

Nourbakhsh, Hossein

From: Hossein Nourbakhsh - *ACRS*
Sent: Friday, February 22, 2008 12:54 PM
To: Farouk Eltawila
Cc: Frank Gillespie
Subject: ACRS Recommendations on SOARCA

Dear Farouk,

Per your conversation with Frank, the following is one of the Committee's recommendation on SOARCA:

Level-3 probabilistic risk assessments (PRAs) should be performed for the pilot plants before extending the analyses to other plants. The PRAs should address the impact of mitigative measures using realistic evaluations of accident progression and offsite consequences. The core damage frequency (CDF) should not be the basis for screening accident sequences.

The rationales for this recommendation is the following:

Experience from contemporary full-scope PRAs demonstrates that there are problems associated with the use of CDF as a numerical screening criterion to restrict the scope of subsequent Level-2 and Level-3 analyses. In such PRAs, the most important contributors to offsite consequences are not necessarily significant contributors to CDF, and are not necessarily characterized by initial containment bypass events. The number of these sequences and their aggregate contribution to overall plant risk can increase dramatically as the numerical cutoff is reduced. Thus, application of a priori CDF screening criteria can inappropriately overlook many risk-significant scenarios. Such an approach also does not provide a fully integrated evaluation of risk in terms of frequency and consequences.

With current computational capabilities, virtually all sequences can be considered through the complete Level-1, Level-2, and Level-3 analyses. Uncertainties at each stage of the process can also be propagated through the full accident scenarios. This type of fully integrated evaluation removes the need for intermediate screening and scenario grouping. It allows for clear identification of the most important scenarios for offsite consequences and facilitates an integrated evaluation of important physical and functional dependencies that affect core damage, severe accident progression, and offsite emergency responses.

The staff argues that events below the current cutoff frequency can become highly uncertain. Although it is true that the uncertainties associated with less frequent scenarios generally increase, it is important to be aware of the potential for severe consequences in regulatory decisionmaking and in assessing defense-in-depth requirements.

One of the arguments for the SOARCA program is the need to update and replace the site-specific quantification of offsite consequences found in NUREG/CR-2239, "Technical Guidance for Siting Criteria Development," (issued 1982), and NUREG/CR-2723, "Estimates of the Financial Consequences of Nuclear Power Reactor Accidents," (issued 1982). It has long been recognized that results of these studies are overly conservative and that the most realistic assessments are those in NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," (issued 1990), and related studies such as NUREG/CR-6295, "Reassessment of Selected Factors Affecting Siting of Nuclear Power Plants," (issued 1997). However, NUREG-1150 is based on state of knowledge and understanding of severe accidents from the 1980s. As we now envision a future in which current reactors will be operating for an additional 20-40 years and new reactors will be built, it is timely to consider updating our understanding of the risks of nuclear power.

Level-3 PRAs for internal and external events based on current PRA and severe accident technology, updated plant configurations and mitigative measures such as emergency operating procedures (EOPs), severe accident management guidelines (SAMGs), and the newly required extreme damage state mitigative

guidelines (B.5.b) should be performed. Such PRAs would require a substantially greater commitment of resources than SOARCA. However, as a minimum, a limited set of updated Level-3 PRAs for the SOARCA pilot plants should be performed to benchmark the consequence analyses and provide useful information to the Commission in deciding whether to proceed with a full set of consequence analyses. Examination of the Level 3 PRA results for the SOARCA pilot plants may identify suitable Level-1 event scenario screening criteria and simplifying assumptions that could be used to develop a defensible, simplified approach. In addition, the Level-3 PRAs would update both the technology and results of NUREG-1150.

Like SOARCA, the proposed PRAs should consider at-power conditions. The intent is to primarily use existing technology and knowledge. Because additional research is required to better understand and characterize the shutdown source term, the at-power Level-3 PRAs should be completed before addressing risk at shutdown.

I left a message yesterday with Bob Prato, that he is more than welcome to come and see a copy of ACRS report on SOARCA and check for any factual mistakes before it is issued .

Hossein