CERTIFIED MINUTES
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SUMMARY/MINUTES OF THE ACRS SUBCOMMITTEE
ON HUMAN FACTORS
SEPTEMBER 27, 1989
BETHESDA, MARYLAND

The ACRS Subcommittee on Human Factors met on September 27, 1989 to review 1) the access authorization rule and 2) performance indicators.

Notice of the meeting was published in the Federal Register on September 13, 1989. Items covered in the meeting and a list of handouts are kept with the office copy. There were no written or oral statements received or presented from members of the public at the meeting. E. G. Igne was Cognizant ACRS staff member for the meeting.

Principal Attendees:

ACRS
F. Remick, Chairman
J. Carroll, Member
C. Michelson, Member
D. Ward, Member

NRC

S. Bahadur
S. Frattali
W. Morris
C. Johnson
S. Stern
S. Feld

Others

J. Ross, Jr., Baltimore Gas & Electric
G. Ellis, System Energy Resources
R. Enkeboll, NUMARC
J. Colvin, NUMARC
R. Boyd, KMC

DESIGNATED ORIGINAL

Certified By EMB

D. Knuth, KMC
M. Modarres, U. of Maryland
L. Everson, NUS
J. Wreathhall, SAIC
M. Azarm, Brookhaven National Lab
P. Riehm, KMS
D. Harte, Fluor Daniel

Highlights:

1. F. Remick, Chairman of the ACRS Subcommittee on Human Factors, in his opening comments stated that the Access Authorization Rule has been in the making since 1981-1982 time frame. The ACRS has seen it before and needs to comment on it.

2. S. Bahadur, RES, briefed the subcommittee on the Access Authorization program for nuclear power plants. In his introduction he stated that during the CRGR briefing basic issues were raised requiring significant modifications. Hence, the rule is still under development by the staff, and this briefing is only a progress report. When the changes are made and the final draft document becomes available, he would again like to meet with the subcommittee.

S. Bahadur, stated that in 1989 the Commission directed the staff to develop a final rule not a policy statement and to also develop a Regulatory Guide endorsing industry-guidelines with appropriate exceptions. The performance objective of the rule is to provide high assurance that individuals granted unescorted access to protected and vital areas are trustworthy and reliable and not an unreasonable risk to the public health and safety. In response to a subcommittee question, he stated that terrorist sabotage will not be addressed.

Major attributes of the rule are 1) background investigation, 2) psychological assessment, and 3) behavior observation program. In response to a subcommittee question on the type of behavior that is unacceptable, the staff stated that an NRC personnel with "Q" clearance, for example can be given unescorted access authorization without further evaluation or psychological testing. Further elaborating, the NRC staff stated that this is generally acceptable because an adequate behavior observation program consisting of about one year duration has been completed by management. The duration time of about one year has been questioned by the subcommittee about its adequacy. Perhaps it should be longer like 3 or 5 years.

S. Bahadur then discussed the issues raised by CRGR. They asked the following questions:

- Why is a rule needed if the utilities are already doing well?

- Why not endorse the industry guidelines in total rather than taking some exceptions?

It was noted that a policy statement instead of a rule was noticed in the Federal Register for public comments, before the Commission requested that a rule be promulgated. The major reason for a rule is to achieve minimum levels of compliance, because not all industry programs are the same.

Some exceptions taken to the industry guidelines are as follows:

- Total military history is necessary, not just for the last 5 years.
- Reliable and valid psychological tests are required. It was stated by the staff that a psychological test can be reliable and not necessarily be valid.
- Review process should be extended to all employees, and not just permanent employees of the licensee.
- The program must be audited every year if a licensee contracts out a portion of its program.

With respect to provisions for access granted to areas which have been "devitalized" under cold shutdown, the staff reiterated the following items:

- Requires fingerprinting -- but not a total background investigation,
- Requires a behavior observation program,
- Requires a series of compensatory measures such as visual inspection of protected and vital areas, and no access to an operating unit in a multi-unit site during cold shutdown.

S. Bahadur, in summary, stated that contested issues will be resolved with the industry and appropriate NRC offices. Then the final access authorization rule package will be submitted to CRGR for their concurrence, request ACRS review of the final package for its comments, and to submit the final rule to the Commission for final approval. It

is expected that ACRS will receive the final package for review within a month or so.

3. J. Colvin, NUMARC, presented a brief historical perspective on the access authorization issue. He submitted to the subcommittee a published revision 8B of NUMARC 89-01, "Industry Guidelines for Nuclear Power Plant Access Authorization Programs," dated August 1989.

4. R. Enkeboll, NUMARC, briefly discussed the report NUMARC 89-01. The major elements in the industry programs are similar to the NRC Guidelines except those noted above by S. Bahadur. With respect to consideration of military service, R. Enkeball stated that the industry treats it as another job, hence 5 years of records are sufficient.

The tenor of the NUMARC presenters indicate that they accept the rulemaking policy and that NRC guidelines are not unreasonable and is negotiable. They will resolve the differences of the access authorization rule with NRC in the near future. This should be completed in a month or so.

5. T. Ryan, C. Johnson and E. Lois, RES, familiarized the subcommittee on risk-based and programmatic performance indicators research completed and ongoing in the Human Factors Branch, RES. The purpose of this work was to support the agency's efforts to achieve a set of credible direct and indirect indicators of safety -- whose measures can be used by the Commissioners and Senior staff management. [Note that this briefing

does not include INPO's comments regarding the inappropriate regulatory use of nuclear power plant performance indicators.]

RES work in this area has been focused primarily on development and validation of indirect or leading indicators of safety. This work is being done at the request of the Commissioners and AEOD. The risk-based indicators should provide safety systems function trends (unavailability of selected safety systems). Programmatic indicators are focused on technical support programs, for example, maintenance (ESF Actuations, daily power loss) and training. Also involved are top-down indicators, or organizational type indicators. RES has also looked into the bottom-up approach, or a combination of indirect and organizational type indicators.

Approximately a year and a half effort has been expended by members of the Human Factors Branch staff thus far; AEOD and NRR have been actively advising RES in this matter. In addition, eight contractors are involved in this project. They are Brookhaven National Lab., Science Applications International Corp., Communications Technology Assoc., Battelle Memorial Inst., U. of Minnesota, U. of Maryland, Wayne State University and American University.

The presentations focused around five basic issues or questions. They are as follows:

- Conceptual framework -- in which initial candidate indicators are identified in the various areas,

- o Criteria -- used for screening and refining the candidate indicators,
- o Criterion measures of safety -- in which candidate indicators have an hypothesized relationship,
- o validating techniques -- for testing hypothesized relationships between candidate indicators and criterion measures of safety.
- o Results of indicators development (first three issues above) and validation (Issue 4) studies.

The risk-based indicators basically involves two inputs. First, is the quarterly trending values of the total hours that a specific safety system in out of service, to the second which is the total hours that the plant is critical. It was stated that the second input is the upper bound for each safety system established by the staff based on multiple PRAs. Finally, the measure of the risk-based indicator is the relationship between the ratio and the bound and the direction of the trend.

6. T. Ryan next discussed the meaning of programmatic performance indicator. He stated that ideally we would like to be able to relate the attributes of a technical support program on organizational factors with a criterion measure. Unfortunately, this type of data is not available. Therefore, in the short term, we will focus on the intermediate outcomes, which are determined by either an engineering analyses or from the data source i.e., LERS. From these casual factors, statistical analysis will be attempted to relate the intermediate

outcome and a criterion measure. He stated that the programmatic performance indicators are not process measure but an attribute of the program itself.

7. C. Johnson, RES, discussed safety system function trends or an indicator of unavailability of selected risk-significant safety systems. He stated that one attribute of safety is the availability of safety systems. They have initially developed an indicator of unavailability of selected risk-significant safety systems and found that initial validation and sensitivity tests are promising, but not conclusive. Validation analysis should be completed in 1989, and should provide a technical basis for NRC to use or not to use the proposed indicator of unavailability of selected safety systems.

In response to subcommittee questions, he stated that the INPO and proposed NRC performance indicators are more similar than different. The major difference are that INPO uses three safety systems and treats them in a composite manner or as an average, while the proposed NRC performance indicator differentiates trains if they are different. INPO never looks to see if the trains are different, while NRC looks for differences before it aggregates them. It was stated that it is only a minor difference.

In response to further subcommittee questions, it was stated that the scientific validation of INPOs method has not been performed and that it may be that NRC methodology after its validation may prove to be a more accurate indicator. It was suggested by the subcommittee that maybe it

would be more expeditious to validate the INPO indicator than trying to develop a new method.

The staff in response to a subcommittee query about how the performance indicators will be used by NRC, stated that management people are the intended users of the indicators in order to set regulatory requirements for plants to operate with a reasonably low risk. Resident inspectors are not intended to use the indicators.

It was noted by the NRC staff that communications between NRC and INPO have taken place in the past, but data or other similar information have not been made available to NRC.

8. E. Lois, RES, discussed programmatic performance indicators. She led off her presentation with indicators on maintenance and training. This work was done under contract to SAIC. A process model was developed where the functional units in a nuclear power plant shows the flow paths among the different units. The model was used by the analyst to examine influences among the units and whether or not they could identify some points where measures can be developed. The process model was developed on the plant level as well as the maintenance level. Preliminary results indicate that the process model of a nuclear power plant is self-correcting and is difficult to identify contributions from individual programs to plant performance. Therefore process indicators for regulatory use are very difficult to apply, primarily because the information from one functioning unit to another cannot reliably be predicted.

Frameworks were then developed in order to characterize the indicators versus the attributes of maintenance. It was found that most indicators tend to either capture the quality, the frequency, or the duration of maintenance and also tried to capture some human factors issues.

She stated that 78 indicators were identified. By applying criteria for screening maintenance candidate performance indicators, for example, which more directly tie to safety, the 78 indicators were significantly reduced to about 9; some of which are a number of wrong unit or wrong train events, number of scrams due to test and maintenance, number of inadvertent ESF actuations, daily power loss and mean time between repairs.

In order to validate the indicators which means to establish relationship's, statistical analysis and engineering analysis were used. Cross-correlation techniques were used to test relationships between the indicative data and measures of safety, and the estimated lead or lag time between the indicators and measures of safety. Measures of safety were used as current indicators. It was stated that one of the major problems in this study was data availability. For most of the indicators, well defined data was not available.

The application of statistical analysis resulted in two indicators showing significant relationship to the measure of safety. They are inadvertent ESFs actuation due to testing and maintenance errors and daily power loss.

She next described efforts of identifying indicators of organizational effectiveness. This work is being performed by the University of Minnesota (lead), Wayne State University and American University. This work started out with the development of a framework of linking organizational factors to safety. The study integrated and looked at why organizational factors are important to safety. Industry and NRC perspectives were also considered and integrated in the model. She stated that important organizational factors are the environment, context, the organizational governance, organizational design and emergent (dynamic) process. The intermediate outcomes of the organization factors are efficiency, compliance, quality and innovation. These intermediate outcomes were stated as preconditions to safety, and are designated in the model as independent valuables of safety and performance in a plant. The safety indicator adopted are taken from NRC and is a dependent variable in the model. Statistical analyses were then applied to performance indicator development of organizational and management effectiveness. Preliminary results show that the following parameters indicate positive/negative correlations with measures of safety:

- o plant age
- o plant size
- o number of plants per utility
- o earlier LERs
- o earlier resources

It was stated that these preliminary conclusions will be tested empirically. Major issues are availability of data and measures of safety.

Non-nuclear analogs will be used for the development of indirect indicators of safety. This work has already been started and is scheduled to be completed in by December of 1990. This work will be performed by Communications Technology Applications.

She next discussed the bottom-up indicators, which is a composite programmatic indicators. This program is to be complete in December of 1990. Its goal is to define an integrated set of programmatic performance indicators. The objective is to select a set of programmatic performance indicators that adequately predicts nuclear power plant programmatic performance as it related to safety.

Total cost for the performance indicator research program is about $500k.

Subcommittee Action:

The subcommittee agreed not to brief the ACRS during its October meeting on the matter of access authorization. The review package is being revised to account for comments received by CRGR and ACRS. When comments received by CRGR and ACRS. When the package is available for review the subcommittee will meet again to complete its review.

The subcommittee will monitor the study on the performance indicator research program and meet again when deemed necessary.

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NOTE: A transcript of the meeting is available at the NRC Public Document Room, Gelman Bldg. 2120 "L" Street, NW., Washington, D.C. Telephone (202) 634-3383 or can be purchased from Heritage Reporting Corporation, 1220 "L" Street, N.W., Washington, D.C. 20005, Telephone (202) 628-4888.