Use of MAAP4 for SBO Sequences

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Overview

- What T/H information is required to support PRA Station Blackout evaluations?
- What are the key MAAP4 models?
- What level of accuracy is required?

SBO Information Needs

- Success Criteria
  - Ability of turbine driven systems to prevent core damage (i.e. HPCI, RCIC, AFW)
    - Not typically controversial – well understood
  - #PORVS for Feed/Bleed after AC Recovered
- HRA
  - Time for key operator actions such as:
    - HCTL (suppression pool temperature)
    - Low vessel water level
    - Core damage (e.g. max core > 1800 °F)
    - PWR RCS depressurization to reduce potential loss from seal LOCA
- AC Power Recovery timing

Key MAAP4 Models

- Primary system water level
- Break flow rate (i.e. Seal LOCA)
- Suppression pool heat up
- Initial core heat up after uncovery
- Reflux condensation

Required Accuracy

- Success Criteria issues are focused on a limited number of configurations:
  - # PORVs for Feed/Bleed (after AC recovered)
  - Limited injection sources (e.g. fire water)

Required Accuracy

- HRA:
  - Uncertainties in human response in many cases exceed variations in T/H predictions
  - Assuring 10-20% agreement with basic T/H validation generally provides sufficient basis for HEPs

Summary

- Use of MAAP4 for SBO Analysis mostly focused on accident timing after turbine systems become unavailable
- Most significant results include:
  - Level decrease due to seal LOCA
  - Ability to prevent core damage when AC power is recovered
- Accuracy of T/H Analysis needs to be balanced against uncertainties in HRA and assumed boundary conditions.