



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

July 3, 2007

MEMORANDUM TO: William J. Shack, Chairman
Subcommittee on Regulatory Policies and Practices

FROM: Hossein Nourbakhsh, Senior Staff Engineer */RA/*

SUBJECT: STATUS REPORT FOR THE MEETING OF THE
SUBCOMMITTEE ON REGULATORY POLICIES AND
PRACTICES, July 10, 2007, IN ROCKVILLE, MARYLAND

The purpose of this memorandum is to forward written materials for your use in preparing for the meeting of the ACRS Subcommittee on Regulatory Policies and Practices on July 10, 2007. The Subcommittee will discuss the status of staff's efforts associated with the State-Of-the-Art Reactor Consequence Analysis (SOARCA) Project. The purpose of the meeting is to gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee. Attached please find the agenda, status report, and background materials.

Attendance by the following members is anticipated and reservations have been made at the following hotels for July 9-13, 2007, unless otherwise indicated.

Shack	RESIDENCE INN	Corradini	BETH. N. MARRIOTT
Apostolakis	RESIDENCE INN	Kress	RESIDENCE INN
Bonaca	BETH. N. MARRIOTT	Maynard	BETH. N. MARRIOTT

Please notify Ms. Barbara Jo White at 301-415-7130 if you need to change or cancel the above reservations.

Attachments¹:

1. Agenda
 2. Status report
 3. Memorandum from Jimi T. Yerokun, Chief, Risk Applications and Special Projects Branch, Office of Nuclear Regulatory Research, to Cayotnana (Tanny) Santos, Chief, Nuclear Reactors Branch, ACRS, Subject: STATE-OF-THE ART REACTOR CONSEQUENCE ANALYSES, ACRS SUBCOMMITTEE MEETING, JULY 10, 2007.
- Enclosures:

cc: ACRS Members
cc w/o attach: F. Gillespie
C. Santos

¹ Electronic copies of the of supporting documents has been sent to members separately.

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**Advisory Committee on Reactor Safeguards
Safety Research Program
Rockville, MD
July 10, 2007**

- Proposed Agenda -

Cognizant Staff Engineer: Hossein Nourbakhsh (301-415-5622, hpn@nrc.gov)

	Topic	Presenter(s)	Time
	Opening Remarks and Objectives	W. Shack, ACRS	10:30-10:40 am
I	State-Of-the Art Reactor Consequence Analysis (SOARCA) Project Overview - Overview - Accident Sequence Selection - Containment System States - MELCOR - Emergency Preparedness - MACCS2	R. Prato, RES R. Sherry, RES R. Sherry, RES J. Schaperow, RES J. Jones, SNL J. Michell, RES	10:40 am -11:00 am 11:00 am -11:20 am 11:20 am -11:30 am 11:30 am -11:50 pm 11:50 am -12:10 pm 12:10 am -12:30 pm
	Lunch		12:30 - 1:30 pm
II	Initial Findings (CLOSED) - Overview - Sequence Selection - Preliminary MELCOR Insights - Structural Analyses - Emergency Preparedness	R. Prato, RES R. Sherry, RES J. Schaperow, RES A. Istar J. Jones, SNL	1:30 -1:45 pm 1:45 - 2:10 pm 2:10 - 2:35 pm 2:35 - 3:00 pm 3:00 - 3:25 pm
III	Dose Threshold (CLOSED)	R. Prato, RES	3:25 - 3:45 pm
	Break		3:45 - 4:00 pm
IV	Discussion	All	4:00 - 5:00 pm
	Adjourn		5:00 pm

Notes:

- Presentation time should not exceed 50% of the total time allocated for a specific item.
- Number of copies of presentation materials to be provided to the ACRS - 25.

FOR INTERNAL ACRS USE ONLY

**Advisory Committee on Reactor Safeguards
Safety Research Program
Rockville, MD
May 2, 2007**

- Status Report -

PURPOSE

The Subcommittee will discuss the status of the staff's efforts associated with the State-Of-the-Art Reactor Consequence Analysis (SOARCA) project. The purpose of the meeting is to gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

BACKGROUND

The phenomenology and offsite consequences of severe reactor accidents has been the subject of considerable research by the NRC. Over the years, several systematic attempts has been made to use quantitative techniques to estimate the probabilities, source terms, and public consequences from potential accidents in commercial nuclear power plants. The Reactor Safety Study (WASH-1400), was the first systematic attempt to provide estimates of public risk. This 1975 study included analytical methods for determining both the probabilities and consequences of various accident scenarios. Two specific reactor designs were analyzed in WASH-1400: Peach Bottom Atomic Power Station, a Boiling Water Reactor (BWR) with a Mark I containment and Surry, a 3-loop Westinghouse Pressurized Water Reactor (PWR) with a subatmospheric containment.

Sandia National Laboratory (SNL) performed a study of technical aspects of siting for nuclear power reactors. The results of this study, also known as Sandia Siting Study, were published in NUREG/CR-2239, "Technical Guidance for Siting Criteria Development," December 1982. This study used five generic source terms for analyzing the consequences and socio-economic impacts of possible plant accidents at 91 existing or proposed reactor sites. These source terms were derived from the Reactor Safety Study (WASH-1400) and its immediate successors.

Since the publication of the Sandia Siting Study, many events have brought a new focus to this study and its results. The results, in terms of predicted offsite early fatalities and latent cancer, have often been quoted by outside organizations to illustrate the potential consequences of a severe accident at a commercial nuclear power plant. Despite accepted arguments that these results does not present an up-to-date picture of consequences at nuclear power plants and does not reflect current state-of-the-art in evaluating severe accident progression and offsite consequences.

On request from the Commission, the staff sent forward to the Commission a paper describing a proposed plan for developing state-of-the-art reactor consequence analyses for all commercial nuclear power plant sites. The Commission responded in an April 14, 2006 Staff Requirements Memorandum (SRM) with a general approval of the plan. The Commission directed the staff to "use the improved understanding of source terms and severe accident phenomenology (e.g., containment failure modes, time of release, release duration, inventory release fractions), and credit the use of Severe Accident Management Guidelines (SAMGs) and other new procedures, such as mitigative measures resulting from B.5.b and other like programs, that were not in place when the earlier study was performed." The Commission also instructed the staff to "present its updated results using risk communication techniques to achieve an informed public understanding of the extent and value of defense-in-depth features including current mitigative strategies, and of the important analytical assumptions."

In the April 14, 2006 SRM, the Commission specifically instructed the staff to "work with the ACRS on technical issues such as identification of accident scenarios to be evaluated, evaluation of source terms, credit for operator actions or plant mitigation systems, modeling of emergency preparedness, modeling of offsite consequences, and definition and characterization of analysis uncertainty."

In an April 2, 2007 SRM, the Commission directed the staff to "reduce the initial scope of this effort to not more than eight plants representing a spectrum of plant vendors and technologies." The Commission also directed the staff to "conduct the first assessments on a subset of the eight plants, for example a selected BWR and PWR plant, in order to resolve issues associated with the integration of methods and resolve details associated with simulation of plant systems and procedures." The Commission also instructed the staff to "provide the results of these studies to the Commission along with a recommendation, based on the insights gained from the initial eight studies, as to whether continuing this project as originally described in SECY-05-0233 is necessary to achieve its objectives."

During the 535th meeting of the ACRS, September 7-9, 2006, the staff briefed the Committee on its plan for the state-of-the-art consequence analyses project. During the 538th meeting of the ACRS, December 6-8, 2006, the Committee discussed the status of staff's effort associated with the SOARCA project. The staff briefed the committee on a number of topics related to this project including plans for MELCOR and MACCS code improvement, selection of scenarios to use for consequence analysis. The staff also briefed the Committee on its plan for a site-specific simulation of offsite emergency response for this project. The Members had many questions regarding the technical details of this study and how uncertainties will be addressed. The Members agreed that the technical details be discussed in a subcommittee as the process and calculations further develops. The purpose of this Subcommittee meeting is to discuss the current status of the staff's efforts associated with this project.

DISCUSSIONS

As directed by the Commission, the staff has reduced the initial scope of SOARCA project. The staff is initially focusing on two sites, Peach Bottom in Pennsylvania, and Surry in Virginia. These two plants have been the subject of a number of earlier risk studies including the NUREG-1150, "Severe Accident Risk - An Assessment of Five U. S. Nuclear Power Plants." The results from these studies should provide valuable insights for the initial phase of SOARCA project.

The staff has identified a number of dominant sequences/sequence groupings based on the results of enhanced SPAR model. However, no discussion has been provided on differences between these new results and those of earlier risk studies such as NUREG-1150.

The staff has also provided a summary results of mitigative measures assessment based on emergency operating procedures (EOPs), severe accident management guidelines (SAMGs), and extensive damage mitigation guidelines (EDMGs). However, no discussion has been provided on how these results were obtained and how reliability of implementation of these guidelines has been treated in these assessments.

The staff is also performing structural analyses for predicting the performance of steel (Mark I) and reinforced concrete (PWR) containment structures, in terms of leak rate or area versus pressure. These analyses are based on earlier studies including containment integrity research performed at Sandia national Laboratories (SNL), Individual Plant examination (IPE) reports, and NUREG-1150 study.

The staff has not yet provided any document on accident progression and source term analysis using severe accident code MELCOR. It is not clear how the state-of-knowledge uncertainties associated with the accident progression phenomena and source term analyses will be addressed. The staff will present the preliminary results and insights from MELCOR code calculations at the Subcommittee meeting.

The staff is evaluating various options for assessment of dose thresholds for latent cancer fatalities. One option is to adopt the official position of the Health Physics Society (HPS) that "recommends against quantitative estimation of health risks below an individual dose of 5 rem in one year or a lifetime dose of 10 rem above that received from natural sources." The staff will discuss this issue further during the Subcommittee meeting.

SUBCOMMITTEE ACTION

The Subcommittee should be prepared to provide its views and recommendations to the Full Committee, at the July meeting. The Committee is not expected to write a letter on SOARCA at this time.