

Severe Accident Analysis Research **Based on Fukushima**

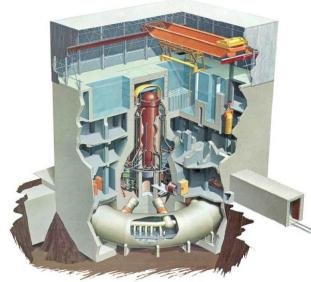
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Joint DOE-NRC MELCOR reconstruction of Fukushima Daiichi Accident

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DRYWELL TORUS



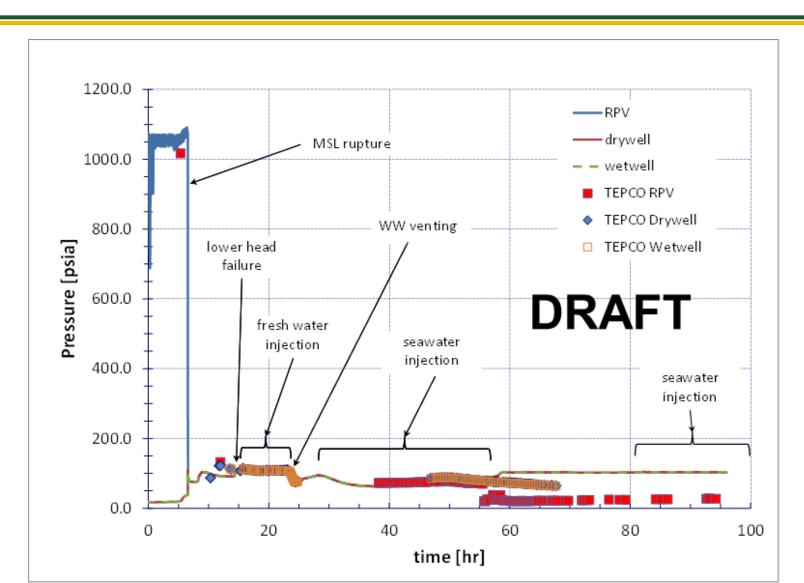
Scope of Effort

- Collect and archive data on accidents (portal)
- Reconstruct accidents
- Assess validity of MELCOR models
- Sandia-led effort with INL and ORNL
- SOARCA Mark-I MELCOR model used as starting point to reconstruct accidents
- Collaboration with and peer review by
 - NRC, JNES, TEPCO, EPRI
- Report published in August 2012



Comparison of MELCOR Unit 1 Analysis of RPV and Containment Pressures

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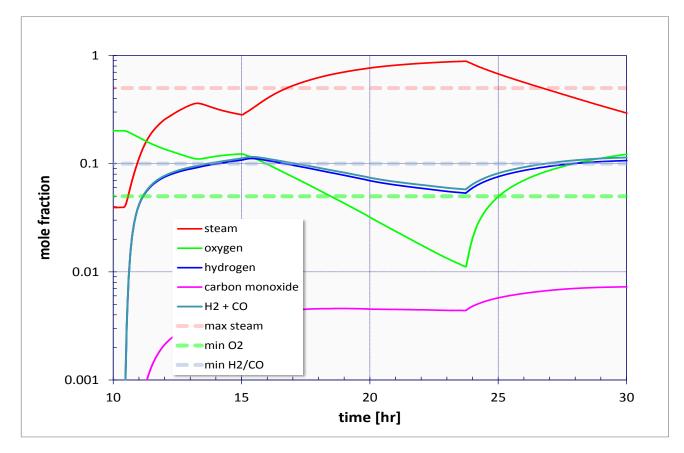




Unit 1 Results – Refueling Bay Vapor/Gas Molar Concentrations

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Gas Composition in Refueling Bay





Predicted Cesium Release at 1F1

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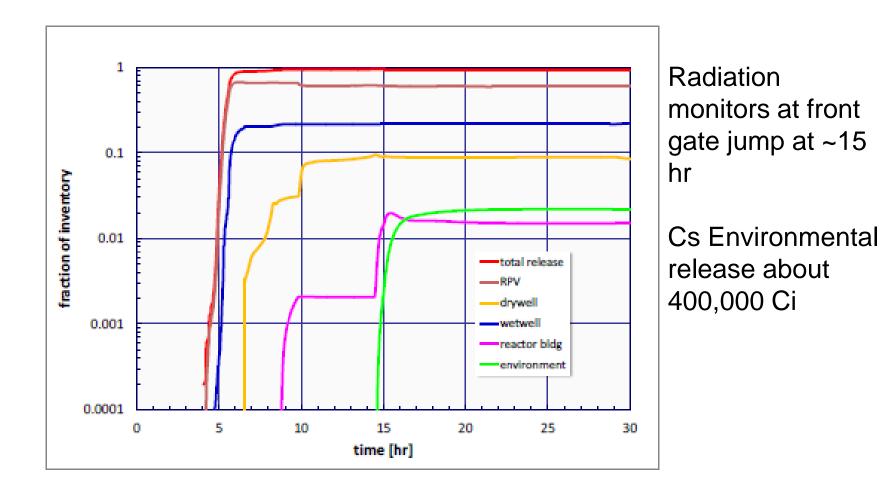


Figure 49 MELCOR-predicted CsI distribution – note that release to environment from reactor building explosion is not reflected in this distribution.



MELTSPREAD & COREQUENCH Best-estimate Ex-Vessel analysis of Unit 1

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IF1 ex-vessel behavior using best estimate codes for spreading (MELTSPREAD) and debris coolability (CORQUENCH)

- MELCOR and MAAP melt pour conditions used as input
- MELTSPREAD calculates extent of spreading and shell heat-up
- COREQUENCH evaluates coolability of debris
- Predictions support TEPCO planning for 1F1 disassembly

Principal results:

- Axial ablation of the concrete below the reactor vessel predicted to be up to 60 cm out of a total thickness of 140 cm in the most extreme case
- While there was significant concrete ablation the debris was coolable for all scenarios



NEA Fukushima Daiichi Project

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NEA is organizing an international project on Fukushima

- Phase 1 is a code benchmarking study of Fukushima accident
- Phase 2 would be to gather data as reactors are defueled
- In Phase 1, numerous severe accident codes are being used to reconstruct accident and then cross-compared (MELCOR, MAAP, SAMPSON, SOCRAT, ASTEC)

Objectives of this study

- Improve severe accident codes via benchmarking with actual data
- Use code results to guide planning of defueling operations
- Participating Countries Include: US, Switzerland, Spain, France, Russian, Germany, Korea, France & Japan

Phase 2 is under discussion

- Program similar to post-TMI project is being considered
- DOE conducting uncertainty quantification study to aid



DOE December 2012 Visit to Fukushima

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