



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

December 17, 2009

MEMORANDUM TO: ACRS Members

FROM: John H. Flack */RA/*
Senior Technical Advisor, ACRS

SUBJECT: CERTIFICATION OF THE MINUTES OF THE RELIABILITY AND
PROBABILISTIC RISK ASSESSMENT SUBCOMMITTEE MEETING ON
NOVEMBER 12, 2009

The minutes for the subject meeting were certified on December 17, 2009. Along with the transcripts and presentation materials, this is the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc w/o Attachment: E. Hackett
C. Santos
A. Dias
S. Duraiswamy

cc w/ Attachment: ACRS Members

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
RELIABILITY AND PROBABILISTIC RISK ASSESSEMNT SUBCOMMITTEE
MEETING MINUTES
NOVEMBER 12, 2009
ROCKVILLE, MARYLAND

Introduction

The ACRS Subcommittee on Reliability and Probabilistic Risk Assessment met on November 12, 2009 at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, Rockville, Maryland, at 8:30 a.m. George Apostolakis, Chairman, presided over the meeting. The purpose of the meeting was to review and discuss the following material: (1) Proposed Commission Policy Statement on Safety Culture, (2) lessons learned from treatment of safety culture in reactor oversight process (ROP), (3) Industry initiatives on safety culture. John Wreathall from J. Wreathall & Co, Inc., and Earl Carnes from the U.S. Department of Energy (DOE) participated as invited experts. Mr. Wreathall addressed his work on safety culture and resilience engineering, and Mr. Carnes briefed the Subcommittee on High Reliability Organizations (HRO). In the afternoon session, members of the NRC staff (Mike Cheek and Audrey Klett) briefed the subcommittee on treatment of safety culture in the reactor oversight process. Tony Pietrangelo and Tom Houghton from NEI followed with an overview of Industry safety culture initiatives, and David Collins an employee at Millstone, presented his personal views on safety culture.

ACRS Members/Staff	NRC Staff	NEI
George Apostolakis (Chair)	M .Virgilio	T. Haughton
William Shack (Member)	J. Cai	A. Pietrangelo
Said Abdel-Khalik (Member)	A. Klett	
Harold Ray (Member)	V. Barnes	
Dennis Bley (Member)	M. Cheek	
Otto Maynard (Member)	C. Casto	
Michael Ryan (Member)	K. Witt	
John Flack (DFO)	C. Carpenter	
	D. Dorman	

ACRS Members/Staff

NRC Staff

NEI

R. Zimmerman

P. Boyle

D. Solorio

A. Sapountzis

J. Piccone

N. Karipineni

J. Firth

A. Ramey-Smith

P. Holahan

T. Harris

J. Ibarra

N. Sanfilippo

Invited Experts

J. Wreathall

E. Carnes

Public Citizens

D. Collins

The presentation slides used during the open portions of the meeting are attached to the transcript of this meeting at the following website: <http://www.internal.nrc.gov/ACRS/> The presentations to the Subcommittee are summarized below.

Opening Remarks by Chairman George Apostolakis

The subcommittee on Reliability and Probabilistic Risk Assessment came to order at 8:30 a.m. in room T2B3 of Two White Flint. George Apostolakis acted as Chairman, John H. Flack as the Designated Federal Official (DFO). A designated time had been set aside on the agenda to hear comments from David Collins. Chairman Apostolakis explained that the purpose of the meeting was to examine the current status of the safety culture initiatives of the NRC and the industry, and that the subcommittee will gather information, analyze relevant information and facts, and formulate proposed positions and actions as appropriate for deliberation by the full committee. Chairman Apostolakis then introduced Martin Virgilio, NRC Deputy Director for Operations, to open the presentations.

Introductory Remarks

Mr. Virgilio introduced himself as Deputy Director for Operations and executive sponsor for NRC project on safety culture. He stated that the objective of staff's presentation was to provide insights on the activities the NRC has underway with respect to safety culture, including the development of a proposed policy statement and draft safety culture characteristics for implementation. He also indicated that for purposes of the meeting, safety culture meant an integrated safety and security culture.

Mr. Virgilio noted the importance of safety culture, the role of the policy statement and the draft characteristics, and specific issues that needed to be addressed in the development of the final policy statement. These issues included the need for consistency of the safety culture terminology and expectations between materials licensees and certificate holders, and reactor licensees, coordination with Agreement States, and treatment of security on equal footing with safety. The most "bang-for-the-buck" is going to be with the materials licensees and working with the agreement states. Mr. Virgilio also noted that it will be important to align NRC with industry on some of the definitions and terms but that it would be challenging when one has to think about the spectrum of licensees and certificate holders. Mr. Virgilio then turned the presentation over to David Solorio and June Cai from the Office of Enforcement.

Proposed Commission Policy on Safety Culture

Mr. Solorio introduced his Office (Office of Enforcement) as having the lead on safety culture. He noted that the Office of Enforcement already focused on allegations and safety conscious work environment which is one of the safety culture components. He then introduced those that worked with him on a day to day basis: June Cai, Alex Sapountzis, and Maria Schwartz. Mr. Solorio next described the previous Commission policy statements that related to safety culture, one policy statement in 1989 that addressed the conduct of licensees' operations, and another in 1996 that addressed safety conscious work environment. He described the Davis-Besse head degradation event and Commission direction that followed. He noted that in 2008, the Commission directed the staff to expand the Commission's policy on safety culture to address security, and ensure that the resulting policy is applicable to all licensees and certificate holders. Additionally, the staff should consider strengthening the treatment of safety culture in the reactor oversight program, and consider ways to enhance stakeholder involvement. In May 2009, the staff submitted to the Commission a proposed draft safety culture policy statement with a definition of safety culture and safety culture characteristics. Mr. Solorio noted that the draft policy statement applies to anyone performing or overseeing NRC regulated activities, and includes safety and security as equally important.

Mr. Solorio then turned the presentation over to June Cai. Ms. Cai introduced herself as having a Bachelor's degree in applied psychology, and a Master's degree on psychology human factors with seven and a half years experience with the NRC. Following a brief discussion of previous safety culture assessments, Ms. Cai discussed the relationship between the proposed safety culture characteristics and the reactor oversight process, and how the characteristics were developed to enable an assessment of whether or not a licensee had a positive safety culture. She then described how the staff responded to a number of Commission questions, and the October 2009

Commission direction that approved publication of the draft Safety Culture Policy Statement. The proposed policy statement had been released for a 90 day public comment period. Ms. Cai next discussed steps to be taken, the need for common terminology development and plans to hold public workshops to work on developing common terminology. The staff is planning to submit a final policy statement for Commission approval in March 2011. Ms. Cai noted in her closing remarks that licensee management has primary responsibility for establishing and maintaining a positive safety culture, but that NRC will continue to maintain an independent oversight role.

Member Comments

- Chairman Apostolakis – There are some characteristics that reflect a cause (e.g., lack of resources), while others reflect an effect (e.g., problem identification and evaluation). There should be a distinction. The more important ones will affect the others. Try to focus on the ones that are most important. One major criterion for choosing characteristics is observability. Also, to separate the cause from the effect, incentives could be the cause that leads to the effect (observable).
- Member Maynard – there is guidance on addressing safety: Manual Chapter 0305, Regulatory Information Summary 2006-13, Inspection Procedure 95003, INPO Principles of a good safety culture. But the one thing that is missing is specific criteria; judgment will ultimately have to be made. It's a good list of characteristics, but I am concerned that the list may be too long and may dilute the real focus on safety culture. It may be better to focus on a fewer number of characteristics that are the most important.
- Member Ray – It would seem that being aware of characteristics that threaten safety culture is equally important to looking for good attitudes, good behaviors, and other positive characteristics. Davis Besse is an example, many good things going on but also bad things that went unnoticed. The staff should also focus on incentives being used to motivate people. Certain incentives can have a negative impact as well as a positive impact on safety culture, e.g., if production goals are not met there will be a 20% reduction in pay. Including incentives within one of the safety culture characteristics (accountability) may not be enough; the bin "accountability" may be too large. I would encourage the staff to find a way to include it (incentives) in high level presentations as well as down in the detail.
- Member Abdel-Khalik - Positive attributes in each of the safety culture areas doesn't necessarily guarantee a positive safety culture. The positive findings should be coupled with the absence of negative findings, or lack of attributes that are threatening to safety culture. Also, NRC's list of proposed safety culture characteristics appears to be mixed; some of them are neutral and could be either good or bad situation, e.g., work practices, work planning. Others are characteristics such as continuous learning environment that can be associated with an attribute. It may be better to come up with a list of focus areas, e.g., work practices, work planning and control, problem identification evaluation, problem resolution, and then evaluate these areas from a safety culture perspective.
- Member Ryan – The list of safety culture characteristics looks like two lists, one that contains the attitudes, and the other that contains the results from the attitudes. Safety-conscious work environment, accountability, and continuous learning environment

appear as the three cultural aspects of the safety culture work environment. Prioritization is the message.

- Member Bley – there are not any prioritizations or relationships. Do we know which the real discriminators are? Let's identify metrics of behaviors to find which ones are the key.

High Reliability Organization

Invited expert Earl Carnes (DOE) introduced himself as a senior advisor with the Department of Energy and briefed the Subcommittee on HROs, and its associated characteristics. Mr. Carnes then proceeded to provide a brief overview of HRO history from the time of Three Mile Island, to the current state of conversation. He noted an upcoming international HRO conference early next year, and Valerie Barnes from the NRC Office of Research indicated that they intended to attend. Mr. Carnes then addressed the characteristics of HROs including anticipating and becoming aware of the unexpected, and then containing it once it has occurred. He noted that for an organization to become an HRO, they needed to shift from a deterministic to an adaptive performance model. Some discussion followed that focused on trying to understand the differences between HRO and safety culture. Dr. Carnes noted that HROs recognize that it's the human's ability to adapt to the unexpected that creates safety, not just relying on safety systems and associated technology. Member Abdel-Khalik indicated, however, that there is a conflict between human adaption and procedure compliance that is essential to nuclear plant operation. Chairman Apostolakis suggested that it may be better to talk about making NRC a HRO rather than licensees, but NRC will still need to inspect or be concerned about licensee safety culture. Mr. Carnes then turn the presentation over to Mr. Wreathall.

Safety Culture Initiatives

Invited expert John Wreathall from J.Wreathall&Co began his presentation by introducing the acronym BAG meaning "Been," "At," "Going," or a three step process to share situational awareness when a situation is evolving in a plant, i.e., where it has been, where it is at, where it is going. Mr. Weathall learned the technique from trainers at Seabrook Station. He used the BAG approach to role out his presentation on safety culture first describing how we got to where we are today from past organizational failures, followed by where we are "at" and the three organizational safety behaviors as we view them today (pathological, bureaucratic, generative), to the where we are "going" and that included a discussion of resilience engineering and complex adaptive systems. System properties were described as being either complex, complicated, chaotic, or simple. Mr. Wreathall then briefly described a performance data gathering system developed for EPRI, the Proactive Assessment of Organizational & Workplace Factors (PAOWF). The system allowed plant managers to look at what is going on at their facility in the absence of an event or significant occurrence, i.e., learning from success. Mr. Wreathall concluded his presentation by noting that a few "generative" plants used the system, but most plants believed they knew where to find their vulnerabilities without the tool. Member Maynard commented that INPO and Industry were also providing similar support that reduced the need for such a tool.

Safety Culture in the Reactor Oversight Process

Audrey Klett and Deputy Director Mike Cheek from the Division of Inspection and Regional Support in NRR, and Chuck Casto, the Deputy Regional Administrator from Region IV began the afternoon session by providing an overview of how safety culture is addressed in the reactor oversight process (ROP). The presentation included three parts, the first on how safety culture oversight is implemented within the ROP, the second on how lessons learned from regional experience had been incorporated into the guidance documents, and third on the results of the ROP self-assessments.

Ms. Klett noted that in the wake of the Davis-Besse event, the Commission directed the staff to enhance the oversight of safety culture in the ROP. Changes were made to inspection procedures to enhance evaluation of cross-cutting issues, and safety culture assessments. The Commission also directed the staff to monitor Industry efforts to assess safety culture, which is what they are doing by observing the NEI process.

The presentation then focused on cross-cutting areas, safety culture components and aspects. If four or more inspection findings have a common theme within the cross-cutting area, then a significant cross-cutting issue (SCCI) is identified. NRC will perform or request licensee to perform a safety culture assessment if there are repeated SCCIs. Members questioned how deep the inspection actually goes to try and understand why a SCCI had occurred, i.e., what caused the finding and why did the licensee fail to identify and fix the problem. Explicit examples were requested. Members suggested that a follow-on subcommittee meeting be held to allow a better understanding of how the NRC inspects, finds, digs into, and then closes out significant cross-cutting issues. The proposed meeting should include actual field experience and representatives from the industry in order to get their perspective on how significant cross-cutting issues are being addressed, and to share insights on how the process works.

Ms. Klett next described lessons learned and enhancements made to inspection guidance that included modified definitions of cross-cutting aspects and SCCIs., and better definition of what was meant by third party safety culture assessment. Ms. Klett address ACRS questions on the time allocated to inspectors to scan through licensee's corrective action program entries (30-50 minutes a day), expectations for resolution of staff concerns with a licensee's safety culture, and criteria for safety culture assessments. She noted that substantial guidance had been added to IP 95003 for performing safety culture assessments. Ms. Klett then provided an overview of the ROP self-assessment process and recent improvements to the ROP. Member Ray and Member Maynard agreed that the process has improved but is still not as objective as they would like it to be.

Fostering a Strong Nuclear Safety Culture

NEI representatives Tony Pietrangelo and Tom Haughton presented an approach to foster a strong safety culture in the nuclear industry. Mr. Pietrangelo began the presentation by providing an overview of the challenges facing the Industry today. They included lack of guidance for assessing safety culture, use of different terminology, reliance on limited data to draw conclusions, and Industry not taking advantage of all possible indications of a weak safety culture. Mr. Haughton noted that Industry is concerned about how NRC groups aspects into SCCIs. Given these challenges, NEI established a pilot program to test a new approach described in NEI 09-07, (Fostering a Strong Nuclear Safety Culture). The NEI guidance offers all stakeholders an opportunity to reach a consensus on how to address safety culture at reactor sites. Mr. Pietrangelo indicated that the guidance could be used for a self-assessment (required by INPO every other year), independent assessment, or third party assessment. It evolved from a module put together by the USA Group. The USA Group previously performed about 20 assessments. For clarification, self assessments are performed with about half the team being off-site personnel from a different Company; an independent assessment has no one from the site on the team; third-party assessments have no one from the Company on the team. There are five different sets of questions to address specifically the following: craft, individual contributors, supervisors, managers and senior management.

The following points were made during the presentation:

- A licensee needs to own their safety culture and assess it on a regular basis. Proposed NEI guidance (NEI 09-07) will attempt to accomplish this objective. It's the licensee's responsibility.
- The Industry needs an agreed upon methodology for doing safety culture assessments, i.e., a consistent systematic industry-wide approach with common terminology.
- NEI's approach would change the way NRC is now performing their oversight of safety culture, i.e., grouping findings into significant cross-cutting issues. Implementation would require a Commission decision.
- Four pilot plants in each of the four Regions (North Anna, Hope Creek, Braidwood, and South Texas Project) are being used to exercise the NEI guidance.

Member Ray also stated that it is important to separate the excellence metric from the safety culture metric. It would be a disservice if the two were confused, i.e., an excellent safety culture cannot be achieved without achieving excellence in operational performance. Mr. Pietrangelo agreed.

Stakeholder Comments on Safety Culture

Dave Collins represented himself as a public citizen to provide his "personal views" on safety culture and treatment of safety culture in the ROP. He opened his presentation by referencing

the 2006 GAO report that recommended NRC increase its efforts to assess licensees' safety culture. He discussed the difficulty in defining safety culture, and noted that according to INPO, 70 percent of events have safety culture as a causal factor. Mr. Collins defined safety culture as "Ethical leadership attitudes in a high reliability organization that ensure potentially hazardous activities are managed and operated with a reasonable low risk to people and the environment." Mr. Collins then discussed the importance of trust and leadership when discussing safety culture. He also quoted Schein that safety culture surveys did not work. Mr. Collins stated that there is a need for a crisp and clear definition of safety culture in order to come up with an effective set of indicators, and emphasized that leaders create the culture and that leadership and ethics should be mentioned in the definition of safety culture. When asked by Chairman Apostolakis what were the two or three important points he wanted to make, he stated that the ROP's treatment of Safety Culture cannot be claimed to be predictable, objective, understandable, transparent, risk/performance based. He noted that the ROP does not have a metric for defining an acceptable safety culture.

Closing Discussion

- Member Ray reflected some skepticism about the extent to which outlier events are being represented in daily activities. This is a dimension that may not be captured by the staff. He also would be concerned if prescriptive requirements were to be replaced by performance requirements. Additionally, he thought that the Industry's presentation on fostering safety culture offered the NRC an opportunity to come up with a consensus among stakeholders about how to assess safety culture and to do it regularly not just after something has gone wrong.
- Member Maynard believed that including security in the policy statement may not be a good idea. The more items that are included within the policy, the more the safety piece of the policy becomes diluted. Security is important, but adding it to the safety culture may degrade the focus on safety. Additionally, he felt that the list of safety culture characteristics may be too long and may be getting into all the things you need to do to manage a plant. It will be difficult for the staff to sort out the difference between adequate protection and excellence. One item not discussed is the impact of plant changes, the cost of change and its impact on the safety culture. Someone should step back and look at all the changes taking place and assess its impact from a safety culture perspective.
- Member Ryan also had concerns about including security with safety culture. Security by its very nature restricts communication, whereas safety culture promotes open communication. Having security at the same level as safety may prevent safety communication. Security culture may need to be treated differently. He also agreed with Member Shack's comment that the materials area will be a challenge. Trying to satisfy all the agreement states (now 37) within one policy statement that could potentially affect 17,000 (of 22,000) licensees, makes this a significantly different challenge than in the reactor domain. He suggested that the ACRS get views on safety culture from the agreement states, (either the Organization of Agreement States or the Conference of Radiation Control Program Directors) before coming to a conclusion. Chairman Apostolakis noted that it was a good point.

- Member Abdel-Khalik believed the standardized methodology proposed by Industry was a good start. He also was concerned about the long list of safety culture characteristics, and that they should be prioritized. He noted that having positive attributes does not by itself indicate a positive safety culture,. Negative attributes also need to be considered. If human adaptation as it relates to HRO, is to reflect, collect data, trend, evaluate, assess over the long term, then it becomes a learning organization and this would have a positive safety culture characteristic
- Member Shack noted that in the non-reactor areas that have less engineering safeguards, this could makes safety culture that much more important, and it may very well be the only line of defense. He was not so concerned about the long list of safety culture characteristics. He also commented that HRO may be more applicable to licensees, i.e., in the end, NRC has to regulate to adequate protection of public health and safety. HRO and resilient organization may be something Industry would want to look at. The same holds true for the NRC. The staff will need to come up with performance measures for the safety culture characteristics. Coming up with performance measures in areas like leadership or ethics would present a difficult problem.
- Member Bley believed the definition of safety culture needs more work, especially if it is to be integrated with security. Maybe at a higher level, i.e., organizational level it could be integrated together; it still needs to be worked out.
- Chairman Apostolakis agreed with member comments. He also indicated that the HRO idea may be more appropriate for licensees, and that more time should be spent on internal safety culture and how HRO may apply. He agreed with members that at some point the staff should return and brief the subcommittee on what has been learned from NRC inspections and that eventually the Committee will need to write at least one letter on all that had been heard. This would include results from NRC's Workshops and treatment of public comments on the proposed policy statement; NRC's inspection findings related to significant cross-cutting issues including views from both the NRC and licensee on identification and treatment of findings and path to closure; findings and conclusions from NEI's four pilot plant activities and use of NEI 09-07 guidance to address safety culture; NRC's internal safety culture and whether HRO initiatives should apply; views from the agreement states, (either the Organization of Agreement States or the Conference of Radiation Control Program Directors) on the proposed policy statement.
- David Collins commented that the problem with safety culture is in the definition. He recommended the Committee focus on coming up with a better definition that would address the six problems he had with the staff's definition.
- Mr. Meshkati commented that NRC needs to put more resources into the research budget on safety culture.