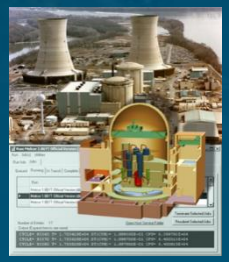
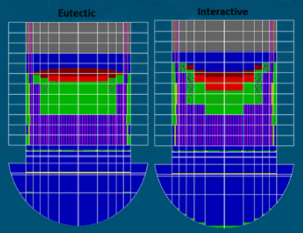
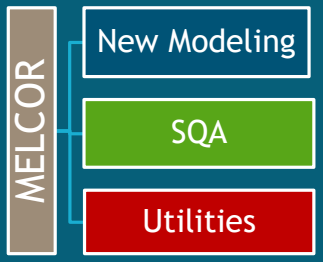
MELCOR EMUG COR Package Workshop 2019







PRESENTED BY

Larry Humphries, Sandia National Laboratories

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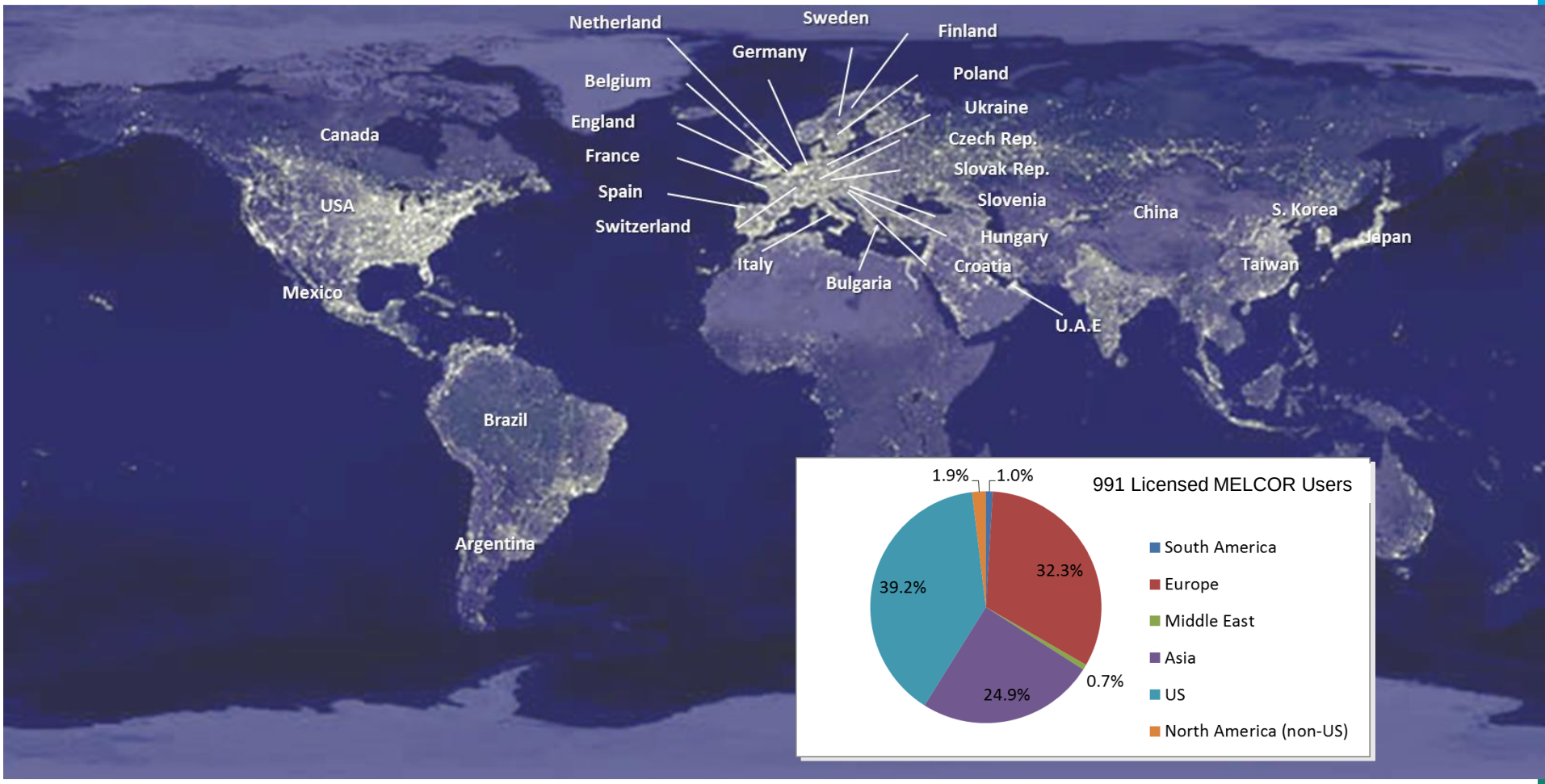
International Use of MELCOR



MELCOR Workshops & Meetings

2018 Asian MELCOR User Group (AMUG)
- Hosted by CRIEPI (Japan)
- August 2018
- MELCOR/MACCS Topics

2019 European MELCOR User Group (EMUG)
- Hosted by Paul-Scherrer Institute (PSI)
- Workshop on COR Package (April 3)
- April 4-5, 2019

2019 CSARP/MCAP/MELCOR Workshop
- CSARP (June 3-5), MCAP (June 5-6), Workshop (June 6 afternoon)
- Albuquerque, NM
- ½ day workshop with focused topics on ex-vessel corium modeling

What is Required of a Severe Accident Code

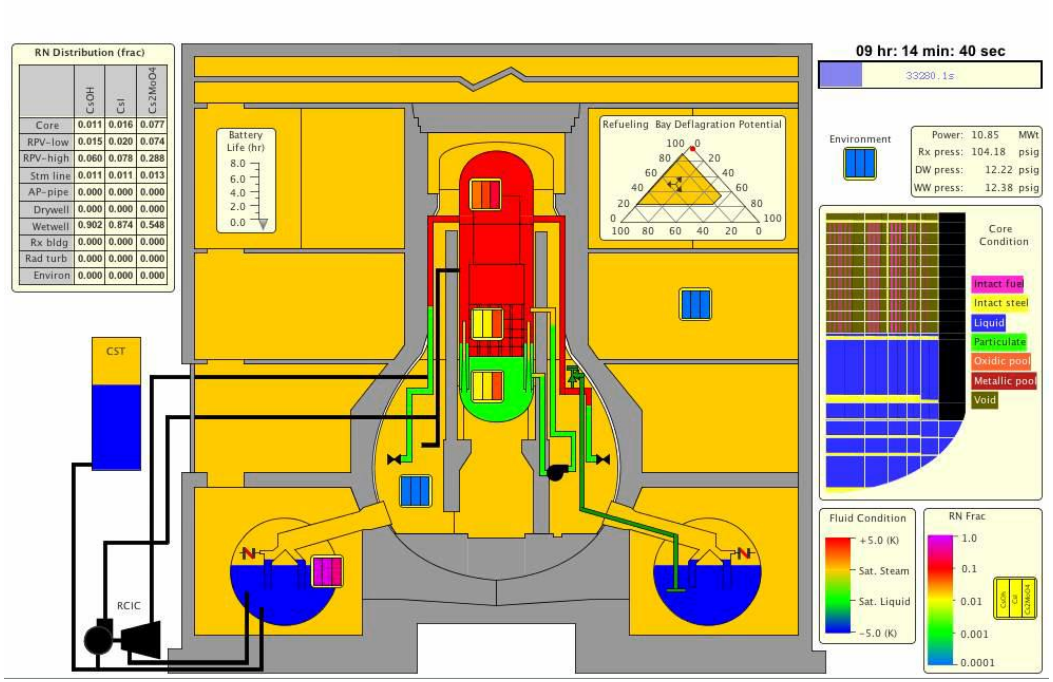
Fully Integrated, multi-physics engineering-level code
- Thermal-hydraulic response in the reactor coolant system, reactor cavity, containment, and confinement buildings;
- Core heat-up, degradation, and relocation;
- Core-concrete attack;
- Hydrogen production, transport, and combustion;
- Fission product release and transport behavior

Diverse Application
- User constructs models from basic constructs
- Multiple 'CORE' designs
- Adaptability to new reactor designs

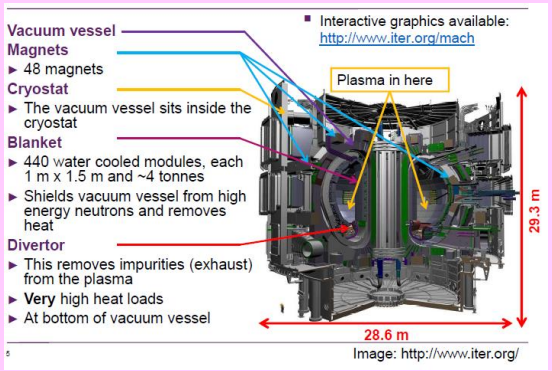
Validated physical models
- ISPs, benchmarks, experiments, accidents

Uncertainty Analysis
- Relatively fast-running
- Reliable code
- Characterized numerical variance

User Convenience
- Windows/Linux versions
- Utilities for constructing input decks (GUI)
- Capabilities for post-processing, visualization
- Extensive documentation



Non-Reactor Applications



Fusion

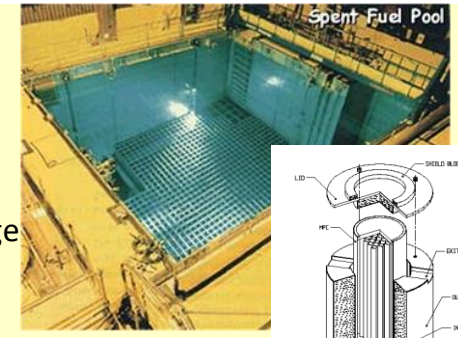
- Neutron Beam Injectors (LOVA)
- Li Loop LOFA transient analysis
- ITER Cryostat modeling
- Helium Lithium
- Helium Cooled Pebble Bed Test Blanket (Tritium Breeding)

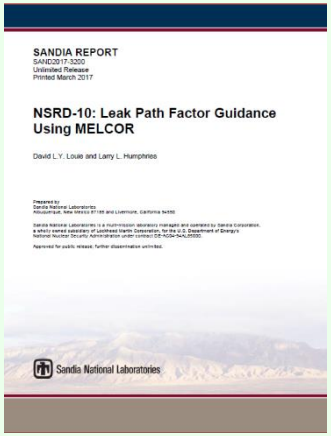
Spent Fuel

Spent fuel pool risk studies

Multi-unit accidents (large area destruction)

Dry Storage





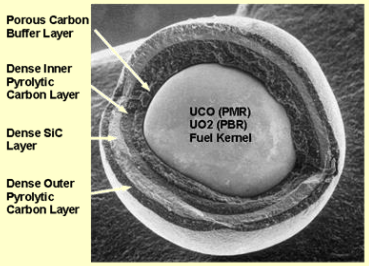
Non-Nuclear Facilities

- Leak Path Factor Calculations (LPF)
  - Release of hazardous materials from facilities, buildings, confined spaces
- DOE Safety Toolbox code
- DOE nuclear facility users
  - Pantex
  - Hanford
  - Los Alamos
  - Savannah River Site

MELCOR 2.2 Emerging Applications

HTGR Reactors

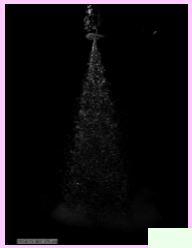
- Helium Properties
- Accelerated steady-state initialization
- Two-sided reflector (RF) component
- Modified Fuel components (PMR/PBR)
- Point kinetics
- Fission product diffusion, transport, and release
- TRISO fuel failure

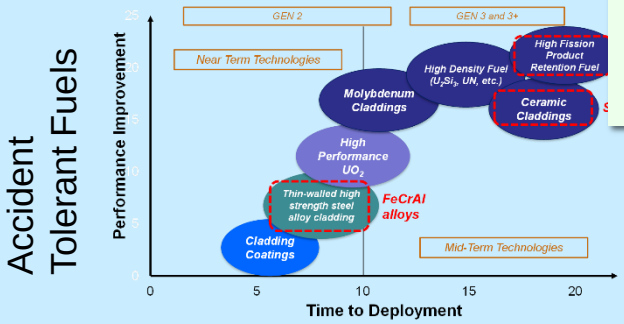


Sodium Reactors

Sodium Properties
- Sodium Equation of State
- Sodium Thermo-mechanical properties

Containment Modeling
- Sodium pool fire model
- Sodium spray fire model
- Atmospheric chemistry model
- Sodium-concrete interaction

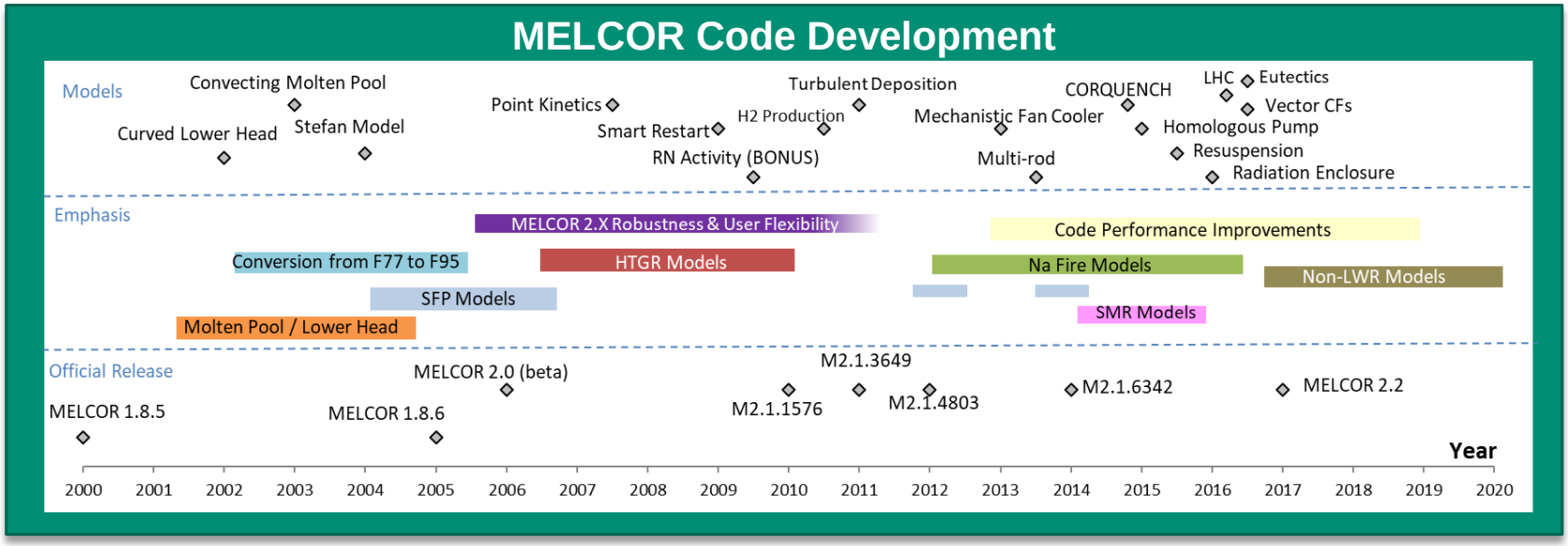


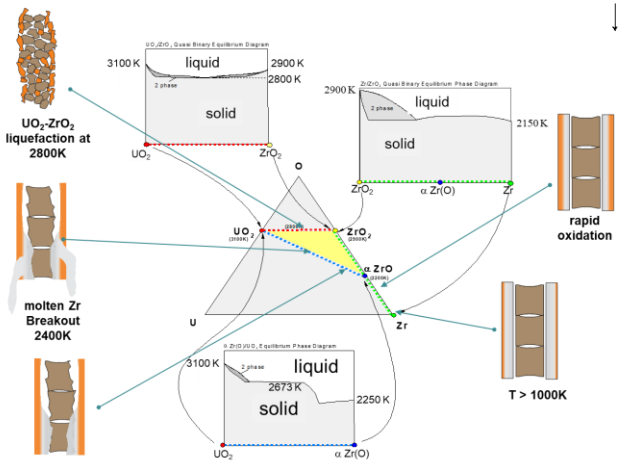


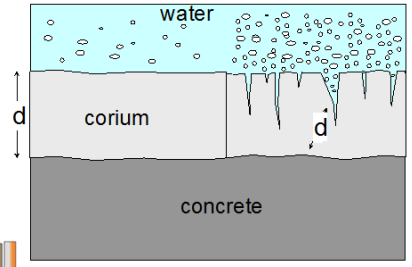
Molten Salt Reactors

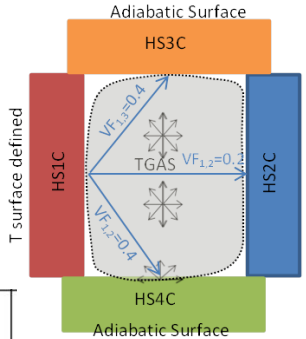
- Properties for LiF-BeF2 have been added
  - Equation of State
  - Thermal-mechanical properties

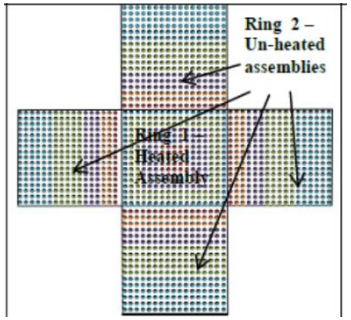
MELCOR General Model Development

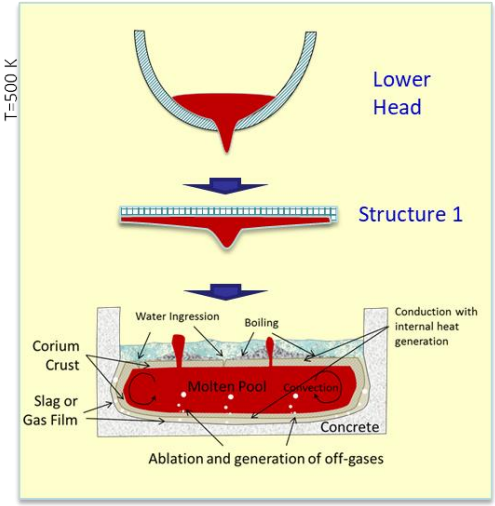




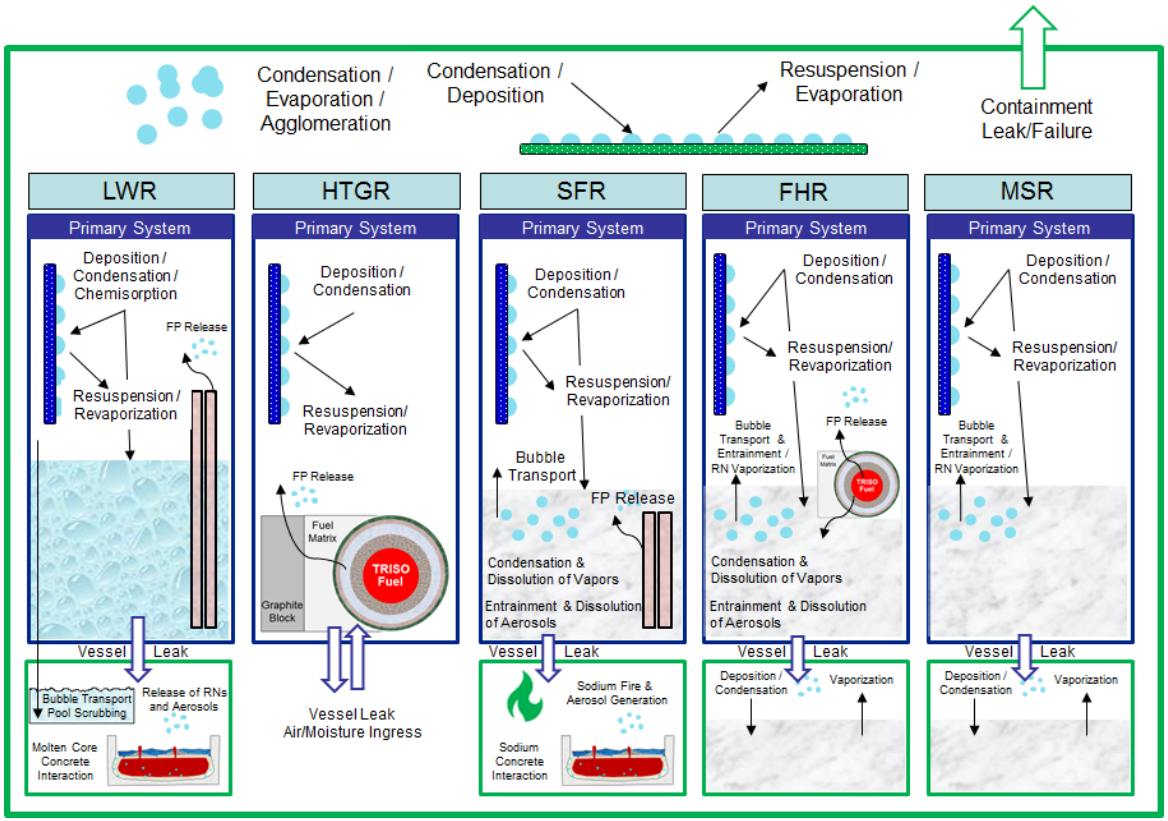


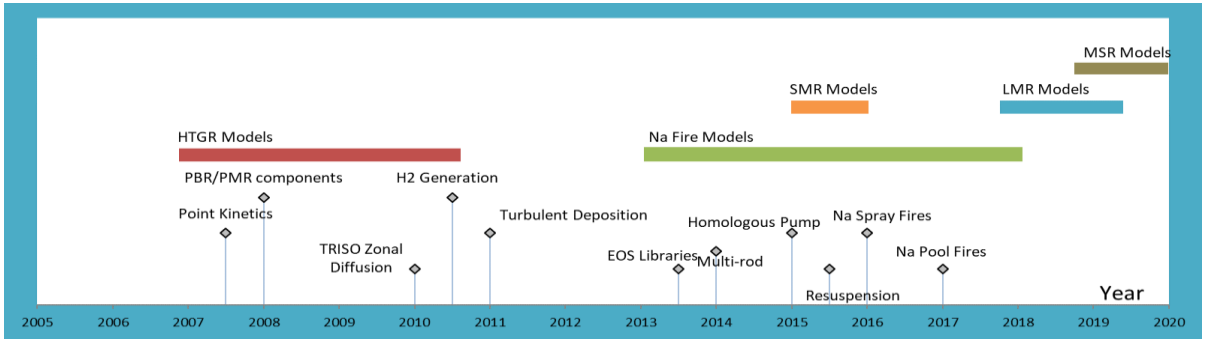






MELCOR Non-LWR Reactor Applications Development





Tuesday

Session	Time
Workshop Introduction	30 min
COR Package Overview	60 min
Fuel Fission Product Release	45 min
COR Heat Transfer	45 min
Eutectic Model	30 min
Oxidation Models	30 min
COR Nodalization	45 min
Lower Head Modeling	45 min
COR plot/CF variables	30 min
~~SNAP/PTFREAD~~	~~30 min~~
Code Coupling	30 min
Wrap-up	30 min