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RIC 2007
Severe Accident Research and Regulatory Applications

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Objectives and Plans for the State of the Art Reactor Consequence Analyses

- Primary Objective
  - Provide NRC's updated, realistic evaluation of severe accident progression, radiological releases and offsite consequences for dominant accident sequences
    - Communication to all stakeholders
  - Focus on best estimate, likely outcomes

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Objectives and Plans for the State of the Art Reactor Consequence Analyses

- Secondary Objectives
  - Better understanding of safety margins
  - Assess benefits of safety improvements
  - Provide basis for prioritizing information needs and activities
  - Provide basis for explicit comparison with industry methods/analysis

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Objectives and Plans for the State of the Art Reactor Consequence Analyses

- Why undertake such a study and why now?
  - Past historical documents (e.g., 1982 siting study) are badly out of date, excessively conservative, do not reflect what has been learned/achieved regarding plant performance and risk
  - Vast improvements in modeling; e.g., quantification of accident progression and source term
  - Plant improvements (systems, training, procedures)
  - Offsite response refinement
  - NRC capability now exists to do consistent, integrated evaluation

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Objectives and Plans for the State of the Art Reactor Consequence Analyses

Approach

- Use detailed integral modeling of plant systems, radionuclide transport and deposition, and release pathways (i.e., PRA, MELCOR, MACCS)
  - Select scenarios using latest PRA information (e.g., most recent SPAR, licensee's PRA, EIS)
  - Analysis of accident progression and fission product release to environment using MELCOR
  - Analysis of offsite radiological consequences using MACCS

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Approach (cont.)

- Account for plant improvements, (e.g. SAMGs), addressed by licensees which prevent, delay, or mitigate core damage and offsite release
- Modeling plant specific Emergency Preparedness programs substantially improves realism (versus earlier conservative treatments, e.g., sample Problem A)
  - Early precautionary actions and treatment of multiple population groups leads to more effective evacuation
  - Road network evaluation (non-radial movement)

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Approach (cont.)

- Health effects modeling to be guided by expert elicitation, i.e., consideration of a threshold below which there are no observable adverse health effects.
- Uncertainties in level 2/3 issues will be addressed for important scenarios in an integrated, self consistent fashion
- Implementation of these new methods on a subset of plants representative of different designs
  - Greater resource allocation to ensuring fidelity of plant representation and modeling

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Status

- MELCOR and MACCS modeling review (PIRT type process) completed
- Improvements identified including
  - MELCOR BWR modeling of SRV fail-open modes and steam line creep rupture
  - MACCS modeling of plume dispersal
    - Greater angular resolution
    - Multiple plume segments to reflect wind shift over time

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Objectives and Plans for the State of the Art Reactor Consequence Analyses

Status

- General methods/approach development completed
- Plant selection/preliminary screening of scenarios near completion
- Next steps
  - Interaction with licensees on plant details
    - Plant systems, procedures, PRA, EP