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Iowa City, Iowa 52242

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Program in Industrial and Management Engineering
College of Engineering

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ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS, U.S.N.R.C.

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ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS
September 13, 1982

7, 8, 9, 10, 11, 12, 1, 2, 3, 4, 5, 6 PM

To: Dave Ward
c/o Mr. David Fischer, Staff Engineer
Advisory Committee on Reactor Safety
Nuclear Regulatory Commission
1717 H Street, NW
Washington, DC 20000

From: James R. Buck, Consultant

Subject: Comments on the Integrated Human Factors Program Plan Toward Revisions

1. The Human Factors Effort serves the Nuclear Regulatory Commission by providing technical information for both utility companies and other NRC personnel and direct enforcement of items dealing with people in nuclear power generation. When this technical information is factual and relatively complete specific regulations or guidelines are issued and implemented for regulation purposes. Otherwise those gaps of knowledge are identified as issues to be resolved and research is either conducted or identified as ongoing elsewhere for a resolution toward NRC regulation. The HF effort was initiated in May 1980 to serve these purposes. This document should then describe what has been done to date, the immediate future activities, and the long-term ideas all within the same organization. The six bullets in the 4th paragraph of page 1 (Intro) are a fine organization and the program breakdown on page 3 readily follows as a goal, objective, or purpose.
2. Next I would recommend summarizing what has been done over all and on-going activities as a groundwork for The Plan. Parts of this past development was internal (in-house) program planning and part of this development for The Plan comes from external activities including a task force from the Human Factors Society and coordination with numerous other groups who are concerned about safety in nuclear power generation. This will show that your plan has a comprehensive basis of preparation and guidance while the allocation of effort in The Plan may mostly be judgement calls, and guidance. There is supporting basis for these judgements.
3. Another feature which impacts this plan is the NRC Regional Organization. This feature will affect the uniformity of direct enforcement without a coordinative plan.

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4. Pages 4 and 5 appear to take issue with the HFS report. I would rather you worked these issues into the report in its stride. However, the differences in judgements need to be stated in simple language.
5. One of the important features that affects the plan but was hardly evident in the writeup is available dollars and personnel at NRC to cover all the topical areas that are needed. These are part of reasons for cooperating with other organizations (e.g. Electrical Power Research Institute).
6. Much of the near-term efforts are a continuation of existing activities and a refinement of them. I would recommend starting with the continuing activities in each of the six study areas first. Then hit the refinements and new thrusts indicated by the issues within each area. It is suggested that the organization by area is a good one because levels of justification can be inserted easily to the degree desired. Part of this justification can be the high correspondence of the Human Factor Society Report. That is, state the action plan elements within each area and then set out justification of that position. For example, a deferral of short-term action may be justified in spite of a high and urgent priority by the Human Factors Society Task Force because someone else (e.g. Holden) currently has a study ongoing of a similar type. Also you can openly disagree with the Society report, as with the human reliability case, and support your opinion there.
7. I strongly recommend against the use of acronyms in the text. That caused me considerable delays in reading which more than offset the very minor length increase which would have occurred due to the use of full English words. The use of technical jargon is another item (e.g. the term "Psychometric properties" on page 13 top paragraph) to avoid if possible. However that is a very minor problem.
8. It is suggested that you add another level of heading. That addition will allow some connected groupings without some of the implied differences in topic. For example, on page 16 under the Man-Machine Interface for Existing Designs, the headings are maintenance, local-control stations, emergency response facilities, and annunciators. These headings refer to an activity, general facilities, and a very specific piece of control room equipment. An added level of heading would allow you to focus a topic of the same character and level of specificity.
9. I really don't consider computers an advanced technology and the use of computer terminals in the control room is certainly not. Almost any chemical processing plant and most industrial processing plants built in the past ten years uses computers for data management and/or direct control. Now there are new ways to use computers which are advanced.
10. The topics: "Advanced Controls and Displays", "Annunciators", and "Safety Status Indication" on pages 17-18 are interrelated topics which all deal with communications and the merging of these topics separate from computers and function allocation would help in the organization. This would also be a good place to address the Human Factors Society

report item on the safety parameters display system. (See page 7 of Appendix A). While it was nice to see the Society report recommendations as presented in the Society report keyed to yours, it bothered me not to see any discussion of what the disagreements are, when there are disagreements. Also I recommend that the "possible" status be indicated that the staff will consider the recommendations in the future and to show the areas in The Plan where it will be considered.

11. Approximate levels of effort to areas and at major units within areas need to be clearly shown.
12. Many of the advanced (long range) research needs some work on near-basic research which neither the institutes nor the NRC is well equipped to address. This form of research is best done in Universities but there is currently zero university effort, none proposed, and little said about how this long-range research can proceed without those basic elements. This document can, and in my opinion, should recommend directly some support to universities to solve these fundamental issues and to provide a better supply of human factors people for the nuclear industry including the NRC.
13. Many of the points in the long-range research are repeated (e.g. extend to newer forms of reactors).
14. Some specific points on my own bias are given below:
 - a. A function generally means a class of activities all sharing a commonality of how it is performed. Therefore function allocation generally means to assign an entire function to a human or to a machine. While this assignment is done for some functions (e.g. top-level decision making), there are many other cases where the assignment can and should change with the human workload. A simple example is using an automatic telephone dialler for commonly called phone numbers but a manual dialler for infrequently called numbers.
 - b. Maintenance is an extensive and complex range of activities including trouble-shooting and equipment checkout which needs high variability and capabilities for large amounts of individual differences. This activity appears to be treated here as a fuzzy blob.
 - c. The term "task" and "job" do not carry bad or unprofessional connotations. However these terms were avoided at times for less understood notions.