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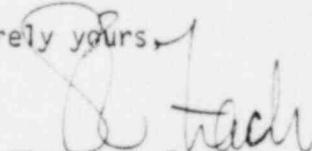
April 3, 1981

Mr. R. W. Froelich
Division of Human Factors Safety
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Froelich:

Enclosed are Kinton's comments on NUREG-0659. Dr. Shriver and I enjoyed our conversation with you last month. We hope that we will have further opportunity for discussing the integration of the systems approach to control room evaluations.

Sincerely yours,


Sarah Elizabeth Zach
Project Director

SEZ/jo

Enclosure

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COMMENTS ON NUREG-0659

STAFF SUPPLEMENT TO THE DRAFT REPORT
ON HUMAN ENGINEERING GUIDE
TO CONTROL ROOM EVALUATION

The guidelines are severely limited in scope to "knobs and dials and creature comforts." They completely miss system process understanding, the primary means of communicating that understanding, training, and the interface between the human brain and the control room. What is addressed in the guidelines, the interface between the human sensory and motor apparatus with the displays and controls, is valid but narrow; not the highest priority of focus, and consequently misleading. That is, although the displays in the control room are difficult to read, the controls are not placed conveniently or organized so as to reflect their functional relationships, and the lighting is often lower than it should be, these factors may not be the causes of operator errors. They are valid points, and no one should argue against improvements of the type indicated by the standards. What is arguable is the priority of these considerations and the recommendations regarding the amount of effort that should be expended to make these improvements.

The fact is that these considerations were of minor significance in the TMI incident, and they do not address what was of major significance at TMI and remains significant in plants today. The matter of significance at TMI was the failure of the minds of the operators to comprehend the actual system processes from the indications they attended to. Indeed engineers entering the diagnostic process shortly thereafter did not immediately comprehend the actual system processes that had occurred and were progressively occurring while they were in attendance. In retrospect, the entire process has been diagnosed with some accuracy, the correct interpretation of indicator cues has been determined, along with a set of control actions that should have been taken had the system processes been correctly synthesized in the minds of the operators at each stage of evolution of the event.

Quite clearly the main focus of a corrective effort must be on the minds of the operators; their hands and eyeballs were not primarily at fault. The

operators did not reach for one control and mistake it for another. Their hands did what their minds told them to do. They did not misread dials because of poor lighting or because they could not see the numbers on the displays. The fault was not in the sensory apparatus of the operators. It is true that there were some contributory factors made by controls being obscured by tags, etc. But basically the operator errors were not sensory or motor human factor errors. The human factor errors were mental.

It should be recognized that this misdirection and misfocus does not invalidate the guidelines; it merely distorts their importance. This, in turn, completely distorts the priority of actions that should be taken to address the human factors of importance. That is, the guidelines address 10% of the problem with an implication that 90% of the effort should be directed at correcting them. A more reasonable allocation of effort would be 10% of the effort to the 10% of the problem that is concerned with knobs and dials. Again this does not make the guidelines any less valid. But it does point up the fact that 90% of the human factor problem has not been addressed in all of the time since TMI, and the guidelines as given represent an inadequate allocation of that time to the real human factor problem. That is a problem in itself, one that should not be compounded by continuing to invest a disproportionate amount of effort on "knobs and dials" human factors in the future. The human factor of importance is that concerned with the human mind, its conception of states of plant processes from the available indications--and the actions appropriate for bringing the plant processes to more desirable states.

Conclusions

1. The guidelines in this draft represent an important degree of broadening over the previous draft. Formally, the guidelines refer to control room design, as per the NRC mandate. But the generality of the system approach to training, procedures, and human factors other than those involved in control room design is made clear in this draft.

2. This broadening is important because most people, including the public, can see that the problem that "surfaced" at TMI is primarily not a control room design problem. The problem is that operators did not correctly conceptualize the plant processes in progress. The problem was not that they could not read the dials, or find the controls, or were tired, or didn't have enough illumination, but that they did not understand what they saw.

3. Further broadening of the guidelines beyond control room design is essential. These draft guidelines need to be integrated with those for training and procedures. The present draft guidelines are relevant to control room design, but the danger is in representing the control room design as the solution to the conceptual problem that was observed at TMI, and which remains in plants today. The danger is that the public will perceive that control room design is a small aspect of the problem. If the NRC presents control room design as a solution to the conceptual problem, the danger is that the public may feel the NRC is attempting to divert attention from the real problem by pretending that shifting a few knobs and dials around will actually make a difference in operator's conception of plant operations and functions.

4. The effort to implement the guidelines should be separated into two parts, one for immediate action and the second for long range development. The long range development should be oriented toward an idealized general design to serve as a model. It will require research to try out design options developed through application of the guidelines. The research will involve the results of other actions that affect the operator, e.g., training, procedures and should not be conducted in isolation of other human factors.