ATTACHMENT 1 (to Staff Evaluation)

SAIC-89/1130

TECHNICAL EVALUATION REPORT FOR THE DETAILED CONTROL ROOM DESIGN REVIEW AT CAROLINA POWER AND LIGHT COMPANY'S BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 and 2

TAC NOS. M56107, M56108

July 10, 1989

Prepared for:

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

Contract NRC-03-87-029
Task Order No. 35

TABLE OF CONTENTS

TECHNICAL EVALUATION REPORT FOR THE DETAILED CONTROL ROOM DESIGN REVIEW AT CAROLINA POWER AND LIGHT COMPANY'S BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

1.0 INTRODUCTION

This report documents the findings of a pre-implementation audit of the Carolina Power and Light Company's Detailed Control Room Design Review (DCRDR) at the Brunswick Steam Electric Plant. The audit was conducted by the Nuclear Regulatory Commission (NRC) during a site visit May 15 through May 18, 1989.

The purposes of the audit were:

- To assess the licensee's progress toward completing the nine DCRDR requirements stated in NUREG-0737, Supplement 1 (Reference 1).
- To discuss the licensee's plans and projected schedules for completing the DCRDR program at the Brunswick Steam Electric Plant.

The audit agenda is provided as Attachment 1 to this report and a list of audit meeting participants is provided in Attachment 2.

1.1 Background

The following is a chronological list of milestones in the Brunswick Steam Electric Plant DCRDR:

1981 The licensee conducted a review of the Brunswick Unit 1 and 2 control rooms using the criteria in NUREG/CR-1580.

12/84 Program plan for conducting the DCRDR submitted to NRC by licensee (Reference 2).

5/85 NRC staff comments on the program plan provided to licensee (Reference 3).

9/85 In-Progress audit of the Brunswick DCRDR, conducted by NRC.

12/85 Updated program plan for conducting the DCRDR submitted to NRC by the licensee (Reference 4).

12/86 Final DCRDR Summary Report submitted to NRC (Reference 5).

6/87 Revision 1 of the DCRDR Final Summary Report submitted, including an updated implementation schedule, (Reference 6).

5/89 NRC conducted the Pre-implementation audit of the Brunswick DCRDR.

1.2 Audit Agenda and Participants

The licensee provided an opening summary of DCRDR program status, work in progress and work to be done. Thereafter, each of the nine DCRDR requirements of NUREG-0737, Supplement 1, was reviewed using the guidance provided in Section 18.1 of NUREG-0800, The Standard Review Plan (Reference 7); and in NUREG-0700, Guidelines For Control Room Design Reviews (Reference 8). A technical discussion of findings was conducted with the licensee's DCRDR project team. In addition, the findings were summarized in a formal exit briefing given by the NRC audit team leader.

The audit team consisted of a NRC team leader and NRC contractors from Science Applications International Corporation (SAIC) and Comex Corporation, representing the disciplines of human factors engineering and nuclear operations. The licensee's team included members from several divisions within Carolina Power and Light Company.

2.0 EVALUATION

In the following sections the status of the Brunswick Steam Electric Plant DCRDR is evaluated with respect to each of the nine DCRDR requirements stated in NUREG-0737, Supplement 1.

2.1 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, who should be given sufficient authority to ensure that the DCRDR team is able to carry out its mission. A core group of specialists in the fields of human factors engineering and nuclear operations and engineering are expected to participate with assistance as required from personnel in other disciplines. Human factors expertise should be included in the staffing of the technical tasks. Finally, the DCRDR team should receive an orientation briefing on the DCRDR purpose and objectives which contribute to the success of the DCRDR. NUREG-0800, Section 18.1, Appendix A describes criteria for the multidisciplinary review team in more detail.

The DCRDR team was managed by a licensee representative. The DCRDR team consisted of individuals with expertise in the areas of instrumentation and control engineering, nuclear systems engineering, nuclear power plant operations, training, licensing, and human factors engineering. Human factors engineering contractor support was provided by RMS Associates and Essex Corporation. The team was largely still intact at the time of the audit, with the DCRDR in the corrective actior phase. The team is still involved in reassessments of Human Engineering Discrepancies (HEDs), and the finalizing of corrective action plans now in progress.

It was the audit team's judgment that the licensee met the NUREG-0737, Supplement 1 requirement for establishment of a qualified multidisciplinary audit team.

2.2 System Function and Task Analysis

The purpose of the system function and task analysis is to identify the control room operator's tasks during emergency operations and to determine the information and control capabilities the operators need in the control room to perform those tasks. An acceptable process for conducting the task analysis is as follows:

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

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

3. Analyze the information and control capability needs identified in Item 2 above to determine appropriate characteristics for displays and controls to satisfy those needs.

The licensee conducted the DCRDR system function and task analysis in coordination with the emergency operating procedures (EOP) upgrade program. The task analysis was based on the Boiling Water Reactors Owners Group generic Emergency Procedures Guidelines (EPGs), Revision 3, the Brunswick Plant-Specific Technical Guidelines developed from the generic EPGs, and the Brunswick symptom-based EOPs. The generic Graphic Display System requirements document, developed by EPRI with Owners Group participation, was also used in the task analysis.

It was the audit team's judgment that the licensee has met the NUREG-0737, Supplement 1 requirement for a system function and task analysis.

However, the licensee has since upgraded their EOPs to include Revision 4 of the generic EPGs. As a result of upgrading their EOPs to Revision 4 of the EPGs, several changes have occurred to operator information and control requirements and these changes have not been analyzed to determine their effect on the control room instrumentation. The audit team recommended evaluating the changes resulting from upgrading EOPs to Revision 4 of the EPG's and incorporating any corresponding changes to the control room instrumentation.

2.3 Comparison of Display and Control Requirements with a Control Room Inventory

The purpose of comparing display and control requirements to a control room inventory is to determine the availability and suitability of displays and controls required to perform the emergency operating procedures. The success of this element depends on the quality of the system function and task analysis and the control room inventory. 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 to allow meaningful comparison to the function and task analysis. Unavailable or unsuitable displays and controls should be documented as human engineering discrepancies (HEDs).

The licensee documented the operator information and control requirements along with instrumentation and control characteristics requirements on task analysis forms. These forms were then used to verify availability and suitability of controls and displays by comparison to both the inventory and to actual control room equipment during EOP walkdowns. This included consideration of whether the equipment exhibited the proper characteristics as well as whether it met appropriate human engineering guidelines. The results of the licensee's evaluation were documented in Appendix A-14 to the Final Summary Report.

In order to test the licensee's results, the audit team conducted a control room walkdown of the Level/Power Control procedure (EOP-01-LPC) and the Radioactivity Release Control procedure (EOP-04-RRCP) to identify potential HEDs that should have been identified by the Brunswick DCRDR. In the walkdown of EOP-01-LPC, the audit team identified no HEDs that had not been identified and addressed by the licensee. The audit team identified six potential HEDs during the walkdown of EOP-04-RRCP (see Attachment 3). The licensee was able to demonstrate that they had identified one of these HEDs. The potential HEDs identified by the audit team involved discrepancies between the EOPs and labeling in the control rooms.

The Radioactivity Release EOP is one procedure that has been updated to Revision 4 of the generic EPGs. The discrepancies noted in the walkthrough of this procedure underscore the need to update the task analysis and

perform a comparison to control room components for Revision 4 and future revisions.

It was the audit team's judgment that the licensee met the NUREG-0737, Supplement 1 requirement for a comparison of display and control requirements with a control room inventory.

2.4 Control Room Survey

The key to a successful control room survey is a systematic comparison of the control room to accepted human engineering guidelines and human factors principles. One accepted set of human engineering guidelines is provided in NUREG-0700; however, other accepted human factors standards may be chosen. Discrepancies should be documented as HEDs.

The objective of the licensee's control room survey was to identify any characteristics of instruments, equipment, layout, and ambient conditions that did not conform to good human engineering practice. Survey Task Plans were used which incorporated the human engineering criteria from NUREG-0700.

It was the audit team's judgment that the licensee met the NUREG-0737, Supplement 1 requirement for a control room survey.

2.5 Assessment of Human Engineering Discrepancies (HEDs) to Determine Which Are Significant and Should be Corrected

Based on the guidance of NUREG-0700 and the requirements of NUREG-0737, Supplement 1, all HEDs should be assessed for significance. The potential for operator error and the consequence of that error in terms of plant safety should be systematically considered in the assessment. Both the individual and aggregate effects of HEDs should be considered. The result of the assessment process is a determination of which HEDs should be corrected because of their potential impact on plant safety. Decisions on whether HEDs are safety-significant should not be compromised by consideration of such issues as the means and potential costs of correcting HEDs.

A description of the licensee's assessment process was provided in Section 4 of the Final Summary Report. The assessment was performed by a suitably qualified multidisciplinary team. The process was designed to prioritize HEDs based on estimations of the potential for error and consequences of error. A numerical value was assigned to identify the priority of each HED. Corrective action recommendations were developed and documented by the assessment team. When it was decided that no corrective action would be required, the justification was documented. Review of several HEDs sampled during the audit indicated that the licensee followed the process outlined in the Final Summary Report.

Recently the licensee has reevaluated the need to correct several HEDs. Among these are five Priority 2 HEDs included in the EOP Instrumentation Project: HEDs 206X-5092, 5093, 5094, 5096 and 5097. The justifications for not correcting two of these HEDs (5096 and 5097) were judged by the audit team to be acceptable. The remaining three HEDs are still being re-evaluated by the licensee. A decision about correcting these HEDs is expected to be made in June 1989, and the licensee will inform the NRC of any changes to the original corrective actions proposed for these HEDs.

The licensee reported that the need to correct two additional HEDs has been reevaluated. They are HEDs 206X-2106 and 2115 in the Annunciator Project.

HED 206X-2115 concerns annunciator tiles which are not functionally grouped. This HED was originally assessed as Priority 3, defined as involving significant error potential but an insignificant consequence of error. The tile relocation task was canceled based on the large number of procedures which would have been affected, and the extremely complex wiring changes which would be required. Although this task has been canceled, the licensee indicated that future additions of annunciators will be placed in the proper functional position.

HED 206X-2106 concerns the global design of the annunciator alarm response controls. This was originally assessed as a Priority 2 HED, defined as involving both significant probability of error and a significant consequence of error. Under the original assessment recommendation, the annunciator response "joy-sticks" were to be separated into zones so annun-

ciators could only be silenced, acknowledged, reset and tested from joy-sticks located in proximity to the annunciators effected. As built, there are about eight joy-sticks on the boards of each control room. Any of the eight joy-sticks can be used to silence and acknowledge any annunciator in the control room.

The licensee decided to cancel the joy-stick zoning task. This decision was reportedly based on cost and operator objections to the modification. The audit team noted an incongruity in the fact that operators may have identified the HED and then objected to the correction. Discussions with onsite NRC personnel indicate that there has been at least one recent occurrence where operators silenced an annunciator without noting it, thereby not realizing that a piece of Emergency Core Cooling System (ECCS) had been activated and then tripped. In the audit team's judgment, there is a significant probability of an operator error occurring because an alarm can be silenced and acknowledged from a location where it cannot be read, combined with the fact that one joy-stick manipulation can silence or acknowledge all alarms on all control boards. This was the DCRDR assessment team's original judgment as well. It was stated that an administrative control has been implemented requiring the operator to go to an annunciator and identify it before silencing/acknowledging. It is the audit team's judgment that administrative control may not be reliable in an emergency situation.

The audit team determined that the licensee has not met the NUREG-0737, Supplement 1 requirement for assessment of HEDs to determine which are significant and should be corrected. To complete this requirement, the licensee should complete the ongoing reevaluation of corrective actions for the three EOP instrumentation HEDs identified above. The licensee should also reconsider its decision about HED 206X-2106 concerning annunciator control zoning. In both cases, the licensee should ensure that the decision criteria of error probability and error consequences are properly taken into account, as required by the licensee's DCRDR assessment methodology, and that cost does not become the over-riding factor.

2.6 Selection of Design Improvements

The purpose of selecting design improvements is to determine corrections to HEDs identified in the review phase of the DCRDR. Selection of design improvements should include a systematic process for the development and comparison of alternative means of resolving HEDs. Furthermore, according to NUREG-0737, Supplement 1, the licensee should document all of the proposed control room changes.

Approximately one-third of the proposed corrective actions identified in the 1986 Final Summary Report and in Revision 1 to that report were installed in the Brunswick control rooms at the time of the audit. The NRC audit team reviewed several implemented changes. Enhancement modifications, including new labeling and annunciator priority coding, were judged in accordance with NUREG-0700 guidance. Design changes such as new recorders and meters and relocation of redundant reactor vessel instrumentation were also judged to be in accordance with NUREG-0700 guidance. No "Priority 1" safety significant HEDs remain to be corrected in the control room. Approximately half of the "Priority 2" safety significant HEDs have been corrected. The licensee has scheduled the completion of all DCRDR related modifications for both units in the 1989-1992 time frame. The audit team reviewed selected work packages for these modifications. There are approximately 56 work packages in various stages of preparation.

It was the audit team's judgment that the licensee has met the NUREG-0737, Supplement 1 requirement for selection of design improvements.

2.7 Verification that Selected Design Improvements Will Provide the Necessary Correction

A key criterion of DCRDR success is a consistent, coherent, and effective interface between the operator and the control room. This criterion may be met by effectively executing the processes of selection of design improvements, verification that selected improvements will provide the necessary correction, and verification that the improvements will not introduce new HEDs. According to NUREG-0800, techniques for the verification process might include resurveys of panels, applied experiments, engineering analyses, environmental surveys, and operator interviews. The

consistency, coherence, and effectiveness of the entire operator-control room interface are important to operator performance.

The verification of corrective actions in the Brunswick DCRDR was identified as the responsibility of the HED assessment team. They addressed this requirement as part of the processes of selecting corrective actions and developing detailed corrective action plans in the various assessment follow-up projects. The licensee identified the following steps taken to ensure that corrective actions would resolve the identified problems:

- Grouping of HEDs that address the same type of problem to ensure integration and consistency of resolution.

- Grouping of HEDs that addressed the same component or type of component to ensure consistency of resolution.

- Evaluation of proposed corrective actions against applicable NUREG-0700 criteria.

Several control room human factors engineering standards were developed. They cover: labeling design, acronyms and abbreviations, color coding, and zone coding. These standards and other human factors guidelines have been incorporated into a Human Factors Design Guide and a site specification, "Human Factors Engineering for Control Panel Modifications" (Specification No. 170-001). This guidance was reviewed during the audit and found to be appropriate.

In January 1989, a new, corporate-wide Nuclear Engineering Department procedure was issued which governs all plant modifications, including control room modifications. This procedure requires consideration of NUREG-0737, Supplement 1, requirements as applicable in the preparation of design modifications. It states that the site Human Factors Engineering Guide should be used as applicable. It requires a human factors engineering review, when applicable, as part of the process of developing a modification. This is among the review responsibilities assigned to Operations. The modification procedure requires conducting a post-implementation walkdown, but does not specify attention to human factors

engineering issues during the walkdown. This procedure does not require separate human factors engineering signoff on modifications; the overall Operations signoff is presumed to take human factors issues into consideration where applicable. The audit team recommended making the human factors engineering requirements in this procedure more evident and more explicit, and requiring a separate human factors signoff when applicable to a modification.

The licensee stated that the DCRDR team has taken, and will continue to take, an active role in ensuring that all DCRDR corrective actions are properly implemented to resolve the identified problems without creating new HEDs. Information was presented during the audit to support this statement. A single coordinator has been assigned to manage all DCRDR-related modification packages. Another individual has been assigned responsibility to ensure that HED corrective action commitments are properly closed out. The audit team reviewed documentation of implemented corrective actions which indicated that, to date, there has been appropriate post-implementation follow-up to verify control room changes resulting from the DCRDR. In addition, audit team verified a sample of implemented corrective actions which indicated that the corrective action verification process has been conducted satisfactorily.

It was the audit team's judgment that the licensee met the requirement of NUREG-0737, Supplement 1, for a verification that the selected design improvements will provide the necessary correction.

2.8 Verification that the Improvements Will Not Introduce New HEDs

As discussed in Section 2.7 above, the licensee did have a process for verifying that the improvements will not introduce new HEDs when implemented. Therefore, it was the audit team's judgment that the licensee has met the requirement of NUREG-0737, Supplement 1, for a verification that the improvements will not introduce new HEDs.

2.9 Coordination of Control Room Improvements with Changes From Other Programs, Such as the Safety Parameter Display System, Operator Training, Regulatory Guide 1.97 Instrumentation, and Upgraded Emergency Operating Procedures

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

Management of the NUREG-0737 Supplement 1 initiatives at Brunswick was the responsibility of one individual. In addition, team members were assigned to work across projects. These management and staffing provisions contributed to project coordination.

The SPDS displays were developed by many of the same people who worked on the DCRDR. The HED assessment team also supported development of the final SPDS displays. The human factors review of the SPDS was performed by the lead human factors specialist for the DCRDR. Some DCRDR HEDs were resolved by incorporating data into both the SPDS and the EOPs. For example, the Brunswick control rooms do not have an integrated group isolation status light display. To resolve this HED, a group isolation checklist was provided in the EOPs and SPDS displays show isolation status at both a summary level and in detail.

The site project coordinator for the DCRDR also had primary responsibility for the EOP upgrade. The DCRDR task analysis was based on the symptom-based EOPs upgraded through Revision 3 of the Boiling Water Reactor Owners Group Emergency Procedure Guidelines. Seventeen HEDs were resolved by the EOP upgrade project. In addition, needs for additional instrumentation were identified in conjunction with the EOP upgrade project

and became HEDs to be corrected in the DCRDR. The standard for acronyms and abbreviations that was developed in the DCRDR is being used in the procedures program and in the SPDS development effort.

Some HEDs were resolved by communicating them to the training department. Training on panel modifications has been provided. The training simulator is being changed to maintain consistency with the control rooms.

Instrumentation upgrades, additions, or replacements to meet criteria in Regulatory Guide 1.97, Revision 2, and in NUREG-0737, Supplement 1, were made in the overall Emergency Response Capability project. Regulatory Guide 1.97 displays were reviewed in the DCRDR.

It was the audit team's judgment that the licensee met the requirement of NUREG-0737, Supplement 1, for coordination of the DCRDR with the development of the SPDS, upgraded EOPs, operator training, and Regulatory Guide 1.97.

3.0 CONCLUSION

The NRC conducted a Pre-implementation audit of Carolina Power and Light Company's Brunswick Steam Electric Plant Detailed Control Room Design Review during a site visit May 15 and May 18, 1989. The purposes of the audit were to assess the licensee's completion of the nine DCRDR requirements stated in NUREG-0737, Supplement 1 and to discuss the licensee's schedules for completing all corrective actions resulting from the program. It was the audit team's judgment that the licensee met eight of the nine DCRDR requirements.

The NUREG-0737, Supplement 1 requirement to assess all HEDs for safety significance and determine whether corrective action is needed was judged by the audit team to be incomplete. As discussed in Section 2.5 of this report, the licensee recently undertook reevaluation of the need to correct several HEDs. To complete the assessment requirement satisfactorily, the licensee should complete these reevaluations in a manner consistent with the assessment methodology defined in the licensee's Final Summary Report on the Brunswick DCRDR.

4.0 REFERENCES

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

2. Control Room Design Review Detailed Program Plan and Implementation Guidelines for Carolina Power and Light Company's Brunswick Steam Electric Plant Units 1 and 2. Carolina Power and Light Company, December 1984.

3. Comments on the Detailed Control Room Design Review Program Plan for Carolina Power and Light Company's Brunswick Steam Electric Plant, Units 1 and 2. USNRC, May 1985.

4. Update of Control Room Design Review Detailed Program Plan and Implementation Guidelines for Carolina Power and Light Company's Brunswick Steam Electric Plant, Units 1 and 2. Carolina Power and Light Company, December 1985.

5. Brunswick Steam Electric Plant Control Room Design Review Final Summary Report, Carolina Power and Light Company, December 1986.

6. Brunswick Steam Electric Plant Control Room Design Review Final Summary Report, Revision 1. Carolina Power and Light Company, June 1987.

7. NUREG-0800, "Standard Review Plan," Section 18.1, "Control Room," and Appendix A, " Evaluation Criteria for Detailed Control Room Design Review (DCRDR)," USNRC, September 1984.

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

ATTACHMENT 1 (to TER)
AUDIT AGENDA

ATTACHMENT 1 (to TER)
AUDIT AGENDA

Day 1 - May 15, 1989

1:30 pm NRC Entrance Briefing and Detailed Control Room Design Review (DCRDR) briefing

2:00 pm Licensee briefing on DCRDR program at Brunswick

2:45 pm Audit team control room walkdown of the Reactor Pressure Vessel Control or Radioactivity Release Control procedure (Access to control room needed; 2 licensed operators needed).

4:30 pm Audit team documentation of sample human engineering discrepancies identified during control room walkdown

5:00 pm End Day 1

Day 2 - Tuesday, May 16, 1989

8:00 am Presentation to licensee of findings from EOP walkthrough identified by audit team

8:30 am Review of implemented and proposed DCRDR related control room modifications including:

- o Annunciator project modifications
- o EOP instrumentation project
- o Indicator upgrade project
- o Component relocation project

11:00 am Review of schedules for implementating any remaining safety significant HEDs.

11:30 am Review of coordination of DCRDR modifications with changes made in other programs including:

- o Safety Parameter Display System
- o Regulatory Guide 1.97 instrumentation
- o Upgraded EOPs
- o Operator training

12:00 Lunch

1:00 pm Licensee discussion of how audit team's sample findings identified during EOP walkdown, were identified in their DCRDR.

2:00 pm NRC Caucus

3:00 pm NRC and licensee technical issue discussion and resolution

5:00 pm End day 2

Day 3 - Wednesday, May 17, 1989

8:30 am NRC Safety Parameter Display System (SPDS) entrance briefing

- o SPDSs Generic Letter Status
- o Previous NRC findings regarding Brunswick SPDS

9:00 am Licensee briefing on SPDS program results to date

10:00 am SPDS Evaluation (Access to control room and TSC needed)

1. Parameter selection
   - o Reactivity control
   - o Core cooling and heat removal from the primary system
   - o Reactor coolant system integrity
   - o Radioactivity control
   - o Containment conditions
2. Continuous display of top level safety function information
3. Concise display of safety function information
4. Located convenient to control room operator
5. High degree of reliability
6. Design incorporating human factors engineering
7. Procedures and training for SPDS operation
8. Electrical isolation

12:30 Lunch

1:30 pm Operator interviews (S/S;STA;TRG instructor)

3:00 pm NRC Caucus

4:00 pm NRC/Licensee SPDS technical issues discussion and resolution

5:00 pm End day 3

Day 4 - Thursday, May 18, 1989

8:00 am NRC/Licensee discussion and resolution of DCPDR or SPDS issues(as necessary)

10:30 am NRC/Licensee management exit

ATTACHMENT 2 (to TER)
LIST OF AUDIT PARTICIPANTS

ATTACHMENT 2 (to TER)
LIST OF AUDIT PARTICIPANTS

ENTRANCE MEETING

Attendees 5/15/89

NAME	ORGANIZATION
Sam Strickland	OPS
James Bongarra, Jr.	NRC/NRR/DLPQ
Gary Bethke	NRC - Comex
Barbara Paramore	NRC - SAIC (human factors)
William H. Ruland	NRC - SRI
C.F. Blackmon, Jr.	CP&L MGR - OPS
William B. Geise	Project Special, - Simulator Support
George Barnes	CP&L Operations
Mike Williams	BTU
Mike Sawtschenko	CP&L Operations
Mike Beck	OPS
Ralph Sanders	CP&L NED, Raleigh
Randy Weiss	CP&L NED, Raleigh
Michael J. Pastva, Jr.	CP&L Regulatory Compliance
Arnold W. Schmich	CP&L NFS, Raleigh
Wilbert May	CP&L NED, Raleigh
T.H. Wyllie	CP&L - BNP

EXIT MEETING
Attendees 5/18/89

NAME	ORGANIZATION
G.W. Bethke	NRC - Comex
Barbara Paramore	NRC - SAIC
Mike Beck	OPS
Mike Williams	TRANG
Mike Sawtschenko	OPS
George Barnes	OPS
Gene Eagle	CP&L - TS
Ralph Sanders	CP&L, Raleigh
K.E. Enzor	
W. Levis	NRC
Joe Holder	CP&L
T.H. Wyllie	CP&L
W.B. Geise	CP&L
J. O'Sullivan	CP&L
Walt Simpson	CP&L
Steve Callis	CP&L
David Dorsett	CP&L
David Rudoff	QA/CP&L
Arnold Schmich	CP&L/NFS
Michael Pastva	CP&L
Albort, May	CP&L
C.F. Blackmon, Jr.	CP&L
R.E. Helme	CP&L
James Bongarra	NRC/NRR

ATTACHMENT 3 (to TER)
POTENTIAL HEDs IDENTIFIED IN THE AUDIT TEAM'S
WALKTHROUGH OF EOP-04-RRCP

ATTACHMENT 3 (to TER)

POTENTIAL HEDs IDENTIFIED IN THE AUDIT TEAM'S WALKTHROUGH OF EOP-04-RRCP

- The Brunswick Chemistry Department indicated that both the High and the High-High alarm setpoints on the Process Offgas Vent Pipe (Plant Stack) were set the same at 4.2 E+5 uci/sec. The EOP entry condition uses a value of 2.94 E+5 uci/sec as the High value. This discrepancy between the EOP and the control room instrument should be resolved.

- The EOP refers the operator to recorder D12-RR-4600 to read Process Offgas Vent Pipe radiation level. This recorder is on a back panel, and provides an LED read-out in the proper engineering units. The more accessible recorder on the front panel is labeled D12-R600, and reads in the base 10 logarithm of the engineering value (uci/sec).

- The entry condition for Reactor Building Roof Vent Rad High (noble gas release) has an EOP setpoint of 3400 CPM for unit 1, and 4200 CPM for unit 2. A paper label is attached to the actual unit 2 instrument indicating that the setpoint is 100,014 CPM. The unit 1 instrument had no setpoint label, and appeared to be set close to 4200 (based on potentiometer setting). The EOPs, and the control room instruments should use the same setpoint and should be labeled consistently.

- An EOP entry condition for Service Water Effluent Rad High has setpoints in the EOP listed in units of CPM. The actual recorder in the control room (D12-RR-604) is calibrated in units of CPS, but doesn't have the units listed on the instrument. Control room instrument D12-K605 in the control room is labeled in CPS. The recorder should be labeled with units, and the EOPs corrected to reflect CPS versus CPM. The EOP problem had been previously identified by CP&L.

- Step RR/RB-9 of the EOP may require the operator to read "MSIV PIT Temperature". The value is available on the back panels on the ECCS Leak Detection panel (1-B21B-51). Obtaining the value involves rotating a 19 position selector switch. The switch and instrument are not labeled "MSIV PIT Temperature". Either the instrument should be labeled like the EOP, or the EOP corrected to read like the instrument label.

- The Process Reactor Building Vent Rad and Main Steam Line Rad monitors on the back panels are not labeled with the instrument designations (D12-RM-k609A & B, and D12-RM-K603A & B).

ATTACHMENT 2 (to Staff Evaluation)

HUMAN ENGINEERING DISCREPANCY

- ANNUNCIATOR PROJECT (SAM STRICKLAND)
- EOP INSTRUMENTATION PROJECT (ARNOLD SCHMICH)
- COMPONENT REMOVAL PROJECT
- INDICATOR UPGRADE PROJECT
- COMPONENT RELOCATION PROJECT
- CONTROL ROOM CONVENTION PROJECT
- CONTROL ROOM HVAC PROJECT
- OFF-GAS FLOW INSTRUMENT PROJECT

(411GNED/1am)

6.3.3 THE COMPONENT REMOVAL PROJECT CONTAINS 18 HEDs, WHICH ARE COVERED IN 20 PLANT MODIFICATIONS. THESE HEDs REMOVE UNNECESSARY COMPONENTS ON THE CONTROL BOARDS.

6.3.4 THE INDICATOR UPGRADE PROJECT CONTAINS 16 HEDs, WHICH ARE COVERED IN SEVEN PLANT MODIFICATIONS. THESE HEDs ADDRESSED PHYSICAL CHARACTERISTICS OF INDICATORS SUCH AS, NUMBER SCALE PROGRESSIONS, AND READABILITY OF INTERNAL SCALE LABELING. THE FUNCTIONAL ASPECTS OF METERS, AND LEGEND LIGHTS AND THEIR LABELS.

6.3.5 THE COMPONENT RELOCATION PROJECT CONTAINS 32 HEDs. WHICH ARE COVERED IN 31 PLANT MODIFICATIONS. THESE PLANT MODIFICATIONS WILL FUNCTIONALLY GROUP INSTRUMENTS.

6.3.6 THE CONTROL ROOM CONVENTION PROJECT CONTAINS 12 HEDs, WHICH ARE COVERED IN 13 PLANT MODIFICATIONS. THE CONTROL ROOM CONVENTION PROJECT SURVEYED ALL ANNUNCIATORS' TILE ENGRAVING, PANEL LABELING, COMPONENT LABELING, FUNCTION LABELING, AND POSITION LABELING. THESE ITEMS WERE COMPARED TO IDENTIFY INCONSISTENCIES AND INCORRECT USAGE WITH ABBREVIATIONS. THE SURVEY ALSO ADDRESSED THE APPLICATION OF COLOR CODING IN THE CONTROL ROOM AND DEDICATED SHUTDOWN PANELS AND CONTROL DIRECTIONAL MOVEMENT.

6.3.7 THE CONTROL ROOM HVAC PROJECT CONTAINS ONE HED, WHICH IS COVERED IN ONE PLANT MODIFICATION. THE HVAC SURVEY ADDRESSED THE TEMPERATURE AND HUMIDITY LEVELS IN THE CONTROL ROOM, HOT/COLD SPOTS, DRAFTS, RELIABILITY, AND OPERATOR COMMENTS.

6.3.8 THE OFF-GAS FLOW INSTRUMENT PROJECT CONTAINS ONE HED WHICH IS COVERED BY ONE PLANT MODIFICATION. THE OFF-GAS OUTLET FLOW RECORDER IS FREQUENTLY OUT OF SERVICE AND IS NOT RELIABLE.

ENGINEERING STATUS OF HED PROJECTS:

6.3.3 The Component Removal Project

COMMITMENT: Unit 1 Refueling Outage 8 (1992)
Unit 2 Refueling Outage 10 (1993)

PLANT MODIFICATION STATUS:

Six plant modifications have been completed.

Five plant modifications are scheduled for completion in 1989.

Two plant modifications are scheduled for completion in 1990.

Two plant modifications are scheduled for completion in 1991.

Five plant modifications are scheduled for completion in 1992.

6.3.4 The Indicator Upgrade Project

COMMITMENT: Unit 1 Refueling Outage 8 (1992)
Unit 2 Refueling Outage 9 (1991)

PLANT MODIFICATION STATUS:

Three plant modifications have been completed.

One plant modification is scheduled for completion in 1989.

Two plant modifications are scheduled for completion in 1990.

One plant modification is scheduled for completion in 1991.

6.3.5 THE COMPONENT RELOCATION PROJECT

COMMITMENT: UNIT 1 REFUELING OUTAGE 8 (1992)
UNIT 2 REFUELING OUTAGE 10 (1993)

PLANT MODIFICATION STATUS:

FOUR PLANT MODIFICATIONS HAVE BEEN COMPLETED.

THREE PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1990.

SIXTEEN PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1991.

EIGHT PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1992.

(4116NED/leh)

6.3.6 THE CONTROL ROOM CONVENTION PROJECT

COMMITMENT: UNIT 1 REFUELING OUTAGE 8 (1992)
UNIT 2 REFUELING OUTAGE 10 (1993)

PLANT MODIFICATION STATUS:

TWO PLANT MODIFICATIONS HAVE BEEN COMPLETED.

TWO PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1989.

THREE PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1990.

FIVE PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1991.

ONE PLANT MODIFICATION IS SCHEDULED FOR COMPLETION IN 1992.

(4116NED/lah)

THE CONTROL ROOM HVAC PROJECT

COMMITMENT: UNIT 1 REFUELING OUTAGE 7 (1990)
UNIT 2 REFUELING OUTAGE 7 (1990)

PLANT MODIFICATION STATUS:

THIS PLANT MODIFICATION IS SCHEDULED FOR COMPLETION IN 1990.

(4116NED/1ah)

6.3.8 THE OFF-GAS FLOW INSTRUMENT PROJECT

COMMITMENT: UNIT 1 REFUELING OUTAGE 8 (1992)
UNIT 2 REFUELING OUTAGE 11 (1993)

PLANT MODIFICATION STATUS:

THESE PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1989.

(4116NED/1eh)

TOTAL PLANT MODIFICATION STATUS:

FIFTEEN PLANT MODIFICATIONS HAVE BEEN COMPLETED.

EIGHT PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1989.

TEN PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1990.

TWENTY-FOUR PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1991.

FOURTEEN PLANT MODIFICATIONS ARE SCHEDULED FOR COMPLETION IN 1992.

(4116NED/1eh)

6.2.10 Control Room Maintenance Project - To be completed by December ~~31, 1988~~ 15, 1989.

HEDs to be addressed: 15 Total

4- Priority 3
10 - Priority 5

2263-3259 (5)	20J7-2390 (5)	206X-1189 (3)
21X5-3260 (5)	206X-2414 (5)	206X-1192 (5)
206X-3581 (5)	20X4-2487 (5)	20F1-1939 (5)
2063-2227 (5)	206X-1122 (3)	216X-0119 (5)
206X-2349 (3)	206X-1125 (5)	206X-2128* (5) Done

6.2.11 Control Room Furnishings Project - To be completed by December 31, 1987.

HEDs to be addressed: 15 Total

20X8-1405	206X-3272	22G3-0104
206X-1406	206X-1166*	22H1-0105
206X-1409*	21G2-0101	20G1-0106
2063-3125*	22G2-0102	20H1-0107
20SY-3204	21G3-0103	20H1-0108

6.2.12 Training Project - To be completed by December 31, 1987.

HEDs to be addressed: 8 Total

20H0-0501	20X3-1168	20G1-0315*
20H0-0506	20G1-0306	20X5-5012
20X5-1105*	20G1-0312	

6.2.13 Zone Coding Project - To be completed by December ~~31, 1988~~ 15, 1989.

HEDs to be addressed: 7 Total

5- Priority 3
2 - Priority 5

2063-2202 (5)	206X-2241 (3)	2063-1126 (3)
206X-2209 (5)	206X-2245 (5)	20X5-5015* (3)
20X1-2240 (3)		

* HED is addressed in more than one project. REV. 1

e. Main Stack Radiation Monitor Recorder Installation Project - Has been completed for Unit 1. To be completed by the end of Refueling Outage 6 for Unit 2 (currently scheduled 01/02/88 to 04/22/88).

HEDs to be addressed: 2 Total

21X3-2407 22X3-2498

6.3 Newly Scheduled Projects

The following projects have been evaluated to determine the appropriate corrective actions for the HEDs listed and implementation scheduled developed.

6.3.1 Annunciator Project - To be completed by the end of Refueling Outage 8 for Unit 1 (currently scheduled 02/15/92 to 05/08/92) and Refueling Outage 9 for Unit 2 (currently scheduled 04/27/91 to 07/19/91).

4- Priority 3
1- Priority 5

HEDs to be addressed: 10 Total

Partial Partial: 20H0-2102* ✓(2) 206X-2116(5)P9 206X-2124 (5)P9

cancelled: ~~206X-2106~~ ✓(2) 206X-2117(5)P9 ~~206X-2127 (5)~~ P8

~~20H0-2103~~ time 206X-2120 (5)P9 20X3-2129 (5)P9

cancelled: 206X-2115 ✓(5)

6.3.2 EOP Instrumention Project - To be completed by the end of Refueling Outage 7 for Unit 1 (currently scheduled 07/07/90 to 10/05/90) and Refueling Outage 9 for Unit 2 (currently scheduled 04/27/91 to 07/19/91).

3- Priority 2

HEDs to be addressed: 6 Total

~~206X-5099~~ Deleted ~~206X-5096~~ (2) cancelled

206X-5092 (2)P0 ~~206X-5097~~ (2) cancelled

206X-5094 (2)P0 206X-5093 (2)P1

* HED is addressed in more than one project. REV. 1

6.3.3 Component Removal Project - To be completed by the end of Refueling Outage 8 for Unit 1 (currently scheduled 02/15/92 to 05/08/92) and Refueling Outage 10 for Unit 2 (currently scheduled 11/28/92 to 02/26/93).

HEDs to be addressed: 18 Total

20X3-5034 (3)	2061-1133 (5) ~~complt~~	20X1-3565 (5)**
206X-3008 (4)**	206X-1409* (5)**	~~206X-2222 (5) complt~~
20X5-5004 (3)**	206X-3255 (5)**	~~22J2-1916 (5) complt~~
20X3-5003 (3)**	20X2-5083 (2)**	20X3-5068* (5)**
20X3-5032 (3)**	~~22J2-1416 (5)~~	20F1-5088 (5)**
20X3-5071 (3)**	~~20J2-1418 (5)~~	2061-1404 (5)**

6.3.4 Indicator Upgrade Project - To be completed by the end of Refueling Outage 8 for Unit 1 (currently scheduled 02/15/92 to 05/08/92) and Refueling Outage 9 for Unit 2 (currently scheduled 04/27/91 to 07/19/91).

HEDs to be addressed: 16 Total

20X3-2413 (2)**	206X-2226 (3)**	20X5-2406* (2)**
2163-2416 (5)**	206X-1146 (3)**	206X-2230 (5)**
206X-1145 (3)**	206X-1187 (3)**	206X-2479 (2)**
206X-2228 (3)**	2063-5019 (3)**	~~206X-2484 (3) complt~~
206X-2080 (2)**	20X5-2405* (2)**	20X8-5021 (3)**
206X-2225 (3)**		

* HED is addressed in more than one project. REV. 1

6.3.5 Component Relocation Project - To be completed by the end of Refueling Outage 8 for Unit 1 (currently scheduled 02/15/92 to 05/08/92) and Refueling Outage 10 for Unit 2 (currently scheduled 11/28/92 to 02/26/93).

HEDs to be addressed: 32 Total

1 - Priority 2
21 - Priority 3
9 - Priority 5

20X2-1162 (5)	206X-5069 (3)	20X5-5079 (3)
20X2-1169 (5)	20X3-5070 (3)	20X5-5080 (3)
20X2-5085 (5)	206X-5072 (3)	2061-5043 (5)
206X-5036 (3)	206X-5073 (3)	20X2-2201 (2)
206X-5051 (3)	206X-5076 (5)	206X-1104 (3)
20X2-5052 (5)	206X-5081 (3)	206X-1113 (3)
20X2-5053 (5)	206X-5033 (5)	206X-1151 (5)
206X-5060 (3)	206X-5057 (3)	2063-1170 (5)
206X-5064 (3)	20X5-5061 (5)	~~20X2-3243*~~ (2)
20X2-5065 (3)	206X-5063 (2)	20X2-5062 (3)
20X3-5068* (5)	206X-5078 (3)	

6.3.6 Control Room Convention Project - To be completed by the end of Refueling Outage 8 for Unit 1 (currently scheduled 02/15/92 to 05/08/92) and Refueling Outage 10 for Unit 2 (currently scheduled 11/28/92 to 02/26/93).

1 - Priority 2
10 - Priority 3
1 - Priority 5

HEDs to be addressed: 12 Total

20RS-3289 (3)	20X2-1302 (2)	20X5-3218 (3)
20X5-1105* (2)	206X-1304 (5)	20X2-3268 (2)
206X-1163 (3)	2063-1305 (3)	206X-5038 (3)
206X-1178 (3)	206X-1306 (3)	206X-5082 (3)

6.3.7 Control Room HVAC Project - To be completed by the end of Refueling Outage 7 for Unit 1 (currently scheduled 07/07/90 to 10/05/90) and Refueling Outage 8 for Unit 2 (currently scheduled 09/21/89 to 12/01/89).

HED to be addressed: 1 Total

1 - Priority 3

20H0-0002 (3)

* HED is addressed in more than one project. REV. 1

6.3.8 Offgas Flow Instruments Project - To be completed by the end of Refueling Outage 8 for Unit 1 (currently scheduled 02/15/92 to 05/08/92) and Refueling Outage 10 for Unit 2 (currently scheduled 11/28/92 to 02/26/93).
HED to be addressed: 1 Total
20X8-5018 (3)"

1 - Priority 3

6.4 Additional Commitments

6.4.1 Development and implementation of a Human Factors Design Guide Project - To be completed by December 31, 1987.

6.4.2 ERFIS and SPDS Survey - This project was a commitment made in the CRDR program plan that could not be completed by the Final Summary Report submittal date. This will be completed as part of the ERFIS/SPDS project, within 3 months after Refueling Outage 6 for Unit 1 (currently scheduled 10/15/88 to 01/06/89) and within 3 months after Refueling Outage 7 for Unit 2.