IN-PROGRESS AUDIT OF THE DETAILED CONTROL ROOM DESIGN REVIEW FOR VERMONT YANKEE NUCLEAR POWER CORPORATION'S VERMONT YANKEE NUCLEAR POWER PLANT

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FOREWORD

This report documents an in-progress audit of the Detailed Control Room Design Review (DCRDR) being conducted by Vermont Yankee Nuclear Power Corporation (VYNPC) for its Vermont Yankee Nuclear Power Plant (VYNPP). The audit was conducted by a team comprised of two representatives of the U.S. NRC, two representatives from Science Applications International Corporation (SAIC), and one representative from Comex Corporation (a subcontractor to SAIC). SAIC's participation was provided under Contract NRC-03-82-096, Technical Assistance in Support of Reactor Licensing Actions: Program III. SAIC had previously provided to the NRC an evaluation of VYNPC's Program Plan.

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INTRODUCTION

Vermont Yankee Nuclear Power Corporation (VYNPC) submitted a Detailed Control Room Design Review (DCRDR) Program Plan for the Vermont Yankee Nuclear Power Plant (VYNPP) on June 19, 1984 (Reference 1). Nuclear Regulatory Commission (NRC) staff comments on that Program Plan were forwarded to VYNPC on September 6, 1984 (Reference 2).

Based on the review of the Program Plan, the NRC staff planned an in-progress audit of the VYNPP DCRDR. That audit was arranged through the NRC Project Manager for VYNPP and was scheduled for April 1-4, 1985. The purpose of the audit was to clarify certain aspects of the review process, to confirm that the review is being conducted appropriately, and to evaluate any preliminary results.

The audit included review of DCRDR documentation, visits to the control room and remote shutdown panels, and discussion of VYNPC activities completed and in-progress. Attachment A provides the audit agenda. Attachment B lists VYNPP DCRDR documentation made available to the audit team. The audit team was comprised of two NRC members, two consultants from SAIC, and a consultant from Comex Corporation. The disciplines of human factors engineering, chemical engineering, and nuclear operations were represented on the audit team. Attachment C provides lists of attendees at the entrance and exit meetings.

This report documents the findings of the in-progress audit. It was compiled and integrated by SAIC with input from Comex Corporation and the NRC staff. The report represents the consolidated observations, conclusions, and recommendations of the audit team.

BACKGROUND

Item I.D.1, "Control Room Design Reviews," of Task I.D., "Control Room Design," of the Nuclear Regulatory Commission Action Plan NUREG-0660 (Reference 3), developed as a result of the TMI-2, accident states that operating licensees and applicants for operating licenses will be required to perform a Detailed Control Room Design Review to identify and correct design discrepancies. The objective, as stated in NUREG-0660, is to improve the ability of nuclear power plant control room operators to prevent accidents or to cope with accidents if they occur by improving the information provided to the operators. The requirements of Supplement 1 to NUREG-0737 (Reference 4) indicate the need to include a number of elements in the DCRDR. They are:

1. Establishment of a qualified multidisciplinary review team.

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

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

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

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

6. Selection of design improvements.

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

8. Verification that improvements will not introduce new HEDs.

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

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

A Summary Report is to be submitted at the end of the DCRDR. As a minimum it shall:

1. Outline proposed control room changes.

2. Outline proposed schedules for implementation.

3. Provide summary justification for HEDs with safety significance to be left uncorrected or partially corrected.

The NRC staff evaluates the organization, process, and results of the DCRDR. Results of the evaluation are documented in a Safety Evaluation Report (SER) published within two months after receipt of the Summary Report.

NUREG-0700 (Reference 5) describes four phases of the DCRDR and provides applicants and licensees with guidelines for its conduct. The phases are:

1. Planning
2. Review
3. Assessment and implementation
4. Reporting.

NUREG-0800 (Reference 6) describes "Evaluation Criteria for Detailed Control Room Design Review." Criteria for evaluating each phase are contained in Section 18.1, Rev. 0 of the Standard Review Plan.

DISCUSSION

Element 1 Establishment of a Qualified Multidisciplinary Review Team

The Vermont Yankee (VY) Project organization for the DCRDR was found to be two-layered as described in the Program Plan. It consists of a three-member management team (VY staff) with human factors consultation and a four-member design review team (three VY staff and a human factors expert from General Physics (GP)). The program management by VY staff is consistent with NRC guidance. The design review team is composed of a human factors consultant, a plant operator, an instrument and controls engineer and the program manager. A subject matter expert is available for the function and task analysis. The composition of this multidisciplinary team is adequate and follows NRC guidance. Other disciplines within VY are called upon as necessary to supplement team membership. The Vermont Yankee Program Plan provided resumes for most of the team members to indicate that qualified individuals were conducting the DCRDR. During the audit it was discovered that additional persons participated in major tasks of the DCRDR. Resumes for these additional persons will be provided in the Summary Report. These people are an operations department representative and a subject matter expert determining I&C requirements and needs for the control room.

During the in-progress audit, VY described team members' level of involvement in each of the DCRDR activities. The assignments made to date were adequate; however, VY should consider following NUREG-0800 when selecting additional personnel for future efforts to complete the DCRDR. In particular, VY should assure that the function and task analysis include the disciplines of human factors and reactor operations; and that these same disciplines are available for both the selection and the verification of design improvements. Orientation and training of the teams were described as based on previous experience at Seabrook and Yankee Rowe, a special course for one team member, and a two-day orientation for all members conducted by an outside human factors consultant.

VY is using a computer data base system for information storage and retrieval. Printouts audited indicate that the system has the capability to store and sort data under different files such as by HED, finding, and guideline. Adequate references and support appeared available for conduct

of a satisfactory review. In conclusion, the qualifications and structure of the team should satisfy this requirement of Supplement 1 to NUREG-0737.

Element 2 Function and Task Analysis to Identify Control Room Operator Tasks and Information Control Requirements During Emergency Operations.

This requirement as stated in Supplement 1 to NUREG-0737 calls for "... the use of function and task analysis (that had been used as the basis for developing emergency operating procedures Technical Guidelines and plant-specific emergency operating procedures)to identify control room operator tasks and information and control requirements during emergency operations" (Reference 4). An adequate task analysis should identify all tasks involved in the plant-specific upgraded Emergency Operating Procedures (EOPs) and all the information and control requirements necessary to perform those tasks. It should identify the required characteristics of displays and controls that will support tasks specified in the EOPs. Such characteristics include range, resolution, need for trending, parameter type, set points, speed of response, and units. Control characteristics include type, discrete or continuous functions, rate, gain, and response requirements.

The audit team established that VY is in the final stage of implementing the new symptomatic Emergency Operating Procedures. VY EOPs are prepared from their plant-specific technical guidelines which in turn were prepared from the Boiling Water Reactor Owners Group (BWROG) Emergency Procedure Guidelines (EPGs), Revision 3. However, no systematic task analysis, to identify information and control requirements, was conducted by VY during this EOP development process. Due to limited resources, VY omitted preparation of technical guidelines (and the associated EOPs) for two areas of the BWROG EPGs, namely, Secondary Containment Control and Radioactivity Release Control. VY indicated that deviations from Revision 3 of the BWROG EPGs are documented and that their procedure generation package (PGP) was submitted to the NRC for review in Spring of 1984. VY intends to begin actions on implementing, if appropriate, the missing guidelines in approximately July, 1986. No NRC response to VY's PGP has been received to date; thus, VY does not possess approval for an EOP set that excludes the two areas.

The audit team expressed considerable concern to VY regarding the omission of these two technical guideline areas for several reasons. First, omission of the areas reduces the scope of any task analysis effort considerably; therefore, the NRC cannot be assured that all emergency-related tasks will be analyzed. Second, the NRC has previously accepted the use of Revision 3 of BWROG EPGs as a functional basis for conduct of the task analysis, and departure as large as that proposed by VY PGP would jeopardize the validity of a task analysis not based on NRC-approved EPGs.

Vermont Yankee stated during the audit that a full task analysis was not conducted as part of the DCRDR; however, the audit team found that a considerable effort to identify information and control needs was performed. With regard to the identification of information and control needs, VY's effort began with the generation of instrument and control (I&C) needs from VY plant-specific EOPs. The effort was completed by a subject matter expert (outside contractor with nuclear operations experience) who derived I&C needs for steps contained in the VY EOPs. Data collected was recorded on forms available to the audit team. Data forms contained a column each for procedure step number, task (EOP steps), I&C needs (parameters), and I&C requirements (characteristics or attributes).

The tasks (EOP steps) as audited on the data forms were mostly high-level steps such as, monitor and control drywell temperature; no task analysis or extraction of task and subtasks had been recorded. The subtasks implicit in these high-level EOP steps may have been considered by the subject matter expert while completing the forms, but they were neither delineated nor recorded. In fact, the subject matter expert often wrote the "intent" of EOP steps so as to interpret the high level or broader needs of the operator.

Therefore, for each EOP step, a list of needed information and controls and the requirements or attributes associated with I&C were gathered but were not related to specific operator tasks and subtasks. For this reason, the audit team could not be assured that all operator tasks contained in the EOPs were identified and analyzed to develop the associated information and control needs. In spite of this apparent deficiency in the process, it is to the subject matter expert's credit that the process produced a rather extensive list of I&C needs and did so independently of the existing control

room; it permitted the identification of many instances where instruments and controls were missing or unsuitably presented. The audit team was concerned that the results of the effort be provided for further reiteration of the VY EOPs in order that task analysis results are included in production of procedures. An iterative process would support the requirements of Supplement 1 to NUREG-0737 that a function and task analysis be used both for the development of EOPs and the DCRDR.

The audit team noted that detail for control and display requirements (characteristics) were not complete. Documentation for all human factors characteristics for controls and displays should be completed. The audit team suggested to VY that a comprehensive list of information and control characteristics would have been useful to the subject matter expert as a memory aid when preparing the "needs" lists. (See NUREG-0800, Section 18.1, page A15 for further guidance.)

A task analysis still must be accomplished for all of Revision 3 EPGs. Deviations from major areas of Revision 3 which exclude operator tasks during emergencies should be justified in the Summary Report. The NRC expects the Summary Report to state how VY intends to complete the task analysis. VY should continue to ensure that the performance of task analysis is independent of the control room, that all tasks are identified and described, and that all associated instrument and control needs are described.

Element 3 Comparison of Display and Control Requirements With a Control Room Inventory.

According to the NRC requirement stated in NUREG-0737, Supplement 1, the DCRDR should include: "(iii) a comparison of the display and control requirements with a control room inventory to identify missing controls and displays" (Reference 4). The necessary input for the requirement is the product from the task analysis -- the needed instruments and controls and their characteristics, and the control room inventory. The intent of this requirement is to identify any missing controls and displays, and those that are unsuitable for the operator task needs. Only when a satisfactory task analysis is completed can the I&C requirements be compared with a control room inventory and thereby satisfy the requirement. Note that the purpose

of the control room inventory is to provide a data base of the characteristics of existing instruments and controls which will allow a meaningful comparison with the needed information and control capabilities. Accordingly, the actual control room instrumentation and controls can conceivably be substituted for a written data base to serve as the inventory.

Comparison of the list of identified I&C needs and requirements was performed upon completion of the activity described above under Element 2. The I&C worksheets were used for comparison with the instruments and controls on the actual control boards rather than with a written data base. The comparison was conducted by a licensed operator and a person knowledgeable in human factors. The comparison also determined Reg. Guide 1.97 instrumentation requirements that can be met in the existing control room. As a result of this comparison activity, approximately 104 "findings" were generated with regard to the availability and suitability of controls and displays.

Because the task analysis was incomplete, the audit team was unable to conclude that all instrumentation and control needs had been completely identified. Use of the control room itself, rather than a written data base, was found to be adequate for the comparison process. The comparison process will need to be repeated for any new I&C needs and requirements that result from the task analysis.

The audit team found that the process VY had used generated many valuable findings (i.e., the static match of I&C requirements with those on the panels). Noticeably absent from VY review processes, however, was a detailed evaluation in the use of needed controls and displays in a dynamic or time-relevant manner. An approach to evaluating information and control needs for performance of concurrent tasks or those tasks in which the operator presently must make mathematical calculations had not been developed for the VY DCRDR.

Of particular concern are instances of missing instruments/controls documented by VY but later discarded because the item in question was available on a "back" panel. No further analysis was conducted to determine if these back panel indications might really be needed on the front panel. Another area of specific concern are those indications in the control room,

especially those associated with the process radiation monitoring systems, that require numerous and laborious mathematical computations to convert from meter reading output to required units suitable for evaluation of plant status. The audit team considered action levels for emergency plan activation as a possible area where operators require a discrete plant parameter; based on exceeding that parameter, the operator must make an emergency declaration. An example of such a discrete value is to be found in the EOP and emergency plan implementing procedure - A.P. 3125. This procedure gives a radiological condition requiring the operator to determine an increase in stack monitor where "gross activity exceeds 0.8/E Ci/sec." is listed. Based on information provided to the audit team by plant operations personnel, to convert stack vent activity to a release rate (Ci/sec), a multiplier had to be applied to vent stack velocity to determine flow. Other multipliers had to be applied to meter activity readings to convert them to usable units of activity concentration, and then the results multiplied by vent flow to arrive at a final determination. No HEDs of this nature were discovered by VY in the comparison checks or in the survey.

In conclusion, the audit team recommends that after the task analysis and subsequent comparison processes are complete, VY should perform a dynamic evaluation of panel layout, control/display integration, and traffic patterns. The purpose of this review activity is to determine the adequacy of the existing control and display arrangements for the performance of all emergency tasks in the present control room configuration. Action level parameters that are required to be direct for operators to expedite tasks in an emergency situation should be reviewed. In order to ensure the validity of this review, the design review team should maintain independence in its evaluation since the tendency to accept the control room "as-built" is an inviting rationalization, particularly for operating plants. With the completion of these review activities, VY should be well on its way to satisfying this requirement of Supplement 1 to NUREG-0737.

Element 4 A Control Room Survey to Identify Deviations From Accepted Human Factors Principles.

This requirement as contained in Supplement 1 to NUREG-0737 calls for the conduct of a control room survey to identify deviations from accepted human factors principles. The NRC staff considers the control room survey

to consist of a systematic comparison of control room desig features with human engineering guidelines. Although the NRC staff has presented guidance contained in Section 6 of NUREG-0700 for this activity, other comparable references will be acceptable.

As documented in their Program Plan, a preliminary survey of the Vermont Yankee control room was performed by Wyle Laboratories in August, 1980. In January, 1982, the BWROG conducted a survey using its own methodology and checklists. BWROG also conducted operator interviews and reviews of operational experience contained in LERs. In 1984, the VY review team performed a supplemental survey using the BWROG Control Room Survey Checklist which included areas of the control room surveyed previously and new modifications implemented subsequent to the BWROG survey. The alternate shutdown panels were also included in the 1984 survey effort.

During the in-progress audit, the control room was evaluated by the audit team in a minisurvey against the criteria in NUREG-0700, Section 6. The audit team concluded that the survey performed by VY was adequate to fulfill the requirement of Supplement 1 to NUREG-0737. One exception to that conclusion is the omission of criteria for the evaluation of mirror-imaged design from the BWROG survey. The audit team observed that the benchboard for the ECCS section of the main control board was mirror-imaged, but the associated vertical panel directly above the benchboard was not similarly mirror-imaged. This subject should be addressed by VY in a supplemental survey activity.

The audit team reviewed the operator questionnaires and interviews that were conducted as a part of the BWROG survey activities. The auditors selected about two dozen "findings" from the original material to determine if the findings had been either corrected or converted to HEDs if appropriate. In all cases audited, with the exception of training issues, documentation that the finding was corrected or converted to an HED was available. Of the several training issues addressed by the review, the audit team was informed of several modifications to the training staff, schedules, and lesson plan content to answer issues raised by the operators. In conclusion, VY appears to have taken substantial action in response to the results of the operator questionnaires and interviews.

As noted above, the audit team concluded that the survey performed by VY satisfies the requirement of Supplement 1 to NUREG-0737 with the exception of the mirror-imaging section of the survey.

Element 5 Assessment of HEDs to Determine Which Are Significant and Should Be Corrected.

Supplement 1 to NUREG-0737 requires that HEDs be assessed for significance. In that assessment, the potential for operator error and the consequences of that error in terms of plant safety should be systematically considered. Both the individual and aggregate effects of HEDs should be considered. One of the results of the assessment process is a determination of which HEDs should be corrected because of their potential effect on plant safety. Considerations associated with the resources, cost, and other factors impacting the selection of the design improvement are to be addressed during the process of selecting a correction rather than during the assessment of the HED for significance on plant safety.

VY's process to assess HEDs begins with a preliminary assessment of findings from the survey. That assessment uses a preassigned multiplier to each checklist item for "degree of compliance" and for "potential for causing or contributing to operator error." Only if the value is greater than a predetermined number was the checklist item processed into results for assessment. The audit team found that any item that was a departure from guidelines (to whatever degree) entered the assessment process as a "finding." "Findings" and HED records were spot-checked to determine if they were properly covered and traced to HEDs; the auditors found that this was adequate. For example, findings related to poor control/display relationships were grouped under HED 200. Based on the audit team's review of survey results and HED records, these steps in the assessment appeared adequate.

Vermont Yankee has redefined the classes for HED assessment differently from those in the Program Plan and has presented them to the audit team. Those categories are:

Class A - An HED that could potentially have a significant impact on safety or cause a deviation from technical specifications.

Class B - An HED that has the potential to cause human error that could be harmful to plant personnel or equipment.

Class C - An HED that could inconvenience the operator, such as a control and feedback arrangement which is inconvenient or clumsy to work with.

The audit team found that classes were improved from the Program Plan. The assessment is conducted by all members of the design committee including the HF specialist. The audit team observed that HED assessment was underway and appeared to be satisfying the requirement. It should be noted that due to incomplete review activities (e.g., task analysis), HEDs or findings previously discarded may require reassessment. Any differences from the Program Plan towards addressing this requirement should be documented in the Summary Report.

Element 6 Selection of Design Improvements.

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

As described in the Program Plan, the process to select design improvements is completed by the design review team for submittal to the management review team. An iterative process is used to reach a consensus, and that consensus is required for the recommendation to be forwarded to the management team for approval. In addition, VY's Program Plan specifically mentions the accomplishment of two steps prior to forwarding the recommendation to the management team. Those steps are "(1) verification that the recommended solution adequately addresses the HED, is feasible, cost effective, and adheres to accepted human factors principles, and (2) validation that this solution does not create another HED" (Reference 1, p. 39). Any recommendation that is disapproved is returned to the design review team.

Once management team approval is obtained, the recommendation is forwarded to VY engineering staff for detailed design and implementation in accordance with plant administrative procedure. VY informed the audit team that such administrative procedures now include a review sign-off by a human factors specialist.

An NRC staff concern from the Program Plan was that an HED-by-HED approach to design improvements would result in piecemeal corrections. The audit team was presented with the first draft of a design convention document that will guide all modifications to the color coding scheme, labeling, mimics, etc., applied to the control room. This convention, once developed, should help to provide an integrated and consistent improvement phase for VY's control room.

During the audit, a list of 50 HEDs with their corrections was presented to the audit team. This list had been forwarded to the management team for approval. Inspection of the list showed that many resolutions are inconclusive and require further study. Approximately 14 HEDs were unresolved and called for rather extensive special studies to arrive at the solution:

The following are the 14 HEDs identified as having inconclusive resolutions.

HED	Inconclusive Resolutions
200	Evaluation for relocation or demarcation/hierarchical labels for poor C/D relationship.
201	Detailed study to determine corrective action (AOG).
300	Develop color standard (consider all contexts; may be up to 10).
400	Develop labeling standards.
401	Review for warning labels need (page 14; was given a Class A but seems to have been downgraded to C).

HED	Inconclusive Resolutions
5C0	Develop switch standard.
5D0	Perform study to determine normal and abnormal ranges, and alarm set points.
5E2	Evaluate scale/pointers for visibility.
600	Perform annunciator study.
700	Develop procedure for temporary labels.
903 906	Implement noise reduction program.
1000	Develop procedure to (minimize) interchange of light lenses.
1301	Institute means of maintaining plant equipment status.

Given the extensive time and effort implied in these resolutions, VY was informed by the audit team that the forthcoming Summary Report (scheduled for July, 1985) would be incomplete and a Supplement may be required.

Aside from the incomplete resolutions of HEDs, the audit team found that VY has established a procedure that should fulfill this requirement of Supplement 1 to NUREG-0737.

Elements 7 and 8 Verification That Selected Improvements Will Provide the Necessary Corrections, and Verification That Improvements Will Not Introduce New HEDs.

The Program Plan did not commit VY to a procedure or technique for accomplishing these requirements of Supplement 1 to NUREG-0737. Also, at the time of the audit VY had not formulated a plan to complete the effort. The audit team noted, however, that the VY review team had forwarded numerous design change recommendations without accomplishing the verification of changes as proposed in their Program Plan (p. 39) and required by Supplement 1 to NUREG-0737. (See NUREG-0800, Section 18.1, for guidance to

complete this requirement.) Vermont Yankee is reminded that these processes are required and should be conducted with input from qualified human factors specialists, nuclear operations expertise, and other disciplines on the DCRDR team.

VY has acknowledged the requirement to develop this portion of their DCRDR plan. The audit team advised them of the need to report this information in the Summary Report for NRC review as it was not available for the audit team's review. Conclusions cannot be made as to the adequacy of VY processes to meet these requirements of Supplement 1 to NUREG-0737 until VY develops a process and presents that process to NRC staff for review.

Element 9 — Coordination of Control Room Improvements With Changes Resulting From Other Programs Such as the SPDS, Operator Training, Reg. Guide 1.97 Instrumentation, and Upgraded EOPs.

VY enjoys the benefits of a small organization in that a relatively small group of people is responsible for NUREG-0737 Supplement 1 efforts. Therefore, a member of the management review team for the DCRDR has been assigned the responsibility for coordinating all programs called for by Supplement 1 to NUREG-0737. All individual project managers are reporting to this one individual, thus providing a high likelihood of integration of all initiatives. However, VY is still required to establish and report specific mechanisms or procedures for the integration of control room improvements with changes from other programs. This information could be provided in the Summary Report.

The audit team reminded VY of the applicability of the task analysis, once performed, to several programs, including DCRDR, EOP's, SPDS, and Reg. Guide 1.97. With the development of necessary procedures and techniques, VY should successfully meet this requirement of Supplement 1 to NUREG-0737.

OTHER

The Summary Report for the VY DCRDR is scheduled to be submitted for NRC staff review on July 1, 1985. The audit team expressed concern to VY that several areas within the scope of the DCRDR may not be completed (such as the set-aside programs of annunciators, color coding, labeling, acronyms/abbreviations, etc.) prior to July 1, 1985. Since resolution of

HEDs or completion of DCRDR-related work will not be completed by Summary Report time, a vehicle such as a supplement to the Summary Report was discussed with VY. VY may also choose to negotiate with their NRC licensing project manager for a later date for the Summary Report submittal. This is strongly advisable due to the short time between the in-progress audit and the Summary Report due date and to the incompleteness of the DCRDR to date.

CONCLUSIONS

The DCRDR for Vermont Yankee is underway. The Program Plan has been reviewed and staff comments provided. An in-progress audit was conducted April 1-4, 1985. Based on information available through the end of the in-progress audit, the following concerns exist about the organization, process, and results of the Vermont Yankee DCRDR. VY should ensure that:

1. Resumes are provided for all persons participating in the DCRDR to permit review of qualifications and that a human factors specialist be involved through the rest of the DCRDR.

2. DCRDR Summary Report requirements are fulfilled on all HEDs, including "set-aside" issues such as annunciators and labeling; that the Summary Report will include all HEDs that VY is going to correct, and how the HEDs are going to be corrected; and that the report will include all safety-significant findings/HEDs that VY is not going to correct, and why the findings/HEDs are not going to be corrected.

3. A formal systematic task analysis will be performed for all technical guidelines derived from the BWROG EPGs, Rev. 3, to determine operator tasks and information and control needs.

4. When comparing information and control needs to the control room inventory, the dynamic nature of operator tasks and work-loading is considered for determining instrument/control suitability.

5. A control room survey is conducted addressing concerns of NUREG-0700 related to mirror imaging.

6. Findings related to missing information needs, discarded as being incorrect since information was available on back panels, be reassessed for suitability and accessibility.

7. HEDs presently included in special studies or evaluations are resolved.

8. A methodology is established and implemented to verify that selected improvements correct HEDs and do not introduce new HEDs.

9. A procedure for integrating control room changes from all improvement programs is established and implemented.

In the audit team's judgment, resolution of the above concerns would increase the likelihood that requirements for the DCRDR will be met and would increase the benefits of the DCRDR. Processes not reported in the Program Plan or modified from the Program Plan should be described along with results in the Summary Report.

REFERENCES

1. Letter from W.P. Murphy (VYNPP) to D.B. Vassallo, NRC. Subject: "Vermont Yankee Detailed Control Room Design Review Program Plan," June 19, 1984.

2. NRC response: "Review of the VY Nuclear Power Plant Detailed Control Room Design Review Program Plan Submittal," September 6, 1984.

3. NUREG-0660, "NRC Action Plan Developed as a Result of the TMI-2 Accident," May 1980; Revision 1, August 1980.

4. NUREG-0737, Supplement 1, "Clarification of TMI Action Plan Requirements - Requirements for Emergency Response Capability (Generic Letter No. 82-33)," December 17, 1982.

5. NUREG-0700, "Guidelines for Control Room Design Review," September 1981.

6. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 18.1, Rev. 0, "Control Room," and Appendix A to SRP Section 18.1, "Evaluation Criteria for Detailed Control Room Design Reviews (DCRDR)," September 1984.

Attachment A

ENCLOSURE

TENTATIVE AGENDA

VERMONT YANKEE NUCLEAR POWER PLANT

DETAILED CONTROL ROOM DESIGN REVIEW

IN-PROGRESS AUDIT

Monday, April 1, 1985

P.M. - Administrative processing for on-site access. Planning and preparation - set up office space, informal briefing and introductions, short visit to control room.

Tuesday, April 2, 1985

A.M. - NRC audit team will review the elements of the DCRDR through briefings by the licensee, discussions with the DCRDR team members and consultants, and audit of documentation to date. The licensee should be prepared to discuss the items under each of the following DCRDR elements:

A. Qualifications and Structure of the DCRDR Team

1 - Amount of human factors expertise available for accomplishment of technical tasks

2 - Specific personnel assignments

3 - Orientation program for personnel involved in the DCRDR.

B. Function and Task Analysis

1 - Use of Revision 3 of the BWROG Emergency Procedures Guidelines as generic basis for analysis

2 - Independence of analysis and identification of information and control requirements from the instrumentation and controls already existing in the control room

3 - Scope of analysis to include all emergency operations tasks.

P.M. C. Control Room Inventory

1 - Description of appropriate control and display characteristics for comparison with task analysis results.

D. Control Room Survey

1 - Application of BWROG Control Room Survey Checklist and supplement

2 - Data (human engineering discrepancies) management among original survey, re-survey and survey of control room modifications.

Wednesday, April 3, 1985

A.M. Continue briefings, discussions, and document reviews on DCRDR elements.

E. Assessment of HEDs and selection of design improvements

1 - Method for addressing the cumulative and interactive effects of HEDs, especially those of lesser individual importance

2 - Description of any plant design conventions (e.g., labelling, color, control type).

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

1 - Description of method.

G. Coordination of the DCRDR with other improvement programs

1 - Method for integrating DCRDR with EOP upgrade, SPDS function, Reg. Guide 1.97 instrumentation, ERFs, and training

2 - Provisions for managing coordination.

P.M. Audit one or more panels in the control room and remote shutdown areas.

Continue review of documentation.

Thursday, April 4, 1985

A.M. Continue audit of control rooms as necessary

Continue audit of documentation as necessary

NRC audit team caucus.

P.M. Exit meeting with licensee to provide preliminary findings and constructive feedback and to dispose of any action items.

Attachment B

Vermont Yankee Documentation for DCRDR Audit

1. BWROG Survey Methods Handbook
2. BWROG Raw Data Checklists
3. BWROG Supplemental Checklists
4. Original (1982) BWROG Survey "Completed Worksheets"
5. Wyle Summary Letter Report 1980
6. Findings File Report
7. HEDs Record
8. Index of HEDs
9. BWROG EPGs (Rev. 3)
10. Vermont Yankee Plant-Specific EOPs (Rev. 0)
11. Instruments and Control (I&C) Needs Worksheets
12. Instructions for Deriving I&C Needs
13. Instructions for Comparison of I&C Needs With a Control Room Inventory
14. Comparison of I&C Needs
15. Classification Document for HED Classes
16. Vermont Yankee Control Room Panel Mimic and Switch Handle Color Standard

Attachment C

Entrance Meeting Attendance

John M. O'Connor	YNSD, I&C
Carol A. Kain	USNRC/SAIC
James Pelletier	VY Plant Manager
Dan Reid	VY Ops Supervisor
Len Marsolais	YAEC
David H. Schultz	USNRC/Comex
Timothy K. O'Donoghue	USNRC/SAIC
Wm. H. Regan	USNRC
Richard J. Eckenrode	USNRC
Bill Raymond	NRC Resident Inspector
Robert Sojua	VY Program Manager

Exit Meeting Attendance

Len Marsolais	YAEC, NSD
Robert Sojua	VY
Bob Liddle	General Physics
John O'Connor	YAEC, NSD
Richard J. Eckenrode	USNRC/DHFS/HFEB
E.A. Sawyer	YAEC, NSD
Tim O'Donoghue	USNRC/SAIC
David H. Schultz	USNRC/Comex
Wm. H. Regan	USNRC/DHFS/HFEB
Carol Kain	USNRC/SAIC
Dan Reid	VY
Jim Pelletier	VY
Dick Branch	VY