ENCLOSURE

HUMAN FACTORS ENGINEERING
DETAILED CONTROL ROOM DESIGN REVIEW
IN-PROGRESS AUDIT
NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

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Human Factors Engineering
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1. INTRODUCTION

On November 27 through 30, 1984, an NRC in-progress audit was conducted of the Detailed Control Room Design Review (DCRDR) by Nebraska Public Power District (NPPD) for the Cooper Nuclear Station. This audit reviewed DCRDR status and activities to date in order to recommend to NPPD program modifications that will improve the DCRDR and further its ultimate acceptability to the NRC staff. Of particular interest were the areas of concern identified by the NRC evaluation [1] of the Cooper DCRDR Program Plan [2].

The audit team was composed of two persons from the NRC Human Factors Engineering Branch and two persons from the Lawrence Livermore National Laboratory, acting as consultants to the NRC.

During the course of the audit, the NRC audit team discussed all aspects of the DCRDR program with NPPD and their DCRDR consultant, General Electric. Documentation of the Control Room Survey, Function and Task Analysis, and HED Assessment process was reviewed in detail. Additionally, the NRC audit team visited the control room to audit the extent to which the survey discovered and documented human engineering deficiencies (HEDs), and to evaluate how well the Assessment process identified HEDs that are significant and warrant correction.

A discussion of NPPD activities in each DCRDR topic area, identified by Supplement 1 to NUREG-0737, and the corresponding audit team assessment of each area follows.

2. DISCUSSION

2.1. DCRDR REVIEW TEAM

2.1.1. Requirement

Supplement 1 to NUREG-0737 requires the establishment of a qualified multidisciplinary review team to conduct a DCRDR. Guidelines for review team selection are found in NUREG-0700, Draft NUREG-0801, and Appendix A to Section 18.1 of the Standard Review Plan, NUREG-0800.

2.1.2. Audit Team Observations

The core of the Cooper DCRDR team consists of:

- The Station Operations Manager
- A Shift Technical Advisor with previous experience as a Shift Supervisor
- A Senior Systems Engineer from General Electric
- A Human Factors Scientist as a Consultant to General Electric

Each member of this core team participated in the majority of DCRDR activities.

Individuals with expertise in the areas of operations, systems engineering, human factors engineering, and instrumentation, and control provided support to the core team.

DCRDR team management and administration is provided by the NPPD Operations Manager. The review team appeared to have access to personnel, information, equipment, and facilities required to support the DCRDR effort.

It was noted that most DCRDR documentation is currently in the possession of General Electric.

2.1.3. Audit Team Assessment

The audit resolved questions regarding the composition of the review team raised in Reference 1. The audit team concluded that NPPD has adequately complied with the DCRDR team requirements of NUREG-0737, Supplement 1.

NPPD should note that they will eventually be required to have copies of DCRDR documentation in the CNS files for quality assurance (QA) purposes. This documentation should also be made readily available to the individuals and organizations responsible for correcting HEDs.

2.2. FUNCTION AND TASK ANALYSIS

2.2.1. Requirement

Supplement 1 to NUREG-0737 requires the applicant to perform systems function and task analyses to identify control room operator tasks and to identify control room operator information and control requirements during emergency operations. Supplement 1 to NUREG-0737 recommends the use of function and task analyses that have been used as the basis for developing emergency operating procedures technical guidelines and plant-specific emergency operating procedures to define these requirements.

2.2.2. Audit Team Observations

The DCRDR team identified operator instrument and control needs to perform emergency operations tasks defined in the Cooper plant-specific Emergency Operating Procedures (EOPs). These EOPs were derived from generic symptom-based Emergency Procedure Guidelines (EPGs) developed by the BWR Owners' Group and included consideration of instrument loop accuracy during accident conditions in the establishment of operator action, control, and caution points. NPPD did not perform or show that they used a true systems function and task analysis to support development of the EPGs and EOPs.

Information and control requirements for each step in the EOPs were defined to a varying degree of detail as determined necessary by the individuals conducting this effort. Characteristics related to indicator resolution or accuracy, and the availability of instrument and control loops under various plant power supply and environmental conditions, generally were not identified.

Definition of information and control requirements and characteristics was carried through to emergency and normal procedures required to support the EOPs and explicitly referenced by the EOPs. This effort was not extended to the event-based Emergency Procedures currently in use, other than those referenced by the EOPs, or to Normal Procedures required to support the performance of the EOPs but referenced only implicitly. NPPD indicated that before the EOPs are finally implemented they may be revised to incorporate existing Emergency Procedures. They also expect to make procedure changes to account for installation of the Safety Parameter Display System (SPDS), Plant Management Information System (PMIS), and instrumentation to satisfy the requirements of Regulatory Guide 1.97 (R.G. 1.97).

2.2.3. Audit Team Assessment

The acceptability of basing the definition of information and control requirements on the plant EOPs could not be established by the audit team without reviewing the supporting task analysis. The Human Factors Engineering Branch of the NRC committed to resolve this issue based upon the results of separate NRC review of the EOP Task Analysis.

The methodology used to define the characteristics of information and controls required to perform the EOPs was generally acceptable. This methodology was not however consistently applied throughout the analysis and certain important information and control characteristics were not adequately addressed. NPPDs analysis should be supplemented as follows to resolve these concerns:

- Characteristics relating to operability requirements (e.g., [illegible]r quality and equipment qualification) under accident condition[illegible] should be defined.

- Requirements relating to indicator resolution should be defined for tasks in which the operator must determine the value of a parameter

or compare the value of a parameter against a action, control, or caution point.

- The level of detail in which required information and control characteristics are defined should be consistent throughout the analysis.

Evaluation of instrument operability during accident conditions may be conducted through coordination with the R.G. 1.97 program. However, the DCRDR must ensure that R.G. 1.97 indications required to support EOP tasks are suitably engineered from a human factors standpoint and are located in proper relationship to associated controls. The audit team is unaware of other programs that will provide the required evaluation of control operability in support of the DCRDR.

The Function and Task Analysis must be carried through to include implicitly referenced normal operating procedures required to support performance of EOPs and existing Emergency Procedures to the extent they will be used as stand-alone procedures after the EOPs are in place. The audit team considers Station Blackout and Remote Shutdown Procedures to be emergency procedures. Revision of the EOP Task Analysis also may be required if the existing Emergency Procedures are incorporated into the EOPs or used in conjunction with the EOPs.

The Function and Task Analysis process must also be applied in the generation of SPDS and PMIS procedures that support emergency operations. It is suggested, however, that NPPD apply this technique to all SPDS and PMIS procedures.

NPPD's Summary Report should address how resolution of these comments has been or will be incorporated into the DCRDR program.

2.3. COMPARISON OF CONTROL AND DISPLAY REQUIREMENTS WITH CONTROL ROOM INVENTORY

2.3.1. Requirement

Supplement 1 to NUREG-0737 requires the applicant to compare the operator display and control requirements determined from the task analyses with the control room inventory to determine missing controls and displays. Guidance in NUREG-0700 also calls for a review of the human factors suitability of instruments and controls used to satisfy operator information and control requirements.

2.3.2. Audit Team Observations

The information and control requirements, to the extent they were defined for the EOP steps, were compared against the instruments and controls available in the control room during a series of EOP walkthroughs. During these walkthroughs the human factors suitability of controls and displays supporting EOP steps was subjectively evaluated by the review team, as a backup to the control room survey.

2.3.3. Audit Team Assessment

The audit team concluded the NPPD method for comparing operator control and information requirements with the control room inventory can be used to satisfy the requirements of NUREG-0737, Supplement 1. However, detailed information and control needs were not consistently identified as part of the Function and Task Analysis. Thus, the NPPD method could not be used to make the rigorous and systematic comparison required to determine that installed instruments and controls are suitable to perform all operator tasks during emergency conditions. Therefore, as the Function and Task Analysis is revised to address the concerns raised in the previous section, this comparison of information and control requirements with the characteristics of installed instruments and controls should be repeated to ensure all requirements identified by the Function and Task Analysis have been addressed.

The evaluation of human factors suitability conducted as part of the comparison walkthroughs was a praiseworthy step as demonstrated by the large number of "survey type" HEDs identified during this effort.

2.4. CONTROL ROOM SURVEY

2.4.1. Requirement

Supplement 1 to NUREG-0737 requires that a control room survey be conducted to identify deviations from accepted human factors principles. NUREG-0700 provides guidelines and criteria for conducting a control room survey. The objective of the control room survey is to identify for assessment and possible correction the characteristics of displays, controls, equipment, panel layout, annunciators and alarms, control room layout, and control room ambient conditions that do not conform to good human engineering practices.

2.4.2. Audit Team Observations

The Cooper Control Room Survey was conducted in three parts:

1) A survey by a BWR Owners' Group (BWROG) team in 1981. This survey was conducted against the BWROG survey checklist and included most, but not all, control room panels.

2) Completion of the BWROG checklist by the NPPD DCRDR team for panels not included in the original survey, and review of significant human factors deviations identified by the BWROG survey. This effort took

place in 1984. Items rated as low level nonconformances by the 1981 survey were not reviewed by the NPPD team.

3) NPPD team control room survey against a supplemental BWROG checklist developed to address topics included in the NUREG-0700 checklists, but not in the original Owners' Group checklist. This was also done in 1984.

The plant computer consoles were not included in the control room survey because the existing plant computer is to be replaced in the near future.

The BWROG checklist taken, together with its supplement, generally embraces the human factors principles contained in NUREG-0700. In many cases, however, the specific evaluation criteria are different and imprecise.

The 1981 BWROG and the 1984 NPPD survey evaluated each control room panel against the principles and criteria contained in the BWROG checklist and supplement. The level of conformance with each principle was assigned a rating between one and four for each panel evaluated by the reviewer. The number rating assigned represented the degree of conformance for the panel as a whole. Thus, a panel containing severe deviations from human factors principles could be deemed "nearly in compliance" by the reviewer if the number of deviations on the panel was small compared to the number of items to which the principle applied. Specifics regarding the observed deviations were generally not recorded except for items assessed to be significant HEDs. HED documentation, particularly by the 1981 survey, was not always detailed enough to allow clear identification of the problem by individuals outside of the review team.

As noted previously, the survey was supplemented by additional NPPD review team observations of human factors suitability during their comparison of information and control requirements with the control room inventory.

During a control room inspection, the audit team noted the following HEDs in areas where complete, or near complete, compliance with the corresponding checklist principles was indicated by the NPPD and BWROG surveys:

- Panels VBD-A and VBD-C: Several switch directions of movement are reversed from expected convention and from other switches on the boards.

- Panel VBD-A: Nonlinear, homemade, scale on Reactor Feed Pump Suction Temperature Indicator.

- Panels VBD-A and VBD-C: Round and T-shaped switch handles obscure view of position indices and labels on switch escutcheons.

- Panel VBD-C: No demarcation of Switchyard Annunciator Acknowledge, Test, Reset, and Ground Reset Switches.

2.4.3. Audit Team Assessment

As discussed in References 1 and 3, the use of the BWROG Control Room Survey checklist, together with the supplement, constitutes an acceptable method that can be used to fulfill the survey requirements of NUREG-0737, Supplement 1. The audit team concluded, however, that documenting the degree of compliance as an "average" for an entire panel, and failing to document observed deviations from human factors principles in sufficient detail to establish a basis for the degree of compliance ratings assigned, is a misapplication of the survey guideline. This averaging approach may have caused specific or individual items which should have been HEDs to be dropped without adequate assessment. This concern will be discussed in more detail in the next section.

Further, finding the HEDs noted above, that were neither identified by the NPPD survey nor the NPPD review of the 1981 BWROG survey, causes the audit team some concern about the consistency with which the Cooper Control Room Survey was conducted. NPPD should determine if the apparently undocumented HEDs indicate a systematic problem with the Cooper survey process. We recommend that their findings and actions be discussed in the Summary Report.

Resolution of these items may require resurvey of the Cooper control room. Should NPPD conclude this to be the case, we suggest that use of the detailed criteria comparable to the NUREG-0700 checklists would form a basis for the survey that is superior to the BWROG checklist criteria.

Since the PMIS and SPDS are not yet installed and thus could not be included in the Control Room Survey, NPPD must ensure that human factors principles and conventions applied to the control room as well as the NUREG-0700 principles relating to computers are applied to these new additions.

The audit team noted that a number of changes that may affect the control room environment and communications are anticipated. Also, new equipment that may be adversely affected by the environment is to be installed. After these modifications are completed, the environment and communications surveys should be repeated. Again, we suggest that the NUREG-0700 checklists would form a basis for these surveys that is superior to the BWROG checklist. During resurvey, the operator's communications ability while using self-contained breathing apparatus and respirators should be evaluated.

The audit team is concerned that the level of detail in the HED records is insufficient to allow Engineering to develop modifications that will adequately correct HEDs without significant input from members of the DCRDR team. Given the three-to-four-year time period planned for corrections, it is possible that team input may not be available towards the end of the process. Therefore, the NRC audit team recommends that NPPD improve the level of detail in which HEDs are documented to the point where each HED can be clearly understood from the written documentation alone.

2.5. ASSESSMENT OF HEDS

2.5.1. Requirement

Supplement 1 to NUREG-0737 requires that HEDs be assessed to determine which HEDs are significant and should be corrected. NUREG-0700 contains guidelines for the assessment process.

2.5.2. Audit Team Observations

NPPD's DCRDR assessment of HEDs was conducted in two parts.

Deviations from human factors principles identified during the control room surveys were screened by multiplying a number (one to four) assigned to indicate the degree of noncompliance by a number (one to three) representing the likelihood that violation of the particular principle involved would result in operator error. If the resultant, the Evaluation Product, was greater than eight, the deviation was considered to be an HED and subject to further assessment. Deviations with Evaluation Products less than eight were called Human Engineering Observations (HEOs) and dropped from further consideration. Discrepancies identified by the Task Analysis or Operator Surveys were considered to be HEDs and were not subject to the screening process.

Cooper's DCRDR team then split HEDs into two categories: those that can be corrected by enhancement and those that will require a design modification to correct. The DCRDR team is recommending to NPPD management correction of all HEDs that can be corrected by enhancement.

HEDs that could only be fixed by modification were further divided into high, medium, or low/none safety importance categories based upon the HED's potential impact upon safe operations, potential for error, and cumulative and interactive effects among HEDs. The DCRDR team is recommending that all HEDs of high or medium safety significance be corrected and that many low significance HEDs also be corrected. In particularly difficult cases, a feasibility study is recommended as the first step towards HED correction.

2.5.3. Audit Team Assessment

The audit team generally agrees with NPPD's process for assessing HEDs once they were categorized as such. We believe, however, that the safety significance of the lack of lamp test capability was understated and recommend that the decision not to correct this HED be reevaluated.

The audit team does not agree with the methodology for segregating HEDs and HEOs during the control room survey for the following reasons:

- The assignment of the degree of noncompliance number based upon the suveyor's judgment of the "average" for an entire panel tends to mask significant HEDs.

- Failure to document the specifics of the HEDs identified made the screening process unauditable by NRC, NPPD Quality Assurance, or General Electric Quality Assurance.

- The screening process masks HEDs that should be corrected to conform with control room human engineering conventions. Conventions, not applied uniformly, are not conventions at all.

NPPD may resolve this issue by documenting the specifics of each HED in their DCRDR Summary Report and providing, for review, justification for each item not corrected. This action will bring NPPD's program into conformity with the BWROG position that HEDs identified by the control room survey will be evaluated on an item-to-item basis [3].

2.6. SELECTION OF DESIGN IMPROVEMENTS

2.6.1. Requirement

Supplement 1 to NUREG-0737 requires selection of control room design improvements that will correct significant HEDs. It also states that improvements that can be accomplished with an enhancement program should be done promptly.

2.6.2. Audit Team Observations

NPPD has not identified details of the design improvements to correct the HEDs designated for correction by the assessment process.

The Cooper DCRDR team has made specific recommendations about which HEDs should be corrected. NPPD management has not yet approved these recommendations or made specific commitments to NRC regarding correction of HEDs. The DCRDR team generally recommended that all high and moderate significance, and many of the less significant, HEDs be corrected. The following scheduling philosophy was noted in the DCRDR team's recommendation:

- Most enhancements should be completed before return to power from the current outage.

- The most safety significant HEDs should be corrected prior to return to power from the next refueling, if design and equipment lead times permit. All HEDs in this category are recommended for correction within two operating cycles.

- Correction of moderate significance HEDs is recommended prior to restart from the second refueling outage after the current one. A few items are deferred to the third refueling to allow coordination with other modifications.

- The less significant HEDs to be corrected are recommended for correction within three operating cycles.

- Construction of a plant specific simulator is recommended to be complete by the fourth refueling after the current outage.

In the case of particularly intractable HEDs, initiation of feasibility studies was recommended to identify appropriate modifications. In these cases, the ultimate schedule for correction will be developed by the studies.

2.6.3. Audit Team Assessment

The audit team agrees with the general philosophy for selecting HEDs to be corrected and scheduling completion dates. The same philosophy should be applied to the results of the HED assessment.

The recommendation to build a plant-specific simulator is commendable. Training on this facility will provide further improvement in operator performance beyond that attainable by implementation of uniform control room conventions and correction of significant HEDs and HEOs.

NPPDs Summary Report should generally describe the modifications proposed and provide schedule commitments for their completion. Where modification schedules are pending completion of feasibility studies, the ultimate choice of corrective action and schedule for installation must be submitted for NRC approval upon completion of the studies.

The NRC audit team recognizes that correction of HEDs relating to Engineered Safety Feature information and controls located on back panels will be particularly difficult. Consequently, we agree with the plan to conduct feasibility studies before committing to specific modifications and schedules. Nevertheless, we expect that timely modifications will be implemented to correct these items.

2.7. VERIFICATION OF CONTROL ROOM DESIGN IMPROVEMENTS

2.7.1. Requirement

Supplement 1 to NUREG-0737 requires verification that selected control room design improvements will provide the necessary corrections of HEDs, will not introduce new HEDs into the control room, and will not result in increased risk, unreviewed safety questions, or temporary reduction in safety.

2.7.2. Audit Team Observations

The process for verifying control room design improvements has not yet been defined in greater detail than that provided in the program plan.

2.7.3. Audit Team Assessment

NPPD should submit the details of the verification process as part of the Summary Report. Particular emphasis should be given to identifying differences between the final program and that described by the Program Plan and to addressing the mix of personnel involved in the verification.

2.8. COORDINATION OF CONTROL ROOM IMPROVEMENTS WITH OTHER PROGRAMS

2.8.1. Requirement

Supplement 1 to NUREG-0737 requires that control room improvements be coordinated with changes from other programs; e.g., safety parameter display system (SPDS), operator training, Regulatory Guide 1.97 (R.G. 1.97), and emergency operating procedures (EOPs).

2.8.2. Audit Team Observations

NPPD has developed a overall schedule for major NUREG-0737, Supplement 1 items. The most current version of this schedule was provided during the audit. The stated goal of this schedule is "to complete the SPDS design, Regulatory Guide 1.97 assessment, and writing of plant-specific emergency operating procedures at approximately the same time . . . including any supplementary work that is required as a result of the control room design review" [4].

2.8.3. Audit Team Assessment

Although the schedules for NUREG-0737 activities have been coordinated, it is not apparent that NPPD has a positive program to ensure these activities happen in a coordinated manner. Additional coordination and interaction at the working level for these projects may be necessary to make the schedule come together.

A schedule update for SPDS, PMIS, procedures, operator training, and R.G. 1.97 modifications required to support the EOPs should be included in the Summary Report to show coordination among these items. Items of particular interest are that: relabeling of control boards to establish nomenclature conventions happens concurrently with and are coordinated with procedure changes to ensure consistency between control boards and procedures; installation of R.G. 1.97 instrumentation required to support EOPs will be completed in time; and training will be adequately coordinated with procedure and hardware changes.

2.9. OTHER ITEMS

The DCRDR team conducted an operating experience review to identify HEDs that resulted in plant trips or reportable conditions. This review was limited to experience at Cooper Station and identified no HEDs. The audit team's review of CNS operating experience noted the good operating record of the plant. It is, therefore, not surprising that the DCRDR operating experience review identified no HEDs. The audit team suggests that review of operating

experience for other BWRs similar to Cooper may identify additional HEDs and provide insight that would result in changed priorities for certain HEDs.

NPPD is currently in the process of designing the remote shutdown capability for CNS. Although it is not currently a NRC requirement, the NRC audit team recommends that human engineering principles be applied to design, specification, and selection of equipment used for remote shutdown, especially the remote shutdown panels. It is particularly important that consistent conventions and nomenclature be maintained between the control room and remote shutdown equipment.

For remote shutdown, PMIS, SPDS, and the Emergency Response Facilities, NPPD has a unique opportunity to infuse human factors principles and plant conventions during the original design phase.

3. CONCLUSIONS

NPPD's DCRDR process appears to be generally well directed towards fulfilling the DCRDR requirements of NUREG-0737, Supplement 1.

The acceptability of basing the CNS Task Analysis upon EOP steps could not be evaluated during the audit. NRC will consider this issue during the review of Cooper's EOPs. Some revisions to the Task Analysis may be needed as a result of this review.

A number of concerns with the DCRDR process were identified by the audit. The NRC audit team recommends, to NPPD, the following actions to improve their DCRDR program and foster its ultimate acceptance. NPPD's actions with respect to these recommendations should be discussed as part of the DCRDR Summary Report.

- The task analysis definition of information and control characteristics for the EOPs should:
  - Define requirements for operability under accident conditions (e.g., power quality and qualification of portions of the instrument and control loops located in harsh environments).
  - Identify requirements on indicator resolution for tasks that require the operator to determine the value of a parameter or compare the value of a parameter against a action, control, or caution point.
  - Maintain a consistent level of detail throughout the analysis.
- The Function and Task Analysis should be carried through to:
  - Normal Procedures implicitly referenced in EOPs that are required to support performance of EOPs.

- Existing Emergency Procedures to the extent they will still be in use after implementation of the EOPs.
- Revised EOPs, if significant revisions are required prior to implementation.
- SPDS and PMIS procedures required to support performance of EOPs.

- The apparent oversights noted in the Control Room Survey should be reviewed to determine if they are indicative of a systematic problem with the survey process, and appropriate action should be taken.
- The control room environment and communications survey should be repeated after completion of planned modifications that will affect the environment (e.g., PMIS, SPDS, and a new communications system). This resurvey should consider the ability of operators to communicate while wearing self-contained breathing apparatus and respirators.
- Human factors principles, conventions and plant nomenclature consistent with that used in the control room should be implemented in the design of the SPDS and PMIS.
- The safety significance of the lack of lamp test capability should be reassessed.
- The specifics of each HEO identified by the Control Room Survey should be documented and justification provided for any HEOs that are not corrected.
- It should be verified that R.G. 1.97 instruments required for performance of EOPs will be available prior to EOP implementation and that relabeling of Control Boards and procedure changes are happening in a manner that ensures consistent nomenclature between the procedures and boards.

Certain portions of the DCRDR program were not sufficiently mature at the time of audit to allow assessment beyond that provided by the Program Plan review. NPPD should ensure their Summary Report discusses the following items in sufficient detail to allow NRC review and determination whether the DCRDR requirements of Supplement 1 to NUREG-0737 have been met.

- Modifications planned to resolve HEDs should be described and completion schedule commitments provided. A supplement to the Summary Report will be needed to provide descriptions and schedules for modification plans resulting from feasibility studies.
- The details of NPPD's verification process for HED corrections should be included.

- An updated schedule for NUREG-0737, Supplement 1, activities should be included. This update shows the interrelationships among these tasks.

Finally, the audit team submits the following suggestions for NPPD's consideration in areas not directly related to the DCRDR requirements of NUREG-0737, Supplement 1.

- Copies of survey checklists, task analysis worksheets, and other DCRDR documentation should be obtained from General Electric and organized into a working file for use by NPPD team members and individuals and organizations responsible for HED correction modifications and other related efforts.
- HED records should be upgraded so the written documentation alone is adequate to provide non-DCRDR team members a clear understanding of each HED.
- Any portions of the Control Room Survey that are repeated or updated should make use of the NUREG-0700 checklists.
- Further coordination of SPDS, PMIS, DCRDR, R.G. 1.97, and EOPs at the working level should be considered.
- The operating experience review should be extended to include experience at other BWRs similar to Cooper.
- Human factors engineering principles should be applied to the design of the CNS remote shutdown capability, including the remote shutdown panels.
- Design conventions and nomenclature applied to remote shutdown equipment should be consistent with those used in the control room.

REFERENCES

1. Letter D. B. Vassallo (NRC) to J. M. Pilant (NPPD), "Review of the Cooper Nuclear Station Detailed Control Room Design Review Program Plan Submittal," dated June 4, 1984.

2. Letter J. M. Pilant (NPPD) to D. G. Eisenhut (NRC), "NUREG-0737, Supplement 1 - Detailed Control Room Design Review (DCRDR)," dated March 1, 1984.

3. Letter D. G. Eisenhut (NRC) to BWR Licensees, Applicants and Construction Permit Holders, "NRC Staff Review of the BWR Owners' Group (BWROG) Control Room Survey Program (generic letter 83-18), dated April 19, 1983.

4. Letter J. M. Pilant (NPPD) to D. G. Eisenhut (NRC), "Response to NUREG-0737, Supplement 1, Emergency Response Capability, Cooper Nuclear Station," dated April 15, 1983.