

RECENT MELCOR APPLICATIONS IN TE

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INTERNAL

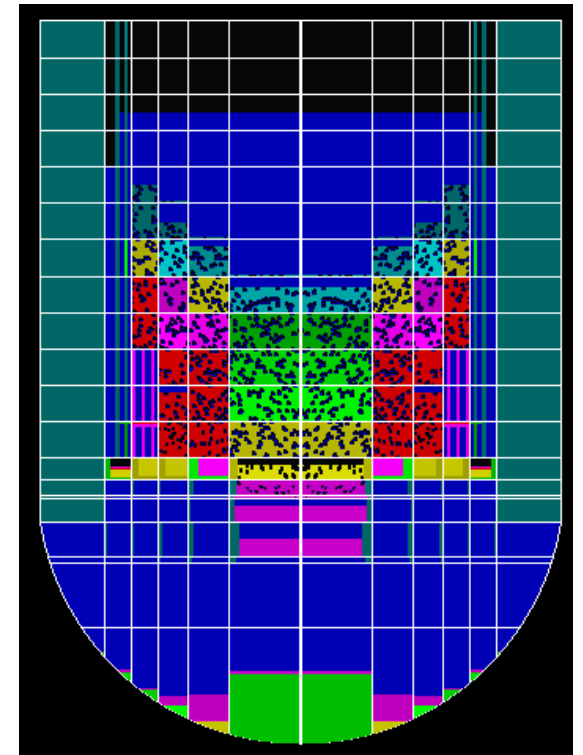
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MELCOR's used inside TE

- Within the frame of R&D international project
- To support the Belgian NPP PSA Level 2 analyses
- Within the verification process of safety criteria for the Belgian NPP
- And future perspectives

WITHIN THE FRAME OF R&D INTERNATIONAL PROJECT BETMI2

- Code to code benchmark on the ability of current advanced codes to predict in-vessel core melt progression and degraded core coolability
- 11 participants representing 6 SA codes
 ASTEC, ATHLET-CD, ICARE/CATHARE
 MELCOR, SCDAP-RELAP, SOCRAT
- TE: 2 transients simulated on TMI-2 plant using MELCOR 1.8.6
 6 mandatory calculations + optional sensitivities
- Focus on core degradation phase up to vessel failure
 variants aim at challenging codes by performing reflooding of the core at different moment/rate



WITHIN THE FRAME OF R&D INTERNATIONAL PROJECT BETMI2

Main results related to MELCOR:

- MELCOR 1.8.6 demonstrates its ability to simulate core melt progression and degraded core coolability
results are in agreement with other codes for most important parameters
- Compared to the other codes represented in the benchmark
MELCOR 1.8.6 results in terms of coolability of the debris are pessimistic
MELCOR 2.1 defaults significantly enhance debris coolability, particularly during debris slumping into the lower plenum
- Sensitivity studies shall be selected in order to exhibit potential cliff-edges
e.g. core support plate and/or vessel failure

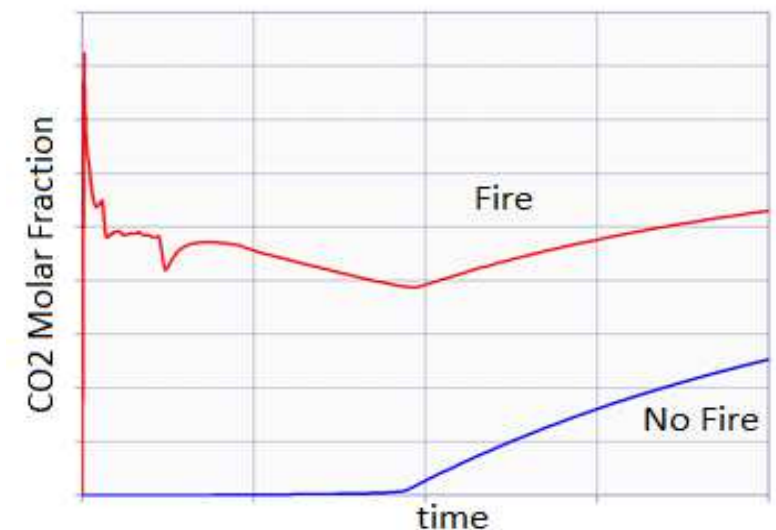
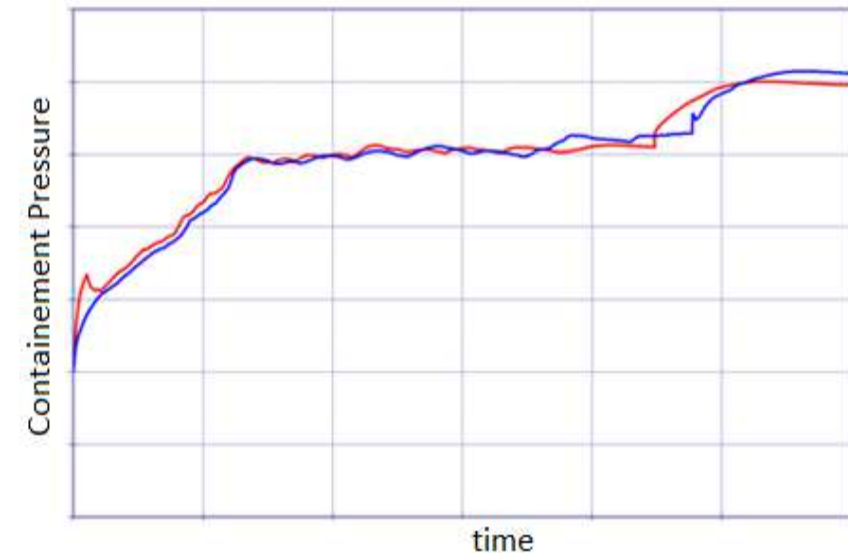
TO SUPPORT THE BELGIAN NPP PSA LEVEL 2 ANALYSES

Internal Fire and Flooding

- All Level 2 PSA studies regarding internal events (except internal hazards) have been finalised in 2013 – MELCOR 1.8.6 used as reference code
- In 2014-15, Accident Progression Event Tree (APET) modified in the frame of internal Fire & Flooding Level 2 PSA
- APET quantification for the part related to the in-containment fire uses MELCOR supporting calculations

Modelling of in-containment fire in MELCOR using mass/energy sources and mass sink – based on existing FDS calculations

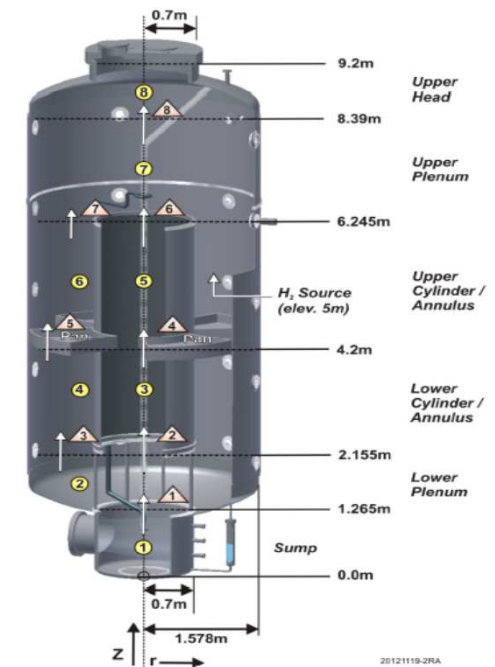
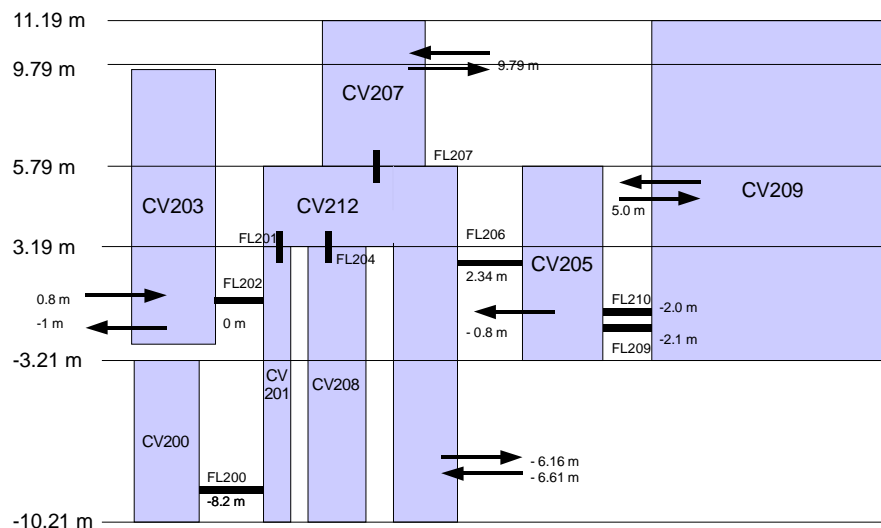
MELCOR results will mainly serve to (re-) quantify the hydrogen risk, the fission products transport and releases towards the environment



TO SUPPORT THE BELGIAN NPP PSA LEVEL 2 ANALYSES

Living PSA

- Refined auxiliary building modelling in MELCOR 1.8.6 decks for Belgian units
 - to better assess fission products releases and hydrogen distribution/transport towards other parts of the NPP adjacent to the reactor building
 - Benchmark MELCOR – FATE on Thai experiment
 - Development of automated tool for modelling auxiliary buildings in MELCOR

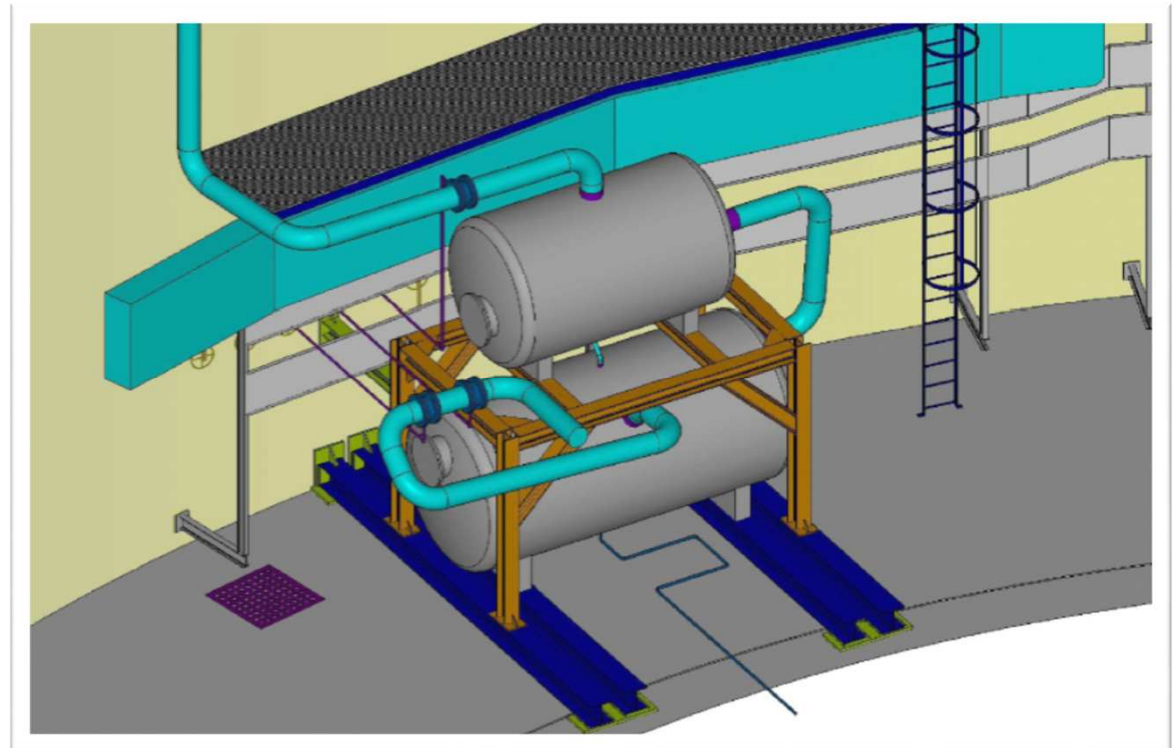


WITHIN THE VERIFICATION PROCESS OF SAFETY CRITERIA FOR THE BELGIAN NPP Filtered Containment Venting System (FCVS)

- Decision to install a FCVS for all the Belgian units
- MELCOR is Tractebel Engineering reference code for severe accident calculation

Used in conjunction with ASTEC-IODE for assessing the design parameters and safety criteria for the FCVS

Used for assessment of aerosols deposition in the piping line in conjunction with ASTEC-SOPHAEROS



WITHIN THE VERIFICATION PROCESS OF SAFETY CRITERIA FOR THE BELGIAN NPP New Technical Support Centre (TSC)

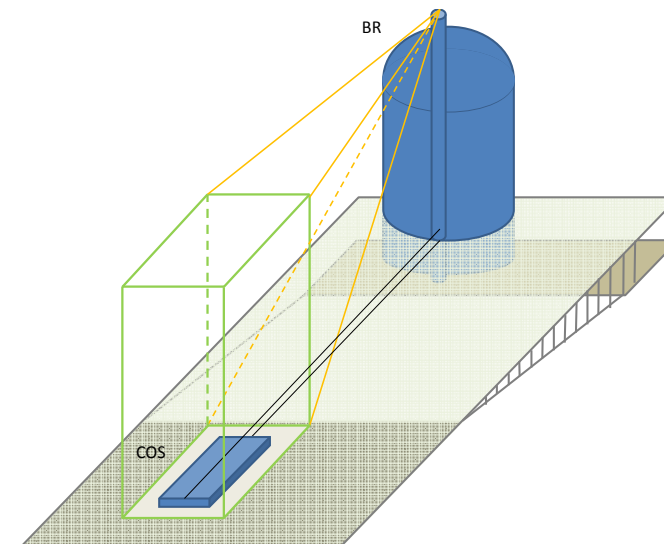
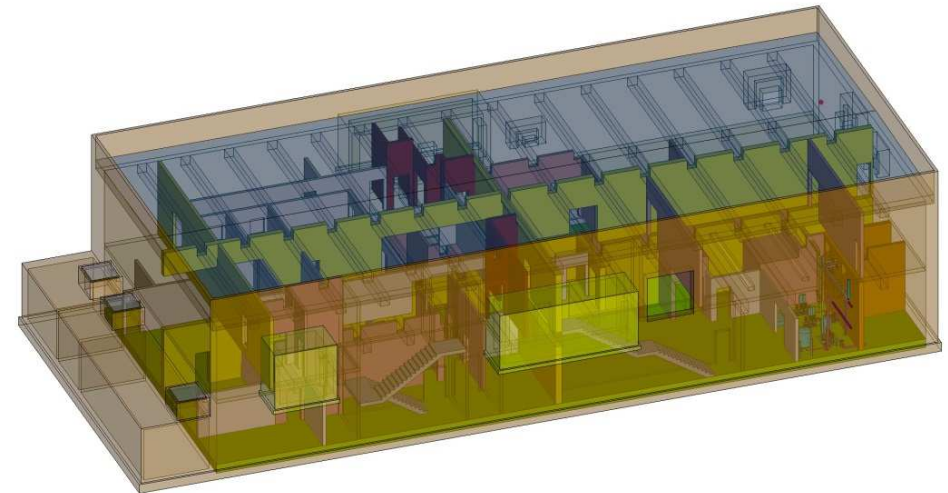
- Conservative evaluation of the volumetric activity around the New TSC

MELCOR releases per Class translated to releases per isotopes based on ORIGEN data for core inventory

Releases from Filtered Containment Venting System and Design Leak during severe accident

Repartition of time-sequenced releases into arbitrary defined volumes

Goal: assessment of New TSC walls and roof thicknesses + filtration efficiency of the TSC ventilation



AND FUTURE PERSPECTIVES

- Intention of TE to use MELCOR 2.1 for future applications
- Use of MELCOR in conjunction with other codes within the frame of R&D international projects, e.g. IVMR (EC-NUGENIA), BIP3 (OECD/NEA)
- SFP analyses for the Belgian NPP (New WENRA RL)
- Other MELCOR applications related to the Living PSA