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

February 23, 2011

MEMORANDUM TO: ACRS MEMBERS

FROM: Michael L. Benson, Staff Engineer ***/RA/***
Reactor Safety Branch A

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS RADIATION PROTECTION AND NUCLEAR MATERIALS SUBCOMMITTEE MEETING, JANUARY 11, 2011, ROCKVILLE, MARYLAND

The minutes of the subject meeting, have been certified as the official record of the proceedings for that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc via e-mail: E. Hackett
C. Santos
Y. Diaz-Sanabria

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

MEMORANDUM TO: Michael Benson, Staff Engineer
Reactor Safety Branch A, ACRS

FROM: Michael T. Ryan, Chairman
Radiation Protection and Nuclear Materials Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE MEETING OF THE SUBCOMMITTEE ON RADIATION PROTECTION AND NUCLEAR MATERIALS ON JANUARY 11, 2011

I hereby certify, to the best of my knowledge and belief, that the Minutes of the subject meeting held on January 11, 2011 are an accurate record of the proceedings for that meeting.

/RA/ ***February 9, 2011***

Michael T. Ryan, Chairman Date
Plant License Renewal Subcommittee

Certified by: Michael Ryan
Certified on: February 9, 2011

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
Radiation Protection and Nuclear Materials Subcommittee Meeting Minutes
January 11, 2011
Rockville, MD

INTRODUCTION

The Advisory Committee on Reactor Safeguards (ACRS) Subcommittee on Radiation Protection and Nuclear Materials met on January 11, 2011 at 11545 Rockville Pike, Rockville, MD, in Room T2-B1. The purpose of the meeting was to review and discuss the staff white paper entitled, "A Comparison of Integrated Safety Analysis (ISA) and Probabilistic Risk Assessment (PRA)." The Subcommittee will hear presentations from the Nuclear Regulatory Commission (NRC) staff and the Nuclear Energy Institute (NEI). The Subcommittee gathered information, analyzed relevant information and facts, and formulated proposed positions, as appropriate, for deliberation by the full ACRS. The entire meeting was open to the public. Mr. Michael Benson was the Designated Federal Official for this meeting. The Subcommittee received no written comments or requests for time to make oral statements from any members of the public regarding this meeting. The meeting was convened at 1:00 pm and adjourned at 4:39 pm.

ATTENDEES

ACRS

Michael T. Ryan, Chairman
J. Sam Armijo
Sanjoy Banerjee
Dennis Bley
Dana Powers
John Sieber

John Flack, Consultant
Mohammad Modarres, Consultant

Michael Benson, Designated Federal Official

Other attendees are listed in the attached document.

SUMMARY OF MEETING

Opening Remarks

Chairman Ryan called the meeting to order and introduced the attending Members. He called upon Ms. Bailey to begin the presentations.

[pp. 5-7 in the transcript]

Staff Opening Remarks and Summary of Commission SRM

Ms. Bailey said that the ISA-PRA comparison was initiated in response to the Commission's direction to revise the fuel cycle oversight process (FCOP). While the current oversight program is adequate for ensuring safety and security, it could be improved. Risk insights gained from the ISA could make the FCOP more risk-informed, performance-based, predictable, and

transparent. Commission Staff Requirements Memoranda (SRM) issued between 2005 and 2009 directed the staff to examine whether quantitative performance measures were feasible. In 2007, NRC's Office of Inspector General recommended that the staff develop a more structured FCOP.

In March 2010, the staff submitted to the Commission SECY 10-0031, which proposed a plan for the FCOP revision. One element of the staff's proposal was to prioritize the inspection program using results of the ISA. Moreover, the staff proposed a significance determination process (SDP) for evaluating the safety significance of inspection findings.

The Commission disapproved of the staff's plan and directed staff to (1) prepare a paper comparing ISA and PRA techniques and (2) develop cornerstones that could apply to a revised FCOP. The staff is to integrate the insights gained from these two activities into a new plan for revising the FCOP. The new FCOP should provide incentives for licensees to maintain strong corrective actions programs (CAPs). The paper comparing ISA to PRA is only one piece of the staff's effort to revise the FCOP.

Ms. Bailey explained that ISA and PRA are being compared for two applications: (1) demonstrating safety under Title 10, Code of Federal Regulations, Part 70 (10 CFR Part 70) and (2) determining significance of inspection findings. While PRA are performed to provide risk estimates, ISA are not intended to reflect an actual risk calculation. ISA are performed to identify potential hazards at a facility, to identify Items Relied on for Safety (IROFS), to prevent or mitigate the hazards, and to identify management measures that ensure the availability and reliability of the IROFS. This process is sufficient for establishing the safety basis for a fuel facility. Developing a fully quantitative PRA would create a resource burden for both the industry and the regulator. The cost of developing a PRA for all fuel facilities may not be justified, given that ISA are adequate for ensuring public health and safety.

ISA were not intended to provide risk estimates, meaning they may not be right for a quantitative SDP. A quantitative analysis may be applied on a case-by-case basis for significance determination. Very few violations would require such an approach.

[pp. 7-45 in the transcript, slides 2-6 in opening presentation]

Overview Comparison of ISA/PRA Methods

Mr. Damon explained that the SRM directed the staff to do a comparison and critical evaluation of ISA against PRA. Two potential applications of ISA and PRA could be establishing a safety basis and significance determination of inspection findings. ISA were put in place for establishing a safety basis, not for calculating risk. Risk information gleaned from an ISA may need to be supplemented with other information to assess true risk significance.

ISA is part of the regulatory structure of 10 CFR Part 70, Subpart H. Its purpose is to (1) identify the sequences that may be of intermediate or high consequence and (2) evaluate whether the events satisfy the performance requirements. The rule requires that high consequence events be "highly unlikely" and the intermediate consequence events be "unlikely." While the regulation does not specify what constitutes "highly unlikely" and "unlikely," there is guidance in the standard review plan for fuel cycle facilities. Ultimately, the licensee/applicant must make this determination, subject to NRC review.

Mr. Damon said that the first two sections of the comparison paper describe what ISA and PRA are and what they are used for. Section 3 is an evaluation of the adequacy of the ISA methodology for making a safety determination. Section 4 introduces Section 5 by showing that an SDP is only one element of a potential FCOP. Section 5 contains an example of using ISA and PRA for significance determination of inspection findings.

An inspection finding is a deficiency that has an impact on risk. The example illustrates a situation where an IROFS is disabled. The loss of an IROFS elevates the frequency of an accident sequence. Evaluating quantitatively the change in risk may be difficult with an ISA, since they do not necessarily supply all the information that may be needed. For one thing, the licensee may have additional safety controls that are not credited in the ISA. Also, offsite consequences in an ISA are often calculated assuming worse-case weather conditions. Hence, additional safety margins, not accounted for in the ISA, may exist at the facility.

[pp. 45-84 in the transcript, slides 1, 2, 5 in comparison presentation]

The SDP example involves enriched uranium in solution in a subcritical geometry. If the container leaks, the fluid should flow to a containment dike, which is also safe by geometry. The example scenario postulates that an inspector discovers a leak path in the dike that leads to a container with unsafe geometry. A process overflow or a process leak would lead to a possible criticality accident. The example calculates the additional risk incurred as a result of the defective dike.

[pp. 85-119 in the transcript, slides 29-31 in comparison presentation]

Ms. Bailey said that the ISA-PRA comparison is just one piece of the FCOP revision. The staff will develop cornerstones and integrate knowledge gained into the next steps for enhancing the FCOP. Staff from the NRC Offices of Nuclear Materials Safety and Safeguards, Enforcement, and Region II will develop the necessary changes regarding CAPs for fuel cycle facilities. Ms. Bailey concluded her presentation on two points: (1) ISA are sufficient for establishing a safety basis for fuel facilities and (2) a quantitative SDP can be implemented on a case-by-case basis.

[pp. 120-128 in the transcript, slide 7 in opening presentation]

Stakeholder Comments

Ms. Schlueter provided opening remarks for the industry presentation.

Mr. Vaughan said that, while the idea of the FCOP revision did not originate with industry, the industry feels that the results of such a process should be reproducible and transparent. All fuel facilities have proceduralized CAPs.

The industry is concerned about the possibility of implementing PRA into an SDP. There is a lot of diversity in the industry, making it difficult to develop databases and uniform models. The fuel facilities do not employ batch processes. Rather they are sequential and stepwise, with disconnects throughout the process. A facility does not have to run through a failure in one step. IROFS are generally designed to stop accidents before they happen.

The tools industry uses in developing ISA have extensive history of use in the chemical industry. Management measures ensure that IROFS are functional when needed. ISA provides a current and adequate safety basis for each facility.
The initial steps of ISA are similar to PRA. The PRA is a different tool for a different job. The industry has expended significant resources developing the ISA technology. The ISA is designed to demonstrate that the performance requirements of 10 CFR 70.61 are met. An accident at a fuel facility is localized, so that no “domino effect” is of concern. Source terms are small for fuel facilities relative to that of reactors.

Mr. Vaughan explained that there is a need to put the fuel cycle facility risk in context. The worst fuel cycle accident was the Tokaimura criticality.

Mr. Vaughan summarized the industry's presentation by reiterating that SDP should not require rigorous PRA techniques.

[pp. 129-165 in the transcript, slides 1-9 in industry presentation]

COMMITTEE DISCUSSION

Staff Opening Remarks and Summary of Commission SRM

Member Powers asked about the type of risk information the Commission wanted the staff to account for. Mr. Damon explained that some things are not clear, since the direction was issued prior to the terms of the current Commissioners. The interaction between the ACRS and the Commission on revising the FCOP occurred before ISA were implemented. It has been a long process, and it is not clear what the current Commissioners think about this issue. Member Powers pointed out that the previous Commissioners could have been asking about accident sequences, bottom line quantitative results, risk metrics, or importance metrics. Mr. Damon replied that the current Chairman has mentioned that he was in favor of the predictable, objective method applied in the reactor oversight process.

Member Armijo asked about cost versus benefit of making the FCOP more risk-informed. Ms. Bailey said that the staff are not necessarily looking for an improvement in safety. They want a more structured, predictable method to help focus their inspection resources. Member Powers commented that the ISA system is not very efficient. The documents are highly detailed, with much effort being spent on identifying important components. Chairman Ryan stated that the ISA is a daunting task. Licensees gain an understanding of their facility's risk profile and can better manage their facilities. This understanding could lead to improvements in the inspection process.

Member Armijo wondered who would be doing the work to improve the FCOP. Member Bley asked about a comparison of the level of effort between a PRA and a highly-detailed ISA [like the one completed for the Mixed Oxide (MOX) Fuel Facility]. Mr. Damon pointed out that one of the centrifuge enrichment facilities has sixty IROFS, while the MOX facility has 12,000. There is a huge range of complexity for these facilities. The IROFS for the centrifuge plant have been risk ranked by the staff, but doing the same thing for the MOX facility would be resource intensive.

Member Sieber pointed out that offsite populations are not in danger from fuel facility accidents. He asked about the balance between the amount of effort required to perform risk assessments versus the potential benefits to public and worker safety. Mr. Damon said that the rule requires the licensee/applicant to consider accidents with high consequences. A cylinder rupture at Sequoyah Fuels led to NRC regulation of chemical consequences related to licensed material. The ISA approach comes from a technique known as process hazard analysis, which was required in Occupational Safety and Health Administration (OSHA) regulations. So, ISA were already being implemented in the chemical industry when they were included in NRC regulations. According to a memorandum of understanding between OSHA and the NRC, an NRC inspector will inform OSHA if he/she notices a safety violation under OSHA's purview (and vice-versa).

[pp. 9-23 in the transcript, slide 2 in opening presentation]

Member Armijo asked about fuel cycle facilities that do not have CAPs. Ms. Bailey pointed out that CAPs are not a regulatory requirement. Ms. Silva said that there is no guidance on what the NRC considers to be an adequate CAP. Member Armijo asked about inspections of a facility's CAP. Ms. Silva explained that the staff does look at what issues are in the CAP and how the licensee dispositions them.

Chairman Ryan asked whether staff inspections included non-radiological events or events not covered by an NRC license. Mr. Morey explained that they inspect only issues that fall within the license. While CAPs are not required by any license, all licensees are required to correct deficiencies. Chairman Ryan observed that the inspector may find a broad range of approaches to correcting deficiencies. Ms. Bailey said that the Commission wants the staff to provide incentives for licensees to develop formal CAPs.

Member Powers asked about providing credit for CAPs without having a standard for measuring the effectiveness of such programs. Ms. Silva agreed that the staff must develop best practices to provide a baseline from which to evaluate CAPs. Member Powers observed that the biggest challenge in a fuel cycle facility CAP is root cause analysis. Mr. Campbell explained that some fuel cycle facilities have committed to NRC-approved quality assurance programs. If not, then the licensees have to address incident investigation under "management measures." It are these management measures that need to be enhanced.

Mr. Damon stated that the Commission asked the staff to use a fuel facility's CAP in the same manner they are used in the ROP. Currently, findings that may be of low safety significance are dispositioned through an enforcement process. A revised FCOP may allow those findings to be handled by the licensee's CAP.

The staff evaluated the significance of all the criticality and chemical safety violations at fuel cycle facilities over the last five years. Based upon qualitative criteria, half of the events screened as low safety significance. The next step would be to use a quantitative process, which would likely screen a few more events as low safety significance. The vision is to allow the licensees to fix the low-significance problems through their CAPs, without having to evoke the enforcement process. Mr. Tschiltz said that strong CAPs must be created so that they are reliable for correcting minor deficiencies before they escalate into serious problems.

[pp. 25-35 in the transcript, slide 4 in opening presentation]

Member Banerjee pointed out that fuel cycle facilities often employ batch processes and that PRA is not usually performed in these cases. Dr. Modarres said that there are human actions in the control room that are proceduralized step by step. These actions are considered as sequences of events in PRA. Member Bley said that HAZOP is applied to define scenarios before the PRA is conducted. Chairman Ryan pointed out that a batch process can start to appear like a continuous process as the steps making up the process increase in complexity.

Member Armijo wondered if a PRA would actually increase safety. Chairman Ryan observed that a process hazards analysis has the same attributes as a PRA without the probability. Mr. Damon said that HAZOP is useful, because it is a structured in a way to think about what can go wrong. They first identify an abnormal condition and then identify a manner in which to control the situation. PRA is much more detailed in that probabilities are assigned to certain events. Member Banerjee said that performing the PRA is expensive. Member Bley observed that, for a complex facility like MOX, the ISA process can be resource intensive.

Member Bley asked if the staff had received complaints about the current FCOP being too arbitrary. Ms. Bailey said that there was a sense from the previous Commission that the FCOP could be more structured and predictable.

[pp. 36-43 in the transcript, slide 4 in opening presentation]

Overview Comparison of ISA/PRA Methods

In response to a question from Member Banerjee, Mr. Damon explained that two of the approved ISA contained identified accident sequences with assigned frequencies for events. Most licensees use a risk index method, which is a rough approximation. Sometimes the licensee modifies the risk index based upon operating experience. Member Bley pointed out that none of the facilities have aggregated the results in a way that allows for meaningful comparison, and Mr. Damon agreed. The rule dictates that the licensee should not sum over accident sequences. If licensees were to perform a sum, then the staff would have to specify an appropriate risk metric. The rule was structured on a sequence-by-sequence basis.

Member Banerjee pointed out that the chemical industry extracts maximum probable property damage and fatalities from their analyses. Member Sieber said that Member Banerjee's example applies to individual accident sequences. There is, however, no equivalent to core damage frequency for reactors. Chairman Ryan said that the chemical industry has robust databases on equipment reliability, so there is some confidence that an analysis at one facility can be compared to an analysis at another facility.

Member Banerjee pointed out that a reprocessing plant is a chemical plant, so there should be no reason for using methodologies that are not already applied in the chemical industry. Mr. Damon said that consequences are quantitative, because the rule requires it. The licensee defines quantitative criteria for "endangering the life of workers," as stated in the rule. Then, they perform calculations, such as a worst case weather dispersion analysis for a chemical release, to determine if the event reaches the threshold. To comply with the rule, they just need to define whether the event is "high consequence" or "intermediate consequence." A criticality event does not require calculations. If a worker is within ten feet of the source, then there will be a fatality. A criticality is assumed to be of high consequence. An onsite chemical release can be more difficult to analyze realistically, so licensees often make a conservative assumption that the event reaches the high consequence threshold.

[pp. 46-54 in the transcript, slides 3, 17-18 in comparison presentation]

Member Banerjee observed that the HAZOP process is a qualitative method to deal with high-consequence events. An advantage of the method is that it can be used for a wide variety of facilities. Mr. Damon said that the rule was intended to achieve that flexibility. The purpose of the ISA was to have knowledgeable people justify the adequacy of the facility design and document that justification. Annual ISA summaries are sent to the NRC staff documenting any changes made to the facility.

Dr. Modarres asked about the level of detail of the event sequences developed for ISA. Mr. Damon said that the level of detail is similar to that of PRA event sequences. Dr. Modarres pointed out that, while probabilities could not be summed over all sequences, a sequence-by sequence analysis could be applied within the ISA context. Mr. Damon replied that, in order to have an SDP, the risk metric must be summed over all sequences. There is a summation problem, since fuel facilities have multiple risk sources (e.g., chemical and criticality hazards) and multiple receptors. In a reactor PRA, there is only one source of risk.

Member Banerjee said that HAZOP does not assign frequencies to events. The process seems to say an event can or cannot happen. Chairman Ryan agreed.

Dr. Modarres asked about identifying the most significant source terms. Mr. Damon emphasized that NRC regulations require one extra step after the HAZOP: determining that high consequence events are highly unlikely.

[pp. 56-68 in the transcript, slides 5, 17 in comparison presentation]

Member Banerjee asked about the initial ISA that were implemented. Mr. Damon responded that they involved a large number of workers after the design of facilities had been finalized. The large number of workers was necessary to have all the right information: criticality safety, failure rates of components, etc. Dr. Modarres said that the level of effort may even be more for an ISA than a PRA. Mr. Damon said that the NRC did not spend any resources developing ISA tools. There are no standards that the industry must follow. Chairman Ryan pointed out that there are commercial tools available, but no standards.

Mr. Damon explained that criticality accidents are unique to fuel cycle facilities and that these accidents were difficult to model probabilistically. Mr. Bley replied that using a PRA does not necessitate going into the great depth of detail that makes criticality accidents difficult to model.

Member Banerjee said that expert elicitation could be applied to obtain more quantitative data. Mr. Damon responded that there is no database with failure data for fuel cycle facilities. Furthermore, the ISA contain proprietary information.

Chairman Ryan asked about the known history of criticality accidents and whether that experience was bounding. Mr. Damon said that they have all been solution criticalities, so not much is known about criticality in a wet powder or other possible scenarios.

[pp. 73-84 in the transcript, slide 1 in comparison presentation]

Chairman Ryan asked whether any licensees process highly-enriched uranium or plutonium. Fissile material could accumulate in air ducts in these facilities, creating a criticality concern. Mr. Damon said that there were two facilities that manufacture naval reactor fuel. While no criticality has occurred, uranium oxide powder has accumulated in ventilation ducts. The criticality events have all occurred in the liquid state due to the lack of safe geometry. The last criticality event in the United States occurred in 1979.

Member Armijo asked about a finding of less potential consequence than an accumulation of highly-enriched uranium. Mr. Damon explained that they may not be evaluated quantitatively. Qualitative screening criteria can be used to filter findings before a quantitative evaluation is undertaken. Member Armijo stated that the process would be most useful for situations that fall in between the obviously significant and obviously insignificant events. Mr. Damon said that one must consider the redundant systems that are in place to mitigate accidents. If all controls have failed with no serious accident actually occurring, then that is still a significant event. A rough order of magnitude is all that is needed to perform significance determination.

Dr. Flack asked about the ISA that contained quantitative information. Mr. Damon said that the more quantitative analyses are clearer about certain aspects. Chairman Ryan said that quantitative analyses allow for better comparisons across systems and facilities. Mr. Damon explained the process the staff goes through to evaluate the ISA.

Dr. Flack asked about how the staff knows what is important at a facility, without having a quantitative analysis. Mr. Damon stated that the ISA were not created to provide that information. The staff has considered the risk significance of IROFS at centrifuge enrichment plants. The process could not be extended to the MOX facility, because of the large number of IROFS involved.

Member Powers asked about ranking IROFS for the MOX facility to prioritize inspection resources. Mr. Tiktinsky explained that the staff identified 200 IROFS that covered important events. The component list associated with the relevant IROFS was then used to identify potential inspection items. Member Powers observed that identifying the most risk-significant inspection items on an intuitive basis is not always straight forward. Mr. Tiktinsky stated that there is flexibility in the program to consider additional inspections, if appropriate. However,

there is a need to lay out the basic idea of the program in advance of implementing it. Member Powers said that, using the Surrey Nuclear Plant as an example, PRA often find combinations of events that would not have been discovered otherwise.

Dr. Flack asked whether Brookhaven National Laboratory's quantitative analysis on red oil accidents at the MOX facility was valuable. Mr. Tiktinsky stated that the Brookhaven analysis was one part of establishing reasonable assurance of safety at the MOX facility.

Member Armijo asked about the overall deliverables of the FCOP revision project. Ms. Silva explained that the inspection manual chapters would have to reflect the new cross-cutting issues, cornerstones, and SDP. The inspection procedures would have to be updated to align with the cornerstones. The revised enforcement policy would largely reflect the use of licensee CAPs to disposition findings of low risk significance. The licensee performance assessment would be revised such that it is more structured and predictable. The licensee may have to demonstrate that their CAP is acceptable.

Mr. Damon explained that many aspects of the new FCOP remain unseen. The purpose of the original SECY paper to the Commission was to determine whether such a project would be feasible.

[pp. 90-119 in the transcript, slide 31 in comparison presentation]

Member Bley asked whether the staff has completed work on developing the cornerstones. Ms. Bailey said that they want to engage stakeholders on the cornerstones by March. The Commission may be provided recommendations for revising the FCOP in July 2011.

[pp. 121-122 in the transcript, slide 7 in overview presentation]

Member Bley pointed out that past PRA with extreme detail in the analysis were unsuccessful. Some forethought in how PRA may be practically implemented for a fuel cycle facility could make it a useful tool.

Dr. Flack asked whether the staff would have to develop in-house models for the SDP. Mr. Damon explained that it all depends on available resources and what the staff learns as it proceeds. Knowledge of human error modeling and failure rates would likely need to be improved.

[pp. 125-126 in the transcript, slide 7 in overview presentation]

Stakeholder Comments

Member Bley observed that not all significant issues are always correctly input into reactor CAPs. He wondered if fuel cycle facilities employed methods of ensuring issues were input into the CAP. Mr. Vaughan said that the fuel facility CAPs procedurally dictate the types of issues that are must be input into the system.

[pp. 132-134 in the transcript, slide 1 in industry presentation]

Member Bley asked whether IROFS failures had to be reported to the NRC. Mr. Vaughan said that IROFS failures had to be recorded and investigated by the licensee. The documentation must be available for NRC inspection. Member Armijo asked whether IROFS failures were included in annual summaries submitted to the NRC. Mr. Vaughan said that the reports are only maintained onsite. The inspectors usually make a judgment about which IROFS are most important and examine the licensee's treatment of the failure.

Member Bley asked about the level of communication among fuel cycle facilities through NEI. Mr. Vaughan said that the companies are willing to share operating experience, as long as proprietary information is not divulged. Ms. Schlueter said that periodic conference calls cover operating experience that is generic to the industry as a whole.

Member Sieber asked about tracking IROFS failures. Mr. Vaughan said that the IROFS system as a whole, including the trigger mechanism and the protective action, are considered. Member Sieber said that the NRC staff should look for underlying causes of IROFS operations in order to determine the safety posture of the facility. Mr. Vaughan explained that NRC inspectors look at IROFS failures often as part of routine Regional inspections.

Member Bley asked about the frequency with which IROFS fail. Mr. Tschiltz said that Part 70 does have reporting requirements for IROFS failures that could create a substantial safety hazard. Dr. Modarres asked about failure of an administrative IROFS. Mr. Tschiltz explained that any event that causes a plant to cease meeting a performance requirement is reportable.

[pp. 138-147 in the transcript, slide 4 in industry presentation]

Member Bley pointed out that a tremendous amount of resources was expended to prepare the MOX facility ISA and wondered whether the PRA method would have been more economical. Member Armijo said that the MOX facility is an outlier in terms of complexity. Mr. Vaughan said that most facilities have some degree of screening. Using a consequence-likelihood matrix, certain things can be screened out of the analysis.

[pp. 148-153 in the transcript, slide 5 in industry presentation]

Member Powers asked about the public perception of a radiation release at a fuel facility. Mr. Vaughan said it would be unfavorable, but that the true offsite impact would be negligible.

[p. 154 in the transcript, slide 6 in industry presentation]

Members Banerjee, Armijo, and Ryan pointed out that Mayak at Kyshtym was a high-consequence event at a fuel facility. Mr. Vaughan said that US fuel facilities do not have the same risks, since no decay heat is involved.

[pp. 156-157 in the transcript, slide 6 in industry presentation]

Member Powers asked how ISA is performance based when they do not compute risk. In answer, Mr. Vaughan referred to the performance requirements in the regulations. Dr. Flack pointed out that the performance requirements apply when licensing the plant. He asked about assessing the plant's performance during operation. Member Powers asked whether a plant would have to be shut down due to performing maintenance on an IROFS. Mr. Vaughan said that the plant would have to shut down if an IROFS was taken out of service. Dr. Flack asked whether there was an action statement, like in a reactor technical specification, that required the fuel facility to shut down upon declaring an IROFS inoperable. Mr. Vaughan clarified that only the unit operation that is protected by the damaged IROFS would have to shut down.

Dr. Modarres asked about the possibility of common cause failure of redundant IROFS. Member Bley said that there is no useful guidance on treating dependencies or human actions. Mr. Vaughan replied that the fuel cycle industry tends to accept the criticality experts' definition of "independence."

[pp. 158-163 in the transcript, slide 8 in industry presentation]

Dr. Flack pointed out that defense-in-depth items are not credited for meeting the rule's performance requirements. He asked whether a facility can take credit for a defense-in-depth component when the IROFS is taken out of service. Mr. Vaughan said that defense-in-depth can only be considered when they are subject to the same requirements and controls as IROFS. Typically, the defense-in-depth measure would not be credited. Dr. Flack pointed out that a PRA would always account for the defense-in-depth components.

[pp. 165-168 in the transcript, slide 9 in industry presentation]

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE MEETING ON RADIATION PROTECTION AND NUCLEAR MATERIALS

January 11, 2011
Date

PLEASE PRINT

	NAME	AFFILIATION
1	Janet Schlueter	NEI
2	Charles Vaughan	NEI
3	~~Scott Sloan~~	~~NRC~~
4	Charles Brinkman	Westinghouse
5	James Ross	GE-Hitachi
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE MEETING ON RADIATION PROTECTION AND NUCLEAR MATERIALS

January 11, 2011
Date

PLEASE PRINT

	NAME	NRC ORGANIZATION
1	Chris Ryder	NMSS/FCSS/FMB
2	Soly I. Soto	NMSS/FCSS/HOOB
3	Dennis Damon	"
4	Jack Guttmann	NMSS/HLWRS/EB
5	Pamela Longmire	NMSS/SFST/LB
6	MAMSSA BAILEY	NMSS/FCSS
7	Patricia Silva	NMSS/FCSS
8	Gary DeMoss	RES/DRA
9	Michelle Gonzalez	RES/DRA
10	Chris Markley	NMSS/HLWRS
11	DAMARIS ARROYO	NMSS/FCSS/MOOB
12	Jonathan Marcano	NMSS/FCSS
13	LARRY CAMPBELL	" "
14	DENNIS MORE	NMSS/FCSS/TSB
15	KEITH COMPTON	NMSS/HLWRS/IDAD
16	Mike Telford	NMSS/FCSS
17	Cynthia Ramirez	NMSS/FCSS
18	Yong Kim	NMSS/HLWRS
19	Jonathan DeJesus	NMSS/FCSS
20	Rex Wescott	NMSS/FCSS
21	Dan Tikvinsky	NMSS/FCSS
22	Ranga Jagannath	NMSS/HLWRS
23	Cathy Haney	NMSS
24	PETE HABIGHORST	NMSS.
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