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October 20, 1982

W3T82-0407

Mr. T. M. Novak  
Assistant Director of Licensing  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

SUBJECT: Waterford 3 (Docket No. 50-382)  
Response to NRC Human Factors  
Control Room Review

Dear Mr. Novak:

Attached is the Louisiana Power & Light response to the Human Factors Engineering audit of the Waterford 3 Control Room conducted on May 13, 1982. Our response to specific HEDs is contained in the main body of the report. The ongoing Human Factors Program is discussed in the Summary and Conclusions, Attachment 1 to this letter. Those items for which LP&L proposes partial or no correction are detailed in Attachment 2. Attachment 3 describes ongoing programs providing resolution to HEDs and support to our Human Factors Program. After our meeting on November 4, 1982, LP&L will issue a revised report.

If you have any questions or need any additional information, please contact Don Lowe or Dr. Sabri at (504) 464-3136.

Very truly yours,

L. V. Maurin

LVM:pbk

Attachments: 1. Summary and Conclusions  
2. Discussion of Open Items  
3. Support Projects

cc: E. Blake, M. L. Stevenson, S. Black

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Attachment 1

SUMMARY AND CONCLUSIONS

1. Audit Findings

Action complete	32
Complete by hot functionals	127
Complete by fuel load	6
No action considered necessary	61
Partial action	<u>2</u>
	228

2. Projects Affecting HED;

Enhancement Manual:

Glossary of terms and abbreviations  
Color code standard  
Materials and application section  
Enhancement control procedure

Control Room Habitability Study

LCP-43 and Fire Panel Enhancements

Control Panel Tagging Study

Emergency Procedures Validation

Proposed EPRI Maintainability Study

MCR Annunciator Response Manual

Operator-Computer Interface

3. Continuing Human Engineering Efforts

HED Committee established as permanent entity to ensure attention to human factors problems.

Human factors engineer assigned to Nuclear Training Group to monitor and assist in Training-Operations-Maintenance-Computer interface.

Task analyst assigned to Nuclear Training Group to define training goals and objectives.

Training update section assigned task of maintaining the Control Room inventory and enhancement program.

## Attachment 2

### Discussion of Open Items

Like most power plants, the design and construction of Waterford-3 took a good many years. During that time many interests competed for space on the Main Control Board and in the Control Room. Design evolution and regulatory requirements have required many changes and reordering of instruments and controls. Each vendor has his own idea of color codes, array conventions, abbreviations and even knob design. Near completion, the addition or change of an instrument becomes a compromise between ideal and possible arrangement. The result is some arrangements that are simply the best you can do and become accepted as something you just have to live with. Of course, priorities for safety related and controls for major systems are established. Coupled with the different vendor concepts and the practicalities of space, are the human preferences. Each engineer and operator has very definite ideas about all the elements.

In order to "live with" these apparent disparities, we must be sure our procedures and training compensate for each deviation from the ideal. LP&L will devote considerable effort to just that. During the EOP walk-throughs and the following analysis of each procedure, not only further change will be considered, but training requirements will be identified.

During the initial testing and first operation the problems of the operators will be closely identified and reviewed by the same organizational element charged with this initial review. This group will track each item we have identified as to be evaluated during testing. Perhaps two examples best illustrate this.

First, the question of Alarm Horn silence. The design of the annunciator system was in line with LP&L's standard for its other plants, that is, the horn automatically silenced after some adjustable time (3-10 seconds). This left the annunciator window flashing white until the operator acknowledged the alarm. When we go to continuous horn, the act of silencing the horn will also change the window to steady white. This would seem to imply the need for a separate "silence" control, but if this situation occurs very often, then the implication is we need auto-silence. So, even though we have supplied an answer to the two HED's (B-3-21, B-3-22) we will carefully review and track the question during the next year.

Second example, meter scales and banding, (HED B-5-22, B-5-23, B-5-34). Many of the scales were selected based on an operational requirement of a system and may appear to be somewhat arbitrary. Scale banding is difficult to establish accurately until the plant actually operates. These two areas have been discussed with operations and engineering at length and the conclusion is we must wait until normal operation ranges are established. We will establish as part of the HED tracking system a periodic evaluation of not only these two areas but all similar HED's where our response consists mainly of opinion. This evaluation will consist of control room observation and organized contact with the operators, both on the job and during requalification training. As part of this process, all identified problems and

Attachment 2 (Cont'd)

cautions will be transmitted to all operators until fixes are in place, or if it comes down to a "live with it" situation, training will be provided.

For your convenience, attached is a listing of all items for which LP&L proposes no-action.

Open Item Listing

<u>Panel</u>	<u>HED#</u>	<u>Priority</u>	<u>Report Section</u>
Reactor Control (CP-2)	B-4-18	2	2.1
	B-8-27	3	2.1
	B-8-29	3	2.1
	B-9-7	2	2.1*Partial
	Correction will be made to the additional finding.		
Plant Protection (CP-7)	B-5-26	1	2.2
Chemical and Volume Control (CP-4)	B-4-6	3	2.3
	B-6-2	1	2.3
Power Conversion and Distribution (CP-1)	B-8-8	1	2.4
	B-9-9	2	2.4
Turbine Startup/Supervisory (CP-13)	B-3-19	2	2.5
	B-8-11	2	2.5
	B-8-30	2	2.5
ESFAS Test (CP-33)	B-4-21	3	2.8
	B-8-32	3	2.8
Engineered Safe Guards (CP-8)	B-5-3, B-5-4, B-5-5, B-5-6, B-5-7	1	2.9
	B-8-26	2	2.9
Annunciator	B-3-2	3	2.11
	B-3-3	2	2.11
	B-3-4	2	2.11
	B-3-8	3	2.11
	B-3-9	3	2.11
	B-3-22	2	2.11
	B-8-12	3	2.11

Open Item Listing (Cont'd)

<u>Panel</u>	<u>HED#</u>	<u>Priority</u>	<u>Report Section</u>
Master Remote Control Local Fire Detection	B-6-27	3	2.12
Plant Monitoring Computer	B-7-2	1	2.13
Auxiliary Control Panel (LCP-43)	B-4-14	1	2.14.1
	B-8-6	1	2.14.1
	B-8-9	1	2.14.1
	B-9-10	3	2.14.1
Generic Findings	B-4-20	3	2.15.1
Controls	B-4-7	2	2.15.2
	B-4-10	1	2.15.2
	B-5-8	1	2.15.2
	B-5-35	1	2.15.2
	B-5-37	1	2.15.2
Motors	B-5-16	1	2.15.3
	B-5-12	1	2.15.3
	B-5-21	3	2.15.3
	B-5-14	3	2.15.3
	B-5-10	3	2.15.3
Recorders	B-5-44	1	2.15.4
	B-5-42	3	2.15.4
	B-5-41	3	2.15.4
	B-5-43	3	2.15.4
	B-5-40	3	2.15.4
	B-5-39	1	2.15.4
Physical Items	B-1-14	3	2.15.5
	B-1-15	3	2.15.5
Accommodation	B-1-26	3	5.2

Attachment 3

PROJECTS SUPPORTING HED EFFORT

1. Control Room Habitability Study

HED: B1-9, 10, 11, 17; B2-9, 10

LP&L will form a work group to address control room storage, furniture, storage of equipment and reference, and functional accommodations. This group will consist of a senior human factors engineer, part of the LP&L operators, the operations supervisor, and two contractors who have participated in similar control room design tasks. This project will be complete by fuel load.

2. Continued Enhancement Efforts

Emergency Shutdown Panel, LCP-43

HED: B5-30; B6-10, 11, 13, 16, 21, 24, 30, 31, 32, 40; B8-21

Lockheed Corporation has completed Rev O, of LCP-43 enhancement drawings. We are reviewing these drawings and considering a proposal by the present enhancement contractor to install these fixes. Will complete by fuel load.

Fire Panel Enhancements

Lockheed Corporation has finished these drawings and LP&L is reviewing a proposal by the present enhancement contractor. Will complete by fuel load.

Waterford-3 Enhancement Manual

LP&L is compiling a manual to control future enhancements and changes to panels. The manual will consist of four sections:

- Standard Terms and Abbreviations Glossary
- Approved Color Code
- Materials and Application Methods
- Control Procedure

This glossary is approved and in use. Adopting this standard will require 471 annunciator window changes and numerous procedure and drawing changes. The windows will be completed prior to fuel load along with an intensive effort toward procedure changes. Prints and system description update will be an ongoing process.

The color code has been studied by Lockheed and is under review. Adoption of a standard is complicated by the wide variety of vendor systems. This will be an ongoing effort.

The materials and application methods section will be written in cooperation with the present enhancement contractor.

### Attachment 3 (Cont'd)

The enhancement control procedure will be part of the Waterford-3 controlled program system and will receive full review by plant personnel.

#### 3. Control Panel Tagging and Tags

The Waterford-3 operations superintendent is investigating methods of tagging that do not obscure controls or information on the panel. Several methods from other plants involving different tag sizes and materials are being evaluated. These tags will be incorporated into the Waterford-3 safety tagging procedure.

#### 4. Emergency Operating Procedure Validation

Using a set of procedure bases supplied by Combustion Engineering, Westinghouse Corporation will perform an EOP evaluation and analysis of operator activities using the existing EOPs and MCR layout. Westinghouse will perform walk-through of each procedure and then map each critical symptom location against the operator tasks. Maps will be drawn to show the communications between the operators, shift supervisor and STA, in terms of frequency, distance, communication medium and receiver/sender.

During a task analysis of each step any human engineering deficiencies will be identified. An event recognition report will be generated for the reactor trip EOP containing recommendations regarding MCR/display modifications, CRT use, SODS capability, training and operating crew interaction and responsibilities. EOP format and revisions will be discussed.

All human engineering problems with any Westinghouse recommendations will be submitted to the Waterford-3 HED Committee for consideration.

Detailed planning has been completed. Walk throughs are tentatively scheduled for November 8-19, 1982 with an interim report by December 10, 1982. Final project report is projected in May 1983.

#### 5. Proposed EPRI Maintainability Study

Waterford-3 has been suggested as one of the plants to test the EPRI Maintainability Study. This is a broad-based human factors study of operations and maintenance of the plant. If LP&L participates in this task any problems will be submitted to the Waterford-3 HED Committee for evaluation.

#### 6. Waterford-3 Alarm Response Manual

Now being written on-site, particular attention is being given to the availability of supplementary information sources for the confirmation and diagnosis of alarms at the MCR. Emphasis is given to those alarm points with multiple inputs.



Attachment 3 (Cont'd)

7. Operator-Computer Interface

Computer interface training is being developed and scheduled for the licensed operators. The training will address in particular the abilities of the computer as an information and diagnostic aid. Emphasis will be given to the sequence of events function.

8. Waterford-3 Simulator and Mock-ups

LP&L is purchasing a full scope control room simulator. This machine will provide a test vehicle for study of recommended changes in enhancements, procedures and control locations. LP&L also has the Lockheed one-half scale mock-up of the control room installed on-site. This will provide another tool for enhancement and control cluster studies, as well as act as a training aid.