UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

MEMORANDUM TO: Derek Widmayer, Senior Staff Scientist
Reactor Safety Branch B, ACRS

John H. Flack, Consultant
ACRS

FROM: Dennis C. Bley, Chairman
Reliability and Probabilistic Risk
Assessment Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE SUBCOMMITTEE ON RELIABILITY AND PROBABILISTIC RISK ASSESSMENT, NOVEMBER 03, 2010

I hereby certify, to the best of my knowledge and belief, that the Minutes of the subject meeting held on November 03, 2010 are an accurate record of the proceedings for that meeting.

/RA/ ***1/30/2011***

Dennis C. Bley, Chairman Date
Reliability and PRA Subcommittee

Certified by: Dennis Bley
Certified on: January 30, 2011

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
RELIABILITY AND PROBABILISTIC RISK ASSESSMENT
SUBCOMMITTEE MEETING MINUTES NOVEMBER 3, 2010
ROCKVILLE, MARYLAND

INTRODUCTION

The ACRS Subcommittee on Reliability and Probabilistic Risk Assessment met on November 3, 2010 at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, Rockville, Maryland, at 8:30 am. The purpose of the meeting was to review and discuss the following material: (1) proposed Commission Policy Statement on Safety Culture, (2) stakeholder input on the proposed policy statement including those from Agreement States, (3) validation study performed by INPO, (4) update to industry's initiatives [NEI 09-07, *Fostering a Strong Nuclear Safety Culture*, dated June, 2009]. Dennis Bley presided as Subcommittee Chairman, Mr. Derek Widmayer as the Designated Federal Official. The entire meeting was open to the public. The Subcommittee received no written comments or requests for time to make oral statements from any members of the public. The meeting was convened at 1:29 pm and adjourned at 5:55 pm.

ATTENDEES

ACRS Members/Staff	**NRC Staff**	**Industry**
Dennis Bley (Chairman)	V.Barnes	T. Haughton (NEI)
Michael Ryan (Member)	D.Sieracki	L. Cox (OAS)
Said Abdel-Khalik (Member)	D.Solorio	M. Gaffney (PSEG Nuclear)
Harold Ray (Member)	J.Firth	G. Kenneth Koves (INPO)
Mario Bonaca (Member)	M. Cheok	
	R.Zimmerman	
Derek Widmayer (DFO)		

ACRS Members/Staff NRC Staff Industry
John Flack ACRS Consultant

Transcripts and viewgraphs presented at the meeting can be found at:
http://www.internal.nrc.gov/ACRS/.

SUMMARY OF MEETING

Opening Remarks by Chairman Dennis Bley

Chairman Bley stated the purpose of the meeting was to examine the NRC staff's proposed Commission policy statement on safety culture, and to discuss associated NRC and the industry

initiatives. He directed members to gather information, analyze relevant information and facts, and formulate proposed positions and actions as appropriate for deliberation by the Full Committee. Eric Fries identified himself as listening in on the telephone line. Chairman Bley turned to Roy Zimmerman for opening remarks and to begin the staff presentations.

Staff Opening Remarks

Mr. Zimmerman introduced himself as the Director of the Office of Enforcement and lead on safety culture, Dave Solorio as the Branch Chief in support of the safety culture initiative, Diana Sieracki as the senior safety culture program manager, and Val Barnes from the Office of Research. He described the steering committee and a working group within the NRC that supported the development of the policy statement, noting that they had very good input from the Industry, Agreement States and from the public. Staff activities associated with the effort to develop the policy statement were summarized, including a three-day workshop that been held in February 2010. The staff continues to view safety culture as a key component to good safety performance. Mr. Zimmerman introduced Ms. Sieracki to provide an overview of the Safety Culture Policy Statement.

Overview of Proposed Commission Policy on Safety Culture

Ms. Sieracki summarized the Commission directive and their subsequent engagement with stakeholders on development of the safety culture policy statement. She described how the policy evolved from being associated with certain characteristics based on the INSAG definition to the current eight traits that subsumed all the characteristics but also added traits associated with leadership safety values, effective safety communication, and respectful work environment. She stated that stakeholders were against having security included in the definition of safety culture, or the traits.

Chairman Bley asked whether security would be addressed in the policy statement, and the staff responded that based on input from the working group members and steering committee members, a preamble was to be placed between the definition and traits reflecting the need to have security considered throughout the process.

Ms. Sieracki defined a safety culture trait as a pattern of thinking, feeling and behaving that emphasizes safety, particularly in goal conflict situations, such as production versus safety, schedule versus safety, and cost of the effort versus safety. She discussed questioning attitude and how it rose to the level of being added as a ninth trait. Chairman Bley asked whether the definition and the traits was a consensus position or a majority position and Ms. Sieracki stated that it was a consensus position, although some individuals felt leadership needed to play a bigger role in the definition.

Ms. Sieracki indicated that there had been some concern about how vendors and suppliers would be considered with respect to implementation. Basically, licensees would be responsible for making sure that vendors and suppliers have a positive safety culture. Member Ryan asked how the staff defined safety-related components, for example, did it go down to the level of protective clothing. Mr. Zimmerman responded that the initiative is more like a mind set and there are no requirements. It's a matter of training and communication about the benefits of what the policy would bring if safety culture is part of the way of doing business.

Chairman Bley asked whether there had been a stakeholder consensus regarding the inclusion of security in the preamble and the staff indicated that stakeholder feedback generally supported it. Chairman Bley asked who the stakeholders were and the staff responded that in addition to those from the nuclear industry, there had been several members from the public, including a

representative from Johnson and Johnson, and Agreement State representatives. There had also been some members of the public on the telephone line and watching through the webstreaming.

Chairman Bley asked whether there had been any plans for implementation of the policy statement, and the staff responded that they had not made any plans up to this point. Member Bonaca asked whether the staff had considered IAEA work in the area, and the staff indicated that they had some interactions with international counterparts earlier in the process.

Ms. Sieracki discussed their interactions with Agreement States, and presented the final proposed draft safety culture policy statement and the Commission paper, noting that the final version will be ready for ACRS review by November 16th. She noted that a ninth trait on questioning attitude will also be added to the final draft. Chairman Bley asked whether the traits would address characteristics that threaten safety culture. The staff responded that concerns with the traits would identify threats to safety culture. Chairman Bley also asked whether making the traits part of the policy statement will mean that the NRC will be "stuck" with them. The staff responded that the traits are very generic and not likely to change, adding that make changes after the Policy was finalized would not present a problem.

Member Abdel-Khalik asked whether there was an appropriate balance between personal and organizational traits and/or responsibilities. Mr. Houghton from NEI responded and explained that there was a balance among the traits. Member Ryan commented that there are three programs where safety culture begins to play a role, the health physics program, industrial safety program and the quality assurance program.

Ms. Sieracki summarized the nine proposed traits and stated that Office of Enforcement will remain the focal point for coordination, and take the lead on implementation through each of the program offices. The key message is that the definition of traits in the proposed final safety culture policy statement had received unanimous support from the various stakeholders. Member Ryan commented that the staff should think about how one will know if implementation had worked as expected. Member Bonaca commented that the staff should also consider international experience, especially SKI in Sweden and other countries where the traits appear to be very similar. Member Ray asked whether the staff had thought about outlier events like Davis-Besse or the one that had occurred in the Gulf Oil disaster and the conditions that had lead up to those events. The staff responded that they had and will continue to look into these events as part of lessons learned initiative.

Input on Behalf of Agreement States

Mr. Cox presented safety culture from the viewpoint of the Organization of Agreement States noting that the Agreement States regulate over 85 percent of the nation's radioactive material licensees. Safety culture has always been the preeminent thought and foundation in Agreement States' programs and regulated community. With this strong foundation of safety culture, the Agreement States look forward to enhancing their programs, but do not believe that there is a need for a huge shift in the safety pendulum. Mr. Cox stated that the Agreement States' safety culture platform has always included health, safety, environment and security. As a policy statement, safety culture can be implemented across all radioactive material uses in an effective and efficient manner, while allowing flexibility and encouraging buy-in from stakeholders. All Agreement States are being encouraged to support the development of the safety culture policy statement, in lieu of a formal regulation. He believed that going forward, the Integrated Materials Performance Evaluation program (IMPEP) should continue to measure safety culture performance as it has since its inception. IMPEP will also continue to be evaluated and modified to ensure it is adequately measuring performance with regards to proposed safety culture definition and the traits. Mr. Cox noted that the Agreement States prefer the use of the term "radiation safety culture" as opposed to "nuclear safety culture" because the former encompasses X-ray and other things that are not

specifically nuclear. The staff also noted that The Conference of Radiation Control Program, and the Advisory Committee on Medical Use of Isotopes directors were engaged and were briefed on the policy statement.

INPO Validation Study

Ms. Val Barnes from the Office of Nuclear Regulatory Research introduced INPO's validation survey. The validation study examined the extent to which survey responses yielded results that supported or were consistent with the traits that came out of the workshop. She stated that the staff focused on the correlation of safety culture with safety performance, and the relationship of the results with the policy statement. She noted that INPO developed the survey, but NRC oversaw the administration and did the majority of the data analysis. Additionally, the Office of Research contracted with Idaho National Lab to verify INPO's analyses.

Ken Koves introduced himself as having been with INPO for six and a half years and having received a Masters and Ph.D. in Industrial Organizational Psychology from Georgia Tech. His presentation included research results from the safety culture survey administered across the power reactor industry, and more recent research from a slightly modified version of the same survey administered to workers at AREVA Fuels.

Chairman Bley asked whether the staff's safety culture work hinged on the results of the study and Ms. Barnes stated that it did not, but they did look for consistency between the traits and survey responses.

Dr. Koves described the survey used in the study as being based on the survey given by Utility Service Alliance (USA) for their safety culture assessments and evaluations. That survey contained 73 items based entirely upon INPO's principles for a strong nuclear safety culture. Additional questions were added to the USA survey to further capture all of the workshop traits. The final version contained 110 items, about 50 percent more items than the original survey. The survey used a seven point Likert scales, ranging from strongly disagree to strongly agree, with a "don't know" point. Examples were provided that included how people were treated by station leadership, whether they had a strong quality assurance process and organization, whether performance indicators helped the staff stay focused on the right things, whether procedures at the site were generally up to date and easily used, whether staffing levels were adequate to meet work demands, and whether people are routinely rewarded for identifying and reporting nuclear safety issues. The survey had been administered online and taken by almost 3000 individuals at 63 sites.

Chairman Bley asked how the survey had been kept free from bias because everyone taking the survey had already seen the INPO principles. Dr. Koves responded that because the items in the survey were based at the attribute level and involved 60 or more particular attributes, he would be surprised if people were biased. Ms. Barnes added that NRC also had significant input into the construction of the survey items further reducing the potential for the bias.

Chairman Bley asked whether 46 percent participation was a concern. Dr. Koves responded that it was adequate as compared to the results from other research they had done, and that the proof will be in the pudding.

Dr. Kroves explained that there were nine factors that resulted from the analysis, management responsibility having the greatest variance. Member Ray commented that two of the subfactors under management responsibility, performance indicators and rewards, fall under the category of incentives. Dr. Koves agreed and provided an overview of the details of the analysis that included grouping items together in terms of the subfactors in multiple dimensional space. He noted that by maximizing the distance between the factors correlation between the factors would decrease which

helps to generate independent factors.

After much discussion, Chairman Bley commented that he would like a better understanding of the questions and their influences on the factors that resulted from the study. Several questions were raised regarding the treatment of data points and the analysis of the variance correlation. Dr. Koves noted that the respectful work environment, which is a subfactor of management responsibility, and the willingness to raise concerns were very much aligned with two of the traits that came out of the February workshop.

Member Abdel-Khalik asked if the results would be any different if the word "nuclear" had been removed and the same survey was given to 3,000 emergency room nurses. Dr. Koves responded that there may be some differences due to organizational size, but at an appropriate level of extraction, there would not be much difference between groups. Ms. Barnes added that the theory for safety culture should be consistent across the Organizational settings, to the extent that the organizational settings are similar in terms of the relationships between people.

Dr. Koves noted that a good factor that came out was questioning attitude, with subfactors that included situation problem awareness, process use and plant knowledge. In general, questioning attitude had what turned out to be the best correlations with other variables that had been considered.

Member Abdel-Khalik asked how plant knowledge falls within that questioning attitude, and Dr. Koves responded that the more knowledge the better the questions and the more one can exercise a questioning attitude.

Dr. Koves compared the factors with the workshop traits by doing a crosswalk between the traits, the INPO principles and the ROP components. He noted that a side by side comparison showed that there was a great deal of similarity between the factors and the traits. A comparison to the AREVA Fuels Factors showed that leadership safety behavior and management responsibility as being the most important traits.

Dr. Koves stated that the average correlations they had come up fell between .22 and .31. Member Abdel-Khalik commented that those correlations would indicate independent behavior in physical systems. A table was shown that related the factors correlation with events and conditions at nuclear power plants, including the number of unplanned critical scrams, unplanned automatic scrams, system heat removal unavailability, emergency power availability, and an index that INPO created, a personnel safety index.

Member Bonaca commented that they had tried to observe these correlations in the past and had not been successful. Dr Koves commented that it may have been due to a number of reasons possibly related to how they analyzed the survey. Chairman Bley questioned the limited amount of data; in some cases a single data point over many years of operation.

In closing his presentation, Dr. Koves stated he believed the results supported the existence of the workshop traits. Member Abdel-Khalik asked if the message to the Committee is that the list of traits is the right list, both Dr. Koves and Dr. Barnes agreed that at this point they're probably a pretty good approximation. The presenters volunteered to come back to provide more details but Chairman Bley didn't know when that could be done.

Fostering a Strong Nuclear Safety Culture, NEI 09-07

Mr. Houghton opened NEI's presentation by stating that they had used the INPO principles and attributes as the lens from which to assess safety culture on an ongoing basis, and through the

survey from which the validation study had been built. NEI supports NRC's activities on the safety culture policy statement and believe it's on the right track. He believed that after the SRM comes out, NEI will be well-positioned to work with NRR to develop common language. He noted that after Davis-Besse, the industry really didn't take the lead on safety culture, and now wanted to get back in front where they would be identifying safety culture problems with NRC overseeing the process. NEI feels that NRC's current approach is limited, that it only looks at a few inspection findings over a year which is not enough to draw a general conclusion.

Member Abdek-Khalik asked whether there had been situations where findings were inconsistent with assessments from a larger body of data. Mr. Houghton responded that there were only about 12 inspection findings at a plant per year, and it only takes four items to declare that there is a substantive cross-cutting issue. NEI believes that there is not enough data to draw a conclusion. Mike Cheok from NRR responded that because only four pilot plants had been done to date, there has not been enough experience to answer the Member Adbel-Khalik's question.

Mr. Houghton also believed that there isn't a consistent way of conducting surveys, and there are differences in the terminology. Industry has three objectives: (1) to have a repeatable, holistic, integrated way of looking at all this data, (2) to have a common methodology for conducting a survey and a snapshot assessment, and (3) to have a common language. After going through the status of the pilot plants, Mr. Houghton turned the presentation over to Mike Gaffney to discuss the pilot plant process.

Mr. Gaffney from Hope Creek noted three pieces that are important to the process (1) the data collection that provides a broad view of safety culture, (2) the off-site review committee that's part of the QA program, (3) early detection capability of what is perceived to be the cultural aspects, and associated need for corrective actions. He explained the purpose of the nuclear safety culture monitoring panel, and the observation program that looks at hundreds of observations of crew work each month as well as NRC findings that are received each quarter. Data gets reviewed and binned according to the principals, and is then assigned a level of consequence.

Mr. Zimmerman asked whether the Policy Statement, once issued by the Commission would change NEI's process in any way. Mr. Houghton stated that it would not, that they have the same traits that NRC uses for its violations.

Member Abdel-Khalik asked if the binning is done incorrectly it can lead to the wrong conclusion. Mr. Gaffney explained that is a challenge, and requires interactions between the monitoring panel team who did the binning, and the leadership team that reviews the data.

Member Ryan asked whether getting a finer set of bins would solve the problem of which bin does it go to and Mr. Gaffney responded that they will keep refining down to where they eventually get to where they want to be. Member Ryan asked whether all plants will bin using the same criteria so that everyone will end up with the same distribution. Mr. Houghton responded that they plan to train the entire industry using the pilot plants, and then have recurring meetings for lessons learned.

Mr. Houghton stated that the site-based president at North Anna commented that the process gave him an opportunity to sit down and interact with his direct reports and talk about safety culture at the station using data. It provided him a vehicle for setting aside a couple of hours a quarter to sit down and talk about the cultural implications of what they were doing, which is one of the key benefits that they see coming from this process.

Mike Cheok commented that NRC strongly encourages all plants to adopt DEI's initiative because it would lead to safer plant operations. He also noted that NRC still needs to retain some kind of independent agency oversight of the process.

Chairman Bley asked how closely the staff had followed what's going on in the pilots and Mr. Cheok responded that they had observed the activities in all four pilot plans. Mr. Houghton commented that they were pleased that NRC had been at their panel meetings, senior leadership team meetings, and been at the survey assessments for three of the plants.

General Discussion

The following key points were made during the closing discussions:

Member Ryan commented that the implementation at the pilot studies is very positive. With respect to the validation study and statistical analysis it would be good to translate that into confidence. Being able to explain this complicated data to the public would be very helpful, because the plants ultimately are going to want to share the data.

Member Bonaca commented that the validation study had done something that had been elusive for the whole industry for a long time. He noted that if it holds together, it would make one the Commissioners (George Apostolakis) very happy since he had attempted but failed to correlate the availability of components with safety culture.

Member Ray commented that the efforts advanced the professionalism and was glad to see that a major disincentive for safety is recognized as being an important factor. He also commented that he continues to be concerned about the “black swan” phenomenon, and that the data alone might not allow us to avoid major catastrophic events. He indicated that he was just not sure that just looking at precursors and managing those effectively is enough to avoid them. He also stated that the staff needed to look at the lessons learned and what needed to be drawn from those events as part of this program. Not only improving the practice of management, but actually trying to avoid repeating mistakes of the past.

Member Abdel-Khalik expressed concerned about the completeness of the set of traits, and bias in the validation study that starts with the INPO principles of strong safety culture, and whether the INPO principles and attributes are accurate and complete.

Chairman Bley provided recommendations to the staff on what to present at the upcoming Full Committee meeting. He closed by thanking everyone but also noting that if the validation study becomes important during the deliberations, the Committee might want to look at it in more detail.