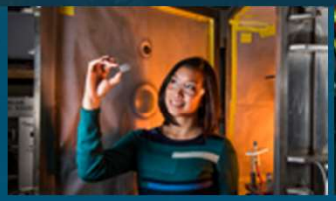
MELCOR Overview introduction



PRESENTED BY

David Louie

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Larry Humphries Bio

- Education:
  - B.S. Idaho State University (General Engineering), M.S. Oregon State University (Nuclear Engineering), Ph.D. University of Florida (Nuclear Engineering), + over 30 years of nuclear reactor safety.
- Current Sandia Role: DMTS at Severe Accident Mod/Analysis
  - 15 years+ as MELCOR lead code developer,
    - Establish quality assurance guidelines and practices for code development
    - Lead the code assessment efforts
    - Model development including eutectic modeling, lower head modeling, radiation enclosure model, multi-rod model
    - Conduct multiple MELCOR workshops for NRC, EMUG, AMUG, and facility safety.
- Previous Experience:
  - Dr. Humphries was principal investigator for the OECD Lower Head Failure (OLHF) experiments and designed, analyzed, and developed computer models for both in-pile melt experiments (USNRC MP1 & MP2) investigating interaction of materials in a severely degraded core and ex-vessel experiments (USNRC XR2) investigating drainage and freezing of metallic melts in a BWR geometry.

David Louie Bio

- Education:
  - B.S., M.S., Ph.D. Nuclear Engineering, University of New Mexico + over 30 years of nuclear safety experiences in reactor and facility safeties.
- Current Sandia Role: PMTS at Severe Accident Mod/Analysis
  - 12 years+, MELCOR developer/application analyst, Independent technical assessor on Sandia ND components
    - 5 DOE-NSRD projects (NSRD-6, 10,11, 15, 16) using MELCOR and SIERRA codes to LPF guidance and substitute DOE-HDBK-3010 data
    - Conduct MELCOR trainings to LANL SB folks and consult to PF-4 MELCOR model development
    - Lead for developing MELCOR training for facility safeties and participate in EFCOG SQA subgroup on Toolbox Alternative.
- Facility safety experiences:
  - 10 years at OMICRON Safety and Risk – SB analyst on DSA development, including accident analyses, including MELCOR, gas/HE explosion, explosion induced fragment calculations at LANL's Area G, RANT, TA-23, TA-18, TA-55, BTF and WETF; NNSS's DAF; LLNL's storage area; New Brunswick Laboratory; and other DOE/NNSA sites
  - 10 years at Los Alamos Technical Associates – safety analyst, shielding/criticality safety engineer for Hanford K-Basin Sludge Removal Project and Rocky Flats, including other remediation sites.

David L. Luxat Bio

- Education:
  - B.S., University of Toronto (Engineering Science); M.S., University of Toronto (Theoretical Condensed Matter Physics); Ph.D., University of Toronto (Theoretical Condensed Matter Physics).
- Current Sandia Role: Manager of the Severe Accident Modeling/Analysis Department
  - Lead research & development initiative to support significant reactor safety technology innovation.
    - Modern accident analysis software – MELCOR
    - Advanced machine learning methods to enable next generation risk-informed safety assessment methods
    - Pioneer strategic developments to enhance decision-making under certainty, utilizing existing & enhanced engineering analysis tools
- Previous experiences:
  - Led large projects and diverse teams in both the U.S. and Canadian nuclear industries
  - Led number of post-Fukushima U.S. nuclear industry initiatives on behalf of EPRI: forensic Fukushima Daiichi accident reconstruction, advising Japanese National Project planning Fukushima decommissioning strategy, enhancement of Severe Accident Management Guidance Technical Basis Report, Containment Protection and Release Reduction (CPRR) rulemaking industry technical basis development

MELCOR Overview Objectives

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- Enabling the participants to learn about the physics and the usage of MELCOR code for leak path factor analysis or other applications at DOE facilities
  - MELCOR is developed here and funded by U.S. Nuclear Regulatory Commission (NRC)
- Important packages in MELCOR will be covered in this overview to build LPF models
  - Cover fundamentals of MELCOR, including SQA
  - Include the tools to aid MELCOR calculations and analyses
- Covering potential major accidents using MELCOR at DOE facilities
- Show examples and MELCOR validations

International Use of MELCOR

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Validated physical models

- International Standard Problems, benchmarks, experiments, and reactor accidents
- Beyond design basis validation will always be limited by model form uncertainty that arises when extrapolated to reactor-scale

CSARP (Cooperative Severe Accident Research Program) is a large international, collaborative community supporting the validation of MELCOR

International LWR fleet relies on safety assessments performed with the MELCOR code

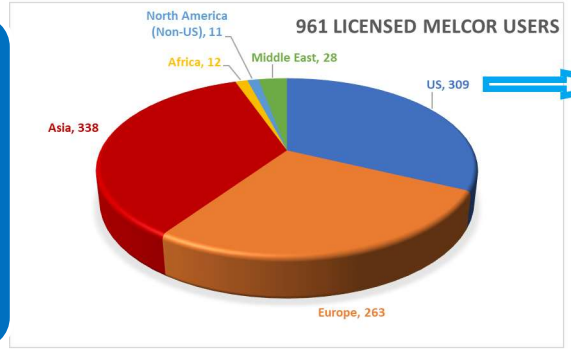
International Collaboration

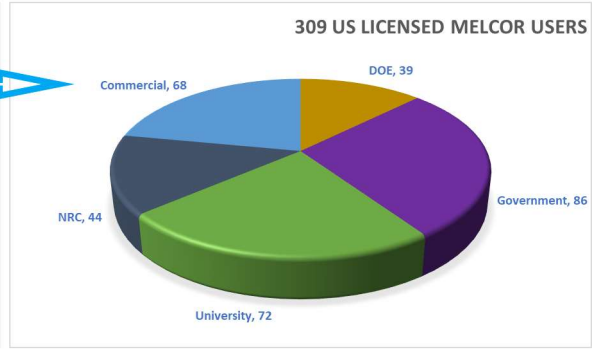
Cooperative Severe Accident Research Program (CSARP) – June/U.S.A

MELCOR Code Assessment Program (MCAP) – June/U.S.A

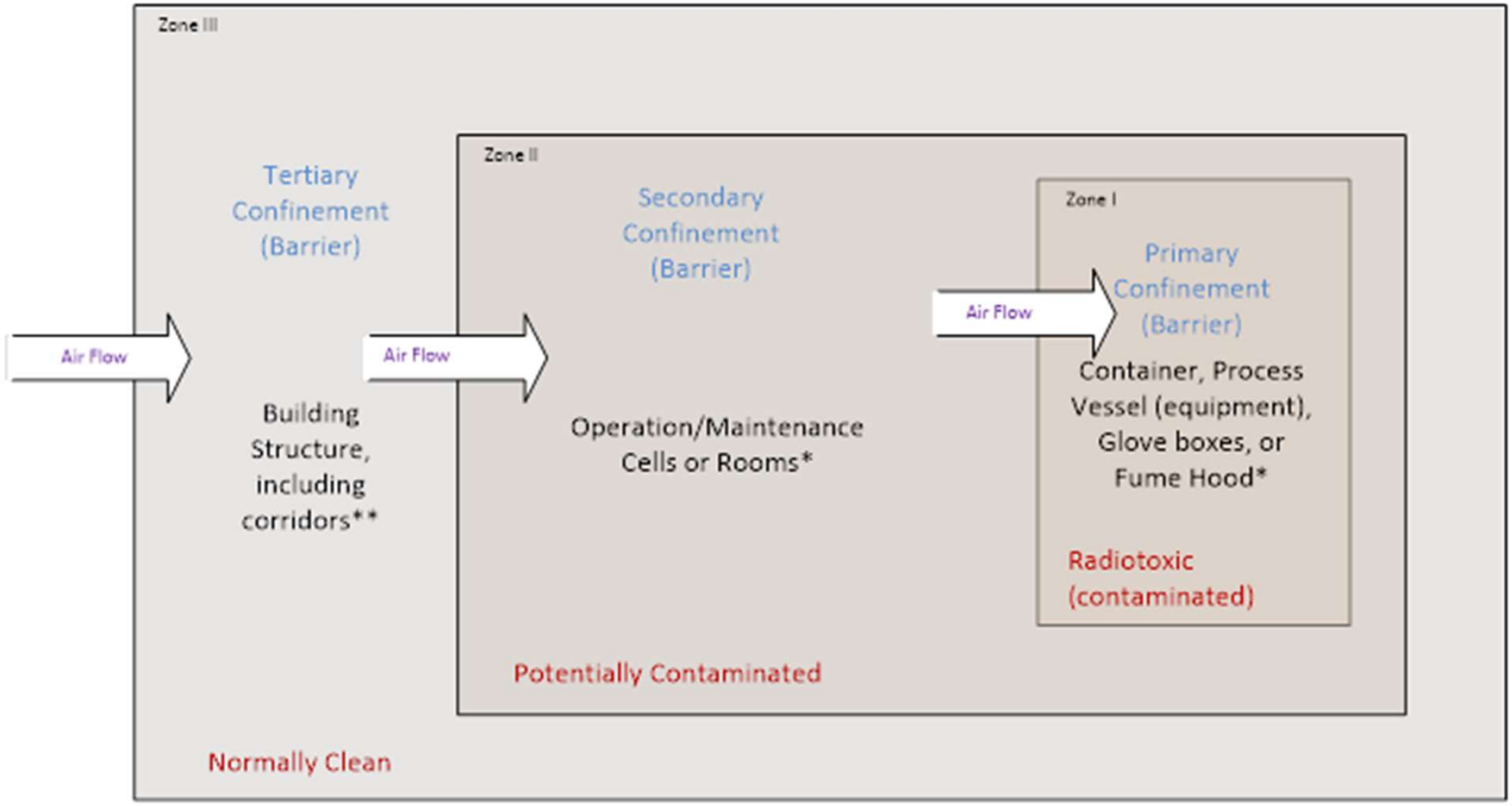
User GrouEuropean MELCOR p (EMUG) Meeting – Spring/Europe

Asian MELCOR/MACCS User Group (AMUG) Meeting – Fall/Asia





3-Tier Confinement Zones with Active Ventilation System

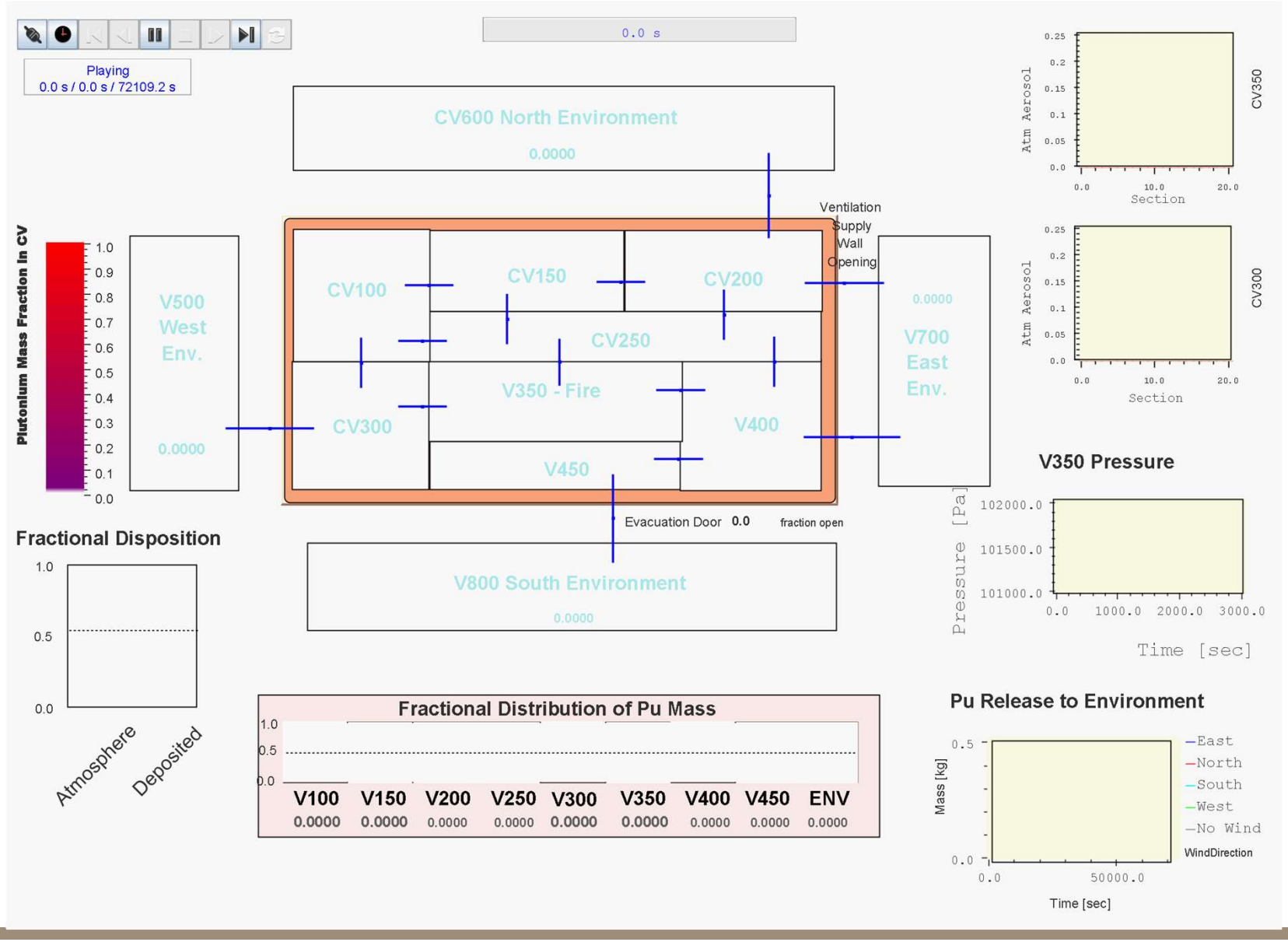


*This barrier/confinement may contain its own ventilation system that includes off-gas treatment

**This barrier/confinement may require airlock for personnel to enter the secondary confinement

Confinement_diagram\v2].vsd

Example of the Release from Facility



MELCOR Overview Agenda

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Session	Duration
1. Introduction (Louie)	10 min
2. Safety basis application of MELCOR (Louie)	40 min
3. MELCOR overview, SQA and tools (Humphries)	30 min
Break	10 min
4. T-H modeling of MELCOR (Luxat)	30 min
5. Aerosol physics modeling (Humphries)	30 min
Break	10 min
6. Control functions and tabular functions	15 min
7. SNAP, DAKOTA introduction (Humphries)	30 min
8. Summary (Luxat)	5 min