CERTIFIED BY: George Apostolakis January 28, 1997
Issued: December 31, 1996

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
HUMAN FACTORS SUBCOMMITTEE
MEETING MINUTES
DECEMBER 3, 1996
ROCKVILLE, MARYLAND

INTRODUCTION

The Advisory Committee on Reactor Safeguards (ACRS) Subcommittee on Human Factors held a meeting on December 3, 1996, in Room T-2 B3, 11545 Rockville Pike, Rockville, Maryland, with representatives of the U.S. Nuclear Regulatory Commission (NRC). The purpose of this meeting was to discuss the NRC staff responses to the questions raised by ACRS members during the Human Factors Subcommittee meeting on September 20, 1996, and also to obtain information on the activities of the Office of Nuclear Reactor Regulation (NRR), the Office for Analysis and Evaluation of Operational Data (AEOD), the Office of Nuclear Material Safety Safeguards (NMSS), and the Office of Nuclear Regulatory Research (RES) in the human factors area. The entire meeting was open to the public. Mr. Amarjit Singh was the cognizant ACRS staff engineer for this meeting. The meeting was convened at 8:30 a.m. and adjourned at 3:00 p.m.

ATTENDEES

ACRS Members/ACRS Consultants

G. Apostolakis, Chairman
R. Seale, Member
T. Kress, Member
D. Miller, Member
J. Carroll, Consultant

RS01
0/1

Principal NRC Speakers

C. Thomas, NRR
F. Collins, NRR
R. Eckenrode, NRR
J. Kramer, RES
F. Coffman, RES
J. Persensky, RES
F. Combs, NMSS
J. Piccone, NMSS
D. Serig, NMSS
J. Rosenthal, AEOD
E. Rossi, AEOD
E. Trager, AEOD

No written comments or requests for time to make oral statements were received from members of the public. A list of attendees is available in the ACRS office and will be made available upon request.

OPENING REMARKS BY THE SUBCOMMITTEE CHAIRMAN

Dr. George Apostolakis, Chairman of the Human Factors Subcommittee, convened the meeting at 8:30 a.m. and stated that the purpose of the meeting was to hold discussions with the representatives of NRR, AEOD, NMSS, and RES concerning their responses to the questions raised during the Human Factors Subcommittee meeting on September 20, 1996, and on the activities of these Offices in the human factors area. He also stated that the Subcommittee would gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

NRC STAFF RESPONSES

Representatives of NRR, AEOD, NMSS, and RES responded to the following 16 questions that were raised by the ACRS members during the Human Factors Subcommittee meeting on September 20, 1996:

Question 1: What are the staff's plans for developing a Human Performance Program Plan (HPPP) activities road map, which would be useful for allocating resources to, scheduling, and understanding the relationship between the activities?

Response: Dr. Cecil Thomas, NRR, stated that the HPPP in its present form was that envisioned by the Human Factors Coordinating Committee's charter. The HPPP is adequately serving the staff's needs, as evidenced by a report from each of the offices that use it. The staff is committed to maintaining and using the HPPP. However, the staff cannot justify diverting limited resources from other work to develop a more detailed road map.

Question 2: The activities delineated in the HPPP appear to be focused on reducing the assumed risk-worth of human actions used in probabilistic risk assessments (PRAs). What is the risk-worth of human actions? Why does the staff believe the risk-worth is too high and should be reduced?

Response: Mr. Frank Coffman, NMSS, stated that the HPPP was not developed based on the concept of risk-worth but was developed from experience accrued by studying human performance at operating plants. Mr. Jack Rosenthal, AEOD, stated that human performance information was extracted from inspection reports prepared by Augmented Inspection Teams and Incident Investigation Teams, as well as from licensee event reports.

Question 3: How does the staff set the priorities for the HPPP activities, and what does the priority ranking mean?

Response: Dr. Thomas stated that the Human Factors Coordinating Committee assigned each program activity a priority of high, medium, or low. The priorities represent the Coordinating Committee's qualitative assessment of the activity's relative importance in terms of safety significance, management direction, and regulatory need. The HPPP identifies the responsible office for each activity. An individual within the assigned office has responsibility for tracking the item to completion.

Question 4: How does the staff decide that an independent program element is required? Why has the staff decided that data gathering should be separated from developing guidance and that the two activities should have different priorities?

Response: Dr. Thomas stated that there are no established criteria for deciding on the need for a program element. The need for and the prioritization of a program element item are based on staff judgment and user-need requests.

Question 5: What does the staff mean by "effective" and "adequate" as used in the objectives and goals in the HPPP? How does the staff know what must be done and when the goal or objective is achieved?

Response: Dr. Thomas stated that the terms "effective" and "objective" have no special meaning and could be eliminated from the document.

Question 6: Should the staff be pushing licensees toward the state-of-the-art in human reliability rather than a proven adequate state?

Response: Dr. Thomas stated that there is no requirement for licensees to move towards the state-of-the-art in the human factors area. The post Three Mile Island requirements of 10 CFR 50.34(f)(2)(iii) for control room designs that reflect state-of-the-art human factors principles, however, are applicable to advanced reactor designs.

Question 7: Numerous human errors have resulted in the misadministration of medical treatments by licensees of NMSS. Why isn't NMSS as involved with human performance efforts as the other offices?

Response: Dr. Dennis Serig, NMSS, stated that the NMSS human factors program was designed to integrate the goals and objectives of the HPPP into the process of regulating materials licensees. NMSS participated in the development and updating of the HPPP.

Question 8: How does the staff plan to respond to the ACRS advice concerning developing metrics for organizations and management that correlate with risk or performance?

Response: Mr. Coffman, stated that the staff has interacted with the ACRS throughout the years on this topic and has identified a need to conduct research on organizational factors. The staff is considering reformulating the research question from the general issue of folding organizational factors into PRAs to more focused questions. He noted that the organizational factors issue was rated low because the Human Factors Coordinating Committee considered the likelihood of successful completing research in this area to be low.

Question 9: What are the technical bases for defining the staffing levels inside and outside the control room, and for communication procedures?

Response: Dr. Thomas stated that the staffing level requirements are found in 10 CFR 50.54. The technical bases for the staffing requirements are described in the statements of considerations published in the July 11, 1983 Federal Register notice that promulgated the staffing requirements. The NRC staff has communicated the technical bases for its expectations for communication procedures in inspection guidance and is developing an associated NUREG.

Question 10: What are the deficiencies or "holes" in NUREG-0700?

Response: Mr. Jay Persensky, RES, stated that fourteen deficiencies were identified in NUREG/CR-5908, "Advanced Human-System Interface Design Review Guideline," which was the predecessor to NUREG-0700, "Human-System Interface Design Review Guideline," Volume 1. The

contractor, who prepared NUREG/CR-5908, prioritized the deficiencies based on available information. The staff addressed these deficiencies based on user-need requests.

Question 11: How are the standards that are adopted by the staff formulated? How does the staff assure that the standards are necessary and sufficient to meet regulatory needs?

Response: Mr. Coffman explained that due to resource considerations the consensus standards are based upon experimental evidence. In order to establish an experimental basis for standards, additional resources would be needed to conduct experiments and to analyze experimental results. He noted that since the sufficiency of consensus standards cannot be guaranteed, the scope of the standards has to exceed the scope of the experimental evidence.

Question 12: The staff scheduled Item 1.2.11 of the HPPP, "Develop Guidance for Computerized Job Performance Aids," to be completed "as technology is developed." What standards does the staff have for such aids that would foster the development of such technology? If the standards do not exist, what are the staff's plans for developing such standards?

Response: Mr. Persensky stated that it is not the role of the staff to foster development of technology. The role of the staff is to review and evaluate industry technology and to perform confirmatory research necessary to support staff reviews and evaluations. The staff plans to issue a supplement for NUREG-0700 that will incorporate more information on computerized procedures.

Question 13: What is the staff's approach to developing performance-based fitness-for-duty criteria?

Response: Mr. Persensky stated that the staff is maintaining awareness of what is occurring in other industries, such as the transportation industry, in the area of fitness-for-duty. Dr. Thomas stated that the staff was unable to make a case for modifying the NRC policy statement on working hours or for proposing a fitness-for-duty requirement to measure fatigue.

Question 14: What is the staff's approach to evaluating the task network model espoused by the Department of

Defense and how will the staff decide whether the model is applicable and useful for regulatory needs?

Response: Mr. Persensky stated that a contractor to RES used data, collected in the area of staffing at various utilities by Brookhaven National Laboratory, to build a task-network model. The staff has done some targeted validation studies of its network model and would like to apply the model results to safety assessments. The staff is awaiting the report from Halden on the Loviisa staffing study, which was part of the advanced reactor staffing project. Currently, the staff is working with the Army Research Laboratory, which has experience in this modeling technology.

Question 15: How does the staff decide on the allocation of resources between human factor research and other research activities such as thermal hydraulic models?

Response: Mr. Coffman stated that the decision on the allocation of research resources is made by the Director of RES based on the recommendations of division directors and branch chiefs. Decisions at each level are made based on common elements, such as, how the research relates to safety and regulatory issues.

Question 16: How does the staff assure simulator fidelity? How important is good fidelity to Emergency Operating Procedure training? What does the staff expect an operator to do if unexpected plant behavior occurs during a severe accident?

Response: Mr. Frank Collins, NRR, stated that simulator fidelity is not defined per se but that the completion of the testing and software documentation specified in ANSI/ANS 3.5, "Nuclear Power Plant Simulators for Use in Operator Training," establishes fidelity. Licensees certify to the staff that they have completed the applicable tests and documentation, and that the simulator meets the requirements of 10 CFR 50.54, "Conditions of Licenses." Since good fidelity is important to training, instructors will cease displaying unrealistic simulator responses to prevent negative training. During severe accidents, operators become more cognitive and actively communicate with the technical support center.

AEOD HUMAN PERFORMANCE EVENT DATABASE

Mr. Eugene Trager, AEOD, presented the background and history of the development of the human performance event database (HPED). AEOD began studies of human performance in 1980. These studies were performed on site with multidisciplinary teams, which included the assistance of Idaho National Engineering Laboratory (INEL), and focused on human factors aspects of operating events. From 1990 to 1993, AEOD completed 20 studies. In 1992, the AEOD staff decided to develop the HPED. The NRR and RES staffs assisted in developing the structure of the database. The structure was based on a human performance investigation process. A technical assistance contract was awarded to INEL to construct the database, but because of budget cuts in 1995 the contract was delayed. Subsequently, the contract was restored with an expanded scope. The AEOD staff plans to distribute the draft HPED to NRR and RES for comment and to a specialists' workshop in October 1997.

SUBCOMMITTEE DISCUSSION

Dr. Apostolakis stated that the fundamental questions are where does the NRC want to be in five or ten years with respect to human factors, what tools are available, and what needs to be done to get there. He stated that the fundamental questions are not answered by the HPPP and that the HPPP is not a plan.

Dr. Apostolakis noted that the issue of the appropriate use of human error models by the NRC deserves attention. He indicated that the staff should adopt human performance models used by other countries, such as the models developed by Rasmussen or Reason.

Mr. Jay Carroll stated that the Committee should recommend in its report to the Commission that the staff seriously pursue research on organizational factors. He also supported improving the licensee event reporting process to capture human performance data, even if a backfit analysis is required.

FOLLOWUP ACTIONS

The Subcommittee requested that the staff be prepared to respond to questions 1, 2, 3, 7, 11, and 16 at the ACRS full Committee meeting on December 5-7, 1996. Mr. Carroll requested a presentation on the HPED during the ACRS meeting. Dr. Thomas offered to brief the Committee on the background and status of the Human Factors Coordinating Committee.

The Subcommittee requested the following documents, which the staff subsequently provided to the members on December 3, 1996.

- Copy of the AEOD report concerning the Human Performance Events Database
- SECY-96-093, "Guidance for Senior Management Meeting and Plant Evaluation Processes," dated May 1, 1996
- SECY-94-113, "Senior Management Meeting Review Process," dated April 22, 1994
- Recent AEOD Studies Involving Human Factor Issues

Dr. Apostolakis also requested that the following documents be provided to all members when they are available.

- NUREG-0700, "Human-System Interface Design Review Guideline," Volume 1
- NUREG-1275, "Operating Experience Feedback Report- Human Performance in Operating Events," Volume 8

SUBCOMMITTEE RECOMMENDATION

The Subcommittee recommended that the full Committee review and comment on the Human Performance Program Plan.

BACKGROUND MATERIAL PROVIDED TO THE SUBCOMMITTEE

1. List of Questions raised at the September 20, 1996 ACRS Human Factors Subcommittee meeting and associated figures
2. Memorandum dated October 21, 1996, from Noel Dudley, ACRS Staff, to ACRS Members, Subject: Certified Minutes of the September 20, 1996 Human Factors Subcommittee Meeting

PRESENTATION SLIDES AND HANDOUTS

The presentation slides and handouts used during the meeting are available in the ACRS office files or as attachments to the meeting transcript.

.....

NOTE: Additional details of this meeting can be obtained from a transcript available in the NRC Public Document Room, 2120 L Street, N.W., Washington, D.C. 20006, (202) 634-3274, or can be purchased from Neal R. Gross & Co., Inc., Court Reporters and Transcribers, 1323 Rhode Island Avenue, N.W., Washington, D.C. 20005, (202) 234-4433.