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Summary of Inputs on Failure Mode Taxonomies

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Outline of Presentation

- Objectives
- Summary of participant inputs
- Scope issues
- Technical issues

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Objectives

- Summarize the taxonomy inputs from participants.
- Discuss scope and technical issues of the activity.

Summary of Taxonomy Inputs from Participants

- Six organizations provided inputs: NRG, EDF, JNES, BNL, OSU, and KAERI
- Two tables summarizing hardware and software failure modes were prepared.
- Each table further classifies the failure modes in terms of their levels of detail, i.e., system, module, circuit board, and generic component levels.

Observations on Participant Inputs

- Some participants included information on failure effects (as a part of an failure mode and effects analysis (FMEA)). Others do not.
- Most do not distinguish between control and protection systems.
- There is more information on hardware failures than on software failures.
- Most participants did not include information about modeling methods and data.
- Little information was provided on common cause failure (CCF).

Scope Issues

- Most of the inputs from participants do not specify the associated modeling methods, nor if failure data are available.
  - It would be beneficial to include such information and would assist in the development of the guidelines.
- Should failure effects be included in the taxonomy?
  - Can generic failure effects be identified, or should they only be determined based on specific applications?

Technical Issues

- Do we need to define failures, failure causes, failure modes, failure mechanisms, and failure effects? (For reliability modeling, both failure modes and effects are needed.)
- Completeness of failure modes in each failure mode category should be further discussed, for example, those of communication and synchronization.
- Common cause failure modes of hardware and software should be further discussed.
- What about failure modes associated with interactions between hardware and software?

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Conclusions and Recommendations

- **More inputs from participants are desirable, i.e., information on modeling methods and data.**
- **Agreement on the categories/levels-of-detail and their definitions in the summary tables is needed.**
- **Discussions on each category of failure modes are needed to reach consensus on the completeness of failure modes.**
- **There may be technical issues that require additional research, e.g., interactions between hardware and software.**