



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555-0001

May 5, 1994

Docket No. 50-341

Mr. Douglas R. Gipson
Senior Vice President
Nuclear Generation
Detroit Edison Company
6400 North Dixie Highway
Newport, Michigan 48166

Dear Mr. Gipson:

SUBJECT: FERMI-2 DETAILED CONTROL ROOM DESIGN REVIEW (DCRDR) -
PRIORITY 3 HUMAN ENGINEERING DISCREPANCIES (HEDs)
(TAC NO. M86938)

On March 16, 1994, Greg Galletti and Clare Goodman, from the Human Factors Assessment Branch, and Tim Colburn, Fermi-2 Project Manager, conducted a DCRDR audit at the Fermi 2 Nuclear Plant. The purpose of the audit was to determine if the licensee had acceptably evaluated priority 3 HEDs that were dispositioned differently from the methodology identified in the DCRDR summary report and its two supplements dated November 30, 1986, August 19, 1987, and November 30, 1987, respectively.

There were 21 priority 3 HEDs for which the NRC auditors reviewed the revised dispositions and their associated technical bases. The 21 HEDs were originally identified in your letter to the staff dated August 27, 1993, and described in further detail in a follow-up facsimile dated November 5, 1993. This information was provided in response to an NRC request dated July 22, 1993, to identify priority 3 HEDs which were evaluated and dispositioned differently than as described in the original DCRDR methodology.

The NRC staff reviewed each of the 21 identified priority 3 HEDs. Ten of those HEDs were resolved through modified implementation of the utility's DCRDR team recommendations. These 10 HEDs remained as priority 3 HEDs in the DCRDR tracking system. The remaining 11 HEDs were downgraded to priority 4 HEDs in the DCRDR tracking system as a result of related modifications to the plant or re-analysis of the original DCRDR findings.

The NRC staff discussed the resolution of each HED with members of your staff to ensure the adequacy of corrective actions. The discussions focused on: (1) a detailed review of the DCRDR documentation for each HED, (2) review of photographed control board mockups used during the licensee's review process for those HEDs requiring potential board modifications, and (3) direct inspection of the as-built control room to review control room modifications. During the control room walkdown, the NRC had an opportunity to discuss control board layout and operating philosophy with members of your staff.

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Mr. Douglas R. Gipson

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The NRC staff has completed its review of your corrective actions and determined that they were acceptable. A detailed description of the 21 HED's reviewed, including the corrective actions, is provided in the enclosure. The NRC staff determined that the goals of the Fermi 2 DCRDR program has been met and that the DCRDR program implementation had been correctly completed.

Sincerely,

Original signed by

Timothy G. Colburn, Sr. Project Manager
Project Directorate III-1
Division of Reactor Projects III/IV

Enclosure:
Priority 3 HEDs

cc w/enclosure:
See next page

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Priority 3 HEDs With Revised Dispositions

HED 450 Flow Meters Have Log Scale

Modification

Originally the correction plan for this HED involved replacing the log scale (square root scale) on a meter with a linear scale. The indicators have a non-linear scale because the scale is used in a non-linear fashion. According to guidance contained in NUREG-0700, a non-linear scale is appropriate in this case. Therefore, this modification is acceptable to the staff.

HED 455 H11-P805 Cluttered

Modification

This is a "lead" or summary HED (encompassing approximately 18 individual HED's for the purpose of writing one engineering design package-EDP) involving several changes to panel 805 (Feedwater and Condensate Systems). The changes to the panel that were eventually implemented by the licensee had been revised from those that had been initially approved by the original DCRDR team.

The staff reviewed before and after pictures of the panel. The overall intent of this "lead" HED was met and changes were made to resolve each of the individual HED's. Approximately 40 items were removed from the cluttered area of the panel. Groupings were made to accommodate logical use and the layout was revised so that it was functional with respect to the procedures. Certain indicators were modified to ease identification. In addition, a parallax problem was resolved. Following the completion of the corrections, the licensee reviewed the individual HED's to confirm that the resolutions addressed each individual HED. The DCRDR team met and approved the close of HED 455. The staff concluded that this modification to the HED was acceptable.

HED 577 Confusing Turbine Run-Up Rate Control

Modification

In order to address this HED the licensee determined that a hardware change, as proposed by the original DCRDR team, would not be as effective (in eliminating the confusion) as rewriting the applicable poorly written procedure. The procedure was rewritten to make it very clear what the operator should accomplish. The operators now know exactly what feedback they should obtain. The procedure was rewritten in a "cookbook" manner and defines exactly what run-up rate (50 RPM/min) should be obtained. In reviewing HED 577 the staff looked at pictures of the controls involved and walked down the relevant steps of the procedure in the control room. The staff, therefore, concluded that this modification to the HED was acceptable.

HED 766 Poor Grouping (of Annunciators)

Modification

This HED is a "lead" HED, which when closed is the basis for closure of 15 other HEDs for annunciators. This HED addressed the "generic" concern of grouping. A particularly difficult issue to resolve was the poor grouping of the diesel auto-start annunciators. They were in the same groupings as the trouble alarms. The licensee addressed this specific concern through (1) an

alarm response procedural upgrade and (2) an emphasis on identifying the location of these annunciators on the electrical distribution panel during operator training. The licensee also indicated that the original issues related to functional grouping of annunciators and modification of annunciator tile inscriptions covered in the HED's were resolved through panel reorganization and tile remanufacturing. The staff, therefore, concluded that this modification to the HED was acceptable.

HED 894 Alarm Window Should Have Reflash Capability Downgrade

This HED involves the Safety Relief Valve (SRV) annunciator window which does not have reflash capability. The correction for this HED included the installation of a new Westronics recorder which provides the needed information to the operator without providing "reflash." The licensee then downgraded this HED from a category 3 to a category 4. Since the intent of the original HED was resolved, the potential for error is no longer of concern. The staff finds this downgrading to category 4 to be acceptable based on the above correction.

HED 1184 Numbering of Annunciator Tiles on H11-P810 Downgrade

This HED involves the numbering of two of the annunciator window boxes. The tiles in the left box are numbered 25-48 and the tiles in the center box are numbered 1-24, which is the reverse of the convention used in the control room for other annunciator panels. The licensee interviewed operators and reviewed the results of operating experience at the plant to determine if this arrangement had been problematic during operations. The results indicated that the arrangement of the annunciator tiles did not negatively affect operator performance and that operators were cognizant of the reversal of the window boxes. In addition, each tile is uniquely identified by a row/column designation which is identified in the alarm response procedures. Operators agreed that this HED is not a concern even though it does not meet NUREG-0700 guidelines. Therefore, this HED was downgraded to category 4. The staff finds this downgrading to be acceptable based on the operating experience review and clear annunciator identification methodology used.

HED 775 Incomplete Banding of Scales Using Color Modification

This HED involved 800 scales in the control room which were reviewed for important display characteristics including: %scale, legibility, number of increments, stroke, color banding and other items. A few of the scales were not modified due to several factors including operating bands that could not be color coded because the bands were mode dependent. The actual modifications to this HED involved several administrative issues. For example, the number of the engineering design package (EDP) changed. The staff finds this modification to be acceptable based on the corrections that were actually implemented in the control room.

HED 776 Same Shape Handles On Different Control Switches Modification

This HED was judged to have very low safety significance. If an error were made there is plenty of time to recover. The pistol grip switches for the EDG voltage control and frequency control are identical in size and shape. As a slightly separate issue, the licensee redesigned the local control panel handle direction to operate in the same manner as the control room. The staff reviewed photographs and the training program for the operators with regard to this problem. In addition, operating experience review showed that this had only been a problem during original start-ups prior to the use of the site-specific training simulator. The staff finds this modification to be acceptable based on the analyses conducted by the licensee.

HED 881 Control Room Lighting Modification

For this HED a lighting consultant was hired after the original DCRDR team had completed its initial report. Improvements in the control room were made. Scooped enclosures were installed on the lights. Due to the specific recommendations of the DCRDR team prior to the consultant's study, it was necessary to revise the original HED to reflect the consultant proposals. The staff finds this modification to the HED to be acceptable based on the improvements made to the control room lighting.

HED 929 Scale for the Gas Purity Indicator Modification

This HED involves the casing on the gas purity indicator. The original HED stated that the indicator moved in a direction opposite to that recommended by NUREG-0700. It was later discovered that there is an industry standard for this particular type of gas purity indicator and the current meter in the Fermi control room meets that standard. Even if the licensee elected to change the indicator, it apparently would not be available. GE was consulted by the licensee and confirmed the above conclusions. The staff finds this modification to the HED to be acceptable based on the unique application of this indicator.

HED 1300 Handwritten With Incorrect Scale Values Modification

This HED was corrected and the modification only involved a change in EDP number and is therefore acceptable to the staff.

HED 1364 Recorder Paper not Compatible Modification

This HED involved replacing the chart paper with paper having appropriate scales. The HED was corrected and is therefore acceptable to the staff.

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HED 621 Must Open Recorder Door to Read Scale Downgrade

This specific HED was a category 4 HED and was corrected and closed as a category 4 HED. The "lead" HED 775 (of which HED 621 was a part) was a category 3 and therefore this HED was artificially raised to category 3 for bookkeeping purposes. The staff, therefore, finds this downgrading to be acceptable.

HED 794 CMC Control Switch Run Light Stays On

Downgrade

The HED involves a Combination Manual Control (CMC) Switch which reads "Auto/Off/On/Trip." The CMC switch is a combination push button control and visual display. The particular issue in this HED is the situation in which a pump has no AC power and is therefore not operating while its control switch, which is DC powered, may display that the pump is in operation. The switch is operated by DC power. The correction to this HED involved administratively requiring the resetting of the switch prior to reinstalling power.

To address this HED the licensee made a list of all plant equipment that has an associated CMC. All training material and procedures were reviewed where a CMC was involved. Training was revised to train operators to use alternate methods to verify equipment status where a CMC is involved. The licensee has also revised a number of procedures as a result of this effort. Operating experience review has shown that this was only a problem before the procedures were written and therefore this HED was downgraded to category 4.

The staff paid particular attention to this HED while in the control room and asked several operators to illustrate the problem and demonstrate how they would use multi-indications to verify equipment status. Based on the staff's review the downgrading of this HED is acceptable.

HED 853 IRM Scale Switch Direction Unconventional

Downgrade

The IRM switch is used to keep the monitors on scale during reactor start-ups and shutdowns and goes counterclockwise instead of clockwise. The licensee acknowledged that its convention was not consistent with industry practice. This HED was identified as a problem prior to having a simulator for operator training. Now that the operators train on the simulator they have become familiar with the switch configuration and according to operator interviews do not consider it a problem.

The staff reviewed pictures of the IRM scale switches and looked at the switches in the control room. The staff agrees that this HED is not a problem and has been acceptably downgraded to a category 4.

HED 857 GEMAC Controller Concern

Downgrade

The indicators are in % and not in engineering units as they should be. The scales cannot be modified on the existing equipment since the parts are not available. This HED involves a line of instrumentation that is now obsolete. No other instruments in the control room are involved. The licensee has a policy that as these controllers fail they are replaced with an entirely new line of equipment. For the controllers that have not yet been replaced, the procedures have been modified so that the operators only have to verify a parameter and do NOT have to perform any calculations.

The staff reviewed each of the GEMAC controllers in the control room and checked that an alarm was associated with each. Based on the operators having both auditory and visual indication of a problem, the staff finds that the downgrading is acceptable.

HED 945 Labeling Problems

Downgrade

This is a "lead" HED and is being tracked by the plant under a labeling improvement program. This program is also being tracked by INPO. Any problem labels found during the DCRDR have been fixed and any improper labels found by the licensee staff are fixed as they are found. The program underway involves approximately 60,000 labels throughout the plant. Six people are working full time to prepare the labels, install them and to verify the correct location of each. The labels are being made in-house and the licensee is changing the procedures, drawings, relay rooms, local equipment in the plant and the control room so that all labels are coordinated. Based on the extensive progress made to date by the licensee this HED is acceptably reassigned to category 4.

HED 1181 Recorders Fail on Scale

Downgrade

The concern of this HED is that recorders can fail on scale if there is a loss of power to the instrument or if the recorder is inadvertently turned off. These are obsolete recorders and will be replaced according to the licensee's 5-year plan. During every shift the recorders and their trace are checked. I&C engineering evaluated 149 control room recorders. The evaluation determined the failure position for each of the recorders and evaluated the necessity for providing failure indication. The study found that for each of the parameters monitored on the recorders a direct or alternate method of "fail on scale" determination is available. Twenty three involve parameters used in EOPs and those are backed up by alarms and have other indications that the operator uses. Therefore this HED may be downgraded.

The staff paid particular attention to this HED while in the control room. The staff confirmed from the operators that alternate indications were successfully used. Based on the staff's review, the downgrading of this HED is acceptable.

HED 1456 Recorder Scales Hard to Read

Downgrade

See discussion under HED 1457.

HED 1457 Trace Hard to Read Through Glass

Downgrade

This HED involves glare on recorders. Non-glare glass was installed which has corrected the glare problem; however, in some cases the information on the recorders is difficult to read because of the cloudy nature of the replacement glass. As a separate activity a number of the recorders involved have already been replaced and for the new recorders glare is not a problem. For the remaining old recorders, the licensee is presently trying to determine if they still need to record the variables shown on the old recorders. The staff viewed the recorders in the control room. Based on the corrections made to date by the licensee, this HED was acceptably downgraded to category 4.

HED 1460 Poor Visibility of Recorded Data

Downgrade

See discussion under HED 1457.

Dated: