

## PSAM 7 / ESREL 04 – Opening Plenary Session

### QRA, RAM and Safety Management in Decision Making: Accomplishments, Challenges, and Future Prospects

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From the perspective of the U.S.NRC Advisory Committee on Reactor Safeguards (ACRS) that I currently chair, it is apparent that great progress has been made in the US since 1998 to bring probabilistic safety assessment into the regulatory decision-making process.

1998 is the year when Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk Informed Decisions on Plant Specific Changes to the Licensing Basis,” was issued. This Regulatory Guide provides licensees with a decision-making process to support changes to their licensing bases that relies, in addition to other inputs, on the results of a PSA evaluation showing that the proposed change will result, at worst, in a very small increase in risk. This RG has had great success in increasing the use of risk-informed approaches in the licensing process. Several hundreds successful submittals using RG 1.174 have been submitted by licensees and approved by the NRC. There is a general sense that the use of risk information is resulting in real safety improvements.

Recently the NRC has embarked on a more aggressive approach to bring risk-information into the very foundations of the regulation. A process to risk-inform rules and regulations is being implemented. An effort is underway to risk-inform even 10CFR50.46, the LOCA rule that is at the foundation of the safety design of the current generation of operating plants. Gone are the days when PSA was looked at with suspicion and mistrust. Some of the initiatives to risk inform the regulation, such as the PTS reevaluation project, demonstrate the technical strength and safety benefit resulting from the logical integration of the deterministic and probabilistic approaches.

And here comes the challenge we face. In a risk-informed regulatory framework, the decision-making process must be supported by quality information. This is especially true when the process may lead to a possible reduction in margins and defense-in-depth. In order to implement measures of defense-in-depth that compensate for uncertainties we must understand the uncertainties and their sources. One would assume that, in order to support *complex* risk-informed regulatory applications, a full scope, internal and external events, all modes PSA with fully developed uncertainty analysis would be required.

But most licensees do not have complete PSAs and many are reluctant to invest the time and money to develop the full scope PSA I described above. And so, a debate is underway on what constitutes a quality PSA. Standards are under development to support this determination. The general view that is being proposed is that the PSA must be of sufficient quality to support the proposed application.

But when quality becomes a matter of debate, the concern arises that wrong decisions may occasionally result from the use of incomplete or low quality information.

There is a likely price to be paid if the quality of PSAs is not improved: the benefit that licensees can derive from their applications is going to be limited. In early 2003, Mr Karl Fleming of Technology Insights developed for the ACRS a report summarizing the views of stakeholders internal and external to the NRC on the issues facing further progress in advancing the use of PSA technology in risk-informed decision making. This report has been published as NUREG-CR-6813. The report concluded that PSA quality was the main obstacle to further progress in risk-informing the regulation. Completeness was by far identified as the most significant issue affecting existing PSAs. Consistent lack of a complete uncertainty analysis to support PSA conclusions was also an issue. These issues are the same now. Hopefully, the potential benefits to be derived from a risk-informed LOCA rule are such that they will promote the improvements necessary to benefit from the rule.

The *integrated decision-making process* of RG 1,174 relies on several inputs, including a risk assessment provided by a PSA. This PSA does not need to be complete, just adequate for the application. Historically, this was in part to encourage risk-informed applications at the time when most licensees did not have complete PRAs. Unfortunately, this has helped develop a culture where applicants are expecting that even in more complex applications the burden of dealing with the results of an incomplete model will continue to fall on the NRC reviewer. I believe that, if we intend to continue to make further progress with risk-informed regulation, this culture must change as applications become more complex and of higher safety significance.