



RIC 2011 State-of-the-Art Reactor Consequence Analyses (SOARCA)

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3/10/11

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Background to SOARCA

- Security assessments of reactor events indicated that radiological releases for certain representative scenarios are:
 - Delayed and smaller than that assumed in some past studies
- Security assessments used our most advanced, integrated, MELCOR modeling of the plant
 - Phenomenological modeling based on extensive severe accident research
 - Offsite consequences predicted using MACCS2 code

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Objective of SOARCA

- SOARCA was initiated to develop a body of knowledge on the realistic outcomes of severe reactor accidents



Peach Bottom



Surry

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SOARCA Objective (cont)

- Incorporate plant improvements not reflected in earlier assessments
- Evaluate the benefits of recent improvements - 10 CFR50.54(hh)
- Incorporate state-of-the-art modeling (MELCOR/MACCS)
- Enable the NRC to communicate severe accident aspects of nuclear safety to diverse stakeholders
- Update the quantification of offsite consequences found in earlier publications

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SOARCA Approach

- Study technical elements
 - Scenario selection
 - Mitigation measures
 - Accident progression and radiological source term
 - Offsite consequences
- Study has adopted new approaches in many areas
 - Focus on "important" scenarios (CDF $\geq 10^{-6}$, 10^{-7} for bypass)
 - Realistic assessments and detailed analyses
 - Incorporate recent phenomenological research

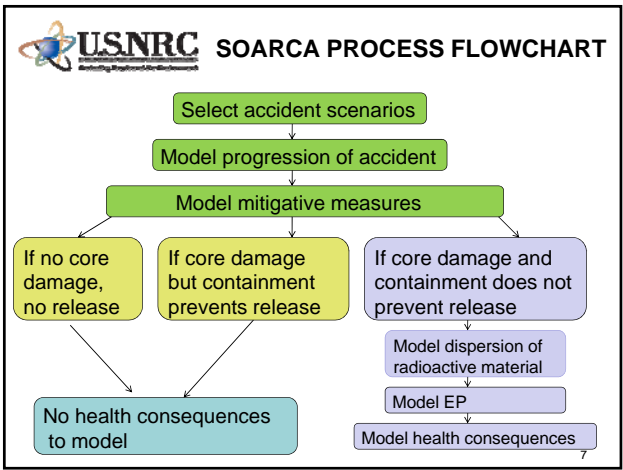
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SOARCA Approach (cont)

- New approaches (continued):
 - Integrated, self consistent analyses
 - Treatment of seismic impacts on emergency preparedness
 - Range of health effects modeling (e.g., Linear-no-threshold model, dose truncation)

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USNRC SOARCA Preliminary Results

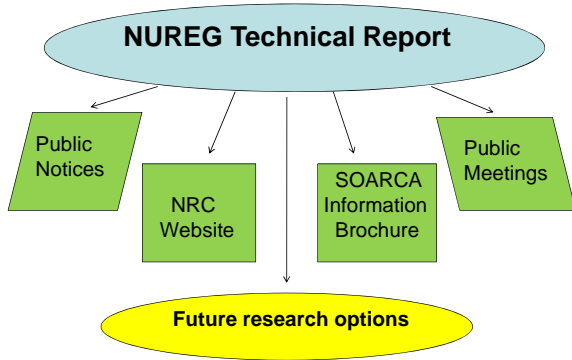
- Selected scenarios could reasonably be mitigated, either preventing core damage or delaying/reducing the radiation release
- For cases assumed to proceed unmitigated, accidents progress more slowly and usually result in smaller and more delayed radiological releases than previously assumed/predicted
- Individual latent cancer risk for selected scenarios generally comes from population returning home after event is over

USNRC SOARCA Project Status

- Series of peer review meetings held
- Licensee fact check performed
- Continue to integrate peer review comments and licensee fact checks
- Uncertainty analysis underway
- Finalize results for 2 pilot plants



WHAT'S NEXT



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POTENTIAL FUTURE RESEARCH

- Conduct SOARCA consequence analysis on other reactor or containment designs for select scenarios
- Use SOARCA tools (MELCOR and MACCS2) and consider SOARCA insights in a site Level 3 PRA pilot study

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