IN-PROGRESS AUDIT

OF THE

DETAILED CONTROL ROOM DESIGN REVIEW

FOR

IOWA ELECTRIC LIGHT AND POWER COMPANY'S

DUANE ARNOLD ENERGY CENTER

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Prepared by:

Science Applications International Corporation
1710 Goodridge Drive
McLean, Virginia 22102

Prepared for:

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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FOREWORD

This report documents an in-progress audit of the Detailed Control Room Design Review (DCRDR) being conducted by Iowa Electric Light and Power Company (IEL&P) for its Duane Arnold Energy Center (DAEC). The audit was conducted by a team comprised of two representatives of the U.S. Nuclear Regulatory Commission, two representatives from Science Applications International Corporation (SAIC), and one representative from Comex Corporation (a subcontractor to SAIC). SAIC's participation was provided under Contract NRC-03-82-096, Technical Assistance in Support of Reactor Licensing Actions: Program III. SAIC had previously provided the NRC an evaluation of IEL&P's Program Plan.

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BACKGROUND

Iowa Electric Light and Power Company (IEL&P) submitted a Detailed Control Room Design Review (DCRDR) Program Plan for Duane Arnold Energy Center (DAEC) by letter dated November 30, 1984 (Reference 1). Science Applications International Corporation (SAIC), assisting the United States Nuclear Regulatory Commission (USNRC) staff in their review of the IEL&P Program Plan, submitted an evaluation of the DAEC Program Plan (Reference 2) to the staff on January 29, 1985. USNRC comments on that Program Plan were forwarded to IEL&P on February 13, 1985 (Reference 3).

Based on review of the Program Plan, the NRC staff planned an in-progress audit of the Duane Arnold DCRDR. A tentative in-progress audit agenda (Attachment A) was sent to IEL&P by letter dated March 11, 1985 (Reference 4). The audit was arranged through the NRC Project Manager for Duane Arnold, and was scheduled for March 18-21, 1985. The purpose of the audit was to clarify the review methodology and to audit documentation of the review to date. The objective was to compare the process of the DAEC DCRDR with the DCRDR requirements of Supplement 1 to NUREG-0737, and to provide feedback to the licensee on the acceptability of the review being conducted. The emphasis of the NRC audit team's efforts was on those areas of the Program Plan where there was a lack of information provided and where the methodologies proposed were inadequate. The audit included review of DCRDR documentation, visits to the control room and remote shutdown panel, and discussions of IEL&P's plans to complete the DCRDR.

The audit team was comprised of two representatives from the USNRC (one of whom served as the team leader), two consultants from SAIC, and a consultant from Comex Corporation. The disciplines of human factors engineering, systems engineering, and nuclear operations were represented on the team.

Attachment B provides complete lists of attendees at the entrance and exit briefings.

This report documents the findings of the in-progress audit. It was compiled by SAIC with input from Comex Corporation.

DISCUSSION

As a requirement of Supplement 1 to NUREG-0737 (Reference 5), the applicants and licensees are required to submit a Program Plan that describes how the following elements of the DCRDR will be accomplished. They are:

1. Establishment of a qualified multidisciplinary review team.

2. 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.

7. Verification that improvements will provide the necessary corrections.

8. Verification that improvements will not introduce new HEDs.

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

Licensees are expected to complete Element 1 during the DCRDR's planning phase, Elements 2 through 4 during the DCRDR's review phase, and Elements 5 through 8 during the DCRDR's assessment and implementation phase. Completion of Element 9 is expected to cut across the planning, review, and assessment and implementation phase.

At the time of the Duane Arnold audit, the DCRDR team had finished the planning phase of the DCRDR. The review, assessment and implementation, and reporting phases had not yet been initiated. Following a brief entrance meeting with the licensee on March 18, 1985, in which the audit schedule was finalized, the NRC audit team and representatives of the DAEC DCRDR team proceeded to address an agenda that reviewed the NUREG-0737 Supplement 1 DCRDR elements.

The NRC audit team's review and evaluation of the DCRDR elements was accomplished through briefings by IEL&P personnel, discussions with the IEL&P DCRDR team members, discussions with the licensee's human factors consultant (Stone and Webster Engineering Corporation), and reviews of completed documentation from the original 8WROG control room survey conducted at DAEC. The NRC audit team performed a limited survey of the Duane Arnold control room in order to compare their results with those obtained by the IEL&P survey teams during the original 1980 BWROG survey. Following these sessions, an exit briefing was held on March 21, 1985, in which the NRC audit team presented the licensee with the principal audit findings. The following comments are arranged according to the above-listed elements and describe the strengths and weaknesses of the Duane Arnold DCRDR project as determined during the audit.

Establishment of a qualified multidisciplinary review team.

The organization for conduct of a successful DCRDR can vary widely, but is expected to conform to some general criteria. 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 for each technical task should bring appropriate expertise to bear. Human

factors expertise should be included in the staffing for most, if not all, technical tasks. Finally, the licensee should develop an orientation program for the personnel selected for the DCRDR team. Section 18.1, Appendix A, of NUREG-0800 describes evaluation criteria for the multidisciplinary review team in more detail.

The IEL&P DCRDR team organization was found to be as described in the Program Plan (pp. 9 and 10). The administrative structure of the DCRDR was found to consist essentially of two entities: the Director of Nuclear Generation and the review team. The ultimate responsibility for the DAEC DCRDR lies with the IEL&P Director of Nuclear Generation. However, the day-to-day conduct of the review will be the responsibility of the review team established specifically for this DCRDR. Management oversight during the progress of the review is from the individual team member's supervising line management. The review team will be responsible for planning, scheduling, coordinating, and performing the DCRDR effort on a daily basis. The review team's in-house staff is primarily made up of representatives of the Mechanical/Nuclear Generation Division and is being managed, as a project, under the aegis of that organization. The Review Team Leader will provide the administrative and technical direction for the review team and will be responsible for integrating the results from the three task team evaluation efforts (i.e., Task Analysis, Operating Experience Review, Control Room Survey) into a final Summary Report. Although the structure of the review team will vary for different project activities, the staffing appears to reflect the demands of the technical tasks and the resources needed by the team. The mix of specialists selected for the core team include representatives from:

- Human factors engineering
- Plant operations
- Instrumentation and controls engineering
- Design engineering.

These disciplines are represented in all DCRDR team activities. Human factors expertise is primarily furnished by consultants with adequate credentials. The review team, as originally constructed and primarily because of its emphasis on the control room survey, did not include a qualified nuclear engineer. The licensee's representatives made it clear

that nuclear engineers in the IEL&P organization would be made available if required. Following an explanation of the task analysis methodology by the audit team, the licensee appeared to have a better understanding of the benefits from having a nuclear engineer as a full-time participant of the team.

In addition to representatives from the above disciplines, the core groups will be supplemented with specialists from other fields, as required, such as electrical engineering, mechanical engineering, training, computer operations, procedures, licensing, health physics, and emergency preparedness. Any additional specialists (e.g., acoustics, lighting) required for specific tasks also will be available to the review team as needed. With the addition of a nuclear engineer to the core team, the audit team feels that the qualifications of all review team members appear to be adequate.

At the time of the audit, the review team's responsibilities were limited to the operating experience review, control room survey, task analysis, and discrepancy assessment phases of the DCRDR. The audit team's conclusion after discussion with IEL&P personnel was that the DCRDR approach would be stronger if the scope of the review team's responsibilities were expanded to ensure that the review team is involved in all DCRDR activities, including: the assessment of safety significance for HEDs, the solution of design improvements, verification that selected improvements will provide the necessary correction, and verification that improvements will not introduce new HEDs.

Responsibilities for each review team member were provided in the DAEC Program Plan (pp. 11-13). However, information covering specific task assignments and the levels of effort proposed for each team member were not. Upon inquiry, the review team provided the audit team with two handouts which listed the discipline emphasized for each of the review processes proposed for the DCRDR. After examining the handouts, the audit team concluded that extensive use of human factors specialists during the planning phase and throughout all portions of the review would be necessary to ensure that the DCRDR is conducted from the proper human factors perspective.

On page 13 of the Program Plan, IEL&P commits to an orientation program for DCRDR team members. The program, similar to the one implemented as part of the original 8WROG survey, will be designed to ensure that the team members share a basic understanding of the DCRDR before they begin their review. The orientation will also familiarize the team with the principles of human factors engineering, and acquaint each team member with the other disciplines represented on the team. However, to ensure that the human factors objectives for the DCRDR are met, and to ameliorate the apparent inadequacies of the Program Plan regarding the DCRDR activities and the scope of the review team's responsibilities, a more formal orientation program is recommended. The program may be expanded to include procedures for accomplishing each aspect of the DCRDR, as well as the methodologies that will be used during the conduct of the procedures. Task plans, detailing the approach and methodologies for each element of the DCRDR, could be developed by human factors specialists and distributed to all members of the review team. The addition of the above activities to the orientation program will contribute significantly toward a basic understanding of the DCRDR by all team members.

Conclusion

The NRC audit team found the qualifications of the core team members adequate to support a successful DCRDR effort. However, to comply fully with NUREG-0737, Supplement 1, several deficient items must be resolved. The assignment of a qualified nuclear engineer to the review team, the involvement of all review team disciplines in all DCRDR activities, and refinement of the task assignments and levels of effort for each member of the review team will be necessary for the complete satisfaction of this requirement.

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

The purpose of the function and task analysis (F&TA) is to identify the control room operators' tasks during emergency operations and to determine the information and control requirements the operators need to perform those tasks. One acceptable process for conducting the function and task analysis is:

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

2. For each task identified in Item 1 above, determine the information requirements (e.g., parameters such as feedwater flow, steam generator pressure) that signal the need to perform the task and the control capabilities needed to perform the task. Displays and controls are not identified at this stage. Operator tasks should be identified and described, and the information and control requirements necessary to perform those tasks should be determined.

3. Analyze the information and control requirements identified in Item 2 above to determine those characteristics essential for adequate task performance. Instrument characteristics include dynamic range, setpoints, precision/accuracy at which the readings must be made (e.g., ± 5), speed of response to the operation of associated controls, units (e.g., PSIG, GPM), and the need for trending, alarming, etc. Control characteristics include type (discrete or continuous); the control operation if the control type needed is discrete (e.g., detented versus spring-loaded, momentary contact positioning); positions (e.g., OPEN and CLOSE, START and STOP); rate; gain and response requirements; locking functions; and feedback information associated with control use.

The described process is <u>prescriptive</u>. It should identify, in detail, what operators need to do in order to control the systems that mitigate the consequences of transients and accidents. In addition to its use in the DCRDR, the F&TA should be the basis for complete and technically adequate EOPs. Identification of tasks and necessary information and control requirements should be based on engineering/operations and human factors analyses and be independent of displays and controls currently in the control room.

As stated in Supplement 1 to NUREG-0737 (Para. 5.1.b.ii), the F&TA that is used to provide the basis for developing emergency operating procedures, technical guidelines and plant-specific emergency operating procedures (i.e., the new function-oriented EOPs) also should provide the basis for

identifying control room operator tasks and information and control requirements during emergency operations. Following this advice, DAEC's F&TA will be based on the symptom-oriented EOPs developed previously to the DCRDR using the Boiling Water Reactor Owners Group (BWROG) Emergency Procedure Guidelines (EPGs) as the review basis.

On May 4, 1984, representatives of the NRC met with representatives of the BWROG Emergency Procedure Guidelines (EPG) and Control Room Design Review (CRDR) Committees to discuss the task analysis requirements of Supplement 1 to NUREG-0737. The purpose of the meeting was for the Owners Group to discuss how the EPG development effort and the DCRDR program addressed operator information and control needs, and for the staff to determine any additional analyses or documentation needed for review of applicant and licensee submittals on the Detailed Control Room Design Review and Emergency Procedure Generation Package.

The findings from that meeting were summarized in an NRC memorandum dated May 14, 1984 (Reference 6). Basically, the contents of that memorandum stated:

1. "...That Revision 3 of the EPG 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.

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

3. "Each licensee and applicant must describe the process used to identify plant-specific parameters and the plant-specific information and control capability needs, and must describe how the characteristics of needed instruments and controls will be determined..."

4. "For each instrument and control used to implement the EOPs there should be an auditable record that defines the necessary characteristics of the instrument or control and the bases for that determination..."

The DAEC task analysis will be accomplished using the symptomatic emergency operating procedures as a starting point. These EOPs were developed from the plant-specific Emergency Procedure Guides which in turn were developed from the BWR Owner's Group generic Emergency Procedure Guides. The EOPs that have been approved reflect Revision 2 to the Owner's Group Guides. They are presently undergoing a rewrite to conform to Revision 3 that adds additional emergency procedures for Secondary Containment Control and Radioactivity Release Control. This rewrite will be approved in time for these revised procedures to be utilized in the task analysis. The approved EOPs and drafts of the Rev. 3-based procedures were reviewed to ensure their adequacy for use in the task analysis. The procedures reviewed were:

EOP 1, RPV CONTROL (RC), Rev. 0 10/15/84

EOP 2, PRIMARY CONTAINMENT CONTROL (PCC), Rev. 0 10/15/84

EOP 3, SECONDARY CONTAINMENT CONTROL (SCC), Rev. A-2 1/21/85 (a lettered revision denotes a working revision of a nonapproved procedure).

EOP 4, RADIOACTIVITY RELEASE CONTROL (RR), Rev. A 1/21/85

EOP 6, SHUTDOWN OUTSIDE CONTROL ROOM (SD), Rev. C 2/8/85 (this procedure was reviewed; but the Review Team did not, at the time of the audit, intend to include the Remote Shutdown Panel in the DCRDR).

EOP C, OPERATOR CAUTIONS, Rev. 0 10/15/84 (this procedure is primarily used as a training aid but is filed with the other EOPs).

The audit team review indicated that the above procedures will provide an adequate basis for the conduct of the task analysis, as the review team intends to follow the steps in the emergency procedures that lead them into normal plant operating procedures. The references to normal plant operating

procedures found in the EOPs are quite extensive, thereby allowing a very thorough task analysis to be conducted. It should be noted, however, that the EOPs will not lead the review team into the Annunciator Response Procedures (ARPs) or the Plant Abnormal Operating Instructions (AOIs). The latter are undergoing a planned revision, but presently consist of 20 major instructions each containing many second-level instructions. Both the ARPs and the AOIs do lead the user into the EOPs which makes the scope of the task analysis adequate as planned.

The audit team also reviewed the Procedure Generation and Review Procedure that is being used by the Nuclear Generation Department to revise their EOPs. A similar document would significantly assist the review team in the accomplishment of the DCRDR and would simplify the preparation of the DCRDR methodology description which is required to be included in the Summary Report.

Material distributed to the audit team by DAEC representative indicates that the F&TA will consist of five phases:

1. Identification of Event Sequence
2. Function Identification
3. Desk Top Analysis
4. Operator Task Identification
5. Task Analysis

While the titles of these phases are not very descriptive, the procedure for conducting the F&TA as described by the review team seems rather straightforward. The plant-specific EOPs will be generated using Revision 3 of the BWROG EPGs in conjunction with existing control room instrumentation. Deviations from the generic procedures (due to plant-specific equipment) will be identified and justified. Plant-specific tasks arising from these deviations will be documented by the review team. The upgraded plant-specific EOPs then will be analyzed using a table-top analysis methodology to identify operator tasks and information and control requirements. Information essential to the conduct of each task will be documented on a task analysis (TA) form in order of performance of the steps making up each task for each emergency procedure. The information to be provided on the TA form will include control requirements, control locations, display requirements,

display location, feedback, procedure/step branch points, and comments associated with each of the tasks. The information (i.e., display and/or feedback) and control requirements necessary for successful task performance will be identified independently of the Duane Arnold control room. Instrumentation and control characteristics associated with the above requirements will be identified on a separate, coded addendum to the TA form, and will include such information as instrument type, dynamic range, units of measurement, and resolution/accuracy. Finally, DAEC assured the NRC that the F&TA will be a comprehensive analysis and will ensure that all control panels and all operator tasks involved in emergency operations will be included.

This approach toward task analysis is satisfactory providing the following concerns are addressed. Since the plant-specific EOPs were written using existing control room instrumentation, each task should be critiqued to ensure that information needs identified reflect what is required rather than what is there. If the methodology utilized by the review team does not stress operator information and control needs derived from the analysis independent of existing control room design, the DCRDR will not accomplish its desired result. The audit team used the review team's data sheets to illustrate the need for this independent analysis; it is believed that the licensee grasped this subtlety.

Similarly, during the identification of instrumentation and control capabilities, the review team should ensure that the control/display characteristics are determined independently of the control room.

The Control Location and Display Location columns on the TA form should be completed with the desired location for the instrumentation, rather than the actual control panel on which the instrumentation appears. The audit team recommends deleting the Feedback column from the TA form. Feedback is nothing more than information needed to monitor task performance. Since this type of information is typically provided in displays, the use of two columns to record similar information is redundant and increases the likelihood that the forms will be filled out inconsistently.

Another concern the audit team has relates to the lack of human factors (HF) participation during all phases of the TA. Experienced human factors

specialists should be used during both the task identification phase and information and control requirements identification phase of the task analysis. The use of human factors personnel in all phases of the review is necessary to ensure that the task analysis is conducted from the proper human factors perspective.

Finally, the review team commented that the task analysis is expected to take no longer than three weeks to complete. The audit team's experience indicates that such a schedule is excessively optimistic.

Conclusion

Based on its findings, the audit team concludes that the F&TA approach, as proposed by DAEC personnel during the week of the audit, should meet the intent of this NUREG-0737, Supplement 1 requirement provided that:

1. The EOP tasks/steps are critiqued to ensure that the information needs identified reflect what is required rather than what is present in the existing control room.

2. Experienced human factors specialists are involved in all phases of the task analysis.

3. The procedure for conducting the F&TA and the methodologies associated with the approach are described in the Summary Report.

A comparison of display and control requirements with a 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 necessary during emergency operations. Success of this element depends heavily on the quality of the function and task analysis and the control room inventory. Characteristics appropriate to the task should be described for each display and control need identified by the function and task analysis. The control room inventory should be a complete representation of displays and controls currently in the control room. The inventory should include appropriate characteristics of current displays and

controls in order to allow meaningful comparison with the results of the function and task analysis. Unavailable or unsuitable displays and controls should be documented as HEDs.

To satisfy this NUREG-0737, Supplement 1 requirement, IEL&P proposes to use the DAEC control room rather than an actual inventory. This approach is acceptable to the audit team. As explained by the review team, the comparison of information and control requirements with the existing instrumentation in the control room will be performed by comparing the information and control requirements and control and display characteristics identified during the task analysis to the instrumentation in the control room. This will identify missing and unsuitably designed instruments and controls. Since neither the task analysis nor comparison activities had been performed at the time of the audit, the audit team is unable to assess the adequacy of the verification process. Nonetheless, the process, as described during the week of the audit, should satisfy this NUREG-0737, Supplement 1 requirement providing certain key elements are kept in mind:

1. The identification of information and control requirements and instrumentation and control (I&C) characteristics to be done during the task analysis must be conducted <u>independently</u> of the control room.

2. During the verification of I&C availability, the presence or absence of required controls and displays must be confirmed by comparing the requirements in the "Control/Display Requirements" column of the TA form to the control room. Instances of missing instrumentation must be noted and documented accordingly on a human engineering discrepancy form.

3. During the verification of I&C suitability, interface problems that may affect task performance during the conduct of emergency operations must be identified. This involves comparing the information and control characteristics identified during the TA to the existing instrumentation in the control room to ensure that the operational characteristics identified as necessary are indeed

reflected in the existing instrumentation. Instances of unsuitable instrumentation must be noted and documented accordingly on a human engineering discrepancy form.

4. The verification of control/display availability and suitability must be performed after the information and control requirements have been determined in the task analysis.

The second phase of IEL&P's comparison activities will involve a Validation of Control Room Functions to determine whether the functions allocated to the control room operators during emergency operations can be accomplished effectively with the control room as it presently exists. The approach to be employed by IEL&P will involve the review team walking through and talking through the symptom-oriented EOPs. Although the specific methodology for conducting this validation activity had not been determined at the time of the audit, the use of walk-throughs/talk-throughs is an acceptable approach for validating the operability of the control room.

Conclusion

The audit team concludes that the process developed by the licensee to compare information and control requirements with a control room inventory of instrumentation and control capabilities, is satisfactory and should meet the intent of NUREG-0737, Supplement 1, providing that:

1. The task analysis is conducted in accordance with the proposed methodologies and assumptions as described in the previous section.

2. The comparison of existing control room instrumentation with the information and control requirements identified by the task analysis as described in the DAEC Program Plan, and the supplemental information regarding the conduct of the control room inventory communicated during the week of the audit, is done as described.

3. The procedure for conducting the comparison of the control room (CR) inventory and the methodologies associated with the approach are described in detail in the Summary Report.

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 against accepted human engineering guidelines. One accepted set of human engineering guidelines is provided by Section 6 of NUREG-0700. Another set is provided by the BWR Owner's Group Control Room Survey Program. Regardless of the guidelines used, deviations between the control room and human engineering guidelines should be identified, and discrepancies should be documented as HEDs.

A survey of the Duane Arnold control room was performed by the BWR Owner's Group in 1980. Subsequent to this survey, and at the request of the BWROG, the Human Factors Engineering Branch (HFEB) of the Division of Human Factors Safety (DHFS) reviewed the BWROG Control Room Survey Program. On September 16, 1982, a working meeting was held with the NRC and BWROG to review the material that had been submitted and to clarify open issues that were either not resolved or not documented.

The findings from that meeting were summarized in a letter to the Owner's Group Chairman dated April 19, 1983 (Reference 7). Basically, the staff concluded that the BWROG Survey Program should not be interpreted as being fully responsive to NUREG-0737 Task Action Plan Item I.D.1, and that additional work would be required. Essentially, in order to meet the Supplement 1 requirement, utilities using the BWROG Control Room Survey Program must complete the following tasks:

1. Submit an individual program plan to the NRC referencing the BWROG Generic Program Plan. The plant-specific submittal should:

    a. Document the qualifications of survey team members, and number and extent of plant personnel participation.

    b. Discuss plans for attendance of plant personnel at BWROG workshops and training courses.

    c. Identify portions of the plant's DCRDR not performed in accordance with the methodology specified in the BWROG Program Plan.

d. Discuss the plant specific program for prioritizing HEDs, reporting DCROR results, and implementing control room enhancements.

2. Update the operating experience review.

3. Complete the BWROG control room survey Checklist Supplement.

4. Repeat portions of the task analysis using updated plant-specific emergency operating procedures to account for differences in the new procedures.

5. Identify specific procedures walked through as part of the systems review, additional work performed (by the utility) to complete the systems review, and plans for reviewing the remote shutdown panel.

6. Prioritize HEDs, determine corrective actions, develop an implementation schedule, and report the results of the DCROR to the NRC.

As required by action item no. 3 above, IEL&P intends to perform a two-part supplemental survey as part of the DCRDR to complement the original Owner's Group survey. The first part of the supplemental effort will use the BWROG control room survey checklist supplement to survey those aspects of the control room that have not changed since the original BWROG survey was performed. In the second part, both the original checklist and the checklist supplement will be used on those parts of the control room that have been altered since the original BWROG survey was performed. The original checklist, however, will only be applied to the new instrumentation which had been installed through February 1, 1984 (the cut-off date). Changes affecting instrumentation subsequent to February 1, 1984 are reviewed on an individual basis using the plant's design change review procedure which has provisions for the consideration of human factors design adequacy. Discrepancies identified during the original survey that have not been fixed will be reassessed along with the new HEDs.

This approach is acceptable to the audit team. However, during the review of the original checklist documentation, the team noted several

problems with DAEC's survey process. The brief control room audit conducted by the audit team revealed that 40% to 50% of the approximately 30 HEDs which were discovered were not documented during the 1980 survey. Further, many HEDs had been grouped generically and not recorded as individual discrepancies. These problems may be a function of both the guidelines used and the training of the survey team members. The guidelines used by the Owner's Group are general and qualitative in nature, contrary to the detailed, quantitative criteria found in NUREG-0700. While the BWROG guidelines have been approved by the NRC, survey team training is essential to ensure credible and comprehensive results. Evidence that the training was less than adequate is indicated by the relatively low concurrence between the review team and audit team as to what constitutes an HED and the details surrounding the information that should be reported.

The review team indicated that any HEDs that had not been corrected since the original survey would be reassessed together with any new HEDs identified during the supplemental survey. However, due to the generic nature of the HED identification and categorization process, the documentation that identified those original 1980 HEDs does not exist.

Sorting out the changes between 1980 and February 1, 1984, seems a formidable task for DAEC, as would accounting for changes between February 1984 and the date of the forthcoming survey. To complicate matters, the usefulness of the design change review procedure used by DAEC to address the human factors adequacy of affected control systems is suspect. For example, review of Specification No. DGC-E 102, the color code design guide which is part of the design change review procedure, identifies six colors that have been approved for use in the DAEC control room. However, review of the control room by the audit team resulted in the identification of an additional nine colors that were not part of the color specification.

It is the opinion of the audit team that in order to take advantage of the original BWROG survey, specific instances of human factors discrepancies must be identified. Additionally, documentation should be provided to ensure that a well-orchestrated and thorough survey has been conducted.

To resolve these problems, IEL&P should either develop documentation of all instances of human engineering discrepancies in the DAEC control room,

or should completely resurvey the control room. It is suggested that less time will be required to resurvey the entire control room than will be required to conduct a survey within the presently intended constraints. The review team also will be less likely to overlook HEDs. In either case, the review team conducting the survey should be adequately trained in the use of checklisting and the principles of human factors engineering to ensure a comprehensive and accurate survey effort.

Conclusion

The audit team found DAEC's control room survey to be inadequate. The review team should either provide documentation of all deviations from the criteria recommended in the original BWROG survey together with the results from the planned BWROG supplemental survey, or reassess the entire control room. The details surrounding the conduct of the approach taken, including the methodologies associated with the approach, should be described in the Summary Report.

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

The potential for operator error and the consequence of that error in terms of plant safety should be systematically considered in the assessment of HEDs. In addition, both the individual and aggregate effects of HEDs should be considered. The result of the assessment process should be a determination of which HEDs are recommended for correction and how soon the corrections will be implemented based on their potential impact on plant safety. Decisions regarding significance of HEDs in terms of potential impact on plant safety should not be compromised at this time by consideration of such issues as the means and potential cost of correcting those HEDs.

The assessment process for evaluating the significance of HEDs for the Duane Arnold Energy Center DCRDR was presented to the audit team by IEL&P representatives. The assessment process planned for the supplemental survey was the same as the one that was used in the original BWROG survey. Specifically, priorities were assigned on a 12-point scale by multiplying the degree of deviation from the BWROG guideline (i.e., ranging from 1 = full

compliance to 4 = no compliance) by the potential for error (i.e., ranging from 1 = low potential to 3 = high potential). Discrepancies with a priority rating of 4 or higher were recommended by the review team as being the most likely candidates for improvements.

It became apparent during the audit that the effect on plant safety of each HED had not been taken into consideration. According to NUREG-0800, Section 2.5, HEDs are to be assessed to "determine their significance on operator performance and plant safety." However, IEL&P's approach to discrepancy assessment, and by corollary, recommendations for modifications to the control room, were based on benefit-to-cost ratios and additional "secondary" considerations, with safety relegated to a less-than-critical concern. After an explanation of this NUREG-0737, Supplement 1 requirement via the guidance recommended in NUREG-0800, the licensee seemed to understand the principles of the assessment process.

Conclusion

Based on discussions during the audit, it appears that DAEC's plans for assessing HEDs will not meet this NUREG-0737, Supplement 1 requirement. However, the review team plans to reassess all discrepancies identified during the original BWROG survey that have not had corrective action taken against them. To maximize the utility of the assessment process, IEL&P could ensure that a reliable baseline for determining HED significance is established. To meet this end, the audit team offers the following recommendations:

1. The methodology for estimating error potential, i.e., the relative degree of degradation of operator performance caused by an HED, should be well grounded in evaluation criteria. It is recommended that the HEDs be subjected to a series of structured questions, similar to those presented in Exhibit 2-2 in NUREG-0800.

2. In addition to the potential for error, the assessment methodology should include an estimate of consequence of error, i.e., the effect on plant safety of each HED.

3. Discrepancies should be assessed by all members of the review team.

4. The interactive effects of discrepancies for impact on operator performance and plant safety should be examined.

5. Discrepancies that have resulted in errors should have a high correction priority.

6. The procedures and criteria involved in the assessment process, and the methodologies for examining the interactive/aggregate effects of multiple HEDs should be described in the Summary Report.

Selection of design improvements.

The purpose of selecting design improvements is to bring HEDs into agreement with acceptable human factors engineering standards, thereby enhancing the safety and productivity of control room operations. At a minimum, this process should correct safety significant HEDs. Selection of design improvements should include a systematic process for development and comparison of alternative means for resolving HEDs. Both enhancement and design modification may be considered (refer to Section 6, NUREG-0700 for further guidance).

At the time of the audit, IEL&P had not formalized a program for the selection of design improvements. However, the process as presently envisioned relies extensively on the Design Change Package (DCP) program. In this program, all corrections of significant HEDs would be processed through the DAEC plant modifications, training, and administrative procedures already in existence. A review of the three HF Design Guides distributed to the audit team which constitute a subset of the DCP program, revealed no procedure or criteria for selecting design improvements.

The review team admitted that they had not considered the selection process to be a function of the review team. Once HEDs had been assessed by the individual task team members, they would be forwarded to management for disposition. Management would in turn recommend solutions based on their understanding of the problem as described in the survey documentation, the

priority rating assigned to the discrepancies during the assessment process (i.e., 1 through 12), and projected cost to correct the discrepancies.

The plans presented by IEL&P for the selection of design improvements have several inadequacies. A review of the HEDs generated during the original survey revealed the level of detail in the descriptions of the discrepancies to be inadequate for conveying information. This lack of detail would deny the personnel designing the detailed solutions the information required to develop a solution that would resolve the HED. As mentioned previously in the Control Room Survey section of this report, this lack of detail ultimately could result in doing the survey a second time in order to obtain the necessary details surrounding the discrepancies.

A second problem with the selection process concerns that of cost. By introducing economic criteria into the selection process without considering the assessment of safety significance, IEL&P may be jeopardizing, unnecessarily, the safety of the plant. The review team should provide management with information on the safety significance of the HEDs, together with their recommendations for design improvements. Management should then consider the benefit-to-cost ratio in light of these other factors.

The final problem with the design improvement process involves the review team itself. The present plan does not afford the review team input into the generation of solutions to HEDs. The multidisciplinary nature of the review team makes them ideal candidates for selecting corrective actions.

To facilitate the identification of possible backfits, the review team should develop a procedure for selecting design improvements. The procedure should include an explanation of the process used for determining corrective action and the methodology for integrating the solutions on a control room wide basis.

Conclusion

IEL&P has indicated their understanding of this requirement through conversation with audit team members during the week of the audit. However, in order to allow the audit team to evaluate fully the effectiveness of the

process used in selecting HED improvements relative to NUREG-0737, Supplement 1, a description of the following activities should be provided in the Summary Report:

1. The procedure for utilizing the design team members and the scope and degree of their interaction with the management team during the process for selecting corrective actions.

2. The procedure and methodology for selecting design improvements and evaluating alternatives.

3. The procedure for implementing design improvements including consideration of possible interactive and aggregate effects of the proposed corrections which might introduce new HEDs.

Verification that selected improvements will provide the necessary correction and verification that im rovements will not introduce new HEDs.

A key criterion for DCRDR success is a consistent, coherent, and effective interface between the operator and the control room. One good way to meet that criterion is through iteration of the processes used for selecting design improvements, i.e., verification that selected design improvements will provide the necessary correction, and verification that improvements will not introduce new HEDs. Each iteration of the selection and verification processes should reduce inconsistencies in the operator-control room system, thereby increasing the effectiveness of that interface.

IEL&P's approach toward satisfying this NUREG-0737, Supplement 1 requirement involves the use of walk-throughs or talk-throughs to ensure that corrections do not introduce new HEDs. Verification that improvements selected will correct the HEDs is not addressed by the Duane Arnold DCRDR program.

At the time of the audit, IEL&P did not appear to understand fully the intent of this requirement. Substantive details surrounding the procedures and methodology were missing from the Program Plan. During the audit, IEL&P commented that they had not established a methodology for ensuring that HEDs would be corrected or that the corrections proposed would not introduce new

HEDs. The licensee expressed some reluctance to consider the impact of a design change involving an HED when the change would not be implemented for a long period of time. It was felt that since the future implementation techniques might differ from what is conceived at present, the verification process would be an exercise in futility.

To address this concern, the audit team commented that the problem could be solved with a comprehensive review of the proposed design improvement and an adequate procedure to review all future changes from a human factors perspective. The establishment of a long-term human factors program was recommended to maintain the control room design within accepted human factors engineering criteria during the operational life of the plant.

Various approaches are available to ensure that proposed control room modifications provide the necessary correction of deficiencies and do not create new HEDs or introduce other safety problems. One possibility relies on the comparison of the modified control room design with:

1. The control room human factors design correction documents.

2. Instrumentation and control requirements identified during the task analysis.

3. Approved project design criteria (e.g., electrical separation criteria).

Another possibility recommended by the audit team which IEL&P may wish to consider involves the use of a computerized data base management system. In addition to providing data storage and archival capabilities, the system could be used to list all of the HEDs against a given component. In this way, the review team would have at its disposal, on a single sheet of paper, all of the pertinent information relevant to a specific component. This would allow a straightforward, table-top comparison among the various HEDs and the improvements proposed for all of the discrepancies. Furthermore, by consolidating information via a central repository, study of the interactive and aggregate effects of the proposed changes would be facilitated.

In addition to the verification techniques already mentioned, the review team could scrutinize the proposed changes using either the same human factors guidelines that were used to identify HEDs initially, or the more detailed, quantitative guidelines found in NUREG-0700. The use of mock-ups, photomosaics, or panel drawings also is recommended. The use of such tools for verification and validation of control room improvements minimizes the possibility of the control room becoming an experimental test bed and being subjected to a repeated series of modifications.

The review team should be the lead in these verification activities. The audit team recommends active participation of DAEC operators in the verification (as well as selection) of design improvements. Participation of DAEC operators in those activities should result in a better operator-control room interface and in better acceptance of that interface by the operators. The audit team also recommends active participation of personnel with experience in human factors and engineering psychology during the verification of design improvements. The expertise of these people can be especially useful in identifying pockets of inconsistency resulting from planned control room changes. Such inconsistencies can lead to future operator errors.

Conclusion

IEL&P needs to develop a procedure for meeting this NUREG-0737, Supplement 1 requirement. A description of the procedure, including the methodology, should be detailed in the Summary Report. The DCRDR is not considered to be complete until this NUREG-0737, Supplement 1 requirement is satisfied.

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 (EOP's).

IEL&P provided the audit team with an outline of their approach for the integration of all NUREG-0737, Supplement 1 programs. The organization of these projects will be coordinated through a five-year Emergency Response Facility (ERF) Program, which falls under the aegis of an ERF project

director. Computerized task networks will be utilized to track the progress of the individual initiatives and to flag problems involving resource availability and commitment deadlines.

The following observations were made by the audit team concerning the adequacy of the DAEC integration effort:

1. Use of the upgraded, plant-specific EOPs as the technical basis for the function and task analysis is in keeping with the intent of this requirement. Such integration should ensure that the control room supports the instrument and control requirements for complete and technically accurate EOPs.

2. It was understood by the audit team that IEL&P does not intend to consider the SPDS as part of the DCRDR due to scheduling differences. It was further understood that once the SPDS becomes available, it will be subjected to a separate human engineering review as part of its design. Ideally, the results from the function and task analysis would be used to verify the selection of SPDS parameters before final implementation. As long as the behavioral implications resulting from the human factors analysis of the SPDS are duly considered and acted upon, this approach is acceptable to the audit team.

3. It was understood that Reg. Guide 1.97 instrumentation is being handled as part of DAEC's five-year Emergency Response Facility (ERF) Program. IEL&P should ensure that this instrumentation is subjected to the same HF review process afforded existing CR instrumentation. Furthermore, the results from the task analysis can be used to verify the suitability and plant-specific requirements of the proposed instrumentation.

4. It was understood that any results stemming from the function and task analysis will be fed back to the appropriate NUREG-0737, Supplement 1 activities.

Conclusion

Providing the following concerns of the audit team are kept in mind, IEL&Ps coordination effort should meet the letter and intent of this NUREG-0737, Supplement 1 requirement:

1. Having one individual with overall responsibility for all NUREG-0737, Supplement 1 initiatives is one mechanism for coordinating control room improvements with other programs. The matrix management philosophy to which IEL&P subscribes makes effective communication across organizational boundaries especially critical. Therefore, IEL&P management should take an extra measure to ensure that necessary channels are available to penetrate any existing organizational barriers that might thwart this coordination activity.

2. IEL&P needs to ensure that a mechanism exists (e.g. formal procedure) for the appropriate exchange of information at the technical work level so that the findings or results of one program are available as input to the other programs.

3. It was understood by the audit team that the new EOPs will address the use of the SPDS, and that the operators will be trained on the new EOPs before they are implemented and before the SPDS is on-line. The training planned for implementing the new EOPs also should address any and all modifications resulting from the DCRDR.

ADDITIONAL ACTIVITIES AND FINDINGS

Review of operating experience.

Although not specifically required by NUREG-0737, Supplement 1, the DAEC DCRDR team plans to conduct a supplementary review of plant operating experience to identify potential HEDs. This conforms to the guidance recommended in Generic Letter 83-18, which notes that licensees should update their operating experience review to incorporate recent operating history.

The operating experience review to be conducted by IEL&P consists of two parts: (1) historical documentation review, and (2) operator interviews. For the documentation review, the licensee proposed to review Licensee Event Reports (LERs) and SCRAM reports. These two sources were examined during the original BWROG survey in 1980 to include the preceding two years. They were screened by the survey team members to identify items that may have contributed to operator error. All LERs and SCRAM reports from the end of the 1980 BWROG survey to February 1, 1984, will be examined by the supplemental survey using the same methodology. Material from the original BWROG survey will not be reevaluated at this time. The scope of the original BWROG survey was defined by the physical limits of the control room, i.e., the survey was limited to LERs and SCRAM reports which referenced equipment, procedures, and personnel errors within the physical confines of the control room.

Operator interviews performed during the original BWROG survey examined plant-specific problems, operation, and desirable features of plant design. The BWROG survey team interviewed nine individuals including shift supervisors, senior reactor operators, and control room operators. The results of this original BWROG survey effort are to be included in the Summary Report. IEL&P does not intend to conduct formal interviews of the control room personnel in the supplemental survey. However, it is recommended in Generic Letter 83-18 that the licensees update their operating experience reviews (OER). Since operator interviews are part of the OER, the audit team recommends that it also be updated.

Remote shutdown panel.

IEL&P does not presently intend to include the remote shutdown panel in the DCRDR; it is not a NUREG-0737, Supplement 1, requirement to do so. Nonetheless, it was obvious to the audit team that the panel's existing design contains several significant, safety related, human engineering design deficiencies. Among them are the need for over 40 keys in order to open the panel doors and actuate the key operated pistol grips, the elevated steel grate floor which invites the loss of keys, the interference of the door when attempting to synchronize the diesel to the bus, the location of the yet-to-be-installed table, and missing instrument identification labels. The audit team recommends including the remote shutdown panel in the DCRDR

where it can be subjected to appropriate review by a qualified, trained, and experienced multidisciplinary team.

CONCLUSIONS

The purpose of the in-progress audit was to assess the compliance of IEL&P's human factors review of the Duane Arnold control room with its DCRDR Program Plan and the requirements of NUREG-0737, Supplement 1. The emphasis of the audit team's efforts was on those areas of the Program Plan where there was a lack of information provided, and the methodologies proposed were inadequate.

At the time of the Duane Arnold audit, the DCRDR team had completed the Planning Phase of the review. The Execution, Assessment, Correction and Documentation Phases had not yet been initiated.

Following a brief entrance meeting with the personnel of IEL&P on March 18, 1985, when the schedule for the in-progress audit was finalized, the audit team embarked on an agenda that addressed the nine DCRDR requirements of NUREG-0737, Supplement 1.

The audit team review of the DCRDR documentation and interviews with DCRDR team members produced the following conclusions:

1. The DAEC review team appeared to have the necessary qualifications to conduct the DCRDR. However, the audit team believes that the contributions of a nuclear engineer for the conduct of the task analysis and a human factors engineer for all task analysis activities as well as all DCRDR activities is necessary to accomplish this element successfully. Furthermore, the scope of the review team's responsibilities should be expanded to ensure that the review team is involved in <u>all</u> DCRDR activities.

2. The function and task analysis proposed by IEL&P should meet the intent of NUREG-0737, Supplement 1, providing the following three concerns are addressed:

a. The EOP steps should be critiqued using appropriate verification and validation procedures to ensure that the operator information and control needs were derived independent of the existing control room design.

b. Participation by a full-time human factors expert during all phases of the task analysis is provided.

c. The procedure for conducting the F&TA and the methodologies associated with the approach are described in detail in the Summary Report.

3. The comparison of existing control room instrumentation with the information and control requirements identified by the task analysis should be satisfactory providing:

   a. The comparison is conducted in accordance with the proposed methodologies and assumptions as described in the applicable section of this report.

   b. The procedure for conducting the comparison of the CR inventory and the methodologies associated with the approach are described in the Summary Report.

4. The control room survey was found to be neither as objective nor as quantitative as necessary to ensure a proper review as indicated by the results of the review of survey documentation and the NRC audit team's sample survey. To meet the NUREG-0737, Supplement 1 requirement, IEL&P should provide thorough and descriptive documentation for all HEDs in the control room. Additionally, the orientation program(s) to be held for the supplemental effort should include an upgraded training program for the personnel involved in the CR survey process. Finally, details surrounding the conduct of the survey effort, including the methodologies associated with the approach, should be described in the Summary Report.

5. From the review of the Program Plan and the ensuing discussion during the week of the audit, the NRC audit team is concerned that

neither the methodology nor the criteria involved in categorizing HED significance has been adequately defined. To ensure conformance with this NUREG-0737, Supplement 1 requirement:

a. Methodologies and procedures need to be developed for categorizing HED significance. The assessment procedure should be based on criteria relating to the likelihood of error and the safety consequence of that error. Discrepancies that have resulted in errors should have a high correction priority.

b. Discrepancies identified during the original survey that have not been corrected should be reassessed.

c. The procedure and methodology for examining the interactive effects of discrepancies for impact on operator performance and plant safety should be described.

d. The procedures and methodologies referred to above should be described in the Summary Report.

6. The Summary Report should include a description of the methodology used for selecting design improvements. Furthermore, the decision criteria for deriving solutions and evaluating alternatives should be developed.

7. At the time of the audit, the DAEC review team did not fully understand the intent of the verification requirement. IEL&P needs to develop a procedure for verifying that corrections provide the necessary improvements without introducing new HEDs. A description of this procedure, including the methodology, should be detailed in the Summary Report.

8. The coordination of the DCRDR with other improvement programs appears satisfactory, providing a mechanism exists for the exchange of information at the technical work level between the staff involved in the various NUREG-0737, Supplement 1, elements.

In the audit team's judgment, resolution of the above concerns would increase the likelihood that NUREG-0737, Supplement 1 requirements for the DCRDR will be met. Several additional recommendations resulted from the in-progress audit of the Duane Arnold DCRDR. These recommendations are not intended as additional requirements, but rather to encourage the fullest possible benefit from the DCRDR. Those recommendations are:

1. Develop detailed task plans for accomplishing each element of the DCRDR. The plans should contain procedures, methodologies, criteria, data forms, review team responsibilities and levels of effort. The task team members should be trained on their correct application prior to each DCRDR initiative.

2. Consider resurveying the entire control room. Developing and conducting a supplemental survey addressing the issues not previously covered, developing detailed and thorough documentation of all HEDs, and identifying for reassessment HEDs that had not been corrected may require an effort as great or greater than conducting a complete survey.

3. Develop a procedure for implementing design improvements. Consideration should be given to the possible interactive and aggregate effects of the proposed corrections that might introduce new HEDs.

4. Consider using a computerized data base management system. The system would facilitate greatly the management, tracking, and assessment of the DCRDR review findings and subsequent selection/incorporation of design improvements.

5. Refine the long-term human factors engineering program that has been established at DAEC to include post-implementation followup of control room changes.

POSTSCRIPT

At the conclusion of the DAEC audit, an exit briefing was given by audit team leader to IEL&P personnel summarizing the team's findings conclusions during the week of the audit. IEL&P responded by stating

intention to correct the DCRDR shortcomings to satisfy fully the requirements of NUREG-0737, Supplement 1.

On April 2, 1985, a post-audit meeting was held at NRC headquarters in Bethesda, Maryland, between IEL&P representatives and members of the audit team. The meeting was requested by DAEC personnel to reaffirm IEL&P's commitment to make maximum use of the audit team's comments.

The presentation given by IEL&P concentrated on the conclusions drawn by the audit team and future changes to the Program Plan as a result of those conclusions. The suggestions offered by IEL&P for modifying the Program Plan indicate that the licensee understands the intent of the nine requirements of NUREG-0737, Supplement 1. Providing the licensee incorporates the guidance of its DCRDR management representatives, and the revised plan parallels the recommendations presented in this report, the DCRDR should satisfy the NUREG-0737, Supplement 1 requirements.

REFERENCES

1. "Program Plan for Implementation of Detailed Control Room Design Review," Iowa Light and Power Company, Duane Arnold Energy Center, November 30, 1984.

2. "Evaluation of the Detailed Control Room Design Review Program Plan for Iowa Electric Light and Power Company's Duane Arnold Energy Center," Science Applications International Corporation, January 29, 1985.

3. "Review of the Duane Arnold Energy Center Detailed Control Room Design Review (DCRDR) Program Plan," U.S. Nuclear Regulatory Commission, February 13, 1985.

4. Letter from W.H. Regan, Jr., U.S. Nuclear Regulatory Commission, dated March 11, 1985, recommending "In-Progress Audit of the Duane Arnold Energy Center Detailed Control Room Design Review (DCRDR)."

5. NUREG-0737, Supplement 1, "Clarification of TMI Action Plan Requirements," U.S. Nuclear Regulatory Commission, December 1982.

6. "Task Analysis Requirements of Supplement 1 to NUREG-0737, May 14, 1984 Meeting with the BWR Owner's Group Emergency Procedure Guidelines and Control Room Design Review Committees," U.S. Nuclear Regulatory Commission, transmitted May 14, 1984.

7. "NRC Staff Review of the BWR Owner's Group (BWROG) Control Room Survey Program (Generic Letter 83-18)," April 19, 1983.

Duane Arnold
TAC #51157
SAIC Charge #1-263-07-557-19
Contract NRC-03-82-096

ATTACHMENT A

TENTATIVE AGENDA
DUANE ARNOLD ENERGY CENTER
DETAILED CONTROL ROOM DESIGN REVIEW
IN-PROGRESS AUDIT

Monday, March 18, 1985

Begin 1:00 P.M.

- Processing for on-site access
- Short entrance briefing
- Quick tour of control room
- Begin DCRDR audit

DCRDR Team

Qualifications of members of the review team;
The role and level of effort of the human factors specialists;
Task assignments and level of effort.

Tuesday, March 19, 1985

Begin 8:15 A.M. - 5:00 P.M.

DCRDR audit continued

Function and Task Analyses

Identification of operator tasks and information and control requirements;
Identification of required display and control characteristics.

Control Room Inventory

Methodology for comparing existing control room instrumentation with required display and control characteristics.

Wednesday, March 20, 1985

Begin 8:15 A.M. - 5:00 P.M. DCRDR audit continued

Control Room Survey
Survey procedures
Survey data collection forms
Survey team

HED Assessment
Methodology
Assessment team

Selection of Design Improvements
Methodology
Team membership

Verification that HEDs Are Corrected and that Improvements Do Not Introduce New HEDs
Methodology

Thursday, March 21, 1985

Begin 8:15 A.M./P.M. DCRDR audit continued

Coordination of DCRDR with SPDS, R.G. 1.97, Upgraded EOPs, and Training
Methodology

Audit in Control Room

Audit at Alternate Shutdown Panel

NRC Team Meeting

2:30 P.M. Exit Briefing

ATTACHMENT B

ATTENDEES OF THE IN-PROGRESS AUDIT ENTRANCE BRIEFING

Name	Organization
Ann Ramey-Smith	U.S. NRC
Richard J. Eckenrode	NRC/DHFS
John J. Blase	M/N Engineering
Whit Hansen	NRC/Comex Corp.
Michael Fineberg	SAIC
Stephen Fleger	SAIC
William Miller	Tech. Support - DAEC
Dick Crinigan	Site Engineering
Ron Potts	Operations Shift Supervisor
Robert Schlesinger	Training
J. Williams	IE, Design Engineering
M. Kirkpatrick	M/N Licensing
E. Matthews	QA
Rick Hannen	IE, DAEC
A. Morse, Jr.	Stone & Webster Engineering Corp.
John Gebert	IE, Engineering
Dave Wilson	Manager, Nuc. Licensing
D.L. Mineck	Plant Supt.
M. Stachowski	IE, Design Engineering
Ray Zook	IE, DAEC
Steve Swails	IE, NGD Licensing

ATTENDEES OF THE IN-PROGRESS AUDIT EXIT BRIEFING

Name	Title	Organization
Steve Swails	Sr. Licensing Engineer	IE
Bob Schlesinger	Supervisor - Licensed Training	GP
John Gebert	Engineer	IE
D.L. Mineck	Plant Superintendent	IE
Ron Potts	Shift Supervisor - Oper. Procedures	IE
J. Kerr	Safety Committee	IE
Mike Stachowski	Engineer	IE
Max Kirkpatrick	M/N Licensing	IE
Gary W. Ellis	M/N Engineering Manager	IE
John J. Blase	M/N Engineering Supervisor	IE
Dave Wilson	Manager, Nucl. Licensing	IE
Stephen Fleger	Research Psychologist	SAIC
Whit Hansen	Ops. Consultant	Comex
Michael Fineberg	Eng. Psychologist	SAIC
Ann Ramey-Smith	Audit Team Leader, Eng. Psy.	NRC/DHFS
Richard J. Eckenrode	HF Engineer	NRC/DHFS
Joel S. Wiebe	NRC-SRI	NRC
Mohau C. Thadaun	NRC Project Manager	NRC
Philip D. Ward	Director, Nuc. Gen.	IE
Gary Van Middlesworth	Training Coordinator	IE
Dick McDangly	Manager Nuclear Division	IE