



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

MEMORANDUM TO: Noel Dudley, Senior Staff Engineer
ACRS

FROM: Dr. George Apostolakis, Chairman
Human Factors Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS HUMAN FACTORS
SUBCOMMITTEE MEETING CONCERNING THE NRC PROGRAM ON
HUMAN PERFORMANCE, MARCH 15, 2000 - ROCKVILLE,
MARYLAND

I hereby certify that, to the best of my knowledge and belief, the minutes of the subject meeting issued on March 22, 2000, are an accurate record of the proceedings for the meeting.

A handwritten signature in black ink, appearing to read "G. Apostolakis", written over a horizontal line.

Dr. George Apostolakis, Chairman
Human Factors Subcommittee

A handwritten date "4/7/00" written in black ink over a horizontal line.

Date



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

April 10, 2000

MEMORANDUM TO: ACRS Members

Noel Dudley

FROM: Noel Dudley, Senior Staff Engineer

SUBJECT: CERTIFICATION OF THE SUMMARY/MINUTES OF THE ACRS
SUBCOMMITTEE MEETINGS ON HUMAN FACTORS MARCH 15,
2000, ROCKVILLE, MARYLAND

The minutes of the subject meeting, issued on March 22, 2000, have been certified as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc: Technical Support Branch
Operations Support Branch (3 copies)

cc via e-mail:
J. Larkins
H. Larson
S. Duraiswamy
ACRS Fellows and Technical Staff
Operations Support Branch

CERTIFIED

Issued: March 22, 2000
CERTIFIED: April 7, 2000

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF ACRS SUBCOMMITTEE MEETINGS ON
HUMAN FACTORS
MARCH 15, 2000
ROCKVILLE, MARYLAND

The ACRS Subcommittee on Human Factors met on March 15, 2000, to hold discussions with representatives of the NRC on the latest revision of the NRC Program on Human Performance and related staff activities. The meeting included presentations concerning SECY-00-0053, "NRC Program on Human Performance in Nuclear Power Plant Safety," results of reports prepared for and by the Office of Nuclear Regulatory Research (RES), and Office of Nuclear Reactor Regulation (NRR) activities. The entire meeting was open to public attendance. Mr. Noel Dudley was the cognizant ACRS staff engineer for this meeting. The meeting was convened at 1:05 p.m. and was adjourned at 5:35 p.m.

ATTENDEES

ACRS

G. Apostolakis, Chairman
J. Barton, Member
M. Bonaca, Member

D. Powers, Member
J. Sieber, Member
N. Dudley, ACRS Staff

NRC REPRESENTATIVES

J. Rosenthal, RES
M. Cunningham, RES
J. Persensky, RES
I. Schoenfeld, RES
D. Trimble, NRR

B. Hallbert, INEEL
D. Gertman, INEEL
J. O'Hara, BNL
V. Bier, University of Wisconsin

There was one written comment and no requests for time to make oral statements received from members of the public. One member of the public attended the meeting. A list of meeting attendees is available in the ACRS office files.

INTRODUCTION

Dr. Apostolakis, Chairman of the Human Factors Subcommittee, explained that the purpose of the Subcommittee meeting was to review the NRC Program on Human Performance in Nuclear Power Plants, the status of international activities, a quantitative analysis of risk associated with human performance, a safety issues report on economic deregulation, the status of control station review guidance, and planned activities by RES and NRR.

Dr. Apostolakis read a statement prepared by Mr. Barry Quigley, who is a senior reactor operator licensed by the NRC. Mr. Quigley's statement requested that the ACRS consider operator fatigue when discussing the causes of human error.

Dr. Apostolakis noted that the ACRS last reviewed and commented on the Human Performance Plan in a letter dated February 19, 1999. He stated that the staff would update the Subcommittee members on its latest revision to the plan and asked Mr. Jack Rosenthal, RES, to begin the presentations.

STAFF INTRODUCTION - Mr. Jack Rosenthal, RES

Mr. Jack Rosenthal, RES, outlined the presentations the staff planned to make and provided background concerning the evolution of the Human Performance Plan. He outlined the program described in SECY-00-0053 and provided the basis for the program. Mr. Rosenthal presented the important events, as identified by the Accident Sequence Programs, that occurred between 1992 and 1997. He then summarized the preliminary results of an Idaho Engineering and Environmental Laboratory (INEEL) analysis of these events. Mr. Rosenthal concluded by explaining the integration of the human performance programs with other NRC program activities.

The Subcommittee members and the staff discussed the following issues:

- percentage of human factors research that is in response to user needs requests,
- inconsistencies between probabilistic risk assessments and operating experience,
- use of ATHEANA in conjunction with other human reliability analyses,
- aspects of safety that are not included in equipment reliability determinations, and
- human performance data that could be provided by licensees.

QUANTITATIVE ANALYSIS OF RISK ASSOCIATED WITH HUMAN PERFORMANCE -
Messrs. Bruce Hallbert and David Gertman, INEEL

Mr. Bruce Hallbert, INEEL, presented the objective of the analysis. Mr. David Gertman, INEEL, explained the method and approach used in the analysis, and summarized the findings. He stated that most identified human errors were latent errors, which had no immediate observable impact. He presented examples of these latent errors and noted that latent errors are not explicitly modeled in probabilistic risk assessments (PRAs). Mr. Hallbert concluded the presentation by summarizing the following findings:

- the average contribution of human performance to event importance was above 90%,
- most incorrect operator actions occurred during normal and abnormal conditions,
- latent errors figured prominently in significant operating events, and
- the need to understand how less significant errors combine to create significant effects.

The Subcommittee members and the staff discussed the lack of peer review received by the models used in the analysis, the definition of terms used in the equation for human error percent contribution, random occurrences, and variability of crew performance. They also discussed the effects of organizational and safety culture, organizational learning, and leadership on human performance. Dr. Powers, ACRS, stated that there were ramifications to the inspection process,

since it does not attempt to identify programmatic failures. Mr. Sieber, ACRS, noted that the analysis did not include an assessment of the contribution of fatigue to human performance.

CONTROL STATION REVIEW GUIDANCE - Dr. John O'Hara, Brookhaven National Laboratory (BNL)

Dr. John O'Hara, BNL, explained that the objective of his work was to define the technology trends in human-system interfaces, evaluate implications for plant safety, develop human factors evaluation guidance, and propose revisions to NUREG-0700. He described the general findings resulting from his work and a guidance development methodology. Dr. O'Hara presented the results of his analyses of alarm systems, hybrid human-system interfaces, and interface management. He concluded by summarizing the current status of his work and his future plans.

The Subcommittee members, Mr. O'Hara, and the staff discussed the effect of emergent control room display technologies to plant safety and the validity of research data developed at the Halden Project to the operation of U.S. nuclear plants.

EFFECTS OF DEREGULATION ON SAFETY - Dr. Vicki Bier, University of Wisconsin-Madison

Dr. Vicki Bier, University of Wisconsin-Madison, evaluated the delegation of the U.S. aviation industry, the U.S. rail industry, and the U.K. electrical industry. She explained that the purpose of the evaluation was to develop a complete list of changes relevant to safety and to emphasize changes with possible negative effects on safety. Dr. Bier described her findings concerning the time scale, overall safety performance, reprioritization of expenditures, safety culture, financial pressures, and downsizing associated with deregulation. She presented the experiences of the associated regulatory organizations and the conditions favorable to safety. Dr. Bier concluded that deregulation is not incompatible with maintaining safety and that the changes associated with deregulation create major challenges to the management of safety.

The Subcommittee members and Dr. Bier discussed the effect of overtime and fatigue on safety, the excessive use of contractors, and equipment availability. The Subcommittee members discussed aspects of the deregulation of the U.S. nuclear industry, such as, stranded costs, the ability to understanding problems with safety culture by trending equipment performance, and recommendations for the NRC.

UPDATE OF INTERNATIONAL SAFETY CULTURE ACTIVITIES - Ms. Isabelle Schoenfeld, RES

Ms. Isabelle Schoenfeld, RES, presented the activities of the following international organizations with regard to safety culture:

- OECD Nuclear Energy Agency (NEA),
- NEA Committee on the Safety of Nuclear Installations,
- NEA Committee on Nuclear Regulatory Activities, and the
- International Atomic Energy Agency.

Human Factors Subcommittee
March 15, 2000

She explained how each of these organizations are actively involved in monitoring safety culture and developing safety culture guidelines. Ms. Schoenfeld described ongoing safety culture activities in Belgium, Canada, Finland, France, Japan, Spain, Sweden, Switzerland, and the United Kingdoms.

PLANNED NRR ACTIVITIES IN HUMAN PERFORMANCE - Messrs. David Trimble and Richard Eckenrode, NRR

Mr. David Trimble, NRR, provided an overview of NRR human factors activities and background on the worker fatigue issue, which is under review by the NRC. Mr. Richard Eckenrode, NRR, presented the NRR staff position concerning how the reactor oversight process will monitor human performance. He stated that the effects of human performance on plant safety will be reflected in the plant performance indicators and baseline inspection findings. Mr. Eckenrode described the supplemental inspection procedure for human performance and the human performance significance determination process.

The Subcommittee members and the staff discussed proposed changes to 10 CFR Part 26, "Fitness for Duty Programs," and the lack of an analysis to support the premise that anything less than complete failure to perform an action may not be as risk-important as complete failure.

STAFF CONCLUDING REMARKS - Mr. Jack Rosenthal, RES

Mr. Rosenthal noted that the staff planned to hold a workshop to assimilate the data contained in the reports that were presented to the Subcommittee and to discuss what actions to take with regards to latent human errors. He stated that the staff was not supporting any activities associated with safety culture. Mr. Rosenthal requested a letter from the ACRS concerning the staff's efforts.

SUBCOMMITTEE COMMENTS, CONCERNS, AND RECOMMENDATIONS

Dr. Powers identified two concerns. His first concern was related to plant assessments and cross-cutting issues and whether the performance indicators would reveal human performance deficiencies before significant events occurred. He stated that the related NRR staff assumption needed to be validated. Dr. Powers' second concern was related to the treatment of human performance in PRAs. He stated that research was needed to better define human reliability analyses (HRA) and to determine how to incorporate the HRA results in PRAs so that more accurate predictions could be made. Dr. Powers suggested preparing a letter that would be supportive of the RES efforts.

Dr. Mario Bonaca supported writing a letter. He stated that the NRC Program on Human Performance should address the right human factors elements and identify correct applications. He noted that the results of the INEEL report should be presented at the April 2000 ACRS meeting. He suggested that the ACRS letter include a discussion of human reliability without

referring to safety culture. Dr. Bonaca suggested that a database of human performance problems be created from the finding of licensees' root-cause analyses.

Mr. Sieber recommended that the presentation made by Mr. Rosenthal be summarized at the April 2000 ACRS meeting. He noted that the NRC has responsibility for protecting the public health and safety but has done little to evaluate and regulate human performance, which is a major contributor to significant events. Mr. Sieber stated that the NRC should develop a database of human performance that could be used to quantify human performance in PRAs. He noted that research tools are needed to make progress in quantifying human performance. Mr. Sieber supported the staff in continuing its human factors activities.

Mr. John Barton stated that the staff's oversight and significance determination processes should include planned activities to assess human performance. He recommended preparing a letter that stressed the need for research to evaluated safety culture issues.

Dr. Apostolakis provided the staff detailed comments on its Program on Human Performance and summarized the Subcommittee's discussion. He stated that neglecting safety culture in the oversight program was a major lapse but that safety culture would not be addressed in the proposed ACRS letter. He suggested the letter be supportive of the staff's activities, focus on the quality of the staff's Program on Human Performance, and provide recommendations for improvement.

STAFF AND INDUSTRY COMMITMENTS

The staff agreed to provide the ACRS with a copy of a case study done by Dr. Heshlinger. [Provided , 2000]

SUBCOMMITTEE DECISIONS

The Subcommittee requested that the staff make a presentation at the April 5-7, 2000 ACRS meeting concerning the NRC Program on Human Performance and the use of human performance inspections in the plant oversight process. The Subcommittee recommended that the Committee prepare a letter on this matter.

FOLLOW-UP ACTIONS

No follow-up actions were identified.

PRESENTATION SLIDES AND HANDOUTS PROVIDED DURING THE MEETING

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

BACKGROUND MATERIAL PROVIDED TO THE SUBCOMMITTEE:

1. Letter dated February 19, 1999, from Dana A. Powers, Chairman, ACRS, to William D. Travers, Executive Director for Operations, NRC, Subject: SECY-98-244, "NRC Human Performance Plan."
2. U.S. Nuclear Regulatory Commission SECY-00-0053, "NRC Program on Human Performance in Nuclear Power Plant Safety," dated February 29, 2000.
3. Memorandum dated March 6, 2000, from Jack E. Rosenthal, Office of Nuclear Regulatory Research, to John T. Larkins, Executive Director, ACRS, Subject: Meeting with the ACRS Human Factors Subcommittee, March 15, 2000, on SECY-00-0053, "NRC Program on Human Performance in Nuclear Power Plant Safety."
4. U.S. Nuclear Regulatory Commission Report, "Accident Sequence Precursor (ASP) Qualitative Analyses," received March 6, 2000.
5. U.S. Nuclear Regulatory Commission Report, "Human Performance Programs at Other Agencies," received March 6, 2000.
6. O'Hara, John M., and Higgins, James C., "Risk Importance of Human Performance to Plant Safety," Brookhaven National Laboratory Report W6546-T1-2-10/99, transmitted by letter, February 28, 2000.
7. Hallbert, Bruce, et. al., "Summary of INEEL Findings on Human Performance During Operating Events," Idaho National Engineering and Environmental Laboratory Report No. CCN 00-005421, transmitted by letter, February 29, 2000.

.....

NOTE: Additional details of this meeting can be obtained from a transcript of this meeting available in the NRC Public Document Room, 2120 L Street, N.W., Washington, D.C. 20006, (202) 634-3274, or can be purchased from Ann Riley & Associates, LTD., 1025 Connecticut Ave., NW, Suite 1041, Washington, D.C. 20036, (202) 842-0034.

.....

CONTENTS OF OFFICIAL RECORD FOLDERS FOR ACRS SUBCOMMITTEES

The Federal Advisory Committee Act requires retention of certain documents related to every advisory committee meeting. The ACRS has applied this requirement to all ACRS subcommittee meetings. The cognizant staff engineer is responsible for assembling an official record folder for each subcommittee meeting. The folder is retained on file by the Operations Support Branch (Michele Kelton). The following is a list of the documents that should be included in the official record folder.

- ~~X~~ Original copy of the certified minutes,
- ~~X~~ Signed Subcommittee Chairman certification sheet,
- ~~X~~ Memorandum forwarding the certified minutes to the members,
- ~~X~~ Memorandum forwarding the working draft of the minutes to the members,
- ~~X~~ Marked-up agenda or proposed schedule,
- ~~X~~ List of attendees
- ~~X~~ Federal Register Notice, and
- ~~X~~ Slides presented at the subcommittee meeting.

~~X~~A copy of the certified minutes should be provided to the ACRS secretary.

~~X~~Three copies of the certified minutes and an ~~X~~electronic copy of the certified minutes should be provided to the Operations Support Branch (Ethel Barnard) for further distribution.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

March 22, 2000

MEMORANDUM TO: Dr. George Apostolakis, Chairman
Human Factors Subcommittee
Noel Dudley
FROM: Noel Dudley, Senior Staff Engineer
ACRS
SUBJECT: WORKING COPY OF THE MINUTES OF THE ACRS HUMAN
FACTORS SUBCOMMITTEE MEETING CONCERNING THE NRC
PROGRAM ON HUMAN PERFORMANCE, MARCH 15, 2000 -
ROCKVILLE, MARYLAND

A working copy of the minutes for the subject meeting is attached for your review. I would appreciate your review and comment as soon as possible. Copies are being sent to the Human Factors Subcommittee members for information and/or review.

Attachment: As stated

cc: J. Barton
M. Bonaca
D. Powers
J. Sieber

cc via E-Mail:
J. Larkins
H. Larson
S. Duraiswamy

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
HUMAN FACTORS SUBCOMMITTEE MEETING
MARCH 15, 2000
ROCKVILLE, MARYLAND

- PROPOSED AGENDA -

<u>TOPIC</u>	<u>PRESENTER</u>	<u>TIME</u>
I. Introduction	G. Apostolakis, ACRS	1:00-1:05 p.m.
II. Overview of Human Performance Plan	J. Rosenthal, RES	^{2:00} 1:05-1:50 p.m.
III. Quantitative Analysis of Risk Associated with Human Performance	B. Hallbert and D. Gertman, INEEL	^{2:15-2:55} 1:50-2:30 p.m.
- BREAK -		
IV. Control Station Review Guidance	J. O'Hara, BNL	^{2:00-2:15} ^{2:55-3:33} 2:30-2:45 p.m.
A. Hybrid Control Station		
B. Alarm Systems		
C. Interface Management		
- BREAK -		
V. Safety Issues Report on Economic Deregulation	V. BIER, University of Wisconsin	^{2:33-3:50} ^{3:50-4:30} 3:15-3:35 p.m.
VI. Update of International Activities	I. Schoenfeld, RES	^{4:30-4:45} 3:35-3:55 p.m.
VII. Planned RES Activities	J. Persensky, RES	^{5:05-5:10} 3:55-4:15 p.m.
VIII. Planned NRR Activities	D. Trimble, NRR	^{4:45-5:05} 4:15-4:30 p.m.
IX. Discussion	G. Apostolakis, ACRS	^{5:00-5:30} 4:30-5:00 p.m.
X. Adjournment	G. Apostolakis, ACRS	^{5:30} 5:00 p.m.

NOTE:

Presentation time should not exceed 50 percent of the total time allotted for specific item. The remaining 50 percent of the time is reserved for discussion.

Number of copies of the presentation materials to be provided to the ACRS - 25.

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
HUMAN FACTORS SUBCOMMITTEE MEETING
MARCH 15, 2000
ROCKVILLE, MARYLAND**

- PROPOSED AGENDA -

<u>TOPIC</u>	<u>PRESENTER</u>	<u>TIME</u>
I. Introduction	G. Apostolakis, ACRS	1:00-1:05 p.m.
II. Overview of Human Performance Plan	J. Rosenthal, RES	1:05-1:50 p.m.
III. Quantitative Analysis of Risk Associated with Human Performance	B. Hallbert and D. Gertman, INEEL	1:50-2:30 p.m.
- BREAK -		2:30-2:45 p.m.
IV. Control Station Review Guidance	J. O'Hara, BNL	2:25-3:15 p.m.
A. Hybrid Control Station		
B. Alarm Systems		
C. Interface Management		
V. Safety Issues Report on Economic Deregulation	V. BIER, University of Wisconsin	3:15-3:35 p.m.
VI. Update of International Activities	I. Schoenfeld, RES	3:35-3:55 p.m.
VII. Planned RES Activities	J. Persensky, RES	3:55-4:15 p.m.
VIII. Planned NRR Activities	D. Trimble, NRR	4:15-4:30 p.m.
IX. Discussion	G. Apostolakis, ACRS	4:30-5:00 p.m.
X. Adjournment	G. Apostolakis, ACRS	5:00 p.m.

NOTE:

Presentation time should not exceed 50 percent of the total time allotted for specific item. The remaining 50 percent of the time is reserved for discussion.

Number of copies of the presentation materials to be provided to the ACRS - 25.

ADVISORY COMMITTEE ON REACTOR SAFEGARUDS

HUMAN FACTORS WORKING GROUP MEETING

Date(s)

MARCH 15, 2000

Today's Date

NRC STAFF SIGN IN FOR ACRS MEETING

PLEASE PRINT

NAME	BADGE #	NRC ORGANIZATION
Joel Kamen	B-8401	RES
J Pearson	B-8413	RES
Mark C. Cunn	B 8615	RES
Jerry Wachtel	B7227	RES
Paul Lewis	B6088	RES
J. DON GARRO	B6093	NRR
Isabelle Schoenfeld	B6983	RES
EUGENE TRAGER	B8425	RES
Jack Rosenthal	A6661	RES
David Desaulniers	B6591	NRR
Greg Collett	B6138	NRR
Richard Eckertod	A6557	NRR
David Trimble	B8545	NRR
STEVEN ARNDT	B58390	RES
JOHN CALVERT	B 8392	RES
Chris Christensen	B 2225	NRR
ROBERT WOOD	B7309	NRR
J Jacobson	B8049	NRR

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

HUMAN FACTORS WORKING GROUP MEETING

Date(s)

MARCH 15, 2000

Today's Date

ATTENDEES - PLEASE SIGN BELOW

PLEASE PRINT

NAME

AFFILIATION

John O'Hara Brockton Nuclear Lab

VICKI BIERA UNIV. WISCONSIN

Bruce Hallbert Idaho National Engineering + Environmental Lab.

DAVE GERTMAN DATA NRI? Engng + Envrmt (ABINVER)

JAMES R. FASTER Siemens Power Corp.

~~John O'Hara~~ _____

human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's letter dated October 12, 1999, which is available for public inspection at the Commission's Public Document Room, The Gelman Building, 2120 L Street, NW., Washington, DC. Publicly available records will be accessible electronically from the ADAMS Public Library component on the NRC Web site, <http://www.nrc.gov> (the Electronic Reading Room).

Dated at Rockville, Maryland, this 18th day of February 2000.

For the Nuclear Regulatory Commission,
L.A. Wiens,
Senior Project Manager, Section 2, Project Directorate II, Division of Licensing Project Management, Office of Nuclear Reactor Regulation.

[FR Doc. 00-4460 Filed 2-24-00; 8:45 am]

BILLING CODE 7590-01-P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Meeting of the Subcommittee on Human Factors; Notice of Meeting

The ACRS Subcommittee on Human Factors will hold a meeting on March 15, 2000, in Room T-2B1, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Wednesday, March 15, 2000—1:00 p.m. until 4:30 p.m.

The Subcommittee will review the proposed Commission paper concerning the NRC program on human performance in nuclear power plant safety, including staff activities associated with quantifying the risk of human performance, the effects of economic deregulation, and latent human errors. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman; written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only

by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS staff engineers named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittee, along with any of its consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC staff and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, and the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor, can be obtained by contacting the cognizant ACRS staff engineer, Mr. Noel F. Dudley (telephone 301/415-6888) between 7:30 a.m. and 4:15 p.m. (EST). Persons planning to attend this meeting are urged to contact the above named individuals one or two working days prior to the meeting to be advised of any potential changes to the agenda, etc., that may have occurred.

Dated: February 18, 2000.

Howard J. Larson,
Acting Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 00-4466 Filed 2-24-00; 8:45 am]

BILLING CODE 7590-01-M

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Subcommittee Meeting on Materials and Metallurgy; Notice of Meeting

The ACRS Subcommittee on Materials and Metallurgy will hold a meeting on March 16, 2000, Room T-2B3, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows:

Thursday, March 16, 2000—8:30 a.m. until 4:30 p.m.

The Subcommittee will review the status of the NRC 10 CFR 50.61 pressurized thermal shock (PTS) screening criterion reevaluation project, including the probabilistic fracture mechanics analysis, the expert

elicitation process for flaw distribution, and the associated probabilistic risk assessments. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman; written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the cognizant ACRS staff engineer named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittee, along with any of its consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC staff, the Nuclear Energy Institute, and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, and the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor, can be obtained by contacting the cognizant ACRS staff engineer, Mr. Noel F. Dudley (telephone 301/415-6888) between 7:30 a.m. and 4:15 p.m. (EST). Persons planning to attend this meeting are urged to contact the above named individual one or two working days prior to the meeting to be advised of any potential changes to the agenda, etc., that may have occurred.

Dated: February 18, 2000.

Howard J. Larson,
Acting Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 00-4467 Filed 2-24-00; 8:45 am]

BILLING CODE 7590-01-P



NRC Program on Human Performance in Nuclear Power Plant Safety

ACRS Human Factors Subcommittee

March 15, 2000

**Jack Rosenthal
J. Persensky**

Office of Nuclear Regulatory Research

David Trimble

Office of Nuclear Reactor Regulation



PRESENTATION OUTLINE

- **SECY-00-0053 - J. Rosenthal, RES**
- **ASP Analysis - B. Hallbert, INEEL**
- **Control Station Review Guidance - J. O'Hara, BNL**
- **Economic Deregulation - V. Bier, UW**
- **International Safety Culture Activities - I. Schoenfeld, RES**
- **Planned NRR Activities - D. Trimble, NRR**
- **Future Planning Activities - J. Persensky, RES**



Background

- **Initial Version of Human Performance Program - 1995**
- **SECY-98-244, October 1998**
 - **Work in Progress**
 - **Described Risk-Informed Process**
- **ACRS Review, February 1999**
 - **Agreed with Process**
- **SECY-00-0053, February 2000**



SECY-00-0053

- **Status Report**
- **Mission**
- **Basis for the Program**
- **Program Elements**
- **Future Activities**



Basis for the Program

- **User Needs**
- **Risk Reviews**
- **Industry and International Activities**
- **Activities at Other Agencies**
- **Related NRC Programs**



Risk Reviews

- **Evaluated Human Reliability Sensitivity Studies -BNL**
- **Qualitative Review of ASP Data - RES**
 - ▶ **5 Years of Events**
 - ▶ **Events with CCDP > 10 E-5**
 - ▶ **Reviewed LERs and Inspection Reports**
- **Quantitative Review of ASP Data - INEEL**
 - ▶ **Same Events**
 - ▶ **Isolated Human Performance Contribution**
 - ▶ **Reviewed LERs and Inspection Reports**



NUREG-1560

Important BWR Human Actions	% of BWR IPEs with HA as Important	Typical % of CDF contribution for HA
Manual depressurization	80	1% to 45%
Containment venting	55	Contribution to containment failure and early release
Align containment or Suppression Pool cooling	55	1% to 5% of CDF plus contribution to containment failure and early release
Initiate SLC	70	1% to 3%
Important PWR Human Actions	% of BWR IPEs with HA as Important	Typical % of CDF contribution for HA
Switchover to Recirculation	70	<1% to 16%
Feed-and-bleed	60	<1% to 10%
Depressurization and cooldown	50	<1% to 7%

Table 1: Important Human Performance (HP) Items for 1992-97 ASP Events

Explanation: CCDP is the conditional core damage probability listed for the event. "HP: Yes, No" lists whether human performance (cause, positive recovery, or negative recovery) was identified for the event. "AIT: Yes, No" indicates whether or not an Augmented Inspection Team investigated the event. Note: A total of 48 events involving 56 units

Event ID No. Plant LER#	Date	CCDP	Event	HP Yes No	%Power	AIT
1. Wolf Creek 48294013	09/17/94	3.0E-03	Inadvertent RCS Draindown	Y	0	N
2. Catawba 241496001	02/06/96	2.1E-03	Loss of Offsite Power with EDG B Unavailable	Y	100	N
3. Maine Yankee 30997004	01/22/97	8.2E-04	RCS Hot-Leg Recirc Valve Subject to Pressure Locking	N	0	N
4. Arkansas Nuclear 1 31396005	05/19/96	5.6E-04	Reactor Trip and Subsequent Steam Generator Dryout (SGTR)	Y	100	Y
5. Oconee 328797003	05/03/97	5.4E-04	Two HPSI Pumps Damaged; Low Water in LDST	Y	0	Y
6. St. Lucie 133597011	11/02/97	3.4E-04	Non-Conservative RAS Setpoint	Y	0	N
7. Fort Calhoun 28592023 28592028	07/03/92	2.5E-04	Rx High Pressure Trip and LOCA	Y	100	Y
8. Oconee 227097001	04/21/97	2.2E-04	Unisolable RCS Leak	N	100	N
9. Oconee 227092004	10/19/92	2.1E-04	LOOP with Failed Emergency Power Source	Y	100	Y
10. Robinson 226192017	08/22/92	2.1E-04	LOOP with SI Pump Recirc Line Obstructed	Y	100	N
11. Wolf Creek 48296001 48296002	01/30/96	2.1E-04	Reactor Trip with a Loss of Train A of Essential Service Water and TDAFW Pump	Y	98	Y



Performance Shaping Factor	Number of Causes of Events
Procedure Quality	12
Communications	7
Procedure Use	6
Knowledge	4
Work Control	4
Corrective Action	4
Staffing Level	3
Design Practices	3
Training	2
Man/Machine Interface	2
Workload	2

Job Function	Number of Causes of Events
Maintenance	17
Electrical and I&C	14
Engineering or Design	10
Operations	6
Vendor or Contractor	5
Training	0
Management specified explicitly	0
Other, Not Known	12



Program Elements

- **Reactor Oversight Process**
- **Plant Licensing and Monitoring**
- **Risk-informed Regulation
Implementation Plan**
- **Emerging Technology/Issues**



NUCLEAR POWER PLANT SAFETY

Reactor Oversight Process

Plant Licensing and Monitoring

Risk-Informed Regulation Implementation Plan

Emerging Technology / Emerging Issues

KEY PROGRAM AREAS

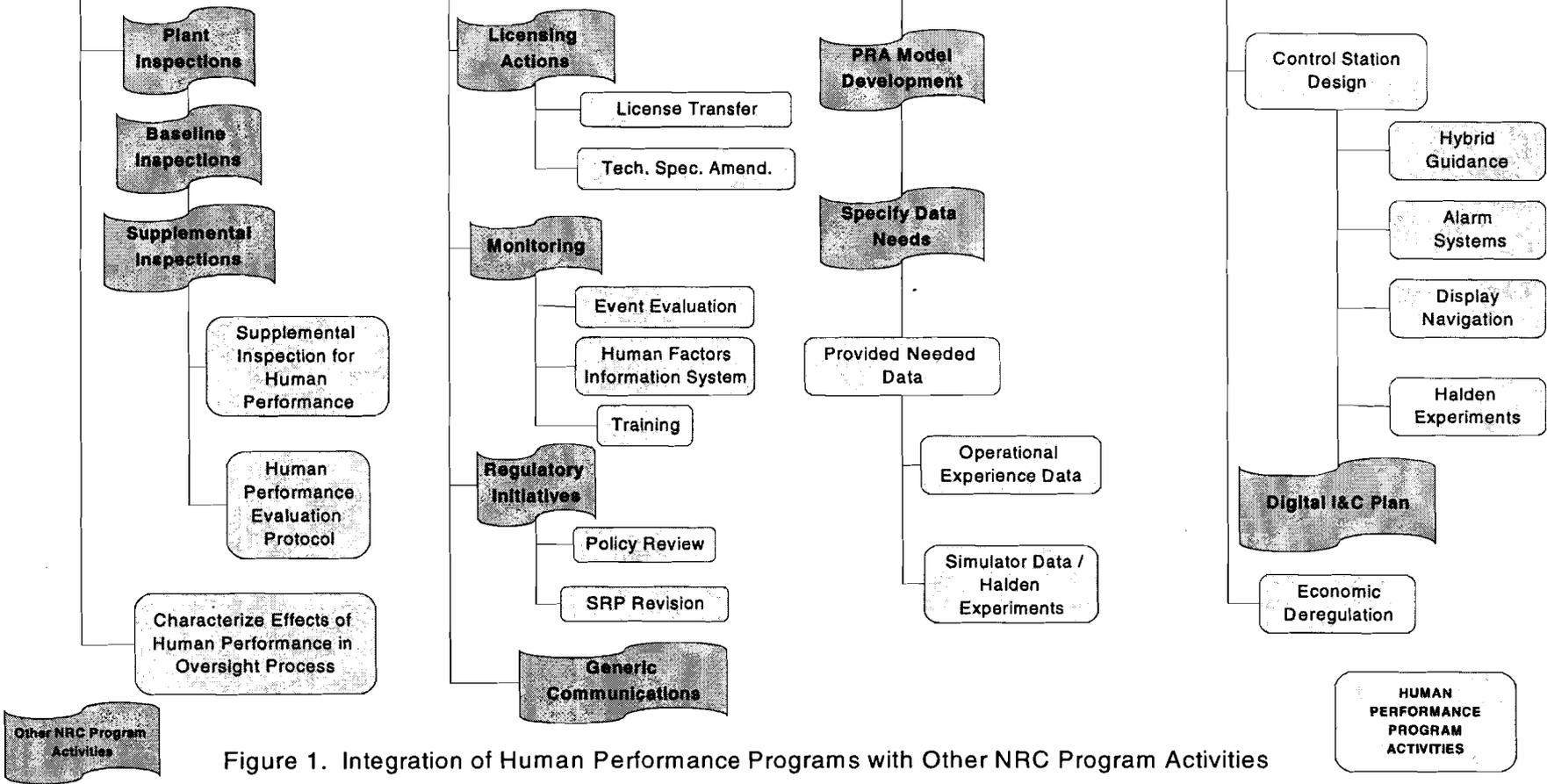


Figure 1. Integration of Human Performance Programs with Other NRC Program Activities



ACTIVITY	MILESTONE	DATE	LEAD/ SUPPORT OFFICE
<u>Reactor Oversight Process</u>			
Supplemental Inspection on Human Performance	Draft to Region for Comment	03/00	NRR/RES*
Human Performance Evaluation Protocol	Completion	12/00	RES*
Characterize the Effects of Human Performance in Reactor Oversight Process	Develop Plan	03/00	RES**



ACTIVITY	MILESTONE	DATE	LEAD/ SUPPORT OFFICE
<u>Plant Licensing and Monitoring</u>			
Licensing Actions Credit for Operator Action	As needed Guidance Completed	06/00	NRR RES*
HFIS	Continuing		NRR
Human Performance and Training Program Oversight	As needed		NRR
Regulatory Initiatives Fatigue Policy SRP Chpt. 13 SRP Chpt. 18 Reg. Guide 1.8 Reactor Decommissioning Rulemaking (Staffing)	TBD Completed Completion Completion Rulemaking Plan	TBD 12/99 FY02 3/00 06/00	NRR NRR NRR RES*** NRR
Generic Communications	As needed		NRR



ACTIVITY	MILESTONE	DATE	LEAD/ SUPPORT OFFICE
<u>Risk-Informed Regulation Implementation Plan</u>			
Operational Experience Reviews ASP Analysis	Continuing Final Report	 06/00	RES* RES*
Results for Simulator Experiments	As Available		RES*



ACTIVITY	MILESTONE	DATE	LEAD/ SUPPORT OFFICE
<u>Emerging Technology/Issues</u>			
Control Station Review Guidance	Revision 2	09/01	RES***
Hybrid Control Stations	Interim Guidance	01/00	RES***
Alarm Systems	Interim Guidance	03/00	RES***
Interface Management	Interim Guidance	03/00	RES***
Halden Experiments	Ongoing		RES*
Integrate with Digital I&C Program	Ongoing		RES*
Economic Deregulation	Safety Issues Report	03/00	RES*



Future Activities

- **Budget Prioritization**
- **ACRS Review**
- **Continued Data Assessment**
- **Peer/Stakeholder Review**
- **International Cooperation**
- **Standards Support**



ACTIVITY	MILESTONE	DATE	LEAD/ SUPPORT OFFICE
<u>Continuing/Planning Activities</u>			
Prioritize Activities in FY2001 Budget		06/00	RES/NRR
ACRS Review	Publish supporting documentation Subcommittee Full Committee	02/00 02/00 03/00	RES* RES/NRR RES/NRR
Identify Future Issues****	SPAR Analyses Develop Scoping Study Stakeholder/Peer Review	04/00 06/00 09/00	RES* RES* RES*
Update Human Performance Program Description	Commission Paper	04/01	RES*
International Cooperation and Consensus Standards Support	Ongoing		NRR/RES



ACRS LETTER - FEB. 11, 1999

- **ACRS FULL COMMITTEE MEETING FEB. 4, 1999**
- **HUMAN PERFORMANCE IS A MAJOR FACTOR IN SAFE NPP OPERATIONS**
- **WELL PLANNED RESEARCH EFFORT NEEDED**
- **STAFF DESCRIBED DISCIPLINED STRATEGY FOR FUTURE DEVELOPMENT**
- **ADDITIONAL STEPS NEEDED**
 - ▶ **RISK-INFORMED APPROACH AS DESCRIBED BY STAFF**
 - ▶ **COMPARE FINDINGS TO ERROR CLASSIFICATIONS IN LITERATURE**
 - ▶ **IDENTIFY ALTERNATIVE SOLUTIONS TO CANDIDATE NEEDS**
 - ▶ **TEST AND VALIDATE SOLUTIONS**
 - ▶ **ESTABLISH REQUIREMENTS FOR INTERFACES WITHIN HPP**
 - ▶ **INTERACT WITH INDUSTRY**

Backup 1



Mission

The mission of the NRC Program on Human Performance in Nuclear Power Plant Safety (PHP) is to ensure that reactor safety is maintained through effective regulation and oversight of human performance in the design, operation, maintenance, and decommissioning of nuclear reactor facilities. This will be accomplished by: (1) identifying human performance issues important to public health and safety, (2) increasing understanding of the causes and safety implications of these human performance issues, and then (3) implementing the appropriate regulatory response to human performance issues.

Backup 2



RISK INSIGHTS FROM REVIEW OF EVENTS REPORTED IN THE ACCIDENT SEQUENCE PROGRAM (ASP) SHOW THAT “LATENT FAILURES” ARE IMPORTANT. THIS FINDING LEADS TO CONSIDERATION OF OPERATIONS AND MAINTENANCE AND PLANT PROCESSES AND PRACTICES. IN CONTRAST, REVIEW OF PRAs SHOW A LIMITED SET OF OPERATING CREW ACTIONS TO BE IMPORTANT. HOW SHOULD THESE TWO VIEWS BE RESOLVED?

BACKUP 3

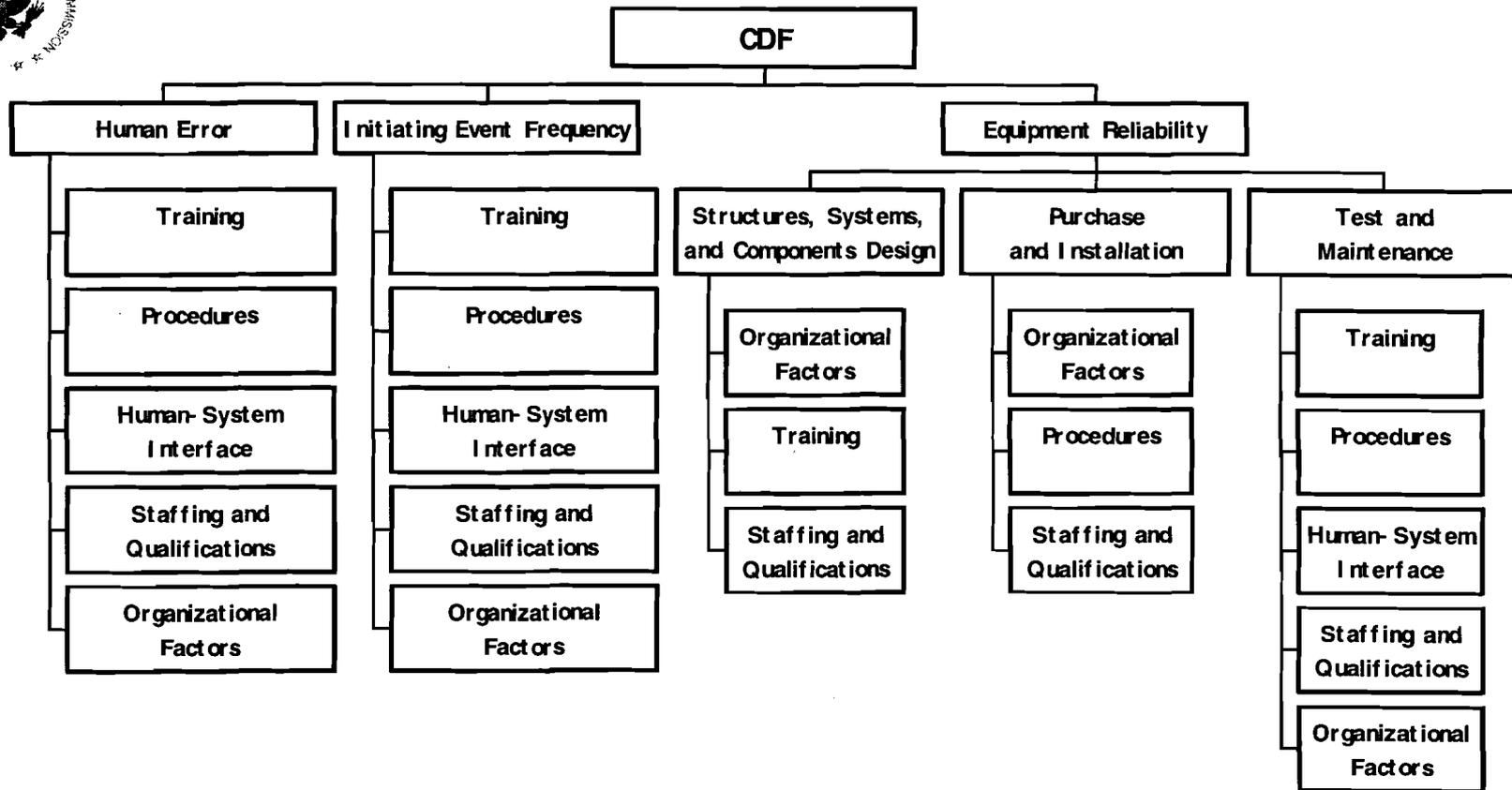


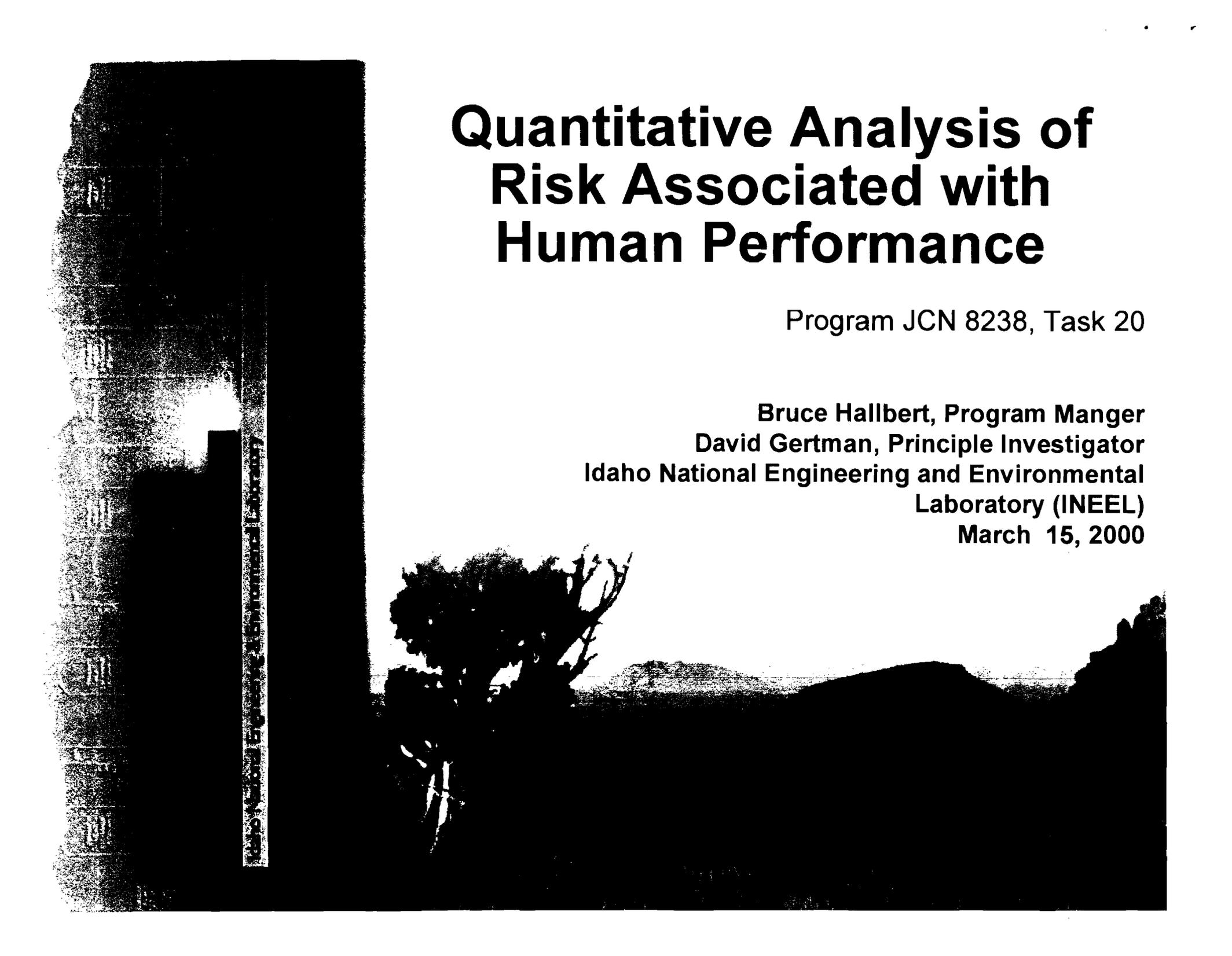
Figure 2. CDF Can Be Impacted in Multiple Ways by Human Performance

BACKUP 4



Category (followed by human performance influence)	Latent Errors	Active Errors
Operations		
Command and control issues including crew resource management	6	5
Failure to follow safe procedures	1	
Improper diagnostics	1	1
Inadequate knowledge or training	7	3
Design and Design Change Work Process		
Design deficiencies	7	
Inadequate design and design change testing	2	
Inadequate engineering evaluation	3	
Ineffective indications for abnormal condition		1
Inadequate knowledge during design process	1	
Drawing configuration management	1	
Maintenance Work Process		
Poor work package preparation, QA and use	3	
Inadequate maintenance practices	4	
Inadequate technical knowledge	2	
Procedural Design and Development Process		
Inadequate procedures	6	
Inadequate alarm response procedures	1	
Organizational Learning and Corrective Action Program		
Failure to respond to industry and internal notices	8	
Failure to follow industry operating practices	2	
Failure to identify by trending	2	
Failure to validate vendor reports	1	
Work Prioritization		
Failure to correct known deficiencies	5	
Continue to operate during unstable conditions		1

BACKUP 5



Quantitative Analysis of Risk Associated with Human Performance

Program JCN 8238, Task 20

**Bruce Hallbert, Program Manger
David Gertman, Principle Investigator
Idaho National Engineering and Environmental
Laboratory (INEEL)
March 15, 2000**

OBJECTIVE(S)

- Study how human performance influences risk at commercial nuclear power plants
- Identify and characterize the influence of human performance in significant operating events
- Provide technical basis to support development of the Human Performance Program (HPP)

METHOD/APPROACH

Use significant events from ASP program (1992-97)

Quantitative

- Use existing PRA methods and models
- Run ASP/SPAR models and calculate importance (CCDP-CDP) measures
 - Importance measures (used REG Guide 1.174)
- Determine the contribution of human performance to event risk

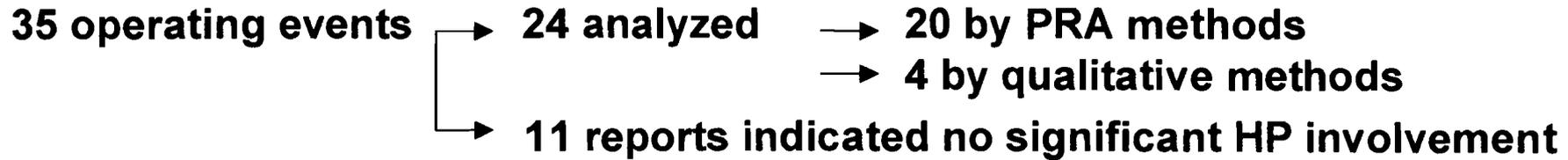
METHOD/APPROACH (Continued)

Use significant events from ASP program (1992-97)

Qualitative

- Review events to determine specific human and process related influences
- Identify causes

ANALYSIS AND FINDINGS



- Event importance for the twenty events ranged from 1.0E-6 (Millstone) to 5.2E-03 (Wolf Creek)
- Three events were in the E-03 range.
- Using the general equation:
$$\text{Human Error \% Contribution} = [(CCDP_{HE} - CDP) / (CCDP_{event} - CDP)] \times 100\%$$

the human performance contribution ranged from 10% for one event to 100% for sixteen events
- Multiple, smaller failures occurred in the events analyzed (between 6 and 12 small errors per event)

ANALYSIS and FINDINGS (Continued)

**Most identified errors were latent - no immediate, observable impact
Ratio of latent to active errors was 4:1**

Latent Errors

- **Failure to correct problems**
 - Known deficiencies, failure to trend, failing to respond to notices
- **Engineering problems**
 - Design, design change testing, engineering evals were sources of failure
- **Maintenance problems**
 - Maintenance practices, post-maintenance testing, work package QA & use

Active Errors

- **Failures in command and control**
 - Wrong actions, right people not present when needed, loss of phone com, actions taken independent of control room
- **Incorrect operator actions**
 - Incorrect line-ups, failure to take actions when automatics fail, actions without procedural guidance, delay in performing cooldown, failure to follow procedures

HUMAN ERRORS IN IPE PRAs

- Pre-event Human Errors

- Few errors are explicitly modeled (e.g., miscalibration, T&M errors, restoration from T&M, etc.
- It has been assumed that methods for determining hardware failure rates implicitly capture many latent human errors

- Post-event Human Errors

- Typically limited to active errors of omission
- Typically focus on action contained in procedures

SUMMARY

For the 24 analyzed events, the average contribution of human performance to event importance was above 90%

Most incorrect operator actions occurred during normal and abnormal conditions as opposed to during EOP execution

Latent errors figured prominently in significant operating events: Failure to fix known problems, inadequate attention to owner's group and industry notices, failures in trending, inadequate maintenance practices and failure to act promptly regarding known deficiencies figured prominently in events



SUMMARY (Continued)

The means by which human performance influenced hardware unavailability and demand failures was different than as it has been explicitly modeled in IPEs.

Need to understand how smaller, less significant errors and failures combine to create more significant effects

No new initiators or event sequences were observed compared to what currently exists in PRA

Control Station Review Guidance

John O'Hara
Brookhaven National Laboratory

Advisory Committee On Reactor Safeguards
Human Factors Subcommittee Meeting

Rockville, Maryland
March 15, 2000

Topics

- Background
- Guidance Development Methodology
- Alarm System Research
- Hybrid Control Station Research
- Interface Management Research
- Current Status and Plans

Background

- Plants are modernizing I&C and control rooms
- Impact on human-system interfaces (HSIs)
 - new HSIs are introduced using advanced digital technologies
 - hybrid HSIs result - a mixture of analog and digital technology
- Extent of modifications can range significantly
 - replacement “in-kind” of a single HSI component
 - multiple, “independent,” small-scale modifications
 - extensive control room modification

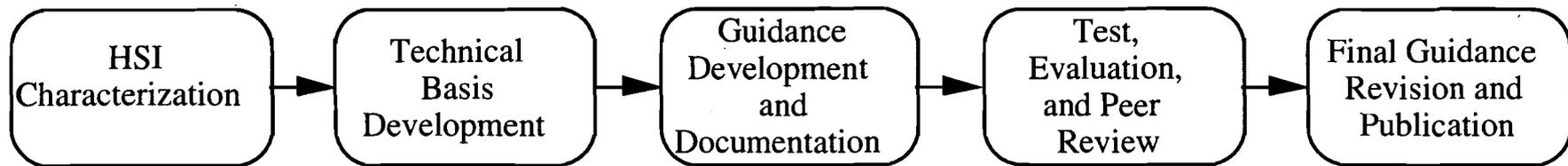
Research Objective

- Identify the issues
 - define the technology trends in HSI modernization
 - what are the potential effects on personnel performance
- Evaluate implications for plant safety and prioritize issues
- Develop HFE guidance to support the safety reviews of priority issues
- Integrate new guidance into NUREG-0700

General Findings

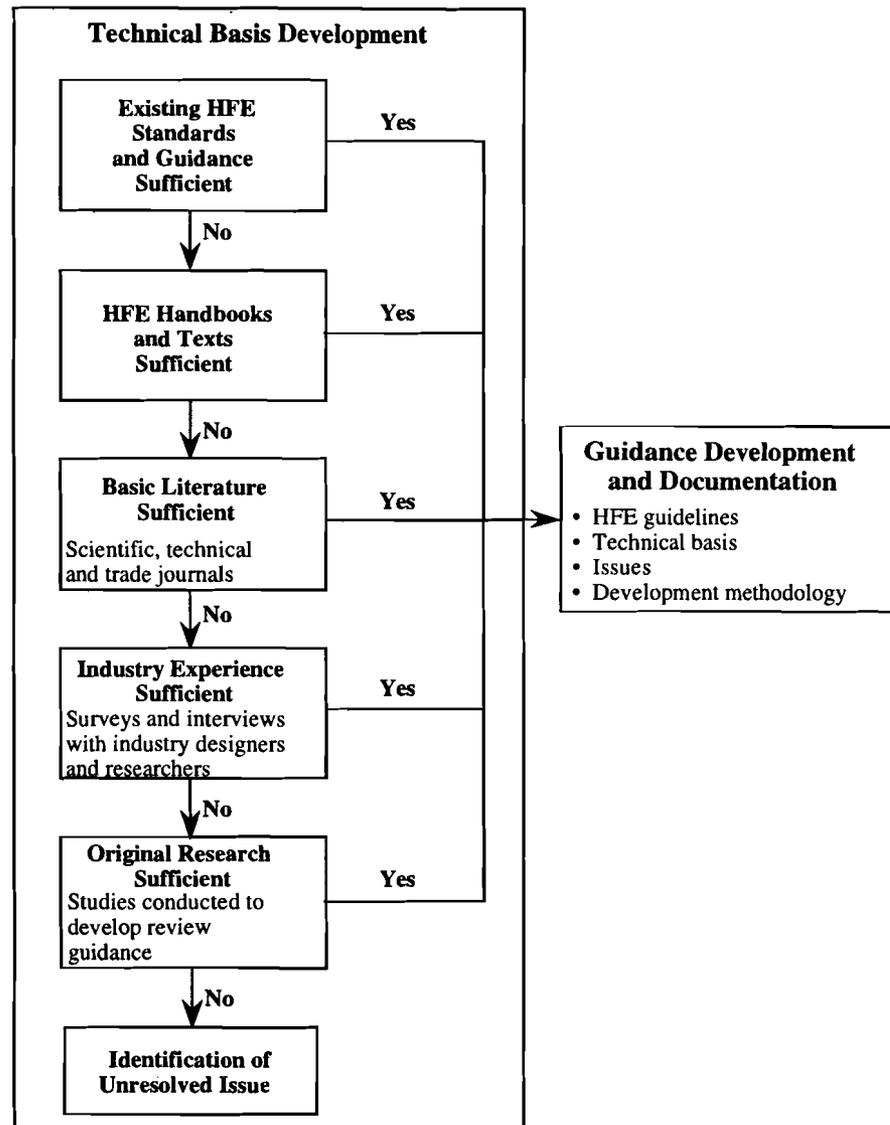
- Trends include key HSI elements affecting performance
 - plant information, procedures, and controls
- Advanced HSI technology can both enhance and degrade performance
- Impact on personnel performance is due to:
 - characteristics of the new digital technology
 - interaction of digital and analog technology

Guidance Development Methodology Overview



- Established to provide:
 - *Internal validity* based on a documented technical basis
 - *External validity* guidance test and evaluation and peer review

Technical Basis and Guidance Development



Test, Evaluation, and Peer/Industry Review

- NUREG-0700, Rev 1 user feedback
- Peer review of individual guidance development efforts
- Field test and evaluation of draft NUREG-0700, Rev 2
- Subject-matter expert workshop
- Public comment

Alarm System Research

- Continuation of earlier research (NUREG-CR-6105)
- Develop and expand guidance addressing
 - processing, display methods, and alarm availability
- Basis
 - technical literature analysis
 - simulator experiment with professional operators
- Results
 - alarm characterization developed
 - confirmatory support for existing guidance
 - guidance revision and clarification
 - new guidance developed

Hybrid HSI Research

- Address gaps identified during NUREG-0700 development
- Basis
 - technical literature analysis
 - site visits and interviews
 - NOK plant modernization study
- Selected topics addressed
 - information systems
 - computer-based procedures
 - soft controls
 - maintainability of digital systems
 - modernization process 10

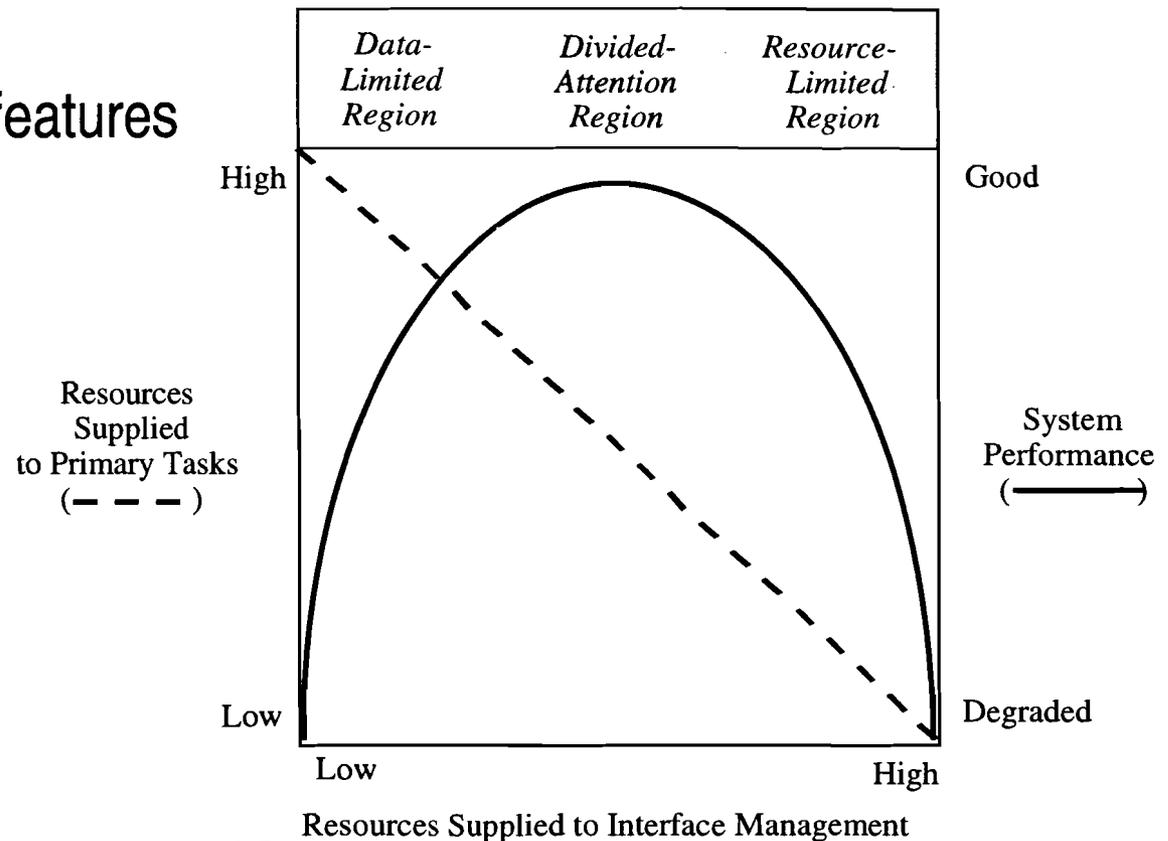
Interface Management Research

- Address specific NRR safety concern
- Basis
 - technical literature analysis
 - site visits, walkthroughs, and interviews
 - lessons learned from NRC alarm and NOK modernization studies
- Approach
 - model effects on human performance
 - identify key design features
 - develop guidance

Interface Management Performance Effects

- Key design characteristics
 - information volume
 - information organization
 - display area
 - navigation design features
 - HSI flexibility

Types of Effects



Current Status and Future Plans

- Hybrid NUREG/CRs being published
- Alarm NUREG/CRs in final NRC review
- Interface management guidance being completed
- NUREG-0700, Rev. 2
 - new guidance is being integrated
 - draft of Rev. 2 expected this summer
 - field test of draft Rev. 2 is expected with the cooperation of several volunteer plants
 - workshop this fall
 - public comment next winter
 - publish NUREG-0700, Rev. 2 in 2001

EFFECTS OF DEREGULATION ON SAFETY

Vicki Bier, University of Wisconsin-Madison

James Joosten, Connect USA

David Glycer, Christensen Associates

Jennifer Tracey, Christensen Associates

Michael Welsh, Christensen Associates

This paper was prepared with the support of the U.S. Nuclear Regulatory Commission (NRC) under Award No. NRC-04-97-064. The opinions, findings and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the NRC.

OVERALL SAFETY PERFORMANCE

A general decline in safety need not follow economic deregulation:

Both the air and rail industries in the U.S. had generally better safety records after deregulation

Nuclear plant managers in the U.K. focused more intently on regulatory compliance and hardware reliability after deregulation

However, the magnitude and speed of the changes associated with deregulation pose substantial challenges to the management of safety:

Safety problems due to deregulation were observed in all three case study industries

REPRIORITIZATION OF EXPENDITURES

Companies in all three case studies undertook major reprioritizations of their expenditures:

Airlines increased the amount of time between engine overhauls after deregulation, but did not experience a higher rate of engine failures

In the rail industry, annual capital expenditures on track maintenance increased by a factor of five, while employment was cut in half

The U.K. nuclear power industry also experienced dramatic downsizing after deregulation, coupled with increased use of contractors

Such changes are not necessarily adverse to safety:

But can cause safety problems if organizations make excessive cuts in safety-related areas

SAFETY CULTURE

Deregulation creates major challenges to safety culture

In aviation and rail, corporate culture adversely affected safety after mergers and acquisitions:

3 fatal accidents and 7 fatalities in 7 months after the Union Pacific/Southern Pacific merger

“Union Pacific’s by-the book culture clashed badly with Southern Pacific’s, ...making do with chewing gum and bailing wire” (Passell, 1998, *New York Times*)

New entrant airlines were substantially more risky than established airlines

Underreporting of safety problems is reported to have increased in the railroad industry after deregulation

SAFETY CULTURE (continued)

In the U.K. nuclear power industry, corporate culture concerns dealt with use of contractors and loss of institutional memory:

“Few contractors understood the implications of the site licence”

“Neither were they aware of the licensee’s safety standards and cultures” (Allars, 1999, U.K. Nuclear Installations Inspectorate)

Safety regulators in the U.S. rail and U.K. nuclear power industries have proposed requiring prior review of major organizational changes that can affect safety

FINANCIAL PRESSURES

Financial difficulties appear to be associated with safety problems in the rail and aviation industries

The link between poor profitability and safety problems appears strongest for small and unprofitable companies:

“Lower profitability is correlated with higher accident and incident rates—particularly for smaller carriers”

“Smaller firms...may be more responsive to fluctuations in the economic environment”

“More intense scrutiny of the safety practices of financially marginal carriers is desirable” (Rose, 1989, 1990)

Companies in financial distress may have increased incentives to cut corners:

Therefore, financial difficulty may be a leading indicator of declining safety margins

DOWNSIZING

Significant concerns were raised regarding downsizing and fatigue in the rail and U.K. nuclear power industries:

Federal investigations of major railroad accidents have identified inadequate staffing and fatigue as contributing factors (including after mergers)

In the U.K., regulators raised concerns that downsizing has led to loss of institutional memory and excessive reliance on contractors

Safety regulators in both industries also raised concerns about increased use of overtime

EXPERIENCES OF SAFETY REGULATORS

Workload increases:

The FAA experienced staff and budget cuts around the time of deregulation, and later found that its staffing levels were insufficient to meet the increased workload:

“If there had been increases in accident rates...then the Congress as well as the US Department of Transportation would have had to bear a heavy measure of blame” (Moses and Savage, 1990)

U.K. Nuclear Installations Inspectorate (NII) increased staffing levels in anticipation of privatization

EXPERIENCES OF SAFETY REGULATORS (continued)

Importance of organizational factors and safety culture:

Safety regulators in both the rail and U.K. nuclear power industries found it advisable to begin requiring prior regulatory approval of significant organizational changes:

Major mergers and acquisitions (rail)

Downsizing and outsourcing (U.K.)

“NII expects licensees to demonstrate that proposed changes are fully considered before... implementation” (Reiersen, 1999, U.K. NII)

CONDITIONS FAVORABLE TO SAFETY

In all three case studies, circumstances favorable to safety may have counteracted safety problems due to deregulation:

The decades-long trend of improving safety in aviation may have masked adverse safety consequences of deregulation

The improved financial performance of the rail industry as a result of deregulation was conducive to safety

Rail deregulation took place at a time when the Federal Railroad Administration was becoming more active in safety regulation

The years immediately following nuclear power privatization in the U.K. were accompanied by extensive financial subsidies

The NII was actively involved in planning for and monitoring the transition to privatization in the U.K.

CONDITIONS FAVORABLE TO SAFETY (continued)

These favorable conditions may not be present in the U.S. nuclear industry:

Therefore, safety improvements similar to those in the aviation and rail industries may not be observed

In the absence of such favorable conditions, deregulation could have greater adverse impacts on safety in the U.S. nuclear power industry than in the case study industries

SUMMARY—WHAT TO LOOK FOR

Long learning curve

Major reprioritization of expenditures:

E.g., maintenance

Challenges to safety culture:

Mergers and acquisitions

New entrants

Other management changes

Pressures to underreport

Use of contractors

Loss of institutional memory

Financial pressures

Downsizing:

Inadequate staffing

Excessive overtime

Increased use of contractors

Loss of institutional memory

Increased workloads for safety regulators

SUMMARY—WHAT TO LOOK FOR (continued)

Other possible effects:

Aging of equipment

Effects on human capital (e.g., skill/experience)

Reduced support services (e.g., engineering)

Reduced benchmarking

Poor labor relations

OVERALL LESSONS LEARNED

Deregulation is not incompatible with maintaining or even improving safety

The magnitude and speed of the changes associated with deregulation create major challenges to the management of safety (Neuschel, 1988):

“Achieving safety under deregulation is a particularly demanding task that requires intensive management skill and dedication...”

“Safety can be managed even under deregulation.

“But it takes total commitment, special know-how, a highly disciplined work force and exemplary skill by management.”

Careful review of safety problems encountered in other deregulated industries may make it possible to minimize similar problems in the U.S. nuclear power industry

“UPDATE OF INTERNATIONAL SAFETY CULTURE ACTIVITIES”

Isabelle Schoenfeld
Human Factors Analyst
RES/DSARE/REAHFB

**PRESENTATION TO THE
ACRS SUBCOMMITTEE ON HUMAN FACTORS**

MARCH 15, 2000

SAFETY CULTURE ACTIVITIES

- **OECD NUCLEAR ENERGY AGENCY (NEA)**
 - COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS (CSNI)**
 - COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES (CNRA)**
- **INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)**
- **INDIVIDUAL COUNTRIES' SAFETY CULTURE ACTIVITIES (SOME EXAMPLES)**

CNRA ACTIVITIES

- NEA Task Force produced report “*THE ROLE OF THE NUCLEAR REGULATOR IN PROMOTING AND EVALUATING SAFETY CULTURE*” - Prepared by Dr. T.E. Murley, June 1999

CSNI ACTIVITIES

- Research Strategies for Human Performance Document (1997)
- Workshop in May 1998, sponsored by the Expanded Task Force (ETF) on Human Factors, Principal Working Group 1 and SOAR on “Identification and Assessment of Organizational Factors”, February 1999

“ORGANIZATIONAL CULTURE” Factor

Defined as “*The shared assumptions, norms, values, attitudes and perceptions of the members of an organization.....Safety Culture is an aspect of the organizational culture where safety is a critical factor in the norms, values, attitudes, of every employee throughout the organization*”

- CSNI recent reorganization establishes a “SPECIAL EXPERT GROUP ON HUMAN AND ORGANIZATIONAL FACTORS”

IAEA ACTIVITIES

- **IAEA offers “Safety Culture Services” to member states**
 - **Produces Safety Culture Guidelines (e.g., INSAG-4)**
 - **Provides peer review of an organization’s safety culture by an external organization**
 - **Holds meetings on “Safety Culture Self-Assessment.” Draft document based on meeting in June 1998. Follow-up meeting June 2000, then final document**
 - **Holds workshops in the Eastern European countries on “The Management of Safety and Safety Culture”**
 - **Convened an IAEA Working Group: Senior representatives of utilities and regulators from Canada, United States, Sweden and IAEA Agency staff ; Paper on “Shortcomings in Safety Management Symptoms, Causes and Recovery,” 1998**
 - The Working Group recommended 6 actions be taken by the IAEA to assist senior management of nuclear installations in the early detection and correction of deteriorating safety performance**

IAEA ACTIVITIES (Cont'd)

Some IAEA Activities related to the 6 actions are:

(1) Developing new tools for Operational Safety Culture Assessment Review Team (OSCART) and Safety Culture Assessment Review Team (SCART).

(2) Held an International meeting in Canada with senior executive utility managers and regulators on integrating the management of safety and successful business management of nuclear power plants

(3) A New Version of the Management of Safety and Safety Culture in the IAEA Safety Standards series

(4) New INSAG-13 on Management of Operational Safety in Nuclear Power Plants and a new INSAG-3, now INSAG-12 on Basic Principles for Nuclear Power Plants which address safety culture

OTHER COUNTRIES

BELGIUM

- **A recent initiative includes annually reviewing and documenting generic safety culture issues at all plants.**
- **Specific safety culture inspections performed in events or specific operational problems reported by the utility or in findings during field inspections.**

CANADA

- **AECB developed a regulatory organizational and management review method, Canadian Adaptive Machine Model (CAMP) for assessing organization and management and to date have applied it to audits of a mine, research reactor, and 4-unit nuclear power station**

FINLAND

- **Safety Culture was formally included in the Finnish nuclear safety regulations at the time the INSAG-4 was issued. Safety Culture is assessed in the new periodic inspection program started in the beginning of 1999**
- **Measures specifically intended for improving safety culture will be included into a national safety culture program**

FRANCE

- **DSIN requires that annually, each plant present a document reviewing their human and organizational problems, their analysis, and their corrective actions. DSIN provides their findings in the human and organizational area**
- **Every three years, IPSN reviews operating feedback based on event reports and on other safety significant occurrences which occurred during this period**
- **Safety Culture is considered during inspections of: organizational factors, training and licensing, subcontractors, incident investigations**
- **EDF's "Nuclear Power Plant Operating Safety Handbook" provides basic principles for nuclear safety including a definition of safety culture based on INSAG-4**

JAPAN

- **Electric Utility Companies in Japan sponsored research on "Examination of Safety Culture in Organizations Operating Nuclear Power Plants"**

The purpose of the research project was to analyze the features of a nuclear power management system functioning from the perspective of organizational science and culture...

SPAIN

- **UNESA (consortium of all Spanish utilities) coordinating a program to maintain and strengthen the safety culture at all Spanish plants involving all personnel. This is being tracked by the CSN**
- **CSN identifying the elements of a good safety management system, measures, and how to foster implementation**
- **CSN is also looking to model development to model the impact of management and organization on the safety of NPPs (based on Canadian CAMM model)**

SWEDEN

- **Document produced by safety experts from industry and regulators adapting INSAG-4 to Swedish conditions. It was recommended to be used as a self-assessment instrument for strengthening the safety culture in industry**
-
- **A 1999 SKI study to show how safety culture is defined, used, and perceived as a tool for strengthening safety work at a plant based on interviews with management and staff in the Swedish NPPs**

SWITZERLAND

- **KSA (Advisory Commission of the Federal Ministers) published a paper on Safety Culture. HSK contributed to this paper, 1997**
- **HSK initiates a research project at the Psychological Institute of the University of Bern, to develop a tool for the evaluation of safety awareness of NPP staff, 1998**
- **HSK Director, Serge Pretre chaired a CNRA Working Group that published the document “The Role of the Regulator in Promoting and Evaluating Safety Culture”, 1999**
- **HSK is improving an inspection tool for inspecting Safety Culture/Safety Management, 1999-2000**

U.K.

- **All U.K nuclear plants are required to go through a periodic safety review. An important element of this review is the inclusion of human and organizational factors**
- **NII has recently introduced a new license condition addressing organizational change**
- **NII conducted study on safety management models and developing a Generic Nuclear Safety Management Model (GNSM)**

Presentation To:

ACRS Subcommittee on Human Factors

March 15, 2000

Subject:

Planned NRR Activities in Human Performance

David Trimble
Richard Eckenrode

Planned NRR Activities

- * Supplemental Inspection Procedure - Human Performance Licensing Actions
- * Human Factors Information System
- * Oversight - Human Performance
Oversight - Training Programs
- * Fatigue Policy
SRP Chapters 13 and 18
Decommissioning Rule Making (Staffing)
Generic Communications
International Cooperation
Consensus Standards Support

Fatigue

- Congressional Inquiry
- Request for Proposed Rulemaking
- Policy Weaknesses
- Stakeholder's Meeting
- Options
 - Revise Policy
 - Provide Guidance to Part 26
 - Industry Standard
 - Rulemaking

Human Performance in Reactor Oversight Process

Assumption:

Effects of Human Performance on Plant Safety Will Largely Be Reflected in the Plant Performance Indicators and Inspection Findings

Two-pronged Effort of Proof:

- **Research - Insights - Operating Experience**
 - Past Human Performance Analyses
 - Risk Studies
- **HFIS - Comparison - Historical Data (5 Years)**
 - New Process Data

**Supplemental Inspection Procedure
for
Human Performance**

IP-71841

Objectives: With Respect to Human Performance,

- 1. Assess Licensee's Root Cause Evaluation and Corrective Actions.**
- 2. Assess Extent of Condition.**

IP-71841 Topic Areas

Human System Interface

Visual Information/Display

Control Function/Control Device

Alarm/Annunciation

Environment

Communication

Coordination of Work/Supervision

Work Practices

Procedure Use/Adherence

Training and Qualifications (IP-41500)

Fitness for Duty

Human Performance Significance Determination Process

Functional Areas: Operations
Maintenance
Surveillance
Testing
Health Physics
Security

Issue Areas: Training
Procedures
Human/System Interface
Environment
Supervision
Communication
Staffing
Fitness for Duty

SDP Basic Premise

Every Human Action Requires Information (e.g. Display Parameters, Training, Procedures, Supervisory Direction) to Initiate the Action and Control Capability (e.g. Switch, Keyboard, Wrench, Test Equipment) to Accomplish the Action.

Second Premise

No Information or Control Capability Is Better Than Incorrect Information or Control Capability.

Third Premise

Anything Less Than Complete Failure to Perform an Action (e.g. Untimely, But Completed), May Not Be As Risk-Important As Complete Failure.

Risk Importance

Regulatory Guide 1.174 - An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis

Draft - Guidance for the Review of Changes to Risk-Important Human Actions - Brookhaven National Laboratory