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John C. Brons
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June 10, 1988
JPN-88-029

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Mail Stop P1-137
Washington, D. C. 20555

Subject: James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
Detailed Control Room Design Review
Supplementary Summary Report

References: 1. NRC letter, H. Abelson to J. C. Brons, dated March 14, 1988, regarding Detailed Control Room Design Review (DCRDR).

Dear Sirs:

In Reference 1, the NRC staff documented their review of the FitzPatrick Detailed Control Room Design Review (DCRDR). The staff requested that the Authority prepare and submit a supplemental summary report to address certain items identified in the Safety Evaluation (SE) and Technical Evaluation Report (TER) that were attached to Reference 1.

Attached is a report which responds to the staff's request. It addresses the eleven items listed in Section 4.0 of the TER. It also includes and justifies a revised implementation schedule for modifications associated with selected HEDs.

If you or your staff have any questions concerning this matter, please contact Mr. J. A. Gray, Jr. of my staff.

Very truly yours,

John C. Brons
Executive Vice President
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Attachment I

NEW YORK POWER AUTHORITY
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
DPR-59

Response to NRC Request for Additional Information
Regarding FitzPatrick Detailed Control Room Design Review

1.0 INTRODUCTION AND BACKGROUND

In Reference 1, the NRC staff asked the Authority to submit a supplementary summary report addressing each of the issues identified in the FitzPatrick DCRDR Safety Evaluation (SE) and Technical Evaluation Report (TER).

The Authority has carefully reviewed the staff's reports. Each of the issues discussed in the SE are described in greater detail in Section 4.0 "Supplemental Work Needed to Comply with Supplement 1 to NUREG-0737," of the TER. Rather than duplicating information, Section 2 of this report will only address the eleven items in Section 4.0 of the TER.

Section 2 of this report has been numbered to correspond to the TER. For example, Authority responses to item 1 of the TER are in Section 2.1; item 2 in Section 2.2, etc.

The Authority has already provided much of the information requested. In those cases, only a reference is stated.

2.0 RESPONSE TO TECHNICAL EVALUATION REPORT (TER) ITEMS

2.1 DCRDR Review Team Resumes

Resumes of the FitzPatrick DCRDR Review Team were submitted to the NRC staff as an attachment to Reference 2.

2.2 Task Analysis Basis

The EOPs used were prepared using the BWROG Emergency Procedure Guidelines Revision 3.

Procedures for secondary containment control (F-EOP-5, "Secondary Containment Control") and radioactivity control (F-EOP-6, "Radioactivity Release Control") were included in the task analysis.

2.3 Emergency Procedure Guidelines (EPGs)

As described in Section 5.1.7 of the DCRDR Summary Report (Reference 4) and Section 4.3.3.3 of the DCRDR Program Plan

Supplement (Reference 7), a full-scale control room mock-up was prepared as part of the FitzPatrick DCRDR. This mock-up is the control room inventory. The Authority considers this superior to a written inventory.

Task analysis scenarios were acted-out using the mock-up. Video tapes of these scenarios were subsequently evaluated to determine instrument availability and suitability.

The Authority may develop a written control room inventory as part of the ongoing DCRDR implementation program. In this case, the mock-up need not be retained as an inventory.

2.4 Modifications Resulting From Special Studies

Apparently, the NRC did not consider Reference 3 in their SE and TER. Approximately one year ago, the Authority submitted a description of modifications to resolve HEDs that required further review in attachment 1 to Reference 3. An implementation schedule for these items was also included.

2.4.1 Square Push-Button Switches

See Sections 7.2.3 and 7.2.4 of Reference 3.

2.4.2 Apron Panel Edge Controls

See Section 7.2.5 of Reference 3, for changes in controls.

As briefly described in Section 4.0.A of Reference 4, a one foot section on the floor in front of each apron will be distinctively marked. Access to this area will be limited by administrative controls.

2.4.3 Turbine & Main Generator Indicators, Controls and Recorders

See Section 7.2.4 of Reference 3.

2.4.4 Single Push-Button for RCIC, HPCI and Core Spray

See Section 6 of Reference 3.

2.4.5 Lighting and Glare

See Section 5.2.1 of Reference 3.

2.4.6 Ambient Noise

See Section 8 of Reference 3.

In addition, the Authority will install carpeting in the Control Room to reduce ambient background noise levels. Installation is currently scheduled for the third quarter of 1988.

2.4.7 Annunciator Arrangement

See Section 4.2.1 of Reference 3.

2.4.8 Annunciator Control System

See Section 4.2.2 of Reference 3.

2.5 Modifications to Resolve HEDs

2.5.1 Drywell Temperature Indication

A drywell atmosphere temperature indicator was added to a control room front panel. (Modification F1-82-021 added instruments 16TR-107 and 16TR-108).

See also Section 2.7.8 (HED 369) of this report.

2.5.2 HED 450

HED 450 will be revised to incorporate the audit team's suggestion. The "recommendations" portion of HED 450 will be revised to include a statement that loss of main condenser vacuum indicates the loss of the main condenser as a heatsink.

2.5.3 HED 181

Since this HED was written in 1981, the Authority has made significant changes to the control room instrument calibration program. QA category I instruments that perform tripping, alarming or controlling function have been added to the calibration program. Instruments that display primary system parameters were also incorporated into the calibration program. Instruments which support surveillance tests required by technical specifications are calibrated every 2 years.

As a result of these efforts, the Authority considers this HED fully resolved.

2.5.4 EPIC Solutions

As stated in Reference 8 and 9, the FitzPatrick Emergency Plant and Information Computer (EPIC) is equipped with redundant CPUs and powered from an uninterruptable power supply.

See also Section 2.7.7, HED 263.

2.5.5 HED 140

A program to assure consistency between EOPs and control room instrumentation is in progress. A FitzPatrick engineering and design procedure (EDP-29, "Design Criteria for Specifying Process Units, Scale Ranges, and Color Coding on Control Room Instrumentation, Meters, Indicators and Recorder Scales") has been prepared and is the basis for the program.

2.5.6 HED 129

HED 129 involves J-handled switches installed on the front row of the apron panels. See Section 7.2.5 of Reference 3.

2.5.7 HED 247

HED 247 involves the absence of separate silence and reset capabilities on the FitzPatrick annunciator system. See Section 4.2.2 of Reference 3.

2.5.8 HED 220

These valves will not be replaced with valves that provide positive valve indication. All three valves associated with HED 220 are sample purge valves.

As described in Section 4.0.D of Reference 4, the value of the process parameter regulated by the valve (flow) is displayed near the valve and provides indirect, but positive indication of valve position. Position indication is not important for these sample line purge valves.

2.5.9 HED 117

As described in Reference 5, HEDs in the labeling resolution category were resolved as part of the control room enhancement program. A description and schedule for this program was provided in Reference 3.

2.6 Partially Uncorrected HEDs

The safety significance of each HED was assigned to one of four

(I - IV) categories. These categories are defined in Section 5.2 of Reference 4. Category I was assigned to the most significant HEDs with category IV assigned to nonsignificant HEDs.

Section 4.0 of Reference 4 justifies the partial resolution of fourteen HEDs. Many of the HEDs discussed in the following sections are also discussed there.

2.6.1 HED 172 (Category II)

This HED concerns twenty meters that indicate zero when they have failed. It is preferable that meters fail off-scale low.

These meters monitor five different parameters:

- Containment Pressure (6 meters)
- Containment Level (4 meters)
- Torus Level (4 meters)
- Reactor Pressure (4 meters)
- Reactor Water Level Fuel Zone (2 meters)

All five parameters are displayed on at least two meters. All twenty meters are located on the same control room panel (09-3). Therefore, failure of any single meter can be easily verified by reading other meter(s) which display the same parameter. Each of these five parameters are also available on the EPIC/SPDS system which can indicate a failed instrument.

These meters are powered from different power supplies which are in turn powered from redundant electrical busses. For example, one the two fuel zone reactor vessel water level meters receive power from a Division I power supply; the other meter is powered from a Division II power supply. This assures that the failure of any one power supply will not result in the loss of all control room indication for any five of these parameters.

Section 4.0.C of Reference 4 also addressed this HED. (Note that the quantity of meters associated with this HED has been increase from seventeen. Also, there are two, not one, reactor vessel level meters on panel 09-3.)

2.6.2 HED 220 (Category II)

See Section 2.5.8 which also discusses HED 220.

2.6.3 HED 252 (Category II)

See Section 4.2.2 of Reference 3 for a description of the FitzPatrick annunciator alarm system.

See Section 4.0.F and 4.0.G of Reference 4.

2.6.4 HED 296 (Category II)

HED 296 involves the absence of cross references to other operating procedures in the EOPs.

The resolution category of this HED has been changed to completed/resolved. F-EOP-33 (now EOP-2) and all other FitzPatrick EOPs have been revised since the 1981 control room survey was performed to consider human factors.

Operators routinely use these procedures. They are retrained annually on these procedures. Their ability to identify and use procedures is tested during NRC operator license examinations.

Explicit procedure cross-referencing is not required. Operating procedures for these four systems (HPCI, RCIC, RHR and Core Spray) are readily identified by the operating staff.

See Section 4.0.K of Reference 4.

2.6.5 HED 320 (Category II)

HED 320 involves the use of more than one operating procedure at a time to perform immediate actions.

The resolution category of this HED has been changed to completed/resolved. F-SP-1 (now F-AOP-39) and F-EOP-25 (now F-AOP-1) have been revised since the 1981 control room survey was performed to consider human factors.

The Authority considers the concurrent use of more than one procedure necessary to control the size of procedures, (i. e. reduce unnecessary duplication) while assuring concise, clear operating procedures.

See Sections 4.0.H and 4.0.J of Reference 4.

2.6.6 HED 352 (Category III)

HED 352 involves the absence of prioritized audible alarms.

The existing annunciator uses two colors (red and white) to prioritize response level. A third annunciator color (yellow) will be added to provide finer gradations of alarm/annunciator response levels.

This third annunciator color will be installed as part of other modifications to the annunciator tiles (HEDs 234, 235 and 245). See Section 3 of Reference 3 for the associated implementation schedule.

2.6.7 HED 353 (Category III)

HED 353 involves the absence of audible alarms that are

distinguishable by alarm location.

A total of four alarm sounds are used in the FitzPatrick control room.

Two alarm sounds service six control room panels. One sound is shared between four control room panels: 09-4, 09-5, 09-6 and 09-8; a different alarm sound is used for panels 09-3 and 09-7. The fire protection panel and EPIC system also have different sounding alarms.

Experience has shown that operators are able to quickly locate incoming alarms using the audible and visual cues already installed.

See Section 4.2.2 of Reference 3 for a description of the FitzPatrick annunciator alarm system.

2.7 EOP Related HEDs corrected by EPIC

The FitzPatrick SPDS is the topmost display in the Emergency Plant Information Computer (EPIC) system. Each EPIC display is titled. As used in this section, the EPIC "Plant" display and SPDS are synonymous.

2.7.1 HED 162

Variable units (i.e. inches of mercury, minutes, feet, mils, rpm, etc.) will be displayed on EPIC trends displays, as appropriate. In some cases, it may be appropriate to display percent instead of physical units.

2.7.2 HED 180

A full core display ("Control Rod Position") is available on EPIC. The following color codes are used to indicate rod position:

Rod Position	Color Code
48	Black
44-02	Yellow
00	Green
Undefined	Red

Rod position is also indicated on the Control Rod Position display for all rod positions except 48 (control rod full out).

2.7.3 HED 197

Main Turbine temperature and expansion are available on the EPIC "Turbine Generator Overview" display.

(In addition, this recorder was replaced during the January 1988 mini-outage to resolve HED 197 [Modification F1-86-115].)

2.7.4 HED 215

See Section 2.7.2, HED 180.

2.7.5 HED 250

The EPIC "General Alarm List" display list alarm time, name/description of alarm and current value. In addition, the two most recent alarms are shown on the top line of each EPIC display.

2.7.6 HED 261

The top level EPIC display ("Plant" or SPDS) provides a concise display of critical plant parameters to aid operators in rapidly and reliably determining the safety status of the plant during major transients. As described in the SPDS Safety Evaluation (Reference 7), variables on this display are EOP entry points plus a containment isolation status which was added at the request of the NRC.

2.7.7 HED 263

This HED is no longer applicable. It referred to the plant process computer present in 1981. As described in References 7, 8 and 9, the Authority replaced the system referred to in HED 263 with a new system, EPIC. During the Operational Availability Demonstration, EPIC reliability was greater than ninety-eight percent.

2.7.8 HED 369

As described in Reference 7, drywell atmosphere temperature, suppression pool temperature, suppression pool level and suppression pool water temperature indication are all available on the SPDS (i. e. top-level EPIC "Plant") display.

2.7.9 HED 372

As described in Reference 7, SPDS parameters are EOP entry conditions. SPDS parameters are color-coded to highlight the approach and entry into EOP conditions.

EPIC displays include aids to help the operator determine EOP action levels. For example, the "Suppression Pool Water Level Control Display" indicates the following action levels:

- Suction Transfer Level
- High Level LCO (Limiting Condition for Operation)
- Low Level LCO
- Downcomer Level
- T-Quencher Level
- Margin to Suppression Pool Level Limit
- Margin to Heat Capacity Level Limit

Similar aids are available on other displays.

2.7.10 HED 382

See Section 3.7.2, HED 180

2.7.11 HED 391

Bulk suppression pool water average temperature is available on the "Plant" and "Suppression Pool Water Temperature" displays. Drywell atmosphere average temperature is available on the "Plant" and "Drywell Temp. Instruments" displays.

2.7.12 HED 392

A "Core Thermal-Hydraulic Operating Map" display is available on EPIC as an operator aid. The map can be displayed on a single screen or "enlarged" so that one-third of the full map fills the display screen.

A "Thermal-Power vs. Core Flow" display is also available.

2.7.13 HED 439

A full-range reactor vessel water level indicator is provided on the EPIC "Plant" display. Individual narrow-range, wide-range and refueling zone instruments are available on the "Reactor Water Level Instruments" display.

2.7.14 HED 452

Drywell atmosphere cooler inlet/outlet temperatures, and average drywell temperature is available on the "Drywell Cooling 1" display. A mimic showing the approximate location of individual instruments and their indicated temperature is available on the "Drywell Cooling 2" display.

2.7.15 HED 455

See Section 2.7.11, HED 391.

2.8 Implementation Schedules

2.8.1 Status Report

As of February 19, 1988, changes to resolve approximately 77% of FitzPatrick's HEDs have been completed. 100% of the HEDs in the following resolution categories have been resolved: Color Code, Standard, and Procedure. Over 75% of the HEDs in the EPIC, Mimic and Labeling categories have been resolved.

To complete these remaining modifications, a DCRDR task group has been formed. This on-site group consists of six engineers/designers, a clerk and a part-time human factors expert. This group is currently working to complete these modifications in accordance with the schedule below.

2.8.2 Revised Implementation Schedule

The Authority is rescheduling the implementation of modifications associated with selected HEDs. Specifically, modifications to resolve the following HEDs will be completed no later than 30 days after the end of the Reload 9/Cycle 10 refueling outage, or June 30, 1990, whichever is later. (The Reload 9/Cycle 10 refueling outage is currently scheduled for 1990.)

[a] 44 HEDs in the Modification/Recorder/Relocation resolution categories

[b] 4 HEDs in the EPIC resolution category

[c] Phase 2 of the Demarcation portion of the control room enhancement program (26 HEDs)

[d] Phases 2 and 3 of the Scale Modification portion of the control room enhancement program (24 HEDs)

No other schedule changes are required at this time. Refer to References 3, 5 and 6 for the Authority's implementation schedule on other HEDs.

New Schedule Justification

This new schedule is necessary to coordinate these control room modifications with the new FitzPatrick plant simulator and keep the simulator up-to-date with the existing control room.

The new simulator is expected to be completed during the

last quarter of 1988 with training scheduled to start shortly thereafter. Other than control room modifications to resolve DCRDR HEDs, 16 modifications will have to be added to the simulator before it accurately reflects the existing control room. (These are the result of Regulatory Guide 1.97 changes installed during the past 2 years.)

Implementing approximately 50 DCRDR modifications to the control room in accordance with earlier schedules would result in a simulator out-of-date by approximately 66 modifications on the day it's declared operational. This would reduce the usefulness of the simulator. It is preferable from the standpoint of human factors, operator training, and cost to postpone these control room modifications and modify the simulator and control simultaneously.

[a] Modification/Recorder/Relocation Resolution Categories

The following HEDs are included in the Modification resolution category: 19, 43, 44, 52, 121, 122, 123, 144, 177, 186, 211, 341, 344, 388, 391, 399, 415, 429, 437 and 456.

The following HEDs are in the Recorder resolution category: 51, 52, 186, 193, 195, 196 and 208.

The following HEDs are in the Relocation resolution category: 5, 15, 16, 17, 24, 46, 47, 48, 49, 50, 51, 217, 248, 380, 421, 426 and 427.

[b] EPIC Resolution Category

To resolve HEDs 6, 9, 13 and 18, the old (GEPAC) process computer must be dismantled and removed. The GEPAC is being replaced by the EPIC computer system. Nearly all of the programs running on GEPAC have been installed and are now running on EPIC. When all of the programs have been fully installed and tested on EPIC, the GEPAC system will be removed.

[c] Scale Modification - Phases 2 and 3

In Reference 5, the Authority described this portion of the control room enhancement program. Phase 2 is the installation of new instrument scales and transmitters when a new transmitter is required. Phase 3 is the installation of new scales and recalibration for instruments not requiring new transmitters.

The following HEDs will be resolved as part of Phase 3: 95, 130, 137, 139, 140, 141, 149, 150, 151, 152, 153, 154, 157, 162, 166, 171, 176, 386, 433, 441, 443, 446, 449 and 451.

Phase 2 was scheduled for completion not later than December 31,

1988. Phase 3 was scheduled for December 31, 1989.

[d] Demarcation - Phase 2

Phase 2 involves the installation of permanent lines and mimics. Temporary lines and mimics were installed last year. Phase 2 was scheduled for completion December 31, 1988.

The following HEDs will be resolved as part of Phase 2: 14, 15, 16, 17, 19, 20, 21, 22, 24, 26, 27, 29, 32, 33, 36, 37, 39, 40, 41, 42, 57, 224, 229, 251 and 430.

2.9 Process to Verify Modifications Correct HEDs

Modifications which resolve HEDs are combined in Conceptual Design Packages (CDPs) with one CDP per panel. All CDPs (i.e. plant modifications, including DCRDR-related modifications) are controlled by administrative procedures. Work activity control procedure WACP 10.1.6 ("Control of Modifications, Component Changes, and Safety and Environmental Impact Evaluation Reports") describes the mechanism for making changes to the FitzPatrick plant. This procedure describes the responsibilities of the Resident Manager, Superintendent of Power and Department Superintendents to review and approve proposed modifications.

The Power Authority implemented controls to assure that control room modifications that will be installed during the 1988 refueling outage are reviewed by the DCRDR Project Group. Modifications are submitted to the group for review and concurrence before incorporation in CDPs.

CDPs involving modifications to the Control Room panels are also reviewed by the Authority's human factors specialist using the guidelines of NUREG-0700.

Control room panel equipment installed after the completion of the DCRDR program and prior to the 1988 refueling outage will be reviewed for compliance with the guidelines of NUREG-0700. Any significant discrepancies will be incorporated into a CDP and corrected.

The Authority has revised Engineering Design Procedure EDP-1 ("Procedure for Design/Engineering Activities") to assure that human factors requirements are considered for operating panels.

Engineering design procedure EDP-9 ("Engraving, Labeling and Mimic Design Criteria for Control Panels, Devices, and Annunciator Window") provides criteria for control room labels in accordance with NUREG-0700 guidance.

A new, more comprehensive engineering design procedure will detail human factors criteria for control room modifications.

This procedure will assure that no new HEDs are introduced in the modification process. Until this procedure is issued for use, DCRDR Project Group review, EDP-1 and EDP-29 will provide similar assurances.

2.10 Process to Assure Modifications Do Not Introduce New HEDs

Section 6.0 of Reference 4 describes how corrections will be assured not to introduce new HEDs.

Also see Section 2.9 of this report.

2.11 DCRDR Coordination

See Section 2.9.

2.11.1 Coordination With Operator Training

As described in Section 2.9, all CDPs are reviewed by the FitzPatrick Training Department staff. In this way, they are formally notified of all modifications and their installation schedule.

The operator training program is revised to reflect the modification and operators retrained when it has been completed.

2.11.2 Regulatory Guide 1.97 Instrumentation

The Authority's human factors consultant (General Physics Corp.) reviewed each of the modification associated with Regulatory Guide 1.97 and involved alteration of control room panel surfaces within DCRDR scope. The guidelines of NUREG-0700 were used a criteria in their review.

Two recommendations resulted from their review. Both recommendations were subsequently retracted when the Authority described the modifications in greater detail.

3.0 NOTES AND REFERENCES

1. NRC letter, H. Abelson to J. C. Brons, dated March 14, 1988 regarding Detailed Control Room Design Review. Includes NRC Safety Evaluation and Technical Evaluation Report.

2. NYPA letter, J. C. Brons to D. B. Vassallo, dated November 21, 1985 (JPN-85-085) transmits resumes of DCRDR Review Team members.

3. NYPA letter, J. C. Brons to USNRC Document Control Desk, (JPN-87-040) dated July 21, 1987. Submits description and implementation schedule for DCRDR HEDs in further review category.

4. NYPA letter, J. C. Brons to D. R. Muller, dated February 28, 1986 (JPN-86-008) regarding DCRDR Summary Report and Implementation Schedule.

5. NYPA letter, J. C. Brons to NRC Document Desk, dated April 20, 1987 (JPN-87-022) regarding Revised Implementation Schedule for Detailed Control Room Design Review.

6. NYPA letter, J. C. Brons to NRC Document Control Desk, dated July 17, 1987 (JPN-87-037) regarding DCRDR implementation schedule for EPIC HEDs.

7. NYPA letter, J. C. Brons to D. B. Vassallo, dated November 30, 1984 (JPN-84-079) transmits SPDS safety analysis report.

8. NYPA letter, J. C. Brons to NRC Document Desk, dated August 4, 1987 (JPN-87-041) regarding response to generic implications of Salem ATWS event post-trip review: data and information capabilities.

9. NYPA letter, J. C. Brons to D. B. Vassallo, dated November 1, 1985 (JPN-85-080) regarding response to request for additional information regarding SPDS/EPIC.