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November 20, 1984

Docket Nos. 50-348  
50-364

Director, Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Attention: Mr. S. A. Varga

Joseph M. Farley Nuclear Plant - Units 1 and 2  
Detailed Control Room Design Review (DCRDR)

Gentlemen:

In accordance with the provisions of Supplement 1 to NUREG-0737, Alabama Power Company submitted a program plan by letter dated October 31, 1983 for conducting a DCRDR at the Joseph M. Farley Nuclear Plant, Units 1 and 2. By letter dated March 9, 1984, the NRC Staff provided comments on the Alabama Power Company program plan and recommended that a meeting be held with the NRC to allow for further discussion on the DCRDR.

Specific responses to the NRC Staff comments contained in the March 9, 1984 letter are provided as Attachment 1. A summary of the Alabama Power Company program plan items that are different from the NUTAC for CRDR guidance was developed as a result of recent discussions with the NRC Staff and is provided as Attachment 2.

On July 25, 1984, Alabama Power Company personnel and the NRC Staff met to discuss the program plan for conducting the DCRDR. It is believed that, as a result of this meeting, the NRC Staff has been provided a reasonable description of the Alabama Power Company DCRDR program plan.

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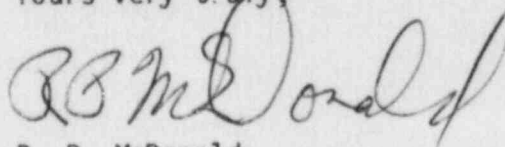
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A major topic of discussion during the meeting was Alabama Power Company's intent to utilize the NUTAC "Control Room Design Review Survey Development Guideline" surveys, checklists and questions in lieu of the NUREG-0700 checklists for the DCRDR survey. The NUTAC approach to conducting the DCRDR survey is that utilization of performance based criteria will more appropriately address applicable human factor principles than the NUREG-700 criteria of parameters that are not readily measurable (e.g., NUREG-0700 requires measurements of geometric distortion and resolution of a CRT while the NUTAC guidelines address operator problems with flicker, glare and readability). It was agreed that Alabama Power Company would use the NUTAC approach to conduct the DCRDR survey while the NRC Staff would use the NUREG-0700 checklists to audit the survey results. The NRC would then determine whether the Farley-specific DCRDR survey did adequately "identify deviations from accepted human factors principles" pursuant to the provisions of NUREG-0737, Supplement 1. These different approaches to the survey should not result in significantly different human factors evaluations of the Farley Control Room.

If there are any questions, please advise.

Yours very truly,



R. P. McDonald

RPM/JLO:ddb-DJLO-CRDR

Attachments

cc: Mr. L. B. Long  
Mr. J. P. O'Reilly  
Mr. E. A. Reeves  
Mr. W. H. Bradford

Attachment 1

APCo Response to NRC  
Comments on DCRDR, Dated March 9, 1984

1. NRC Comment: The DCRDR team has no nuclear systems engineer. The NRC staff recommends that the Human Factor Specialist (HFS) participate in the verification phase and in coordination of the DCRDR with other improvement programs. The NRC staff recommends that APCo provide engineers with expertise in industrial, reliability, and risk assessment engineering.

APCo Response: APCo will add a nuclear systems engineer to the DCRDR team. The HFS is extensively involved in the planning phases of the APCo CRDR. In addition, the HFS is a participating review team member during the survey and HED assessment. The HFS will participate as needed in the verification phase and in the coordination of the DCRDR with other improvement programs. The HFS has a Ph.D. in Industrial Engineering. The nuclear systems engineer and I&C engineers from the appropriate design organizations will provide technical expertise but will not serve as voting team members in the assessment phase. None of the tasks outlined in the APCo DCRDR program plan require expertise in either reliability or risk assessment engineering.

2. NRC Comment: The NRC Staff had the following comments on the APCo real-time simulation approach to task analysis:
- a) Procedures for a complete function and task analysis at a detailed level are not included in the APCo program plan (reference Section 3.4 of NUREG-0700). The Staff concludes that both "Event-Related Guidelines" and "Function-Related Guidelines" are necessary to cover all emergency operations.
  - b) The method for identifying information and control requirements for emergency plant operation is not explicitly addressed in the APCo program plan. Procedures need to be developed for the system function analysis and the identification and evaluation of information and controls required by the operator to meet tasks responsibilities.
  - c) Procedures for generating a control room inventory have not been explicitly defined. It is not clear how the instrumentation defined in the ERP's can be systematically checked during a real-time simulation using the ERP's. The time available to the operators for each task in a real-time simulation is limited.
  - d) The data collection forms for documenting task information (i.e., the Task Sequence Charts) do not indicate that information and control requirements will be defined.

APCo Response: APCo has revised the DCRDR task analysis to more readily address the NRC staff concerns related primarily to information and control requirements. A description of the revised task analysis which includes the process for identifying the characteristics of needed instrumentation and controls is provided below.

The scope of the function and task analysis described in NUREG-0700, Section 3.4 is not consistent with the more limited scope outlined in NUREG-0737, Supplement 1. Specifically, NUREG-0737, Supplement 1 requires "The use of functions and task analysis (that had been used as the basis for developing emergency operating procedures...) to identify control room operator tasks and information and control requirements during emergency operations."

The WOG Emergency Response Guidelines (ERG's), Revision 1 have identified generic tasks and functions. The bases for Farley-specific procedures are the WOG symptom-based ERG's Revision 1. It has been assumed in the APCo DCRDR program plan that the WOG ERG's will be approved for implementation by the NRC PSRB. After such approval, it is not incumbent on APCo to justify the steps in the ERG's. Given a valid set of Farley-specific procedures derived from the ERG's, the DCRDR task analysis will then determine the information and control requirements to complete each procedure step and verify that these requirements can be met by instruments and controls that exist in the Farley control room. The following Farley-specific emergency event procedures (EEP's) and all function restoration procedures (FRP's) will be analyzed using a table-top method of analysis:

- EEP-0      Reactor Trip or Safety Injection
- EEP-1      Loss of Reactor or Secondary Coolant
- EEP-2      Faulted Steam Generator Isolation
- EEP-3      Steam Generator Tube Rupture

The output of the table-top analysis will be recorded on Task Analysis Worksheets (TAW's) which provide an auditable means to document information and controls requirements and the corresponding instrumentation and controls. The TAW's will serve as an auditable record of how the needed characteristics of the instruments and controls were determined. An example TAW form is provided as Figure 1.



As part of the table top task analysis, APCo will identify information and control requirements. These information and control requirements will be identified without regard to the specific controls and displays that exist in the Farley control room. The DCRDR task analysis will identify the following information and control requirements from the Farley-specific EEP's and FRP's.

Displays - Values (1050, 25, 766, etc.)

Units (psi, gpm, °F, etc.)

Precision ( $\pm 5^\circ\text{F}$ , difference of 10 psi, etc.)

Characteristics (trend, greater than, in range, etc.)

Controls - Type (discrete, continuous)

Positions (on/off, 0-10 in increments of 2, etc.)

The above represent characteristics of instruments and controls identified in the EEP's and FRP's that operators need to complete. Unless indicated as a problem by questionnaires, interviews, or operating experience, characteristics such as transfer functions, loop time constants, gain, etc., will not be addressed during the DCRDR task analysis.

The instrumentation and controls that support the FNP-specific procedure tasks will be checked as follows:

- 1) Review Team members will verify that any information and control requirements identified during the table top analysis are met by specific instruments and controls in the control room.
- 2) Several operators will be walked through the applicable Farley EEP's and FRP's in the simulator.

During these walkthroughs, the operators will be asked to point out the instruments and controls they would use to accomplish the steps called out in the emergency procedures. The instruments and controls identified by the operators will be compared to those instruments and controls identified in the verification of the information and control requirements.

APCo believes that the above description of the process for using plant-specific emergency procedures, that are based on generic guidelines and background documentation, to identify the characteristics of needed instrumentation and controls is comprehensive and precludes the need to generate a control room inventory. The real-time simulation used for ERP validation has verified the operator's ability to use instrumentation and controls necessary for real-time responses to emergency operating conditions.

3. NRC Comment: The sample Checklist/Survey worksheets enclosed in the APCo program plan appear to lack space for recording the nomenclature/location of the discrepant item(s) involved.

APCo Response: The worksheets have been revised so that all discrepant items can be identified by panel location and instrument number. An example worksheet is provided as Figure 2.

4. NRC Comment: The HFS should be oriented to the FNP control room prior to the survey.

APCo Response: APCo agrees and will provide an orientation for the HFS prior to the survey.

5. NRC Comment: The NRC Staff recommends that the scope of the DCRDR include a human factors evaluation of the remote shutdown capability.

APCo Response: APCo will survey the Hot Shutdown Panels specified in Abnormal Operation Procedure (AOP) 28.0, "Control Room Inaccessibility", during the DCRDR survey and will perform task analysis on AOP 28.0.

6. NRC Comment: Although the APCo program plan mentions the use of consensus opinion and use of an INPO NUTAC document to rate HED's, the plan does not include a precise method to systematically assess HED's for significance. The Staff recommends that further documentation be provided to demonstrate that a concrete and valid technique will be employed.

APCo Response: The method for HED assessment will include the use of several rating scales. Each HED will be rated on every scale by as many voting DCRDR team members as possible. These scales will be 7-point Likert-type scales from which an HED can be consistently categorized as to its potential for causing serious operator error. An example HED assessment form is provided as Figure 3. The details of the assessment method will be included in the DCRDR summary report.

7. NRC Comment: The NRC Staff is concerned that the APCo program plan does not mention two important criteria for judging HED significance, namely the probability of error occurrence and the seriousness of possible outcome.

APCo Response: The HED assessment scales to be used in the DCRDR will include, but not necessarily be limited to, the probability that an HED will cause an error and the effect of such an error on the operation of the plant.

8. NRC Comment: The proposed schedule for resolution of APCo's Category 2 HED's is unacceptable. HED's known to have caused problems should be addressed promptly or a time limitation should be placed on the completion date. In addition, APCo's Category 3 HED's should be addressed promptly.

APCo Response: During assessment, HED's will be placed in four categories as follows:

Category 1 - HED's judged likely to prevent or delay the operator from completing a procedure step during emergency operation or HED's identified as causing or assessed as likely to cause problems of safety significance during normal operations

Category 2 - HED's identified as causing, or assessed as likely to cause problems during normal operation that do not have safety significance

Category 3 - HED's with problem potential undefined

Category 4 - HED's not likely to cause problems

For HED's which do not require plant modifications (i.e., resolutions requiring procedural or training revisions), resolution will be completed as soon as possible. For HED's requiring plant modifications, APCo has adopted the following goal dates:

Category 1 - As soon as design, procurement and plant conditions allow.

Category 2 - No later than the end of the first refueling outage after the summary report is submitted, assuming acceptable lead times are available for design and procurement.

Category 3 - No later than the second refueling outage after the summary report is submitted. The completion date will depend on economic and lead-time considerations.

Category 4 - No change required. Any control room change and associated completion date is at the discretion of APCo.

It is APCo's position that the critical path of an outage will not be extended for licensing related modifications that do not involve a safety concern.

9. NRC Comment: The APCo program plan does not discuss the criteria that will be used to select among candidate improvements to resolve HED's. The staff recommends that a well-defined procedure and criteria be developed.

APCo Response: The selection of the most appropriate design improvement is a complex process, but it is a process that goes on continuously in the APCo design support organizations. The process and criteria mentioned briefly in Section 5.3 of the APCo program plan are those used currently to evaluate alternative design improvements for the Farley plant and ensure that modifications are implemented in accordance with the design. HED resolutions will predominantly address physical changes, procedural modifications and or training improvements.



It is not the process nor the criteria that should be evaluated from a regulatory perspective, but the result. Regardless of the process used to resolve HED's, the ultimate judgement should be made on the basis of whether the resolution actually corrects the specific HED's.

10. NRC Comment: While APCo shows some attempt toward addressing the verification of proposed room modifications, the absence of a description of the procedures or processes required for a successful verification effort does not permit the NRC Staff to assess APCo's understanding of an intent to meet these requirements.

APCo Response: As part of its effort to maintain the human factors configuration of the FNP control room in the future, APCo will develop Farley-specific design directives (e.g., switch conventions) for use by design organizations during the design process for all future modifications affecting the control room. The design organizations will also utilize appropriate NUTAC criteria during the development of the design. Some HED resolutions will not require any verification to ensure that HED resolutions do not create new HED's (e.g., labeling that is replaced to meet specified human factor criteria). For more complex HED resolutions (e.g., functional grouping of displays) visual and/or physical verification will be made. In major modifications this verification could include the use of mock-ups, detailed conceptual design reviews, walkthroughs, etc. The HFS will be used, as needed, during the verification process for the initial HED resolutions review.

11. NRC Comment: The Staff suggests that verification of HED resolutions on the APCo simulator be performed prior to installation in the control room.

APCo Response: APCo believes that proper use of design directives, an evaluation of modifications to appropriate NUTAC criteria during the design process and a physical and/or visual verification will provide sufficient confidence in HED resolutions prior to installation in the control room.

The APCo simulator is dedicated to training at FNP and as such, should reflect, to the extent possible, actual control room configurations. Additionally, APCo feels preliminary modifications to the simulator would not be cost effective. APCo, therefore, will not alter the simulator configuration for the purpose of verifying HED resolutions.

12. NRC Comment: The Staff recommends that an information management system be developed to provide a tracking system for HED design modifications.

APCo Response: APCo will implement a system to track HED resolutions.

13. NRC Comment: Although APCo foresees the value of coordinating the DCRDR with other programs, the NRC Staff finds that the actual mechanics of a coordination effort or the intent to actively develop and implement a plan for such coordination have not been demonstrated. To the extent practicable, without delaying the completion of the DCRDR, it should also address any control room modifications and additions made or planned as a result of other post-TMI actions and lessons learned from operating reactor events such as the Salem ATWS events.

APCo Response: The NUTAC "Guidance for an Integrated Implementation Plan for Emergency Response Capability" document was used to develop the Farley-specific Emergency Response Capability program. The APCo DCRDR is implicitly integrated with the development of Farley-specific emergency procedures, in that the task analysis activity of the DCRDR will utilize Farley-specific emergency procedures. Regulatory Guide (R.G.) 1.97, SPDS and inadequate core cooling design efforts will be in progress at the same time as the DCRDR. To the extent that control room changes related to SPDS, inadequate core cooling, and R.G. 1.97 are known, they will be evaluated during the DCRDR. The HFS will review aspects of the SPDS and inadequate core cooling design specifications related to human factors to ensure the systems' acceptability from a human factors standpoint. The DCRDR team will evaluate impending R.G. 1.97 plant modifications affecting the control room during the DCRDR. The output of the DCRDR (HED's and suggested modifications) will be integrated with the SPDS functional specifications where appropriate.

14. NRC Comment: The staff has determined that APCo should provide justification for those guidelines in NUREG-0700 not examined.

APCo Response: APCo considers NUREG-0700 to be guidance only and as such feels that no justification is required. APCo believes that the criteria and guidelines used in the DCRDR should stand on their own merit and should be evaluated for compliance with the provisions for human factors principles as embodied in NUREG-0737, Supplement 1. APCo has evaluated the NUTAC guidance cross-references to NUREG-0700 guidelines and has determined that only the principles associated with NUREG-0700 guidelines 6.3.1.5A and 6.3.1.5B 1-3 concerning notifying the operator of cleared alarms may not be adequately addressed in the NUTAC guidance. APCo will add a question to both the engineering and operator questionnaires regarding the cue(s) that signify an annunciator has returned to normal. In APCO's judgement, all human factors principles embodied in NUREG-0737, Supplement 1 will be addressed in the APCo DCRDR program following this addition.

Figure 1  
Farley Nuclear Plant

TASK ANALYSIS WORKSHEET

Sheet 1 of 2

Information and Control Requirements

TASK	NUMERICAL VALUE	UNITS	CHARACTERISTICS (Trend, greater or less than, range)	PRECISION	CONTROL TYPE	CONTROL POSITIONS





Figure 2  
Farley Nuclear Plant  
CHECKLIST/SURVEY WORKSHEET

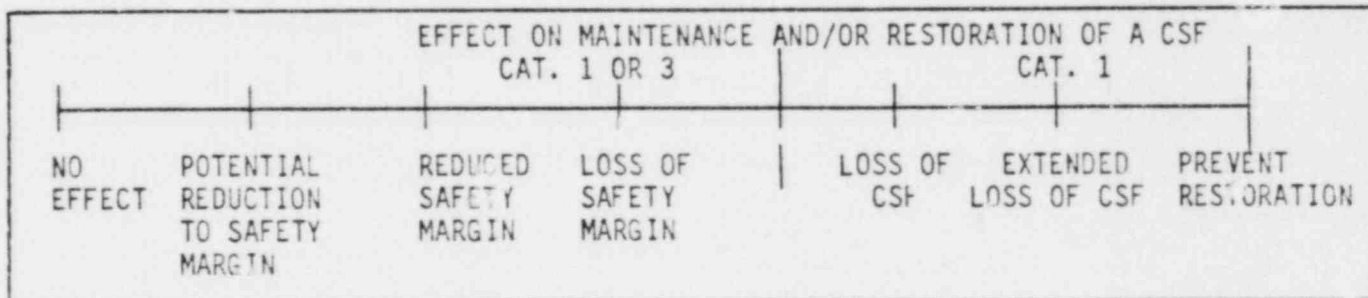
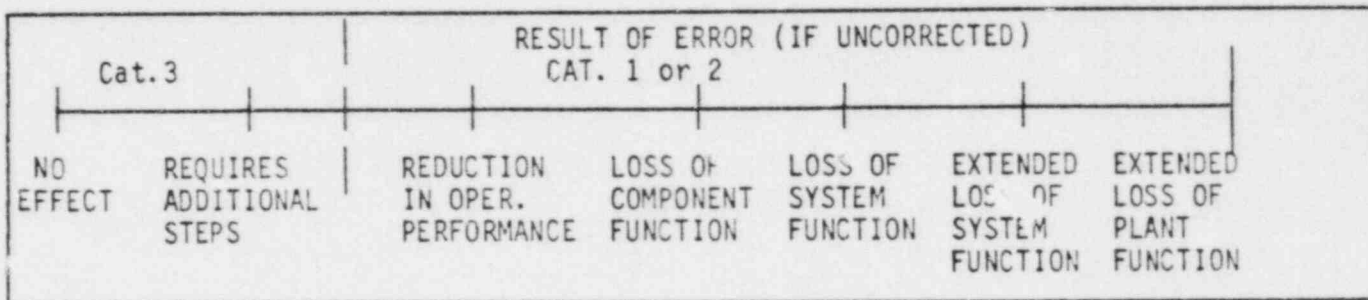
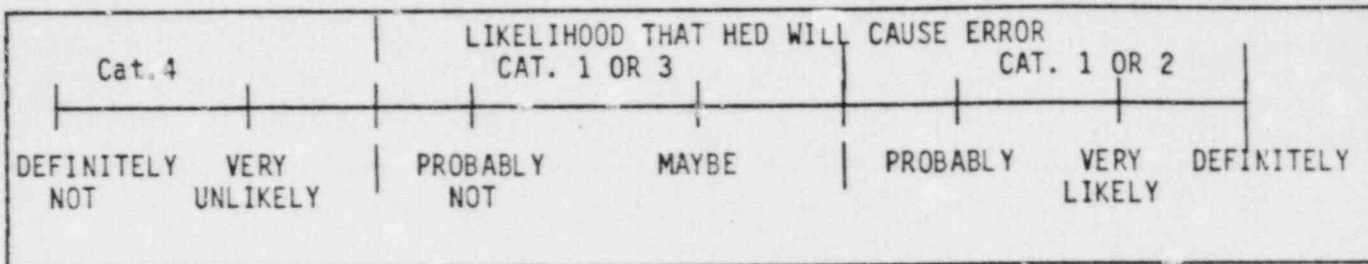
COMPLIANCE

# G-51	PANEL NUMBER:	YES	NO	N/A
Emergency controls are readily accessible.				
List instrument numbers not in compliance:				
Comments:				

Figure 3  
Farley Nuclear Plant  
CONTROL ROOM DESIGN REVIEW

HED CATEGORIZATION  
RECORD

HED # \_\_\_\_\_



REMARKS \_\_\_\_\_

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Figure 3 (continued)

TEAM ACTION					
CATEGORIZATION	1	2	3	4	
NOTE: DISSENTING TEAM MEMBER(S) OPINION NOTED ABOVE					
TEAM MEMBER	TEAM MEMBER SIGNATURE		CONCURRENCE		DATE
Team Leader	(T)		YES	NO	
Administrative Asst.	(A)		YES	NO	
Human Factors Spec.	(H)		YES	NO	
Operations Specialist	(O)		YES	NO	
Procedures Specialist	(P)		YES	NO	



Attachment 2

Summary of APCO Program Plan Items  
Differing from NUTAC Guidance

Section	APCo Proposal	NUTAC Guidance	Justification/Correction
3. Management, Staffing and Scheduling	Planning Phase says that CRDR procedures will be developed if required.	More detail should be provided about the overall organization and focus of the DCRDR project. An implementation plan should be developed which describes the purpose of the CRDR. This plan should be provided to the review team as part of the orientation.	Development of detailed procedures for every CRDR activity may not be necessary since the review team will perform these activities. Some activities are sufficiently detailed in the program plan.
3.2 Review Team Structure	APCo has added an Administrative Assistant and an Emergency Procedures Specialist to the NUTAC guidance Review Team.		APCo feels these additional members will enhance Review Team capability.
3.4 Review Team Organizational Interfaces	APCo does not propose to utilize line organizations as an integral part of the DCRDR; only when certain tasks require their assistance.	Line organizations should perform control room reviews as often as possible.	APCo believes the review team has the necessary expertise to perform all control room reviews without involving line organizations. If additional expertise is required, then line organizations will be utilized.
4.1.1 Historical Documentation Review	APCo states that the Administrative Assistant will screen all significant documents for possible discrepancies relating to the control room.	The review team leader must review all documents which may relate to control room discrepancies before presenting them to the review team for evaluation.	The review team leader will review the Administrative Assistant's list of possible control room discrepancies before presenting it to the review team for evaluation.

Section	APCo Proposal	NUTAC Guidance	Justification/Correction
4.1.4 Structured Interviews	<p>Follow-up interviews will be performed after the operator questionnaires are reviewed only if it appears there are some discrepancies or ambiguities to the answers.</p> <p>These interviews will be performed by the DCRDR team leader's designee.</p>	<p>Follow-up interviews are included as a required portion of the DCRDR project.</p> <p>Contracted personnel should conduct follow-up interviews.</p>	<p>APCo believes that interviews should only be conducted if they can add significantly to the information gained from the questionnaires.</p> <p>Since the purpose for the follow-up interviews is to clarify, it would eliminate confusion if the DCRDR team members performed the interviews themselves.</p>
4.2 Control Room Survey	APCo will not re-evaluate surveys which were addressed in the 1980 Control Room Survey (e.g., noise survey)		Earlier survey resolved discrepancies.
4.2.2 Personnel Assignments	Survey Teams will consist of members of the DCRDR team if possible.	The surveys will be conducted by members of various line organizations.	In order to avoid confusion during the review of Control Room surveys, members of the DCRDR team will perform the surveys themselves.

Section	APCo Proposal	NUTAC Guidance	Justification/Correction
5.2 Evaluation Criteria	HED categories are revised.		Based on other utilities' experience in HED assessment, the revised APCo method should be more effective.
5.3 Resolution of HEDs	All proposed resolutions will be evaluated for effectiveness. Designers will be instructed to include human factors engineering in all proposed control room modifications. APCo will utilize a physical or visual verification for those HED resolutions deemed appropriate to ensure that new HED's are not introduced as a part of the initial HED resolution.	All resolutions should be reviewed for good human factors engineering with a mock-up of all modifications utilized before implementation.	Some resolutions may be more adequately verified by means other than a mock-up.
5.5 Methods of Implementation	All modifications will be performed in accordance with plant procedures. Any negative feedback from operation personnel will prompt a post-modification review.	Validation of modifications will be performed 60 days after operation by the review team. A report will be provided to the vice-president categorizing the effectiveness of the modification. Operator feedback will be continually received regarding all control room modifications.	Existing plant procedures and policies will provide effective feedback.