

June 15, 2000

MEMORANDUM TO: ACRS/ACNW Members

**/RA/**

FROM: Michael Markley, Senior Staff Engineer  
ACRS

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS/ACNW JOINT  
SUBCOMMITTEE MEETING ON THE DEVELOPMENT OF RISK-  
INFORMED REGULATION IN THE OFFICE OF NUCLEAR MATERIAL  
SAFETY AND SAFEGUARDS, MAY 4, 2000, ROCKVILLE, MARYLAND

The minutes of the subject meeting, issued June 14, 2000, have been certified as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc: via E-mail  
J. Larkins  
H. Larson  
ACRS Staff Engineers  
ACRS Fellows

**CERTIFIED BY:**

B. John Garrick - 6/15/00

ACRS-3203  
Date: 6/14/00

CERTIFIED MINUTES OF THE  
ACRS/ACNW JOINT SUBCOMMITTEE MEETING  
MAY 4, 2000  
ROCKVILLE, MARYLAND

**INTRODUCTION**

The U.S. Nuclear Regulatory Commission (NRC) Joint Subcommittee of the Advisory Committee on Reactor Safeguards (ACRS) and the Advisory Committee on Nuclear Waste (ACNW) met on May 4, 2000, at 11545 Rockville Pike, Rockville, MD, in Room T-2B3. The purpose of this meeting was to discuss the development of risk-informed regulation in the Office of Nuclear Material Safety and Safeguards (NMSS), including risk-informed fuel cycle programs, integrated safety assessments (ISAs), byproduct risk analysis, dry cask storage risk analysis, the results of a public workshop on the use of risk information in regulating the use of nuclear materials, and related matters.

The entire meeting was open to public attendance. Mr. Richard K. Major was the cognizant ACRS/ACNW staff engineer for this meeting. The meeting was convened at 8:30 a.m. and adjourned at 3:45 p.m.

**ATTENDEES**

ACRS/ACNW Members

G. Apostolakis, ACRS Member  
J. Garrick, Co-Chairman, ACNW  
G. Hornberger, ACNW Member  
T. Kress, Co-Chairman, ACRS

R. Major, ACNW Staff  
M. Markley, ACRS Staff  
J. Sorensen, ACRS Fellow  
R. Savio, ACRS/ACNW Staff

Principal NRC Speakers

J. Flack, NMSS\*  
A. Rubin, RES\*  
T. Sherr, NMSS

B. Ulrich, NRC Region I  
M. Virgilio, NMSS

Principal Industry Speakers

None.

Participation by Members of the Public

R. Bernero

NMSS Office of Nuclear Material Safety and Safeguards  
RES Office of Nuclear Regulatory Research

There were approximately 7 members of the public in attendance at this meeting. A complete list of attendees is in the ACRS/ACNW Office File, and will be made available upon request. The presentation slides and handouts used during the meeting are attached to the office copy of these minutes.

### **OPENING REMARKS BY THE SUBCOMMITTEE CHAIRMAN**

Dr. B. John Garrick, Co-Chairman of the ACRS/ACNW Joint Subcommittee convened the meeting at 8:30 a.m. He introduced Dr. Kress as the Co-Chairman of the Joint Subcommittee as well as the ACRS/ACNW Members in attendance. He stated that the purpose of this meeting was to discuss the development of risk-informed regulation in the Office of Nuclear Material Safety and Safeguards (NMSS), including risk-informed fuel cycle programs, integrated safety assessments (ISAs), byproduct risk analysis, dry cask storage risk analysis, the results of a public workshop on the use of risk information in regulating the use of nuclear materials, and related matters.

Dr. Garrick stated that the Subcommittee had received no written comments from members of the public but noted that Mr. Robert Bernero, former Director of NMSS, requested time to make an oral statement.

### **DISCUSSION OF AGENDA ITEMS**

#### **NRC Presentation**

Mr. Martin Virgilio, NMSS, led the discussion for the NRC staff and provided an overview of the staff's approach to risk-informing NMSS activities. Dr. John Flack, NMSS, discussed the status of staff efforts to implement SECY-99-100, "Framework for Risk-Informed Regulation in the Office of Nuclear Material Safety and Safeguards," including training activities and feedback from the public workshop held April 25-26, 2000. Mr. Alan Rubin, RES, discussed the pilot plan to develop a probabilistic risk assessment for dry cask storage. Mr. Thomas Sherr, NMSS, discussed the proposed revision to 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." Ms. Betsy Ullrich, NRC Region I, discussed the studies in NUREG/CR-6642, Vol. 1-3, "Risk Analysis and Evaluation of Regulatory Options for Nuclear Byproduct Material Systems." Significant points raised during the presentations include:

#### **Approach to Risk-Informing NMSS Activities**

- ! In a Staff Requirements Memorandum dated June 28, 2000, the Commission approved the staff's proposal (five step process) in SECY-99-100 and directed the following actions:
  - S development of appropriate nuclear material safety goals analogous to the Commission's Goal Policy Statement for reactors,
  - S development of a goal for the avoidance of property damage and associated metrics,

- S evaluation whether critical groups can be defined for classes of nuclear material use, consistent with recent Commission decisions on the License Termination Rule (10 CFR Part 20) and proposed rule on high-level waste disposal at Yucca Mountain (10 CFR Part 63).
- ! In July 1999, NMSS established a Task Force on Risk Assessment and Risk Management.
- ! In response to the ACRS/ACNW joint report (SECY-99-100) dated November 17, 1999, the staff completed the following actions:
  - S developed screening criteria,
  - S solicited public input on possible screening criteria and safety goals,
  - S initiated action to examine risk assessment methods and metrics currently applied or proposed for use in NMSS, and
  - S refined needs and programs for personnel training and development.

### **Training and Public Feedback**

- ! The staff is pursuing a three-tier approach to training. This includes training for both headquarters and regional NRC personnel. Training will also be needed for Agreement State representatives.
  - S Tier 1: managers and supervisors
  - S Tier 2: technical staff (pilot program)
  - S Tier 3: risk analysts and specialists
- ! A major portion of the public workshop focused on identifying candidate regulatory applications and associated screening criteria. Candidate criteria include:
  - S maintaining or improving safety, improving the effectiveness of NRC programs and processes, and reducing unnecessary burden.
  - S analytical tools exist or can be developed.
  - S implementation can be realized at a reasonable cost.
- ! Areas of suggested candidate applications include: broad scope licenses, unsealed sources, sealed sources and gauges, and transportation.
- ! During the public workshop, there was general agreement that the development of nuclear material/waste safety goals would be worthwhile, but should be qualitative. The relationship between safety goals, strategic goals, performance goals, and regulations needs to be well defined. Risk-informed regulatory initiatives should be pursued in parallel with development of safety goals.
- ! The NRC should use case studies to clarify how risk-informed regulatory initiatives will be implemented in different areas. Suggested case studies include: waste disposal and decommissioning; casks, packages, and transportation; sealed and unsealed sources; medical use of isotopes; and large process facilities.

## PRA for Dry Cask Storage

- ! The staff proposes to develop a pilot PRA for a spent fuel dry cask storage system. The staff expects this analysis to provide the basis for developing other site-and design-specific PRAs. The staff stated that this will also provide information for the development of a safety goal and possible risk-informed revisions to 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste."
- ! The Holtec International HI-STORM 100 System has been selected for the pilot PRA. Preliminary events initiators (impact, thermal, criticality, etc.) and system modes (handling, on-site transport, and storage) have been identified for event sequence analysis. Events are being considered for normal and accident conditions, site-related natural phenomena, and man-made incidents. The staff plans to consider both environmental release probability and radiation-induced latent cancer fatalities (dose).
- ! The staff plans to develop screening and preliminary consequence analysis to eliminate inconsequential or risk-insignificant initiators and sequences from further consideration. This is expected to provide insights for the need for more detailed quantitative and qualitative analysis.

## 10 CFR Part 70

- ! Fuel facilities have diverse processes that rely heavily on human actions for safe operations. There are more administrative controls than engineering controls.
- ! A number of fuel facilities have developed Integrated Safety Assessments (ISAs) as a condition of their license. The proposed revision to 10 CFR Part 70 requires licensees to perform an ISA identifying "items relied on for safety" to prevent and mitigate accidents. The rule mandates that measures be established to ensure that these items are available and reliable and that performance requirements be established for each type of accident identified in the ISA.
- ! The proposed rule mandates that the ISA identify radiological and chemical hazards, accident sequences, consequences and likelihood, and items relied on for safety.
- ! Performance requirements for workers and the public are categorized as follows:
  - S Highly Unlikely: worker (100 Rem or more, chemical caused fatality)  
public (25 Rem or more, > 30 mg uranium intake, irreversible chemical injury)
  - S Unlikely: worker (more than 25 Rem, less than 100 Rem, irreversible chemical injury)  
public: (greater than 5 Rem, less than 25 Rem, chemically-induced transient illness, environmental effluent standard)
- ! All processes must be maintained subcritical in accordance with ANSI/ANS 8.1.

- ! Chemical standards are proposed only for NRC licensed material and chemicals produced from licensed material. Agreements have been reached to refer appropriate concerns to other federal agencies (e.g., OSHA, EPA, etc.).
- ! Standard Review Plan Chapter 3 was developed to provide guidance to the staff for use in reviewing licensee ISA submittals.

### **Nuclear Byproduct Material Risk Review**

- ! The Nuclear Byproduct Risk Review Group was established in 1997 in response to NRC Direction Setting Issue 12, "Risk-Informed, Performance-Based Regulation." The goals of the group were to identify and document a technical basis for risk-informed regulatory approach to the regulation of byproduct material and to develop plans for a graded approach using risk information.
- ! The risk assessment (NUREG/CR-6642, Vol. 1-3) involved an evaluation of the probability and consequences for defined byproduct systems using qualitative and, to the extent practicable, quantitative risk analysis tools in defining categories of radiological risk for normal and off-normal conditions. The risk assessment did not include evaluation of exposure to patients from medical uses, transportation regulated in accordance with 10 CFR Part 71, and developing and future technologies.
- ! The results of the study risk measures alone are not sufficient as a basis for regulation of a byproduct system. There is no clear relationship between the risk values for individuals in the system and the inspection priority assigned. Additional study is needed to properly characterize the risks and reevaluate resource allocation.

### Public Participation

Mr. Bob Bernero, former Director of the NRC Office of Nuclear Material Safety and Safeguards, provided a brief presentation to the Joint Subcommittee. Significant points made during the presentation include:

- ! The first step that is needed is a clear statement of the level of protection that is sought. He suggested that this statement be expressed in qualitative terms, as a statement of the safety goals or objectives.
- ! Measuring the level of protection associated with waste isolation should consider the best estimates of likely releases, careful account of uncertainties, and evaluation of the impact on the margin of protection.
- ! Performance assessments (PAs), with full treatment of uncertainties, are appropriate for analyzing waste isolation. This approach is useful in making judgments about performance. However, there is no way to set an equation to calculate acceptable performance.

## **SUBCOMMITTEE COMMENTS, CONCERNS, AND RECOMMENDATIONS**

Subcommittee members raised the following significant points during its discussion with the staff and industry representatives:

- ! Dr. Apostolakis questioned why the staff was considering the issue of property damage in risk-informed initiatives in the materials areas when it is not considered in the Commission's Safety Goal Policy Statement for reactors. The staff stated that the Commission directed the staff to include the avoidance of property damage as a goal in the NMSS risk-informed framework (SECY-99-100). The staff also stated that the issue of safety goals was heavily discussed during the public workshop on April 25-26, 2000, and noted that there was general support for an overarching principle with a series of application-oriented safety goals developed from the bottom-up.
- ! Dr. Apostolakis questioned the staff's approach to developing safety goals in a qualitative manner. Drs. Apostolakis and Kress expressed the view that the safety goals and criteria should be quantitative. The staff stated that any approach must have meaning relative to some intended use and noted that there are some unique challenges in the materials area. The staff also noted that the interface and training of Agreement State representatives will be unique relative to that associated with reactors.
- ! Dr. Garrick expressed the view that the "number one" problem is waste disposal. He suggested that a number of problems in the area of reactors will be resolved if waste disposal issues can be reconciled. He stated that a major difference is that the safety issues for waste disposal are not driven by accident scenarios and noted that the time period is very long. He stated that major concern is environmental impact as opposed to prompt, early fatality from reactor accidents. Dr. Kress agreed and suggested that there is a need for risk acceptance criteria. Dr. Hornberger emphasized that the environmental issue is also very important because water is scarce in certain parts of the world and that the available water supply will serve as drinking water, contaminated or not.
- ! Drs. Garrick and Apostolakis questioned the pilot application of PRA for dry cask storage. They noted that the event trees will likely be very simple and that the scenarios could be bounding. Dr. Apostolakis questioned whether and the staff confirmed that they plan to develop frequency-consequence (F-C) curves in analyzing risk. The staff also stated that they plan to analyze the importance of human actions but noted that they expect seismic phenomena to be the major contributor to risk. Dr. Kress cited the recent ACRS review of the spent fuel pool fire issue and suggested that the staff also consider further analysis for source term and potential cask fire phenomena.
- ! Dr. Apostolakis questioned why ISA was pursued rather than PRA for 10 CFR Part 70 licensed facilities. He suggested that the difference in scope could be defined and still maintain the rigor of probabilistic risk analysis. Dr. Garrick noted that ISA is a more process-oriented, prescriptive tool that is not fully risk-informed because it does not distinguish probability. The staff stated that the major difference is in the degree of quantification and noted that ISA was developed for use in the chemical industry. The staff stated that ISA enables licensees to gain risk insights concerning their facilities

without separating what is “likely” and “highly unlikely.” Dr. Apostolakis questioned whether it would be possible to request licensees to perform probabilistic analysis via a Generic Letter as had been done for the Individual Plant Examinations (IPEs) for reactors (GL 88-20). Dr. Garrick expressed the view that ISA may be an “avoidance technique” for addressing the issue of probability and questions regarding safety margins. He suggested that a future meeting be scheduled to discuss the technical merits of ISAs.

- ! Dr. Apostolakis requested to review a sample of event trees used in the nuclear medicine database in order to evaluate the calculation of consequences and uncertainties. Dr. Garrick noted that frequency is calculated based on the numbers of incidents per use of the facility. He stated that the studies discuss uncertainty related to “operations” versus “accidents” but does not identify what is done to address uncertainties. The staff stated that an uncertainty analysis was not performed in the same context normally associated with PRAs. The staff stated that the goal was to develop ranking tables to identify where regulatory changes may be warranted. The staff also noted that although regulatory enhancements may be warranted in some areas, the early payback has been the identification of areas of limited risk significance thereby allowing the reallocation of NRC resources.

### **STAFF AND INDUSTRY COMMITMENTS**

During this meeting, the staff made the following commitments in response to comments and questions raised by members of the Joint Subcommittee:

- ! Dr. Garrick suggested that the staff’s training programs better emphasize the merits of a risk-informed approach, benefits of risk analysis, and contributors to risk. The staff acknowledged that the NRC training programs tend to jump directly into the application of “tools” for risk analysis and agreed to consider enhancing the introductory aspects of the training program and associated courses.
- ! Dr. Garrick noted that a major effort is required in the development of logic models that identify “what can go wrong.” He stated that it is essential that the analysts understand how the plant/facility works in order to develop a structured set of scenarios and suggested that there is a real need to solicit the input of technical experts. Dr. Kress expressed the view that it is important to clarify how defense in depth will be considered. Dr. Apostolakis stated that a discussion on the context of uncertainties is also important. The staff agreed to take the members comments under consideration.

### **SUBCOMMITTEE DECISIONS**

At the conclusion of the meeting, the Joint Subcommittee discussed the need to better coordinate ACRS and ACNW reviews because neither Committee reviewed the proposed rulemaking on 10 CFR part 70 during the early stages of development. The joint Subcommittee decided to pursue the following courses of action:

- ! The Joint Subcommittee decided to schedule a future meeting to discuss the technical merits of ISAs. The Joint Subcommittee decided to consider holding a meeting in Lynchburg, Virginia, to discuss the BWXT ISA.
- ! The Subcommittee decided to recommend that “one” Committee (ACRS or ACNW) have the lead in preparing future reports and letters concerning matters under consideration by the Joint Subcommittee. It was also recommended that the participating members of the other Committee be noted in the associated letter or report, as appropriate. This recommendation was suggested to improve the efficiency, effectiveness, and timeliness of future reports. Dr. Garrick volunteered to prepare a draft report concerning the deliberations of this meeting.

**FOLLOW-UP ACTIONS**

None.

**BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE PRIOR TO THIS MEETING**

1. Subcommittee agenda.
2. Subcommittee status report.
3. Memorandum dated June 28, 1999, from Annette Vietti-Cook, Secretary, NRC, to William D. Travers, Executive Director for Operations, NRC, and John T. Larkins, Executive Director, ACRS, Subject: Staff Requirements - SECY-99-100 - Framework for Risk-Informed Regulation in the Office of Nuclear Material Safety and Safeguards.
4. Report dated November 17, 1999, from B. John Garrick, Chairman, ACNW, and Dana A. Powers, Chairman, ACRS, to Richard A. Meserve, Chairman, NRC, Subject: Implementing a Framework for Risk-Informed Regulation in the Office of Nuclear Material Safety and Safeguards.
5. SECY-99-100, Memorandum dated March 31, 1999, from William D. Travers, Executive Director for Operations, Subject: Framework for Risk-Informed Regulation in the Office of Nuclear Material Safety and Safeguards.
6. SECY-00-0048, Memorandum dated February 24, 2000, from William D. Travers, Executive Director for Operations, to The Commissioners, Subject: Nuclear Byproduct Material Risk Review.
7. U.S. Nuclear Regulatory Commission, NUREG/CR-6642, Vol. 1-3, “Risk Analysis and Evaluation of Regulatory Options for Nuclear Byproduct Material Systems.”
8. SECY-99-147, Memorandum dated June 2, 2000, from William D. Travers, Executive Director for Operations, NRC, to The Commissioners, Subject: Proposed Rulemaking - Domestic Licensing of Special Nuclear Material.

\*\*\*\*\*

Note: Additional details of this meeting can be obtained from a transcript of this meeting available in the NRC Public Document Room, 2120 L Street, N.W. Washington, D.C. 20006, (202) 634-3274, or can be purchased from Ann Riley & Associates, Ltd., (Court Reporters and Transcribers) 1250 I Street, NW, Suite 1014, Washington, D.C. Rhode Island Avenue, N.W. Washington, D.C. 20036 (202) 842-0034.