Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

WGRisk Task (2006)-2 Probabilistic Risk Criteria

P. Hessel – PSAM9 – Hong-Kong - May 19-23, 2008

Canada

Task History

- In 2006, the COOPRA project has been stopped. Its RIDeM working group has worked on Safety Goals,
- In 2006, the Nordic countries initiated a long term project “The validity of Safety Goals”
- The WGRisk members decided to take advantage of the two projects and initiated a new task that
  - Includes collecting the rationales and experience on safety goals,
  - Is coordinated with the past COOPRA project and the present Nordic project

Task History - 2

- This task (OECD/NEA/WGRisk task (2006)-2) will be chaired by three “Lead Organizations”:
  - CSNC – Canada (Philippe Hessel) chair,
  - RELCON, Sweden (Michael Knockenhauer), and
  - VTT, Finland (Jan-Erik Holmberg)
- The objective of this task is to review the probabilistic safety criteria, the rationales for their setting, their current status, and actual experience in the member states.

Project Schedule

- 1st meeting March 2007.
  - 10 countries
  - Developed the questionnaire
- May 2007
  - Sent the questionnaire to all OECD members and to the IAEA
  - Deadline for answering the questionnaire set to September 15, 2007

Project Schedule - 2

- Second task group meeting – Stockholm, November 2007
- Coupled with the seminar on the NKS project.
  - 4 countries attending
  - Reviewed the responses received (16) and identified needs for clarification
- 3 other responses received after the deadline.

Project Schedule - 3

- After receiving answers to clarification questions and answers to questionnaire from other countries, prepared a compilation of responses for the 3rd Task group meeting.
- 3rd Task Group meeting in Paris, March 3-4, 2007.
  - 6 countries represented on March 3,
  - 9 countries represented on March 4.
- Goal of the meeting: Prepare the draft report of the project,

Project Schedule - 4

- 4th meeting is scheduled for November 2008
  - Will be devoted to preparing the draft report to the WGRisk
- The final report will be presented to the WGRisk at its Spring 2009 meeting.

- The present presentation addresses the first results from analysis of the received responses to the questionnaire.

Received Responses

- Responses have been received from 19 respondents:
  - 13 Regulatory Bodies
  - 6 Utilities.
- Responses from utilities came from the utilities in the “Lead Countries” only.
- The responses are generally well prepared and documented.
- Two responding countries declare not having Probabilistic Risk Criteria.
- A total of 11 different Probabilistic Risk Criteria are identified

Identified Probabilistic Risk Criteria

- Core Damage frequency (14 respondents use this criterion),
- Large Release frequency (12 respondents use this criterion)
- Small Release frequency (1 respondent uses this criterion)
- Individual risk of fatalities (3 respondents use this criterion)
- Systems reliability targets (2 respondents use this criterion)
- Containment Failure Frequency (1 respondent uses this criterion)
- General Objectives (1 respondent uses this criterion)
- Risk Related to Shutdown conditions (1 respondent uses this criterion)
- Objectives related to EPR (1 respondent uses this criterion)
- Instantaneous risk (1 respondent uses this criterion)
- Frequency of doses (1 respondent uses this criterion)
- Societal risk (1 respondent uses this criterion)

Sorting the Probabilistic Risk Criteria

- Analysis of the criteria definitions led to collapse the criterion into 5 groups:
  - Core Damage Frequency,
  - Frequency of Releases
  - Containment Failure Frequency,
  - Individual Health Risk, and
  - Screening Criteria
- Two criteria (systems reliability targets and Instantaneous risk) were considered out of scope and will not be included in the final report.

Highlight on the responses

- During the March 2008 meeting, several answers to the questionnaire put in light differences between countries.
- Analysis of these differences could lead to a improvement in some countries.
- We decided to include these questions in the task report:
  - *not early (late) releases,*
  - *small releases,*
  - *use of band criterion and uncertainty*

Not Early (late) releases

- Many countries use the US-originated “Large Early Release Frequency (LERF)” criterion.
- Some countries have defined the releases criterion as “Large Release” without any timing.
  - This is explained by the fact that some accident sequences can be quite long and that a pressure increase in the containment can occur late in the accident progression, leading to containment failure more than 24 hours after the Initiating Event.
- Several participants noted that the present PSA considering only LERF could miss important sequences

Small Releases

- On the respondents, only one country has defined a “Small Releases” criterion.
- While this is based on a specific reactor technology, such small releases could occur on other technologies.
- The case is of accidents where the amount of failed fuel is low, with the possibility that the containment button-up will not be initiated due to the low pressure and activity.
- However, these small releases could trigger site evacuation.

Use of Band Criterion and Uncertainty

- Very few countries use “Band Criteria”, i.e., define a target and a limit.
- However, several countries noted that, while using a single criterion, they use a band concept when making decisions.
- This use of band concept is generally related to uncertainty.
- This issue should be subject to a more in-depth analysis.

Legal status of the Criteria

- The major part of the responding countries consider the probabilistic criteria as “indicators” or “orientation values”, meaning that they have no legal status.
- This applies to existing plants.
- However, several countries note that, for new plants, the criteria would be “strict” for new plants, i.e., that a new plant not meeting the criteria will not be licensable.

Communication with the Public

- Generally, the probabilistic criteria has not been used for communication with the public.
- However, the utilities made contradictory responses to that question:
  - Some utilities state that the use of the probabilistic criterion has been a help in public forums.
  - Other utilities declare they had very bad experiences in using the criteria for communication with the public.
- This can be due to the different cultures in the countries.

Benefits of setting probabilistic criteria

- Most countries note that the use of probabilistic criteria has resulted in safety improvements.
- One country note that, notwithstanding these benefits, caution has to be made that meeting probabilistic criteria should not be a deterrent to continue improving safety.

Conclusion

- The results from the questionnaire has put into light interesting new information.
- Some of these results are likely to lead to modifications in some countries criteria.

- Questions?