

NOV 20 1986

Docket Nos. 50-282
and 50-306

Mr. D. M. Musolf, Manager
Nuclear Support Services
Northern States Power Company
414 Nicollet Mall
Midland Square, 4th Floor
Minneapolis, Minnesota 55401

Dear Mr. Musolf:

SUBJECT: DETAILED CONTROL ROOM DESIGN REVIEW (DCRDR)

As a result of Supplement 1 to NUREG-0737, Northern States Power Company submitted by letter dated May 27, 1983 a program plan for a "Detailed Control Room Design Review (DCRDR)" for the Prairie Island Nuclear Generating Plant (PINGP), Unit Nos. 1 and 2. The staff has completed the review of your program plan; has conducted a site in-progress audit at PINGP with our consultant from Science Applications International Corporation (SAIC) on March 6 through 9, 1984; and has resolved all open issues during a site meeting held on July 28 and 29, 1986, with your staff and consultants. In addition, the staff has completed the review of your DCRDR Summary Report submitted by letter dated December 31, 1985, and supplemented on June 12, 1986.

The Safety Evaluation (SE), Enclosure 1, provides the results of the Commission's review of your submittals discussed above and our observations during the site visits. Our evaluation is based on the organization, the process, and the results of the DCRDR for the Prairie Island Nuclear Generating Plant, Unit Nos. 1 and 2 as compared to the requirements of Supplement 1 to NUREG-0737 and guidance provided in NUREG-0700 and the Standard Review Plan, Section 18.1, Rev. 0 and Appendix A.

The Technical Evaluation Report (TER), Enclosure 2, provides a detail discussion of a review performed by our consultant SAIC which identified open items that required additional information in order that our review of DCRDR could be completed. The open items were resolved by the supplemental information submitted by your letter dated June 12, 1986 and our site visit on July 28 and 29, 1986. By our letter dated September 22, 1986, the Commission transmitted the "Meeting Summary of July 28 and 29, 1986" that addressed all remaining open items.

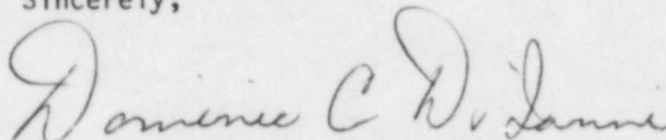
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Based on this review, the Commission finds that Northern States Power Company has adequately addressed the DCRDR activities for the Prairie Island Nuclear Generating Plant, Unit Nos. 1 and 2 and will meet the requirements of Supplement 1 of NUREG-0737 upon the completion of the remaining DCRDR initiatives. This finding is contingent upon your commitments to:

1. Evaluate 128 human engineering discrepancy (HEDs) that relate to control board standards as to being safety or nonsafety related.
2. Complete all modifications to the control room by December 31, 1990.
3. Have the Control Board Standard dated March 24, 1986 as a living and controlled document for use as a guide for future control room modifications.
4. Maintain on file the NUREG-0700 "Guidelines References" for HEDs appearing in Section D of the DCRDR Summary Report (Reference 7, SE enclosure) where applicable.

This completes our review effort of the DCRDR (Item I.D.1.2 of NUREG-0737) for the Prairie Island Nuclear Generating Plant and TAC Nos. 56154 and 56155 will be closed as of the date of this letter. A copy of our Safety Evaluation and TER is enclosed.

Sincerely,



Dominic C. DiIanni, Project Manager
Project Directorate #1
Division of PWR Licensing-A

Enclosures:

1. Safety Evaluation
2. Technical Evaluation Report

cc's: See Next Page

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Mr. D. M. Musolf
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO DETAILED CONTROL ROOM DESIGN REVIEW (DCRDR)
FOR FACILITY OPERATING LICENSE NOS. DPR-42 AND DPR-60
NORTHERN STATES POWER COMPANY
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-282 AND 50-306

INTRODUCTION

Item I.D.1, "Control Room Design Reviews," of Task I.D, "Control Room Design," of the Nuclear Regulatory Commission (NRC) Action Plan NUREG-0660 (Ref. 1) 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 (DCRDR) 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 or cope with accidents if they occur by improving the information provided to them. Supplement 1 to NUREG-0737 (Ref. 2), confirmed and clarified the DCRDR requirement in NUREG-0660. As a result of Supplement 1 to NUREG-0737, each applicant or licensee is required to conduct their DCRDR on a schedule negotiated with NRC.

DISCUSSION

Northern States Power Company (NSP) submitted a Program Plan for the DCRDR to the NRC on May 27, 1983 (Ref. 3). The NRC staff comments on the Program Plan were forwarded to NSP on November 9, 1983 (Ref. 4). An on-site, in-progress audit was conducted at the Prairie Island Nuclear Generating Plant, Units 1 and 2 (PINGP) on March 6 through 9, 1984; consultants from Science Applications International Corporation (SAIC) assisted the staff and the findings of the audit were forwarded to NSP on July 17, 1984 (Ref. 5). NSP submitted a PINGP DCRDR status report and response to the March 1984 in-progress audit on January 31, 1985 (Ref. 6).

In response to the status report, the NRC agreed on March 11, 1985 to an extension of the completion date for the DCRDR with the Summary Report submittal to be due on January 1, 1986. The NRC received NSP's submittal of the PINGP Summary Report in December 1985 (Reference 7). A draft technical evaluation report and a final Technical Evaluation Report (Ref. 8) were prepared by SAIC and sent to NSP for their response to open items that required further information.

The licensee by letter dated June 12, 1986 (Ref. 9) provided supplemental responses to the questions raised by the staff and its consultant. Because of the number of open items and the complexity of some of these, an on-site meeting between the NRC staff and NSP representatives was held on July 28 and 29, 1986 to discuss the open items, clarify the NSP responses and resolve any outstanding issue.

In addition, NSP has included the Remote Shutdown Panel as a part of DCRDR.

The staff evaluation is based on the information, clarification, and submittals of the licensee as well as the on-site Meeting Summary (Ref. 10) dated September 22, 1986.

CONCLUSION

The staff's conclusions with regard to each of the elements of the DCRDR required by Supplement 1 to NUREG-0737 are summarized below:

1. MULTIDISCIPLINARY REVIEW TEAM

Based on the Summary Report, the in-progress audit and discussion during the audit, we conclude that NSP has established a qualified multidisciplinary review team which meets the requirements of Supplement 1 to NUREG-0737.

2. SYSTEM FUNCTION AND TASK ANALYSIS

The use of a plant specific version of the System Review and Task Analysis from the Westinghouse Owners Group (WOG) as the basis of the Prairie Island, Unit Nos. 1 and 2 system function and task analysis (SFTA) process is acceptable as discussed in NUREG-0800, Section 18.1, Appendix A (Ref. 11). The staff had been concerned that in the Summary Report there was inadequate documentation to identify how plant specific information and control characteristics were derived from the background documentation.

At the site meeting of July 28 and 29, 1986 (Ref. 10), NSP explained and clarified the process and methodology of the SFTA used and also presented a sample of the process documents.

The licensee confirmed that information and control requirements from the WOG Generic Plant Step Description Tables and Element Tables were used to define the characteristics and criteria for required instrumentation at PINGP. This was done by a NSP consultant independently, without using (or being in) the control room to find what and where instrumentation existed at this stage of the DCRDR. The staff discussed and the licensee clarified the Figures of Appendix B of the June 12, 1986 submittal (Ref. 9).

Figure 1 shows an example of background materials from the WOG, and it contains the generic information and control requirements applicable to two ERG steps.

Figure 2 is an example of a "Step Description Table." It describes instrumentation and control characteristics and criteria necessary to accomplish the steps.

Figure 3 is an example of the "Task Analysis Indications and Controls" worksheet. It contains a listing and description of the instrumentation required.

Figure 4 is an example of PINGP plant specific "Element Tables" listing the instrument identification numbers.

Figure 5 is an example of a "Control Requirements Table" listing all the criteria required for operation of a specific control.

Figure 6 "Instrumentation Requirements Table" is a counterpart of the Control Requirements Table listing all the criteria for using the display/indicator.

It is our judgement, based upon our review of all DCRDR documentation provided by the licensee, that NSP has satisfied the NUREG-0737, Supplement 1 function and task analysis requirement. However, since IE Information Notice No. 86-64, dated August 14, 1986, indicates that many utilities may have not appropriately developed or implemented upgraded emergency operating procedures (EOPs), the licensee should verify that the problems with EOPs identified in this Information Notice are not applicable to PINGP. If there are problems, the licensee should consider reevaluating the adequacy of their DCRDR task analysis.

3. CONTROL ROOM INVENTORY

The control room inventory and its comparison against the information and control needs derived from the system function and task analysis meet the requirements of Supplement 1 to NUREG-0737.

4. CONTROL ROOM SURVEY

The staff had a concern as to whether NSP used survey guidelines other than NUREG-0700. The discussions at the site clarified that NUTAC documents were used in the early stage of the DCRDR as a reference for the technique in conducting the surveys. The licensee confirmed that Section 6 of NUREG-0700 guidelines were used except for 14 deviations. Of these 14 deviations, five were of concern to the staff. These were discussed at the site visit and reviewed in the control room. The following is the clarification, justification, and resolution of these five deviations.

- a. NUREG-0700, Guideline Section 6.4.4.5.d(1) is relevant to rotary switch functions and position indications. It recommends a "line engraved both on the top of the knob and down the side." Westinghouse OT-2 switches are used at PINGP. These switches were examined at the board in the control room. They have either two positions (10 and 2 o'clock) or three positions (10, 12 and 2 o'clock) with an engraved dot indicating the pointer end of the control.

The operators are trained and are aware of the functions and positions of these switches.

This deviation is acceptable.

- b. NUREG-0700 Guideline Section 6.4.5.1.d(2)(b) is relevant to the trough distance of thumbwheels. These "thumbwheels" were examined at the control room board and it was found that the star handle was designed to be grasped by the whole hand and not just by the "thumb" as a thumbwheel would be.

The convention used at Prairie Island is acceptable.

- c. NUREG-0700, Guideline Section 6.5.3.1.c(1) is relevant to monitoring permissive indication of starting electric motors. The guidelines are that "system/equipment status should be inferred by illuminated indicators and never by the absence of illumination." At PINGP, the "Large Motor Monitor" system is to alert the operator to limit heat buildup in the motor windings from repeated starts in a short time. The absence of illumination indicate "Motor start not recommended." It is considered as a "permissive" indication and not an alarm. The lights are lit when the "permissive" allows starting of the motors.

The convention is acceptable.

- d. NUREG-0700, Guideline Section 6.6.2.4.c is relevant to label visibility during actuation of controllers. "Labels should be visible to the operator during control actuation."

Labels were examined in the control room and it was found that the PINGP convention is consistent within the control room. The labels are for one type of controller spring loaded AUTO/MANUAL positioner. The operators are not confused about the action of the positioner even if the label "AUTO" is momentarily covered while grasping the control.

This was found acceptable.

- e. NUREG-0700, Guideline Section 6.6.3.8.a is relevant to control position labeling. "All discrete functional control positions should be identified."

The object of this concern at PINGP is a Westinghouse OT-2 rotary selector. The staff examined it at the board during the site visit and found that it has two discrete functional control positions which are labeled and a spring-loaded center position which is also labeled. The center position is not a discrete functional position, it indicates only the absence of an "open" or "close" signal for motor valves.

This was found acceptable.

The staff concluded that the "deviations" from NUREG-0700 guidelines are acceptable and the survey at PINGP meets the requirements of Supplement 1 to NUREG-0737.

5. ASSESSMENT OF HUMAN ENGINEERING DISCREPANCIES

NSP used an elaborate assessment process and systematic methodology in assessing HEDs which meet the requirements of Supplement 1 to NUREG-0737. However, the NRC did have concerns on specific HEDs. These concerns can be summarized as:

- ° Assigning two different priorities (priority 2 and 3) for motor operated valves.
- ° Adequacy of (a) the range scales of auxilliary feedwater flow instrumentation; (b) parameter ranges of reactor coolant pump lower bearing water temperature, seal outlet temperature, labyrinth seal differential pressure, and seal injection temperature; and (c) computer alarm auditory and visual displays.
- ° Possible confusion arising in the control position of "T" handle of rotary switches.

These concerns were discussed at the on-site meeting with the licensee and the results of these discussions are detailed in the Meeting Summary (Ref. 10) with a commitment to have 128 HEDs that relate to the control board standards evaluated as being safety or nonsafety related. In addition, the licensee committed to complete the control room modifications resolving PINGP HEDs by December 31, 1990.

The NRC found NSP schedules acceptable.

6. SELECTION OF DESIGN IMPROVEMENTS

NSP has developed a technically sound process to implement design improvements and makes extensive use of the full-scale mock-up. However, there was a concern related to whether possible cumulative effects of the HEDs were considered. Based on NSP's response (Appendix

B of Ref. 10), the procedure to review the cumulative effects by walk-through and the staff visit to the mock-up, the simulator, and the control room, it is concluded that the cumulative effect of the HEDs covering annunciators, legends, push buttons, and label location has been adequately addressed and that the selection of design improvements is adequate and meets the requirements of Supplement 1 to NUREG-0737.

7. VERIFICATION THAT DESIGN IMPROVEMENTS PROVIDE NECESSARY CORRECTION AND DO NOT INTRODUCE NEW HED'S

The verification program as described by NSP is acceptable and meets the requirements of Supplement 1 to NUREG-0737.

8. COORDINATION OF THE DCRDR WITH OTHER SUPPLEMENT 1 TO NUREG-0737 PROGRAMS

The NSP integrated coordination plan is adequate and meets the requirements of Supplement 1 to NUREG-0737. However, there was a concern related to "how operator training" will be integrated with the implementation of control room modifications.

The clarification during the site visit was that training is a requirement in "NSP's Uniform Modification Process" which requires that training be identified and that training be completed before a modification is turned over to operations. In addition, NSP developed a schedule to ensure that the simulator has been upgraded to facilitate operator training prior to operation of the modified control board.

The staff concludes that NSP response is acceptable.

CONCLUSION

In conclusion, the staff found in general that the PINGP effort is one of the better DCRDR initiatives being conducted by a utility and when completed will meet the requirements of Supplement 1 to NUREG-0737.

In addition, the licensee committed:

- a. To have all 128 HEDs that relate to the control board standards evaluated as being safety or nonsafety related.
- b. To complete all modifications of the control room by December 31, 1990.
- c. To have the Control Board Standard (dated March 24, 1986) as a living and controlled document to be used at PINGP as a guide for future control room modifications.
- d. To have on file the NUREG-0700, "Guidelines References" for the HEDs appearing in Section D of the summary report where applicable.

Principal Contributor:

Dr. S. Saba

REFERENCES

1. NUREG-0660, "NRC Action Plan Developed as a Result of the TMI-2 Accident," U.S. NRC, May 1980; Revision 1, August 1980.
2. NUREG-0737, Supplement 1, "Requirements for Emergency Response Capability," U.S. NRC, Washington, D.C., December 1982, transmitted to reactor licensees via Generic Letter 82-33, December 17, 1982.
3. Letter to Director, Office of Nuclear Reactor Regulation, U.S. NRC from D. Musolf, Manager, Nuclear Support Services, NSP. Subject: "Supplement 1 to NUREG-0737, April 15, 1983, Response to Generic Letter 82-33 Control Room Design Review Program Plan Submittal," for Prairie Island Nuclear Generating Plant, dated May 27, 1983.
4. "Nuclear Regulatory Commission Staff Comments on the Prairie Island Nuclear Generating Plant Detailed Control Room Design Review Program Plan," U.S. NRC, November 9, 1983.
5. "In-Progress Audit Report of the Detailed Control Room Design Review for Prairie Island Nuclear Generating Plant, Units 1 and 2," U.S. NRC, July 17, 1984.
6. "Prairie Island Nuclear Generating Plant Detailed Control Room Design Review Status Report and Response to March 1984 In-Progress Audit," Northern States Power Company, January 31, 1985.
7. "Detailed Control Room Design Review Summary Report, Prairie Island Nuclear Generating Plant (Report Number 10188-PI-8000)," Northern States Power Company Nuclear Technical Services Department and Honeywell Inc. Technology Strategy Center, December 1985.
8. "Technical Evaluation of the Detailed Control Room Design Review for Northern States Power Company's Prairie Island Nuclear Generating Plant Unit 1 and 2," prepared by Science Applications International Corporation, dated April 25, 1986.
9. Letter to Director, Office of Nuclear Reactor Regulation, USNRC from David Musolf, Manager, Nuclear Support Services, NSP. "Supplement 1 to NUREG-0737, Generic Letter 82-33, Supplemental Information In Response to Issues Raised by the NRC staff on the Prairie Island DCRDR Summary Report," dated June 12, 1986.
10. Letter to D. M. Musolf, NSP, from Domonic C. DiIanni, PM, NRC, dated September 22, 1986 with enclosure of the "Meeting Summary of July 28 and 29, 1986, with Northern States Power Company (NSP)."
11. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 18.1, Appendix A, "Evaluation Criteria for Detailed Control Room Design Reviews," September 1984.