

SESSION I: INTRODUCTION

SESSION CHAIR: MR. GONZALEZ (IRSN)

As invited lecturer, Mr. Ang presented an introduction of the main the subjects that were to be dealt with in the Workshop. In particular, he focused the attention on the following items:

- *Uncertainty concept and sources.* Aleatory uncertainty is random, cannot be eliminated, and is built into the PSA model. Epistemic uncertainty is due to lack of knowledge for the phenomena involved or for the parameters that affect such phenomena, and can be reduced by acquiring more information.
- *Progress made in treating uncertainty.* The practice of International Standard Problems (ISP) represents one way of inferring the extent of uncertainty. International R&D co-operative programmes have proven to be very valuable for reducing Severe Accident (SA) uncertainty and for increasing confidence in SA code predictions.
- *ROAAM development and applications.* Early PSA relied on simple event tree analyses. A more integrated uncertainty treatment started in 1990 with NUREG-1150. Formal expert elicitation was introduced to deal with issues of high uncertainty. Risk Oriented Accident Analysis Methodology (ROAAM) is devised to overcome some of the Level 2 PSA limitations, such as the weakness in dealing with phenomena uncertainty.
- *Expert judgment.* The usefulness of expert opinion in PSA is recognized in a number of studies. Formal knowledge elicitation was an element of NUREG-1150 methodology, although some reservations exist on e.g. choice of experts.

Mr. Ang provided information regarding documents currently used as guidance for the treatment of SA uncertainty, as well as some observations based on his experience. Among the issues that are difficult to overcome, he mentioned access to international R&D data, in the sense that data are not easily accessible, and resource allocation, in the sense that resource limitation does not permit in-depth studies.

At the end, Mr. Ang recalled the main points regarding the theme of the Workshop as follows:

- Significant progress has been made in achieving a better understanding of SA phenomena for LWRs. The epistemic uncertainty has been reduced accordingly
- Broad consensus on key uncertainty issues has been achieved
- Methods for uncertainty analysis have been developed and successfully applied. Containment Event Tree is generally seen as a minimum requirement, but currently there is no accepted procedure for uncertainty analysis in a Level 2 PSA
- ROAAM has been applied to resolve a number of issues and may provide the framework for future assessment of key uncertainty issues
- Future demands on PSA quality may require an uncertainty approach beyond what is currently acceptable