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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO DETAILED CONTROL ROOM DESIGN REVIEW

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

INTRODUCTION:

The Power Authority of the State of New York (PASNY) submitted its Detailed Control Room Design Review (DCRDR) Summary Report (SR) for the FitzPatrick Nuclear Power Plant on February 28, 1986. The staff, assisted by consultants from Science Applications International Corporation (SAIC) and COMEX Corporation reviewed the SR and conducted a pre-implementation audit at the FitzPatrick site from September 16-18, 1986. PASNY subsequently submitted a letter to the NRC dated April 20, 1987 that addressed further DCRDR activities at FitzPatrick. This report documents the staff's evaluation, thus far, and includes the results of the on-site audit.

EVALUATION

The staff evaluation of the FitzPatrick DCRDR is provided in the following paragraphs. This Safety Evaluation Report (SER) is supported by the attached Technical Evaluation Report (TER) prepared by SAIC. The staff endorses the evaluations, recommendations, and conclusions as presented in the TER.

Establishment of a qualified multidisciplinary review team

On the basis of its audit, the staff concludes that PASNY has established and used a qualified multidisciplinary review team to perform the DCRDR. Confirmatory information (as requested in Attachment 1) should be submitted to fully document that this requirement of Supplement 1 to NUREG-0737 has been satisfied.

Function and task analysis to identify control room operator tasks and information and control requirements during emergency operations

The process used for performing the function and task analysis of the FitzPatrick control room meets the requirements of Supplement 1 to NUREG-0737. However, the staff could not confirm that it is up-to-date, i.e., based on Revision 3 of the Boiling Water Reactor Owner's Group (BWROG) Emergency Procedure Guidelines. The licensee should provide confirmatory documentation that Revision 3 was, indeed, the basis.

Comparison of display and control requirements with a control room inventory

The process used for performing the comparison of control room requirements with a control room inventory meets the requirements of Supplement 1 to NUREG-0737. However, the staff could not confirm that it is comprehensive. The licensee should provide confirmatory documentation that the list of requirements that was compared to the inventory included control and display requirements derived from Revision 3 of the BWROG Emergency Procedure Guidelines.

A control room survey to identify deviations from accepted human factors principles

Based on its audit and a review of the licensee's summary report and April 20, 1987 submittal, the staff concludes that the control room survey process used in the FitzPatrick DCRDR is acceptable and meets the requirements of Supplement 1 to NUREG-0737.

Assessment of human engineering discrepancies (HEDs) to determine which are significant and should be corrected

The assessment process implemented by PASNY is acceptable and meets the requirements of Supplement 1 to NUREG-0737.

Selection of design improvements

Because neither the selection process nor the design improvements were adequately described, the staff could not confirm that this requirement of Supplement 1 to NUREG-0737 has been satisfied. The licensee should provide a more detailed description, as requested in the attached TER.

Verification that selected improvements will provide the necessary correction and will not introduce new HEDs

The licensee's Summary Report provides general statements concerning the use of the control room mock-up for verifying selected design improvements, but does not define and commit to a specific process for verifying that proposed control room modifications correct HEDs and do not introduce new HEDs. Design improvements should be verified as a package, to determine the overall effectiveness of the modifications in improving the operators ability to cope with emergencies. Additionally, operations personnel should be involved in the selection and verification of proposed control room modifications to obtain operator's perceptions and acceptance of the proposed changes. To complete this element of the DCRDR, the licensee should describe a formal process and plant which it will implement to accomplish a rigorous, integrated, verification of design improvements.

Coordination of control room improvements with changes from other Supplement 1 to NUREG-0737 Initiatives

The staff concludes that the licensee has implemented an acceptable program of coordination with two exceptions: (1) the integration of instrumentation that will be modified or added as a result of R.G. 1.97, and (2) operator training. PASNY should address these two items and provide a description of how they have been, or will be, coordinated with the control room improvements as they are implemented.

CONCLUSION

The licensee's Summary Report for FitzPatrick indicated a definite commitment toward conducting a program which will meet the requirements of Supplement 1 to NUREG-0737. Staff review, thus far, indicates that the licensee has completed several of the DCRDR requirements. However, in order to fully satisfy the DRCDR requirements stated in Supplement 1 to NUREG-0737, the licensee should provide responses and resolutions to the items listed in Attachment 1 to the SER.

REFERENCES

NUREG-0700, "Guidelines for Control Room Design," September 1981.

NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980; Supplement 1, December 1982.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 18.1 Rev. 0, September 1984.

Detailed Control Room Design Review Summary Report and Implementation Schedule, New York Power Authority, James A. FitzPatrick Nuclear Power Plant, February 28, 1986.

Letter from Brons, J.C. (NYPA) to Document Control Desk (NRC) dated April 20, 1987.

TECHNICAL EVALUATION REPORT OF THE DETAILED CONTROL ROOM DESIGN REVIEW FOR NEW YORK POWER AUTHORITY'S JAMES A. FITZPATRICK NUCLEAR POWER PLANT

1. INTRODUCTION

The New York Power Authority (NYPA) submitted the Summary Report for its James A. FitzPatrick Nuclear Power Plant Detailed Control Room Design Review (DCRDR) to the Nuclear Regulatory Commission (NRC) on February 28, 1986 (Reference 1). That report was reviewed by Science Applications International Corporation (SAIC) personnel on contract to the NRC. The review led SAIC to recommend a pre-implementation audit of the DCRDR. The pre-implementation audit was conducted September 16-18, 1986. This report documents the evaluation of the DCRDR through the pre-implementation audit stage and includes an evaluation of the revised human engineering discrepancies (HEDs) provided in the April 20, 1987 submittal (Reference 2). The DCRDR however, is not yet complete and will require a further submittal by the licensee and evaluation by NRC.

2. EVALUATION

SAIC has reviewed all information on the FitzPatrick DCRDR available to date. The purpose of the review was to evaluate whether DCRDR requirements in Supplement 1 to NUREG-0737 (Reference 3) had been satisfied. The evaluation was performed by comparing information provided by NYPA with criteria in NUREG-0800, Section 18.1, Rev. 0, Appendix A of the Standard Review Plan (Reference 4). SAIC's evaluation of the DCRDR for FitzPatrick, along with the summary of the criteria from the Standard Review Plan, is provided below.

2.1 Establishment of a qualified multidisciplinary review team

The organization for conduct of a successful DCRDR can vary widely, but the following general criteria are expected to be met. Overall administrative leadership should be provided by a utility employee. The DCRDR team should be given sufficient authority to carry out its mission. A core group of specialists in the fields of human factors engineering, plant operations,

instrument and control engineering, and nuclear engineering are expected to participate with assistance, as required, from other disciplines. Staffing to accomplish each DCRDR element should bring appropriate expertise to bear. Human factors expertise should be included in the staffing for accomplishment of most, if not all, DCRDR elements. Finally, the DCRDR team should receive an orientation which contributes to the success of the DCRDR. Section 18.1, Appendix A, of NUREG-0800 describes criteria for the multidisciplinary review team in more detail.

The audit team determined that the NYPA provided the administrative and managerial leadership for the DCRDR. The core group of team members combined the necessary multidisciplinary skills, including human factors engineering, plant operations, instrument and controls, training, and nuclear engineering. Since resumes of the DCRDR personnel were not submitted in the Program Plan, (Reference 5 and 6) or Summary Report, NYPA should, therefore, provide confirmatory submittals of DCRDR team resumes in a Supplement to its Summary Report. It is the review team's judgment that by providing confirmatory submittal of resumes, NYPA will meet the requirement of Supplement 1 to NUREG-0737 for establishment of a qualified DCRDR team.

2.2 Function and task analyses to identify control room operator tasks and information and control requirements during emergency operations

The purpose of the function and task analyses is to identify the control room operators' tasks during emergency operations and to determine the information and control capabilities the operators need to perform those tasks. An acceptable process for conducting the function and task analyses is:

1. Analyze the functions performed by systems in responding to transients and accidents in order to identify and describe those tasks operators are expected to perform.

2. For each task identified in Item 1 above, determine the information (e.g., parameter, value, status) which signals the need to perform the task, the control capabilities needed to perform the task and the feedback information needed to monitor

task performance. Displays and controls are not identified at this stage. Operator tasks have been identified and described. The information and control capabilities necessary to perform those tasks are being determined.

3. Analyze the information and control capabilities in Item 2 above to determine those characteristics essential to adequate task performance. Information characteristics include parameter type; dynamic range; setpoints; resolution/accuracy; speed of response; units; and need for trending, alarming, etc. Control characteristics include type (discrete or continuous), rate, gain, response requirements, locking functions, and feedback information associated with control use.

The described process is prescriptive. It should identify, in detail, what operators need to do in order to control the systems which mitigate the consequences of transients and accidents. It should also identify an appropriate functional interface between the operators and those systems. In addition to their use in the DCRDR, the function and task analyses should provide the basis for complete and technically adequate emergency operating procedures (EOPs). Identification of tasks and necessary information and control capabilities should be based on engineering analyses and should be independent of displays and controls in the control room.

General Physics Corporation was contracted to perform the system functions and task analyses. Much of the work was carried out in the contractor's facility, thereby ensuring independence from the control room. The prime source of information used by General Physics to identify system functions was the training department system description in the Final Safety Analysis Report (FSAR). The operator tasks which must be performed during emergencies were based on plant-specific EOPs. These tasks were, in turn, based on the Boiling Water Reactor Owners' Group Emergency Procedure Guidelines (BWROG EPGs). NYPA however, did not specify in writing which revision of the EPGs was used. Reference 7 from the NRC states that Revision 3 of the BWROG EPGs should be evaluated during the DCRDR. NYPA should identify in writing which revision was used.

The task analysis worksheets designed by General Physics documented the information and control requirements needed to perform the EOP task steps (Reference 8). The relevant characteristics associated with each task step were recorded on the task analysis worksheets. This included parameter type, range, set points, units of measure, type of switch, controller, indicator, and reset devices. The task steps, information and control requirements necessary to perform those tasks and the characteristics essential to the task performance were developed solely by General Physics, independent of the control room.

In summary, the review team concluded that the licensee's process used for conducting the function and task analysis was acceptable, however, if the task analysis did not include EPG Revision 3, it is not complete. NYPA should provide NRC with a confirmation that operator tasks performed during EPG Revision 3 procedures were included in the DCRDR task analysis process.

2.3 Comparison of display and control requirements with the control room inventory

The purpose of comparing display and control requirements with a control room inventory is to determine the availability and suitability of displays and controls required for performance of the EOPs. Success of this element depends heavily on the quality of the function and task analyses and on the comprehensiveness of the control room inventory. Display and control requirements should be derived from analyses which are sufficiently detailed to support development of complete and technically adequate EOPs. Characteristics appropriate to the task should be described for each display and control need identified by the function and task analyses. The control room inventory should be a complete representation of displays and controls currently in the control room. The inventory should include characteristics of current displays and controls appropriate to meaningful comparison with the results of the function and task analyses. Once an adequate control room inventory is developed, a systematic comparison of information and control capability requirements with existing controls and displays should be made. Displays and controls determined to be unavailable or unsuitable should result in documented HEDs.

General Physics constructed a full-scale photographic mock-up of the inner ring panels of the control room. This was used as a control room inventory, except when the EOP steps required the operator to use instruments or controls located on back panels. For these cases, the availability and suitability of existing instruments and controls was verified in the actual control room.

The information and control capability requirements contained in columns 3 and 4 of the task analysis worksheets were compared during walk-throughs in the mock-up. Both availability and suitability were verified. HEDs were discovered by this process.

In addition to the above comparison of display and control requirements with the control room inventory, General Physics personnel used control room operators to walk through the four scenarios which they developed to validate control room functions. Both slow-time and real-time walk-throughs were performed. In cases where the operator could not execute an EOP step, an HED was written. Videotapes of these walk-throughs were produced. These tapes were used to perform a link analysis. This showed the sequence of operator tasks and gave insight into control room staffing, traffic patterns, and instrument and control distribution. The link analysis did not result in any HEDs.

It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for a comparison of display and control requirements to the control room inventory until they confirm that BWROG EPG Revision 3 operator task needs have been compared to the inventory.

2.4 A control room survey to identify deviations from accepted human factors principles

The key to a successful control room survey is a systematic comparison of the control room with accepted human engineering guidelines. One accepted set of human engineering guidelines is provided by Section 6 of NUREG-0700 (Reference 9). Discrepancies between the control room and human engineering guidelines should be documented as HEDs.

The control room was first surveyed in 1981 using the BWR Owners' Group checklist. The NRC Generic Letter 83-18 states that this is acceptable if the supplemental checklist is also used (Reference 10). NYPA conducted a separate survey in 1983 using the BWR Owners' Group survey supplemental checklist. This survey included resurveying post-1981 modifications to the control panels. During its audit of September 16-18, 1986, the NRC pre-implementation audit team conducted a sample survey of the control room and concluded that the surveys performed by NYPA in 1981 and 1983 did not conform to survey guidance such as that of NUREG-0700.

Evidence of the inadequacy of prior survey efforts included the following findings: (1) hierarchical labeling was not considered; (2) related controls and displays located on vertical and sloping panels were not integrated by the use of mimics, demarcation, or color padding; (3) unused controls and displays had not been removed; (4) operator aids, prompts, and labels installed by operators were used throughout the control room; (5) plant conventions regarding switch positions were violated, but not written as HEDs; and (6) labels with white letters on a black background were chosen instead of black on white.

In order to address the survey concerns identified by the NRC audit team, NYPA submitted, on April 20, 1987, a revised summary of engineering discrepancies and descriptions of proposed modifications. This submittal provides evidence that HEDs, both generic and specific, have been written regarding mimics, demarcation, color coding, hierarchical labeling, general labeling, temporary labeling, and operator aids. It is the review team's judgment that NYPA meets the requirement of Supplement 1 to NUREG-0737 for a control room survey to identify deviations from accepted human factors principles.

2.5 Assessment of HEDs to determine which are significant and should be corrected

HEDs should be assessed for significance. The potential for operator error and the consequence of that error in terms of plant safety should be systematically considered. Consideration of the combined effects of HEDs on operator performance should be specifically included in the assessment process (e.g., the control room survey identifies a number of HEDs related

to a particular display--all of those HEDs may affect the operator's ability to read that display). The result of the assessment process is a determination of which HEDs should be corrected because of their potential impact on plant safety. Decisions on whether HEDs are significant in terms of potential impact on plant safety should not be compromised by consideration of such issues as the means and potential cost of correcting those HEDs.

Reference 11, Report GP-R-212197 of September 12, 1986, and the NYPA Summary Report describe the methodology used in dividing the HEDs into the following four categories: Category I - HEDs associated with documented errors; Category II - HEDs associated with potential or interactive errors; Category III - HEDs associated with low probability errors of serious consequences; Category IV - nonsignificant HEDs.

The NYPA DCRDR team met in the control room photo mock-up to make their assignments to categories by consensus. It was an analysis by expert personnel. Examination of the documents which describe the methodology for establishing the criteria for the categorization of HEDs shows that safety, possible operator confusion, consequences, and the possibility for one HED to cause an error precipitating an additional error(s) were all given consideration by the group of experts who met to reach consensus regarding criteria selection and subsequent HED categorization. It is the review team's judgment that the assessment process was logical and of sufficient scope to meet the requirement of Supplement 1 to NUREG-0737.

2.6 Selection of design improvements

The purpose of selecting design improvements is, as a minimum, to correct safety-significant HEDs. Selection of design improvements should include a systematic process for developing and comparing alternative means for resolving HEDs. Both enhancement and design modification may be considered. The selection of design improvements should work to bring the control room into agreement with acceptable human factors engineering guidelines. Existing control room conventions (explicit or implicit) should be documented and reviewed for completeness of application and for conflicts between conventions and with accepted human factors engineering guidelines. HEDs may be resolved by application of existing or revised control room conventions. HEDs may also be resolved by explicit new control room con-

ventions which should be developed and documented as part of the DCRDR process.

Reference 12, Report GP-R-212198 of September 12, 1986, entitled "Conceptual Designs and Documented Bases for Design Selection Recommended for Control Room Modifications to Resolve Human Engineering Discrepancies (HEDs)," describes a two-phase process in which the HEDs were placed in ten disposition categories. The first phase involved recommendations by General Physics' human factors engineers. These recommendations were presented to the entire DCRDR team for review, discussion, modification and finalization. The resolution categories are (1) demarcation; (2) labeling; (3) color coding; (4) scale modification; (5) relocation; (6) modification; (7) EPIC (Emergency and Plant Information Computer); (8) review; (9) no change recommended; and (10) deleted.

Most of the above categories are self-explanatory, but some require more detailed description. The "modification" category involves the addition of new equipment as well as the modification of existing equipment. The "EPIC" is a computerized information system which includes the Safety Parameter Display System (SPDS) (one display only). It is a non-1E system which will eventually replace the existing plant process computer. It provides a great deal of information to the operator; however it is not yet installed and factory acceptance tests have not been completed. The "deleted" category generally contains HEDs which were generated during the system function and task analyses from EPGs which were not applicable to the FitzPatrick plant.

NYPA submitted to NRC a "Revised Implementation Schedule for Detailed Control Room Design Review Control Room Enhancement Program" on April 20, 1987 (Reference 2). In this report, NYPA states that they must reschedule the completion of the control room enhancement program from June 1987 to December 1989 for final completion of the program. This program is intended to resolve 177 HEDs which were assigned to one of the following seven categories: demarcation, labeling, color coding, scale modification, standards, procedures, and miscellaneous. Since none of these HEDs were assigned to HED Assessment Category I, (HEDs associated with documented errors), it is the review team's judgment that the revised implementation schedule for these HEDs is acceptable.

The April 20, 1987 NYPA DCRDR submittal included a description of special study programs that were still in progress and summaries of corrective actions that were not detailed enough to evaluate. NYPA should submit to NRC a description of the proposed corrective actions resulting from the special studies and more detailed information regarding the modifications and schedules for HEDs listed in Section 4.0 to this report.

It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for selection of design improvements. In order to meet this requirement, NYPA should submit the supplemental DCRDR information listed in Section 4.0 of this report.

2.7 Verification that selected improvements will provide the necessary correction

A key criterion of DCRDR success is a consistent, coherent, and effective interface between the operator and the control room. One good way to satisfy that criterion is through iteration of the processes of selection of design improvements, verification that selected design improvements will provide the necessary correction, and verification that improvements will not introduce new HEDs. The verification processes should be completed prior to implementation of design improvements in the control room. Exceptions might be workspace/environmental HEDs for which "final verification" (i.e., final adjustment) may have to await implementation of the design improvement in the control room. Techniques for the verification process might include partial resurveys on mock-up panels, applied experiments, engineering analyses, environmental surveys and operator interviews. Each iteration of the selection and verification process should reduce inconsistencies in the operator-control room interface while increasing the coherence and effectiveness of that interface. The consistency, coherence and effectiveness of the entire operator-control room interface is important to operator performance. Thus, evaluation of both the changed and unchanged portions of the control room is necessary during the verification processes.

The licensee's Summary Report states that the control room mock-up will be used to verify that changes do not introduce new HEDs "where appropriate and feasible." The NRC audit team however, had several questions concerning the utility's verification efforts. NYPA did not make clear the extent to which

it intended to use the mock-up to verify that the proposed solutions would correct HEDs and not introduce new HEDs. The decision to maintain the mock-up in an up-to-date configuration and to use it as a design, verification, and or training aid had not been formalized at the time of the audit. Secondly, the utility has not described how it intends to verify HED solutions. Thirdly, the utility has not described the process by which it will verify that proposed corrections can be resolved by its EPIC system. Generally, the NRC does not accept non-1E indications for information required by EOP steps. Neither the EPIC system nor the SPDS are 1E at FitzPatrick.

It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement to verify that its proposed HED solutions will actually correct the HEDs and not introduce new HEDs.

2.8 Verification that the control room improvements do not introduce new HEDs into the Control Room

NYPA has not provided NRC with a description of the process for verifying that the proposed DCRDR modifications do not introduce new HEDs into the control room. It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for verification that the proposed DCRDR modifications do not introduce new HEDs.

2.9 Coordination of control room improvements with changes from other programs such as the Safety Parameter Display System (SPDS), operator training, Reg. Guide 1.97 instrumentation, and upgraded Emergency Operating Procedures

Improvement of emergency response capability requires coordination of the DCRDR with other activities. Satisfaction of Reg. Guide 1.97 requirements and the addition of the Safety Parameter Display System (SPDS) necessitate modifications and additions to the control room. The modifications and additions should be specifically addressed by the DCRDR. Exactly how the modifications are addressed depends on a number of factors including the relative timing of the various emergency response capability upgrades. Regardless of the means of coordination, the results should be integration of Reg. Guide 1.97 instrumentation and SPDS equipment into a

consistent, coherent, and effective control room interface with the operators.

2.9.1 Reg. Guide 1.97 and the Safety Parameter Display System

Improvement of emergency response capability requires coordination of the DCRDR with other activities. Satisfaction of Reg. Guide 1.97 requirements and addition of the SPDS will require modifications and additions to the control room. Those modifications and additions should be specifically addressed by the DCRDR. Exactly how they are addressed will depend on a number of factors, including the relative timing of various emergency response capability upgrades. Regardless of the means for coordination, the result should be the integration of Reg. Guide 1.97 instrumentation and SPDS equipment into a consistent, coherent, and effective control room interface with the operators.

The licensee's Summary Report discusses the interrelationship of other improvement programs that were generated due to the BWROG survey program and BWROG EPGs, including the symptomatic EOPs and the SPDS. However, the Summary Report does not provide a coordination plan for the Reg. Guide 1.97 program.

In order to meet the coordination requirement of Supplement 1 to NUREG-0737, NYPA should describe, in writing, how it intends to integrate instrumentation requirements of Reg. Guide 1.97.

2.9.2 Upgraded EOPs

Ideally, coordination of the DCRDR with the upgrade of the EOPs should begin with a detailed task analysis which supports both areas of concern. The result of coordinating the DCRDR with upgrade of the EOPs should be a control room which supports complete and technically adequate EOPs.

NYPA adequately described in its Summary Report how the DCRDR and the EOPs were coordinated. The BWROG EPGs were used as the basis for the EOPs. Also, the DCRDR task analysis used the BWROG/EPRI/DOE function analysis of the BWROG EPGs as the basis for the task analysis. Thus, the EOP program was integrated into the DCRDR program.

2.9.3 Training

There are two aspects to coordination of the DCRDR with training. One is the use of training to resolve HEDs. The other is to familiarize operators with control room modifications and enhancements, which may be fairly extensive. The result should be operators who are thoroughly familiar with their revised control room interface and who have the specific knowledge necessary to deal with HEDs which are appropriately resolved by training. Training is not discussed by NYPA. Thus NYPA fails to comply with the Supplement 1 to NUREG-0737 coordination requirement. In order to meet the requirements of Supplement 1 to NUREG-0737, NYPA should address how the training program is used to resolve any HEDs and how it is familiarizing operators with extensive control room-wide modifications and enhancements.

3. CONCLUSIONS

Based on a review of NYPA's FitzPatrick Nuclear Power Plant, DCRDR documentation and a Pre-implementation audit, it is the review team's judgment that NYPA meets three of the nine Supplement 1 to NUREG-0737 requirements. The reviewer's conclusions are listed below in terms of the Supplement 1 to NUREG-0737 requirements.

1. It is the review team's judgment that NYPA meets the Supplement 1 to NUREG-0737 requirement for establishment of a qualified multidisciplinary review team.

2. It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for a comprehensive system function and task analysis. In order to meet the requirement, NYPA should assure the NRC that the Revision 3, Emergency Procedure Guideline tasks have been subjected to the DCRDR task analysis. The specific procedures involved in this concern are:

   - Secondary Containment Control.
   - Radioactivity Control.

3. It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for a comparison of display

and control requirements to the control room inventory until they confirm that BWROG EPG Revision 3 operator task needs have been compared to the control room inventory.

4. It is the review team's judgment that NYPA meets the Supplement 1 to NUREG-0737 requirement for a control room survey to identify deviations from accepted human factors principles.

5. It is the review team's judgment that NYPA meets the Supplement 1 to NUREG-0737 requirement for an assessment of HEDs to determine which are significant and should be corrected.

6. It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for selection of design improvements. In order to meet the requirement, NYPA should:

   - Provide the results of special HED modification studies (see Supplemental Information Required for list of studies).

   - Provide revised modification descriptions for the HEDs identified by the NRC DCRDR pre-implementation audit team. See Supplemental Information Required for the specific HEDs included in this concern.

   - Provide additional justifications for leaving safety significant HEDs uncorrected or partially corrected. See Supplemental Information Required for the specific list of HED concerns identified by the audit team.

   - Provide additional descriptive information regarding fifteen safety significant or EOP-related HEDs to be corrected on the EPIC system. See Supplemental Information Required for specific HEDs included in this concern.

   - Provide a current schedule for implementation of remaining DCRDR modifications.

7. It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for verification that the proposed modifications correct the HEDs. In order to meet the requirement, NYPA should provide NRC with a documented procedure outlining the verification process.

8. It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for verification that the proposed modifications do not introduce new HEDs. In order to meet the requirement, NYPA should provide NRC with a documented procedure for verifying that control room modifications do not introduce new HEDs into the control room.

9. It is the review team's judgment that NYPA does not meet the Supplement 1 to NUREG-0737 requirement for coordination of control room improvements with changes from other programs, such as Safety Parameter Display System, operator training, Reg. Guide 1.97 instrumentation and upgraded EOPs. In order to meet this requirement, NYPA should provide NRC with a documented description of how Reg. Guide 1.97 requirements and training programs are coordinated with DCRDR at FitzPatrick.

4.0 SUPPLEMENTAL WORK NEEDED TO COMPLY WITH SUPPLEMENT 1 TO NUREG-0737

1. Provide resumes of DCRDR review team members (confirmatory documentation).

2. Confirm that task analysis was conducted in accordance with Revision 3 of the BWOG EPGs. This includes:

   - Secondary Containment Control Procedure
   - Radioactivity Control Procedures

3. Document that BWOG Revision 3 EPG tasks, and information and control requirements, which were identified during the task analysis, were compared to the control room inventory in the evaluation of instrumentation availability and suitability.

4. Document the control room modifications resulting from the following special studies:

HED #	REVIEW DESCRIPTION	PANEL
124, 132, 134, 214	Feasibility and cost of replacing 96 square push button switches for feedwater and turbine systems controls.	9-6, 9-7
129	Operational significance of inadvertent tripping of 52 controls located on apron panel edge and recommended corrective action and estimate cost.	ALL
228, 420 422	Feasibility, optimum layout, and cost of relocating 33 turbine main generator indicators, controls and recorders.	9-7
425	Feasibility and cost of single push-button initiation for RCIC, HPCI and core spray.	N/A
143, 355	Extent of lighting glare on instruments, and the scope and cost of possible solutions.	N/A
246, 342, 349, 350, 400	Extent of high ambient noise and the scope, cost, and feasibility of possible solutions. Study to include detectability of audible alarms and impact of paging system.	N/A
234, 235 245	Feasibility, scope, and cost for annunciator arrangement considering consistency, and logic for trips, warnings, diagnostics, status indication, prioritization.	ALL
247	Determine desirability, feasibility, and cost of converting annunciator control system from two button to four button system.	ALL

5. Document the revised HED modifications for the following HEDs discussed during the pre-implementation audit.

   HEDs 437, 452 and 43 indicated the necessity for drywall temperature indication to be installed or duplicated on a front panel - these actions are planned.

   HED 450 - the April 20, 1987 submittal shows that the audit team recommendation that justification should also include loss of vacuum to indicate loss of circulating water has not been heeded.

   HED 181 - the submittal shows that the audit team suggestion has not been heeded.

   EPIC solutions for HEDs - the submittal shows no changes in justifications for using non-1E equipment for safety - EOP related HEDs. HED 416 has, however, been corrected.

   HED 140 - the submittal shows that the various indicators discussed will be changed so that if EOPs reference gauge pressure, the indicators will also read in gauge pressure.

   HED 129 - the submittal shows that alternative resolutions are being studied.

   HED 247 - the submittal gives no indication of action relating to the audit team suggestion.

   HED 220 - the submittal still indicates "No Change" resolution category.

   HED 117 - the submittal shows that labels will be provided to define the safety relief valve control function.

6. Document revised justifications for leaving the following safety-significant HEDs uncorrected or partially corrected.

Category II and III HEDs with unsatisfactory justification for no correction:

HED 172 (Category II)
HED 220 (Category II)
HED 252 (Category II)
HED 296 (Category II)
HED 320 (Category II)
HED 352 (Category III)
HED 353 (Category III)

7. Provide additional descriptive information regarding safety-significant and EOP-related HEDs being corrected by the EPIC Program.

HED 162	HED 261	HED 391
HED 180	HED 263	HED 392
HED 197	HED 369	HED 439
HED 215	HED 372	HED 452
HED 250	HED 382	HED 455

8. Provide current schedules for implementation of remaining DCRDR HED modifications.

9. Document the process used by NYPA to verify that the proposed modifications correct the HEDs.

10. Document the process used by NYPA to verify that the control room modifications do not introduce new HEDs into the control room.

11. Document how the DCRDR program was integrated and coordinated with:

    - Operator Training
    - Reg. Guide 1.97 Instrumentation and Modifications

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2. Letter JPN-87-022 to NRC Document Control Desk, April 20, 1987.

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4. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 18.1, Rev. 0, September 1984.

5. Detailed Control Room Design Review Program Plan, New York Power Authority, J.A. FitzPatrick, October 1983.

6. Supplement to DCRDR Program Plan, New York Power Authority, J.A. FitzPatrick, August 1983.

7. Memo for V.A. Moore, NRC, from S.H. Weiss, NRC. Subject: "Meeting Summary - Task Analysis Requirements of Supplement 1 to NUREG-0737, May 4, 1984, Meeting with BWR Owners' Group Emergency Procedure Guidelines and Control Room Design Review Committees," May 14, 1984.

8. JAF DCRDR Project Report, "Task Analysis," General Physics Report to NYPA, GP-R-212196, September 1986.

9. NUREG-0700, "Guidelines for Control Room Design Review," U.S. Nuclear Regulatory Commission, September 1981.

10. Memo from D.G. Eisenhut to Boiling Water Reactor Licensees of Operating Reactors, Applicants for an Operating License, and Holders of Construction Permits. Subject: NRC Staff Review of the BWR Owners' Group (BWROG) Control Room Survey Program (Generic Letter 83-18), April 19, 1983.

11. JAF DCRDR Project Report, "Methodology for Prioritizing HEDs," General Physics Report to NYPA, GP-R-212197, September 1986.

12. JAF DCRDR Project Report, "Conceptual Designs and Documented Bases for Design Selection Recommended for Control Room Modifications to Resolve HEDs," General Physics Report to NYPA, GP-R-212198, September 1986.

13. JAF Human Engineering Discrepancy Record, NYPA, undated.

14. Responses to Agenda Items Prepared for the NRC Audit of the JAF for the DCRDR, NYPA, September 1986.

15. NUREG-0660, Vol. 1, "NRC Action Plan Developed as a Result of the TMI-2 Accident," U.S. Nuclear Regulatory Commission, May 1980, Revision 1, August 1980.

16. NUREG-0737, "Clarification of TMI Action Plan Requirements," U.S. Nuclear Regulatory Commission, November 1980.