ATTACHMENT TO
SAFETY EVALUATION

EVALUATION OF THE DETAILED CONTROL ROOM DESIGN REVIEW SUMMARY REPORT FOR OYSTER CREEK NUCLEAR GENERATING STATION

Supplemental Technical Evaluation Report

May 20, 1985

Prepared for:

U.S. Nuclear Regulatory Commission
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FOREWORD

This Supplemental Technical Evaluation Report (STER) was prepared by Science Applications International Corporation (SAIC) under Contract NRC-03-82-096, Technical Assistance in Support of NRC Licensing Actions: Program III. The evaluation was performed in support of the Division of Human Factors Safety, Human Factors Engineering Branch (HFEB). This report includes the SAIC evaluation of the following documents and activities: the licensee's Summary Report (Reference 1); the Program Plan (Reference 2); the Supplement to the Summary Report (Reference 5); the meeting of November 1-2, 1984 (Reference 3); and the on-site Pre-Implementation Audit (Reference 4).

TABLE OF CONTENTS

EVALUATION OF THE
DETAILED CONTROL ROOM DESIGN REVIEW
SUMMARY REPORT
FOR OYSTER CREEK NUCLEAR GENERATING STATION

This report documents the Science Applications International Corporation (SAIC) evaluation of the Summary Report of the Detailed Control Room Design Review (DCRDR) submitted to the Nuclear Regulatory Commission (NRC) by GPU Nuclear Corporation (GPUN) for the Oyster Creek Nuclear Generating Stationon April 30, 1984 (Reference 1). This evaluation also considers information obtained from the previously submitted Program Plan (Reference 2). Further information regarding DCRDR activities was acquired at a meeting held between GPUN and the NRC on November 1-2, 1984 (Reference 3). (Some of the types of exhibits viewed during the meeting are shown in Appendix A.) Additional information relevant to the DCRDR was obtained during a pre-implementation audit held on November 28, 1984 (Reference 4). Findings from both of these meetings also were considered in assessing GPUN's Summary Report as was documentation submitted in a Supplement to the Summary Report submitted to the NRC on April 8, 1985 (Reference 5). This report supersedes our earlier report dated July 20, 1984.

Results of the SAIC evaluation follow a brief overview of the background leading up to preparation and submission of the Summary Report by the licensee.

BACKGROUND

Licensees and applicants for operating licenses are required to conduct a Detailed Control Room Design Review. The objective of the review is to "... improve the ability of nuclear power plant control room operators to prevent accidents or cope with accidents if they occur by improving the information provided to them" NUREG-0660, Item I.D.1 (Reference 6) . The need to conduct a DCRDR was confirmed in NUREG-0737 (Reference 7), and the requirements to be met in such a review were contained in Supplement 1 to NUREG-0737 (Reference 8). Guidelines for conducting a DCRDR are provided in NUREG-0700 (Reference 9) while NUREG-0800 (Reference 10) presents the evaluation criteria for use by the NRC.

The DCRDR requirements as stated in Supplement 1 to NUREG-0737 can be summarized in terms of nine specific issues, a list of which provides a convenient outline of the areas covered in this technical evaluation. The nine issues include:

1. Establishment of a qualified multidisciplinary review team.

2. Use of function and task analyses to identify control room operator tasks and information and control requirements during emergency operations.

3. A comparison of display and control requirements with a control room inventory.

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

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

6. Selection of design improvements that will correct these discrepancies.

7. Verification that selected design improvements will provide the necessary correction.

8. Verification that improvements can be introduced in the control room without creating any unacceptable human engineering discrepancies.

9. Coordination of control room improvements with changes resulting from other improvement programs such as SPDS, operator training, new instrumentation (Reg. Guide 1.97, Rev. 2), and upgraded emergency operating procedures

A DCRDR is to be conducted according to the licensee's own Program Plan (which must be submitted to NRC); according to NUREG-0700, it should address the previously stated requirements and be conducted in accordance with the

following four phases: (1) planning, (2) review, (3) assessment, and (4) reporting. The product of the last phase is a Summary Report which must include an outline of proposed control room changes, their proposed schedules for implementation, and summary justification of human engineering discrepancies with safety significance to be left uncorrected or partially corrected. Upon receipt of the licensee's Summary Report and prior to implementation of proposed changes, the NRC must prepare a Safety Evaluation Report (SER) indicating the acceptability of the DCRDR (not just the Summary Report). The NRC's evaluation encompasses all documentation as well as briefings, discussions, and audits if any were conducted.

The Summary Report submitted for evaluation by GPU Nuclear describes completed tasks and findings from a control room design review which was initiated in late 1980 at Oyster Creek prior to the issuance of the DCRDR requirements stated in Supplement 1 to NUREG-0737 and the methodology suggested in NUREG-0700 or other appropriate guidance. A control room mock-up was constructed, and in early 1981 guidelines and objectives were formulated to provide a framework for the control room design review. A major review of the alarm system was undertaken, and other planned modifications affecting plant controls and displays were subjected to human factors evaluation. Review of the control room as a whole was conducted between 1982 and 1983 and included preparation of a Program Plan and analysis of tasks associated with executing symptom-oriented emergency operating procedures.

PLANNING PHASE

1. Preparation and Submission of a Program Plan

The Program Plan submitted for Oyster Creek showed that GPUN met many of the basic objectives for conducting a control room design review. Many of the elements of a review specified in Supplement 1 to NUREG-0737 had been addressed. However, specific areas of the work were not described in sufficient detail to provide assurance that the licensee understood the processes necessary to complete the tasks and therefore meet the requirements. The results of the evaluation of the GPU Nuclear Program Plan are detailed in Reference 11.

The licensee's Program Plan included a brief description of the staffing and management that were established to conduct the control room design review. From additional information provided by GPUN in the Summary Report, it appears that the structure and management of the DCRDR were flexible enough to permit a multidisciplinary effort. Overall direction of the review was provided by GPUN. More specifically, management of the DCRDR was the responsibility of GPUN's Director of Systems Engineering and Manager of Plant Analysis.

2. Structure and Qualifications of a Multidisciplinary Review Team

A competent and relevant multidisciplinary team was established to conduct the control room design review. The team included GPUN staff, personnel from MPR Associates, and human factors consultants. The resumes provided indicate that the expertise of the review team included:

- System Engineering
- Reliability and Risk Analysis
- Human Factors Engineering
- Operations Analysis
- Instrumentation and Control
- Chemical Engineering
- Electrical Engineering
- Mechanical Engineering
- Nuclear Engineering.

GPU Nuclear outlined the degree of involvement of MPR and consultants and provided personnel assignments. It appears that participating organizations and individuals were qualified for DCRDR tasks for which they were responsible. GPUN was responsible for overall direction of the review. GPUN staff participated in almost all review activities to some extent. GPUN acted as contract manager for MPR and the human factors consultants, set the review schedule, integrated the review and corrective actions with plant activities, and scheduled correction of discrepancies. MPR developed the review's framework, coordinated review phases, and drafted report findings. The human factors consultants participated in development of review guidelines, engaged in walk-throughs, and assisted in the evaluation of deficiencies.

The review team, as established, appears to have had freedom to carry out the review and access records, information, and facilities as needed. The team apparently also had the ability to acquire support from other administrative staff and specialists as needed. Other staff involved in the review are mentioned by specialty (systems engineer/safety analysis staff, shift technical advisors, operating staff, etc.); however, resumes for these individuals were not provided. Overall, GPUN did assemble a team which was qualified to carry out the requirements of Supplement 1 to NUREG-0737.

3. Coordination of the DCRDR with Other Improvement Programs

The licensee's Program Plan indicated an intent to comply with the coordination requirements of the NRC and awareness of the potential disruption of the control room and complications to operator training that may result from an uncoordinated implementation plan of corrective actions. In order to facilitate coordination of programs and to ensure that the high standards established during the DCRDR are maintained, future modifications to the control room such as the Safety Parameter Display System and instrument modifications for compliance to Regulatory Guide 1.97 will be subject to procedures which integrate human factors reviews into the design process. The procedures are supported by a full-time human factors staff. The process and procedures are described in the licensee's Summary Report (Reference 1, pp. I.3-I.4). The process and procedures have been already applied to design of the Remote Shutdown Panel.

During the November 1-2, 1984 meeting, GPUN staff and MPR consultants specifically described additional interfaces of the DCRDR with other NUREG-0737, Supplement 1 improvement programs. For example, Revision 2 of the BWROG Technical Guidelines was used to formulate plant-specific EPGs. GPUN then conducted a task analysis procedure to help generate its EOPs. The EOP activity was coordinated with the DCRDR using an interactive process involving walk-throughs, rewrites, and validation. Operator training of EOPs also was part of this process.

As a result of discussions which took place at the pre-implementation audit (Reference 4), GPUN agreed to document the use of their proposed computer-driven CRT to correct a group of 26 HEDs. Because the computer is not a safety-grade device, GPUN stated that they could not use it as the

sole display of parameters necessary for the execution of EOPs. However, in their Supplement to the Summary Report, GPUN did not describe how it intends to integrate the use of the computer/CRT and the existing equipment when executing EOPs. Does GPUN plan to re-write portions of the EOPs, upgrade training, or take other measures which apply to the HEDs in Group V?

In conclusion, with the exception of the above-mentioned concern, it appears as though GPUN did coordinate control room design improvements with changes from other programs. Furthermore, GPUN has implemented an ongoing review process and associated procedures which integrate a human factors review into the design of all future modifications to the control room. This process is supported by a full-time human factors staff. This should ensure continued integration and coordination of the DCRDR with other improvement programs and therefore fulfill the NUREG-0737, Supplement I requirement.

REVIEW PHASE

GPU Nuclear Review Phase plans and activities included:

1. Review of operating experience
2. Review of operator functions and responsibilities
3. Review based on plant procedures and walkthroughs
4. Function and task analysis
5. Control room inventory
6. Control room survey.

To some extent, the above activities are those recommended by NUREG-0700 guidelines as contributing to the review phase objectives. Activities 4, 5, and 6 contribute to the accomplishment of specific DCRDR requirements contained in Supplement 1 to NUREG-0737. Activities 2 and 3 permitted a review and validation of operating procedures and provided data relevant to the assessment phase of the project. Activities 2, 3, and 4 are discussed together in the System Function and Task Analysis section to follow.

1. Review of Operating Experience

A review of operating experience is not explicitly required by Supplement 1 to NUREG-0737. However, it is an activity recommended by NUREG-0700 guidelines as contributing to the accomplishment of review phase objectives.

As described by GPU Nuclear in the Program Plan, its review of operating experience included: (1) a review of Licensee Event Reports and internal plant records on reactor trips and other events to ensure that problems actually encountered in Oyster Creek's operation were identified and factored into the control room review; (2) a review of Nuclear Power Experience summaries; (3) conduct of a formal opinion survey of control room operators to identify strengths and weaknesses of the control room; and (4) the acquisition of solicited and unsolicited information from operators during walk-throughs.

From information provided in submitted documentation and at meetings, it appears that GPUN performed an operating experience review consistent with the guidelines provided in NUREG-0700. Both BWR plant and industry-wide reports were reviewed and documented as part of the DCRDR activities. The majority of plant operators and training personnel were interviewed formally during the data collection phase of the operating experience review. Operations input was also gathered informally during walk-throughs.

2. System Function and Task Analysis

Supplement 1 to NUREG-0737 states that the licensee is required to perform a "function and task analysis (that had been used as the basis for developing emergency operating procedures) to identify control room operator tasks and information and control requirements during emergency operations." In other words, the objective of the task analysis is to establish the input and output requirements of control room operator tasks. These information and control requirements are then to serve as benchmarks for examination of the adequacy of control room instrumentation, controls, and other equipment.

For licensees choosing to use the Boiling Water Reactor Owners' Group (BWROG) control room survey program, the NRC has issued Generic Letter 83-

18, clarifying some task analysis requirements (Reference 12). A further memorandum, issued by the NRC on May 14, 1984, has defined the requirements for performing a task analysis when the licensee uses the BWROG emergency procedure guidelines (Reference 13). This latter position was considered in this evaluation of GPUN's task analysis activities and is summarized below:

- It appears that Revision 3 of the General Electric Corporation Emergency Procedure Guidelines (EPGs) provides a functional analysis that identifies, on a high level, generic information and control needs. However, these EPGs do not explicitly identify the plant-specific information and control needs which are necessary for preparing emergency operating procedures and determining the adequacy of existing instrumentation and controls.

- Because plant-specific information and control needs cannot be extracted directly from the EPGs, plant-specific analysis is required.

- Each licensee and applicant must describe the process used to identify plant-specific parameters and other plant-specific information and control capability needs and must describe how the characteristics of the needed instruments and controls will be determined. These processes may be described in either the Procedure Generation Packages or the DCRDR Program Plan with appropriate cross-referencing.

- For each instrument and control used to implement the emergency operating procedures, there should be an auditable record that defines the necessary characteristics of the instrument or control and the basis for that determination. The necessary characteristics should be derived for analysis of the information and control needs identified in the NRC-approved EPGs and from analysis of plant-specific information.

GPU Nuclear's methodology for performing the function and task analysis was described in both its Program Plan and Summary Report submittals. Additional information was acquired at the meeting held between the licensee and the NRC. GPUN started its original system function and task analysis (SF&TA) activities in 1980 by conducting walk-throughs of 1980 off-normal and normal procedures in a full-scale control room mock-up. GPUN has more recently completed an SF&TA using new symptom-oriented EOPs. This evalua-

tion focuses on this latter effort as Supplement 1 to NUREG-0737 specifies that the SF&TA be used as a basis for developing the new EOPs and for conduct of the DCRDR.

As described by the licensee at the meeting, GPUN began the process of implementing the symptom-oriented EOPs in 1983. In order to comply with Generic Letter 83-18, GPUN converted the BWROG Technical Guidelines (EPGs) Revision 2 into plant-specific technical guidelines or "first-cut" procedures by analyzing plant systems and components to determine needed parameters, safety limits, etc. The process involved determination of functions and tasks required of operators during emergency conditions and thei r information needs and control functions. GPUN stated that these "first-cut" procedures were not tailored to the displays and controls installed in the Oyster Creek control room at that time. The procedures were subjected to a number of iterations. Walk-throughs and training exercises were conducted in the mock-up and Dresden simulator. Although the Dresden simulator does not replicate the Oyster Creek control room, these activities provided some degree of verification and validation that the EOPs could be implemented in the Oyster Creek control room.

The determination of instrument and control characteristics was the result of a number of activities including the iteration of EOP development, the EOP walk-throughs, and a desk-top analysis of system functions and operator tasks required during emergency conditions. Information on the characteristics of controls and displays to meet operator needs also resulted from walk-throughs to evaluate the suitability of existing equipment. In a separate effort, GPUN staff evaluated the availability and suitability of instruments in the control room using a survey approach. Existing characteristics such as meter ranges, scales, need for zone banding, upper and lower units, setpoints, etc., were examined critically.

The SF & TA activities including EOP development and EOP walk-throughs resulted in a verification that controls and displays already in the control room supported tasks required by the EOPs. Many of the processes described by GPUN also emphasize the validation of the compatibility of the procedures, manning, and training with the control room for the accomplishment of emergency tasks. However, since data collection forms were not provided for the review, i.e., there is no audit trail, it is not possible to

evaluate fully the scope and breadth of the analysis of information and control needs and characteristics required.

In summary, GPUN has complied partially with the four points discussed in the NRC memo of May 14, 1984 (Reference 13). With regard to the first two points, the memo referred to Revision 3 of the BWROG EPGs as providing a function analysis. Since GPUN used Revision 2, the two emergency procedures, secondary containment and radioactivity release control, have been omitted from the system function and task analysis activities to date. As documented in the Supplement to the Summary Report , these procedures will be developed during the next refueling outage at Oyster Creek, which will commence in 1985. With regard to the second two points in the memo, GPUN has not provided a comprehensive description of the task analysis and has not provided an example of an auditable record which defines the necessary characteristics of each instrument and control used to implement the EOPs and the basis for that determination.

In conclusion, GPUN seems to have performed a system function and task analysis activities which partially comply with the NRC requirement. In order for the NRC to evaluate fully the degree to which the system function and task analysis meets the requirements of Supplement 1 to NUREG-0737, GPUN should:

1. Provide written documentation of those processes it has described at meetings to determine information and controls required for emergency operations and their requisite characteristics. This is necessary because GPUN has not provided an example of an auditable record which defines the necessary characteristics and basis for the determination of each instrument and control used to implement all of the BWR EOPs.

2. Write EOPs for the two remaining emergency procedures; namely, secondary containment control and radioactivity release control. The GPUN should carry out a system function and task analysis for these procedures using prescriptive task analysis techniques. The process used should be documented, and an example of completed task analysis worksheets including the identification of display and control characteristics should be submitted.

3. Control Room Inventory

The licensee's stated objective for this task was to identify all instrumentation, controls, and equipment within the control room. GPUN's inventory is based on photographs used for a mock-up which include all components with which the operator interfaces. This includes all main control panels and visual annunciators for alarms. The actual inventory is contained in a set of reproducible drawings which includes radiation monitoring panels. The compilation of the inventory appears to be complete.

The compiled inventory was used by the licensee in several phases of the control room design review. During the review of operator functions and responsibilities, the inventory was used to verify that the operator could perform required duties. Similarly, the inventory was used to verify that tasks implicit in the symptom-oriented EOPs could be accomplished. The inventory also was used as an integral part of the control room survey effort. The availability and suitability of displays and controls were determined primarily during the walk-throughs in which the needed control and display characteristics, although not documented, were compared with the inventory.

Supplement 1 to NUREG-0737 requires the comparison of control room control and display characteristics with information and control requirements derived from a function and task analysis. GPUN has not yet provided a written description of how required display and control characteristics were identified independently of the control room during the task analysis. Furthermore, the comparison of control and display characteristics with those determined from the task analysis needs to be accomplished for Revision 3 of the EPGs, and an auditable record maintained. Not until these data are provided, can a full evaluation of the inventory task be completed.

4. Control Room Survey

GPUN conducted a survey of control room components to identify any characteristics of instruments, equipment, layout, and ambient conditions that did not conform to good engineering practice. The survey included: (1) a panel review (controls, displays, panel layout, process computer displays); (2) survey of alarm systems; and (3) survey of control room

environment (ambient conditions, lighting, sound, workspace, communications, etc.).

Survey results were obtained by reviewing photographs of panel components from the inventory. Measurements and observations were made in the control room itself, as necessary. These results were then compared with detailed human engineering guidelines prepared for the Oyster Creek control room. These guidelines, shown in Appendix A of the Program Plan, were developed from guidelines contained in MIL-STD-1472B (Reference 14) and human engineering references such as VanCott and Kinkade (Reference 15) and Woodson and Conover (Reference 16). The development of such guidelines was necessary as GPUN conducted its survey of Oyster Creek prior to the issuance of the NRC DCRDR guidelines (NUREG-0700).

It appears from both discussions with GPUN and a review of documentation that the control room survey was comprehensive in that it included all primary control panels. The Remote Shutdown Panel was not surveyed as it is currently under construction and evaluation. The actual survey instrument used by the licensee was not included in its submittals and was not reviewed at the meeting (Reference 3). Thus, although it is clear that a control room survey was conducted as required by NUREG-0737, Supplement 1, a review of the actual survey instrument used by GPUN would have provided greater confidence in the comprehensiveness and rigor of the survey effort.

ASSESSMENT AND IMPLEMENTATION PHASE

GPUN's assessment and implementation phase is addressed in Section V of the Program Plan. Section IV of the Summary Report provides a summary of conclusions, and Section V describes the corrective action plan to resolve discrepancies uncovered by the review. A summary of review findings is included in Tables V-I and V-II of the Summary Report.

1. HED Assessment Methodology

GPUN's control room review resulted in the identification of roughly 1000 HEDs. Some 20 deficiencies related to the control room environmental issues. One hundred sixty-eight deficiencies were generated by the review

of operator tasks and over 800 deficiencies were uncovered by the detailed survey of the control room hardware.

HEDs identified during the review were assessed to determine whether corrective action needed to be taken. The fundamental criteria were (1) the likelihood that a deficiency would lead to an operator error; and (2) the impact that such error on the plant would be significant. These criteria are appropriate and imply consideration of operational safety. The licensee also included plant availability and potential for equipment damage as secondary criteria.

HEDs were prioritized individually or generically by review team consensus into one of three categories based on likelihood of operator error and impact of such error on the plant. Categories were defined as follows:

Importance Category A - a deficiency that may impair an operator's performance under off-normal conditions.

Importance Category B - a deficiency that violates one or more human factors guidelines used in the review but is unlikely to lead to an irreversible operator error in an off-normal situation or can lead to operator error under normal conditions and/or generic deficiencies that individually are not likely to degrade performance seriously, but taken together can be significant.

Importance Category C - a deficiency which is unlikely to affect operator performance under any condition, or a deficiency for which solutions are not clear cut.

Scheduling of the corrective action for each deficiency initially was accomplished by placing each deficiency into one of five categories. Scheduling ranged from corrective actions to be taken at the earliest opportunity (Category 1) to accomplishing the correction either as conveniently as possible or after the 1987 refueling outage (Category 4). HEDs corrected during the course of the review process were placed in Category 5, "already corrected." Revised schedule categories were provided in the Supplement to the Summary Report. This scheduled established three categories for completion of evaluation and/or HED implementation. Pending GPUN's

completion of the evaluation and NRC's receipt of the proposed corrective actions, it will be possible to complete a review of the licensee's scheduling and implementation of corrective actions.

GPUN's HED assessment activity satisfies the requirements of NUREG-0737, Supplement 1 to determine which HEDs are significant and should be corrected. Discussion at the meeting (Reference 3) indicated that a multidisciplinary group consensus process involving human factors consultants, operators, MPR personnel and GPUN staff was used to assess HEDs individually and in aggregate for their potential plant safety consequences. The output of this evaluation was safety-significant HEDs to be analyzed for design improvements. Consistent with NUREG-0700 guidelines, several groups of HEDs, including HEDs considered to warrant no corrective action, were subjected to a detailed evaluation.

2. Selection of Design Improvements

Overall, it appears that the selection of design improvements was an integral part of the DCRDR performed at Oyster Creek. A number of factors were considered by the review team in selecting design improvements. Examples of these factors include: (1) relative effectiveness of the action to correct the problems; and (2) relative practicality of implementing the action promptly. Possible alternative design improvements examined by the licensee were changes or additions to control room hardware and administrative actions such as procedural changes or training. As a result of the selection process, the licensee stated that the vast majority of identified HEDs were considered correctible through hardware change. Only about 15% of the deficiencies warranted procedural change. Based on this combination of verbal and written information, the audit team believes that the process implemented and the criteria used by GPUN to select design improvements to resolve HEDs satisfy the requirement of Supplement 1 to NUREG-0737.

3 and 4. Verification That Selected Design Improvements Will Provide the Necessary Correction and Verification That Improvements Can be Introduced in the Control Room Without Creating Any Unacceptable Human Engineering Discrepancies.

The licensee did implement a process to verify that design improvements would provide the necessary correction without introducing new problems. All corrective actions were subjected to a human factors review and normal plant approval requirements for any changes to the existing configuration, documentation, and training. As previously mentioned, the licensee has developed a program that requires human factors reviews for both the conceptual and final designs of all control room modifications. System engineers and I&C personnel also review design cha...

All corrective actions which involved changes in configuration were incorporated on the full-scale mock-up. Walk-throughs were conducted with operating staff to confirm that the operators' response had been improved and that no new problems had been introduced. Thus, the licensee has met these requirements of Supplement 1 to NUREG-0737.

ANALYSIS OF PROPOSED DESIGN CHANGES AND JUSTIFICATION FOR HEDS WITH SAFETY SIGNIFICANCE TO BE LEFT UNCORRECTED OR PARTIALLY CORRECTED

Licensees are required by Supplement 1 to NUREG-0737 to submit an outline of proposed design changes, including their proposed schedules for implementation and a summary justification for HEDs with safety significance to be left uncorrected or partially corrected.

Results of the DCRDR, categorized into seven groups, were included in the Summary Report for Oyster Creek. A preliminary evaluation of the findings resulted in the identification of numerous HEDs, solutions, and/or schedules that were too ambiguous or briefly described to permit assessment. Many of these HEDs were discussed by GPUN at the November 1-2 meeting (Reference 3). The remaining HEDs provided the focus for the pre-implementation audit held on November 28, 1984, and were discussed in the Supplement to the Summary Report.

The following are the results of the SAIC evaluation of proposed corrections and justifications for no correction. The evaluation considered documentation provided in the Summary Report and Supplement and in verbal information provided by the licensee at the meetings and audit. This review will retain the numbering scheme used by the licensee in the Supplement to the Summary Report to group HEDs. Each discrepancy is numbered sequentially within each group.

All the HEDs listed below require further evaluation by the licensee. Schedules for evaluation were provided by the licensee in the Supplement to the Summary Report. The licensee needs to describe proposed modifications as appropriate and provide a schedule for implementation in a future Supplement to the Summary Report.

Group I: HED No. 1-16
Group II: HED No. 21, 42, 49, 56, 66, 67, 69, 70, 71, 74, 75
Group IV: HED No. 17, 37, 39, 43, 45, 58, 59, 60, 61, 62, 63, 64
Group VI: HED No. 10, 12

GROUP VII: No Action Required or Deficiency Corrected

This group contained both HEDs that had been corrected and those HEDs that were assessed as requiring no action. Corrective actions already completed were found to be adequate as were justifications and reasons provided for not correcting HEDs.

CONCLUSIONS AND RECOMMENDATIONS

We conclude that GPUN's control room design review activities completed to date satisfy most of the requirements specified in NUREG-0737, Supplement 1. However, three of the requirements have been been partially satisfied. The following is a summary of our comments on GPUN's compliance with each of the NUREG-0737, Supplement 1 review steps and requirements.

- It appears that a qualified multidisciplinary team was established to conduct the DCRDR activities.

- A review of operating experience was conducted consistent with NUREG-0700 guidelines and objectives.

- The licensee's SF&TA included determination of functions and tasks in an iterative fashion and analysis and walk-throughs of Revision 2 of the BWROG updated EOPs. GPUN needs to provide written documentation of those processes it has described at meetings to determine information and controls required for emergency operations and their requisite characteristics. Prior to the implementation of Revision 3 of the EPGs, GPUN should carry out a system function and task analysis for these procedures using prescriptive task analysis techniques. The process used should be documented, and an example of completed task analysis worksheets, including the identification of display and control characteristics, should be submitted.

- The inventory by itself, as represented by a full-scale mock-up and reproducible drawings, is satisfactory. GPUN has not provided a written description of how required characteristics were identified independently of the control room. Therefore it is not possible to evaluate their comparison to the inventory. In addition, GPUN needs to conduct this comparison for Revision 3 of the EPGs.

- A human factors survey of the control room was conducted in what appears to be a thorough manner. GPUN used guidelines which it derived from several sources. It appears that the control room survey was conducted as required by Supplement 1 to NUREG-0737.

- The process GPUN described to assess the significance of HEDs fulfills the requirements of Supplement 1 to NUREG-0737.

- The process implemented and criteria used by GPUN to select design improvements to resolve HEDs fulfill the requirement of NUREG-0737, Supplement 1.

- The licensee implemented a process to verify that improvements could be introduced into the control room without creating new HEDs.

- From information provided at a meeting and in documents submitted, the audit team concluded that the licensee is satisfying the requirement to coordinate control room improvements with changes resulting from other improvement programs.

- GPUN has corrected many identified HEDs. Some, however, have not been corrected at this time. The licensee should provide proposed modifications and/or implementation schedules for those HEDs previously identified in this report.

REFERENCES

1. "Summary Report on the Oyster Creek Control Room Design Review," GPU Nuclear, NRC Accession Number 8405150216, April 1984.

2. "Program Plan for the Control Room Human Factors Review at Oyster Creek Nuclear Generating Station," GPU Nuclear, June 1983.

3. Meeting held between the NRC and GPUN at MPR offices, Washington, D.C. November 1-2, 1984.

4. Pre-Implementation Audit held on November 28, 1984.

5. "Supplement to Summary Report on Oyster Creek Control Room Design Review." GPU Nuclear, April 1985.

6. 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.

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

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

10. NUREG-0800, "Evaluation Criteria for Detailed Control Room Design Review," U.S. Nuclear Regulatory Commission, October 1981.

11. Memo from W.T. Russell, Division of Human Factors Safety, to G.C. Lainas, Division of Licensing, Subject: "Review of Oyster Creek Nuclear Generating Station Detailed Control Room Design Review Program Plan Submittal," February 1, 1984.

12. NRC Staff Review of the BWROG Control Room Survey Program (Generic Letter 83-18), April 19, 1983.

13. Memo to Voss Moore from S. Weiss, May 14, 1984. Subject: Meeting summary of task analysis requirements for the BWR Owners Group.

14. Military Standard MIL-STD-1472B, Human Engineering Design Criteria for Military Systems Equipment and Facilities, Department of Defense, Washington, D.C., December 1974.

15. VanCott, H.P. and Kinkade, R.G., Editors, "Human Engineering Guide to Equipment Design," Revised Edition, Government Printing Office, 1972.

16. Woodson, W.G., and Conover, D.W., "Human Engineering Guide for Equipment Design," University of California Press, 1964.

LIST OF ATTENDEES
OYSTER CREEK MEETING

NOVEMBER 1-2, 1984

Name	Organization
Ann Ramey-Smith	NRC/HFEB
John Stokley	SAIC
Bonnie Rusinek	GPU
Jack Donahue	NRC/DL
Rafael J. Gramatges	WESC/GPU
Michael Laggart	GPUN
Pat Walsh	GPUN
Herb Estrada	MPR
Gary Broughton	GPUN
Carol Kain	SAIC

LIST OF ATTENDEES
OYSTER CREEK PRE-IMPLEMENTATION AUDIT

NOVEMBER 18, 1984

Name	Organization
Ann Ramey-Smith	NRC/HFEB
C. J. Cowgill	SRI/OC
B. Rusinek	GPU
P. S. Walsh	GPUN
M. W. Laggart	GPUN
Herb Estrada	MPR Assoc.
T. G. Broughton	GPUN
Charles J. Haughney	Comex (NRC Contractor)
Ellen Levine	SAIC
Jack Donahue	NRC/DL

APPENDIX A

The following is a description of some of the exhibits displayed and reviewed during the November 1-2, 1984 meeting between GPUN and the NRC:

- Materials used for the review of operating experience including extracts of LERs and Operator Opinion Survey.
- Program Plan.
- Annotated guidelines used as checklist in control room survey.
- Sample flow charts of EOPs including prototype procedure diagrams for containment control and an overview matrix.
- Copy of "first-cut" procedures including the present (approved) version of EOPs.
- GPU checklist of instrument characteristics for EOPs.
- Correspondence related to verification of procedures.
- Sample documentation of alarm system modification, including before/after photos of alarm panels, various mock-ups used for development of alarm modification, and before/after sample of alarm response procedures.
- Drawing of 8F/9F including sample label plates.
- Before/after photo of core spray logic.