwater System.

CYPDCTG Disposition:

The CYPDCTG concurs with the Impell recommendation. The CYPDCTG has recommended the performance of such a review in Table 3-4, Deficiency 22.

11. Diesel Generator Heat Exchanger Tube Plugging

There were several Work Permits which resulted in plugging diesel generator heat exchanger tubes. Although the diesels are tested to ensure that they operate satisfactorily after the tube plugging, it is impossible to determine the total number of tubes plugged.

Impell Recommendation:

Impell recommends that the diesel engine coolant heat exchangers be inspected to determine the plugged tube status. A procedure should be established to adequately control plugging tubes both of engine and lube oil heat exchangers to ensure that the diesel generator meets its design basis.

CYPDCTG Disposition:

The CYPDCTG concurs with Impell recommendation. The CYPDCTG has recommended such inspection and procedure development in ____.

REFERENCES

1. Good Practice TS-402, "Plant Modification Control Program", Institute of Nuclear Power Operations, May, 1985.

2. Good Practice OP-202, "Temporary Modification Control", Institute of Nuclear Power Operations, May, 1985.