



5th Meeting of European MELCOR User Group (EMUG)
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Overview of MELCOR Activities at KTH

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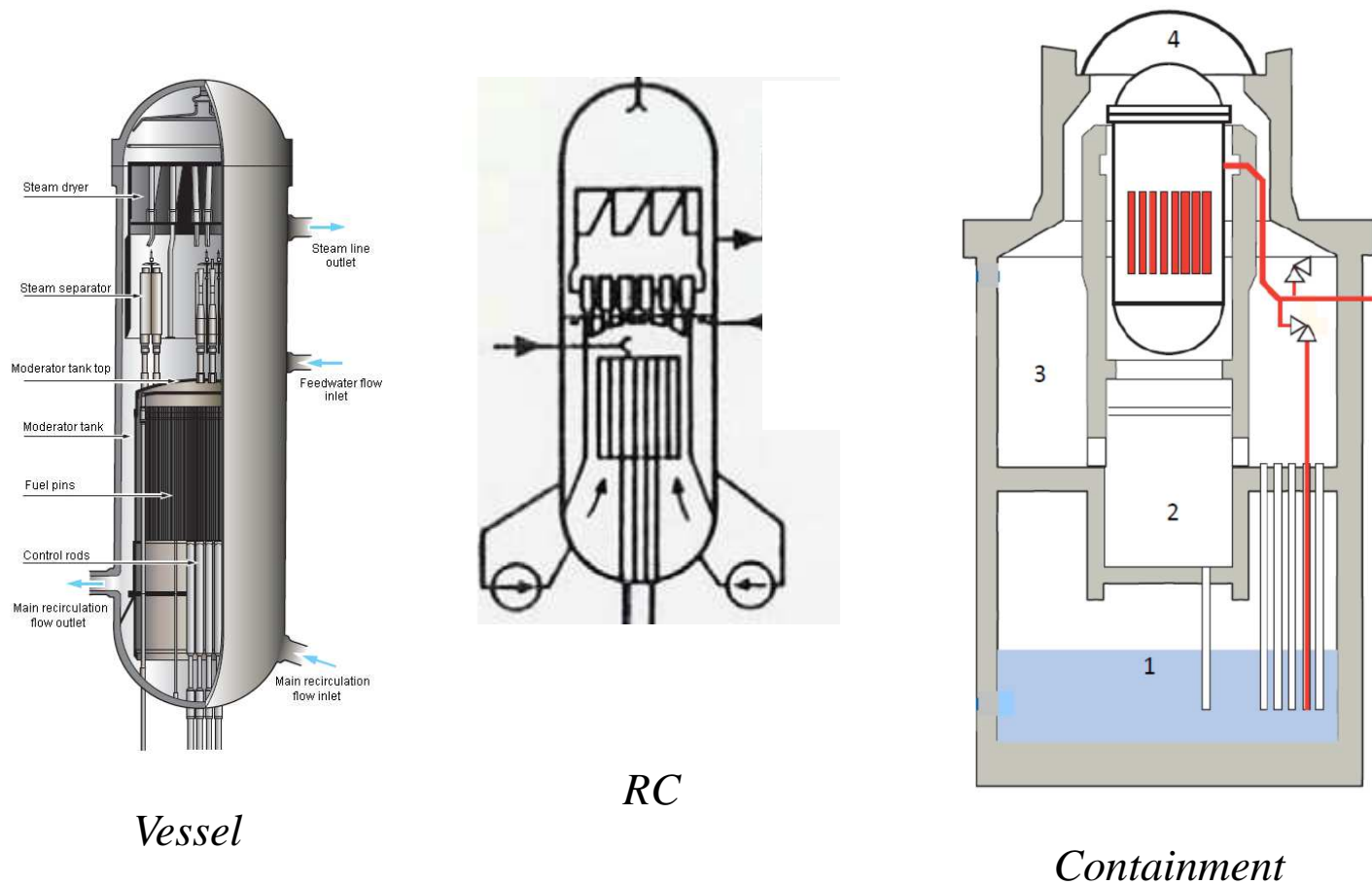


MELCOR Applications at KTH

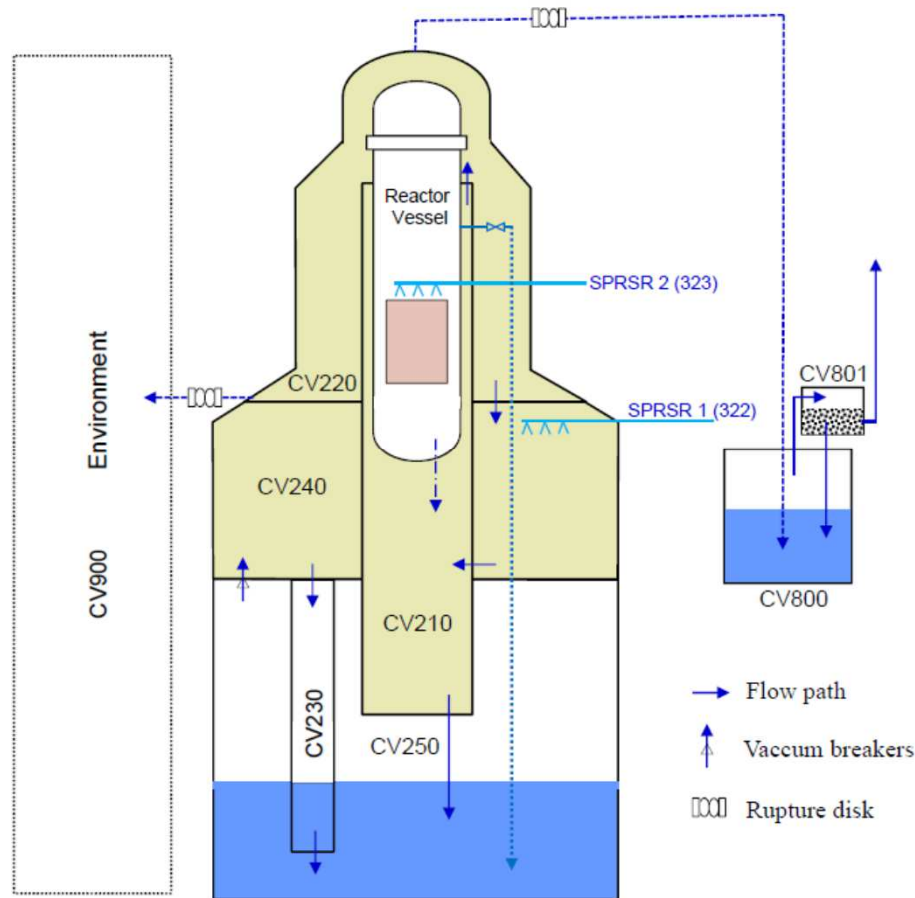
- DBA safety analysis
 - Forsmark-1 2006 event
- SA safety analysis for power uprate
 - Ringhals-3 PWR
 - Oskarshamn-3 BWR
 - Oskarshamn-2 BWR
- Analysis of in-vessel corium progression
 - To provide melt conditions for mechanistic study on in-vessel and ex-vessel coolability.
- Analysis of Fukushima accidents
 - F-I-3
 - F-I-2 – *see the separate presentation of Chen et al*
- SA analysis of spent fuel pools – *to be performed.*

SA Analysis of Oskarshamn-2

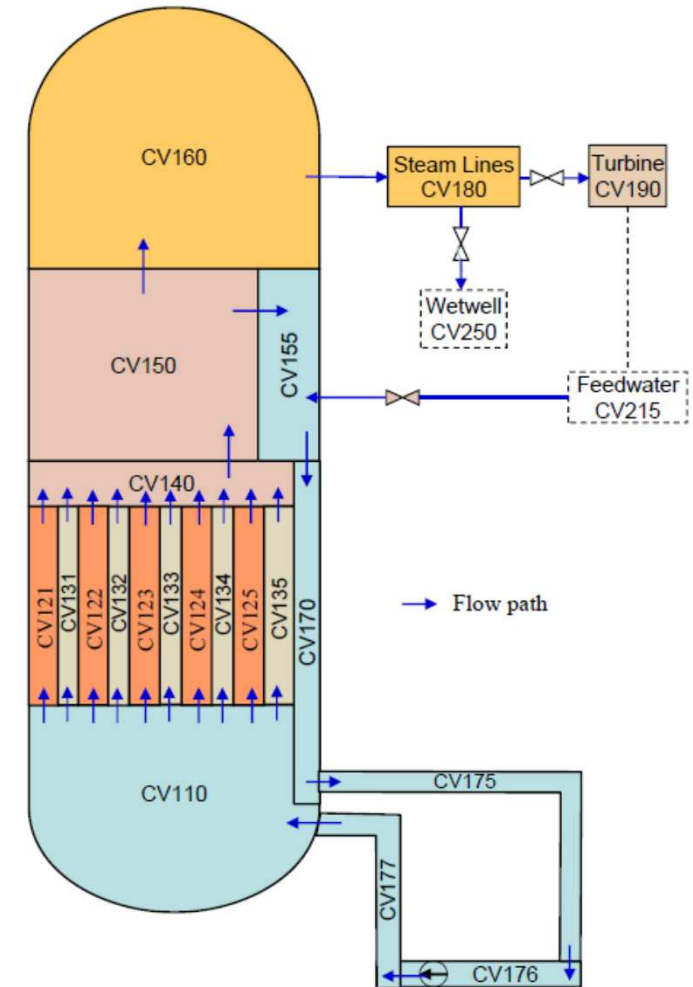
- Oskarshamn-2 is a BWR with the original capacity of 1800 MWth.
- The reactor is applying for 29% power uprate, to 2300 MWth operation..



- Nodalization



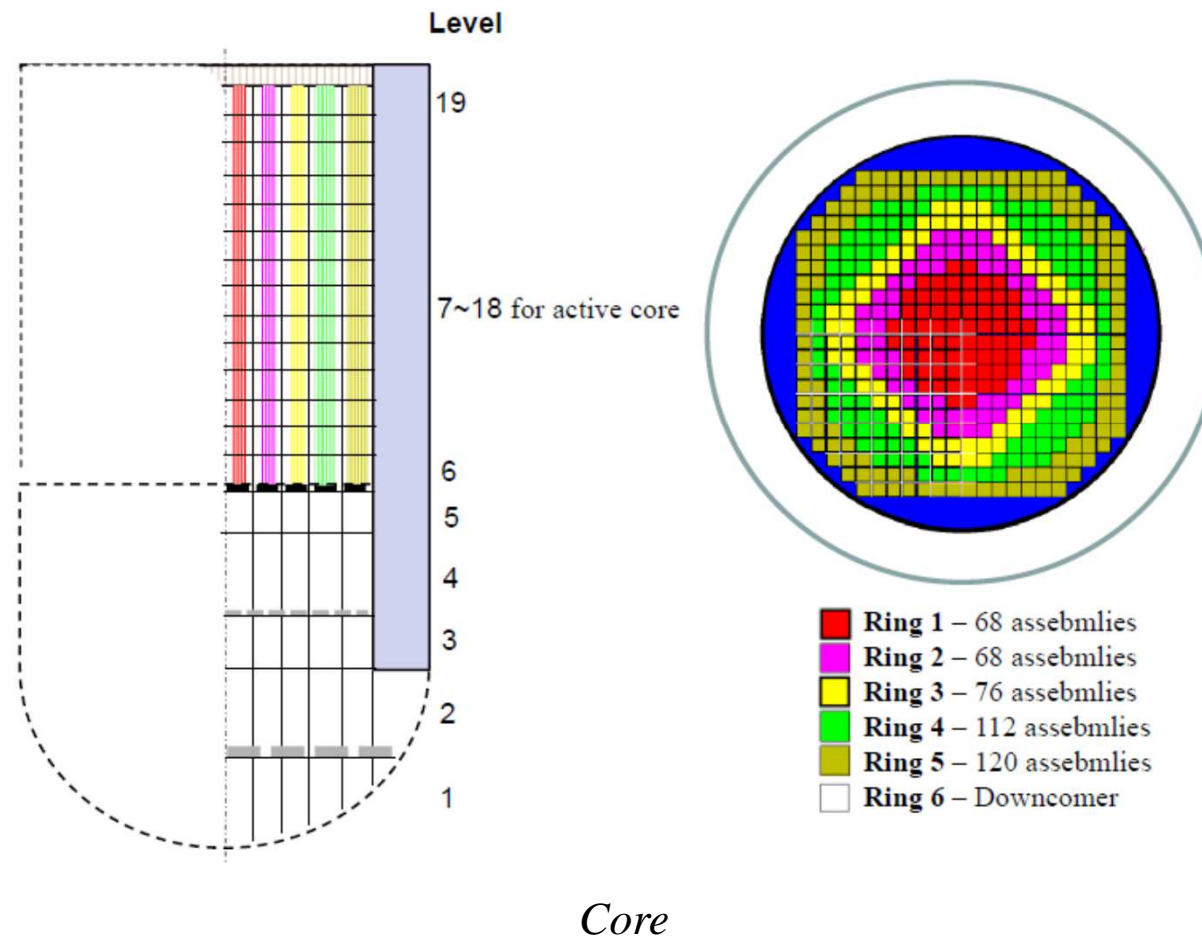
Containment



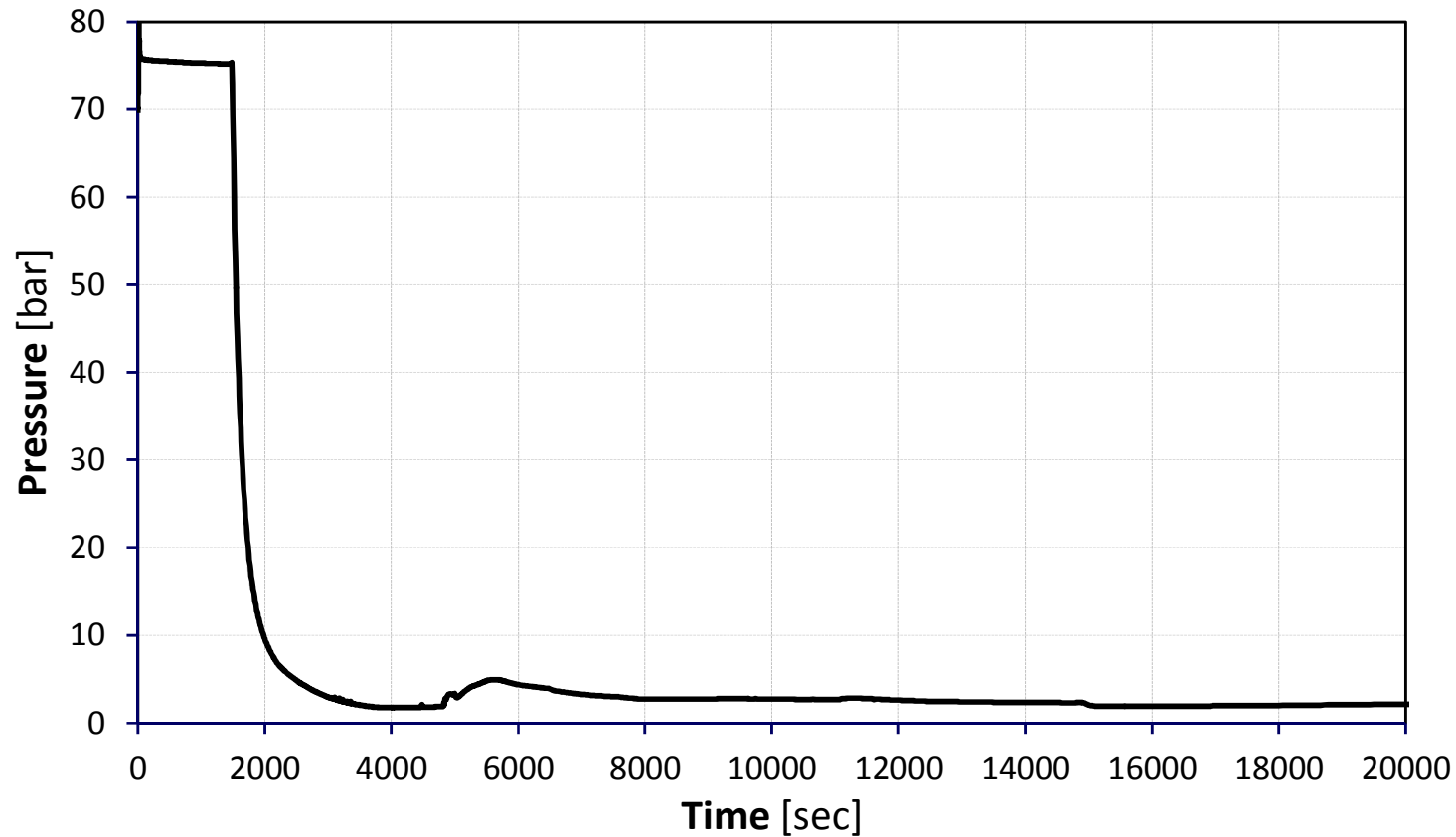
Vessel

SA Analysis of Oskarshamn-2

- Nodalization

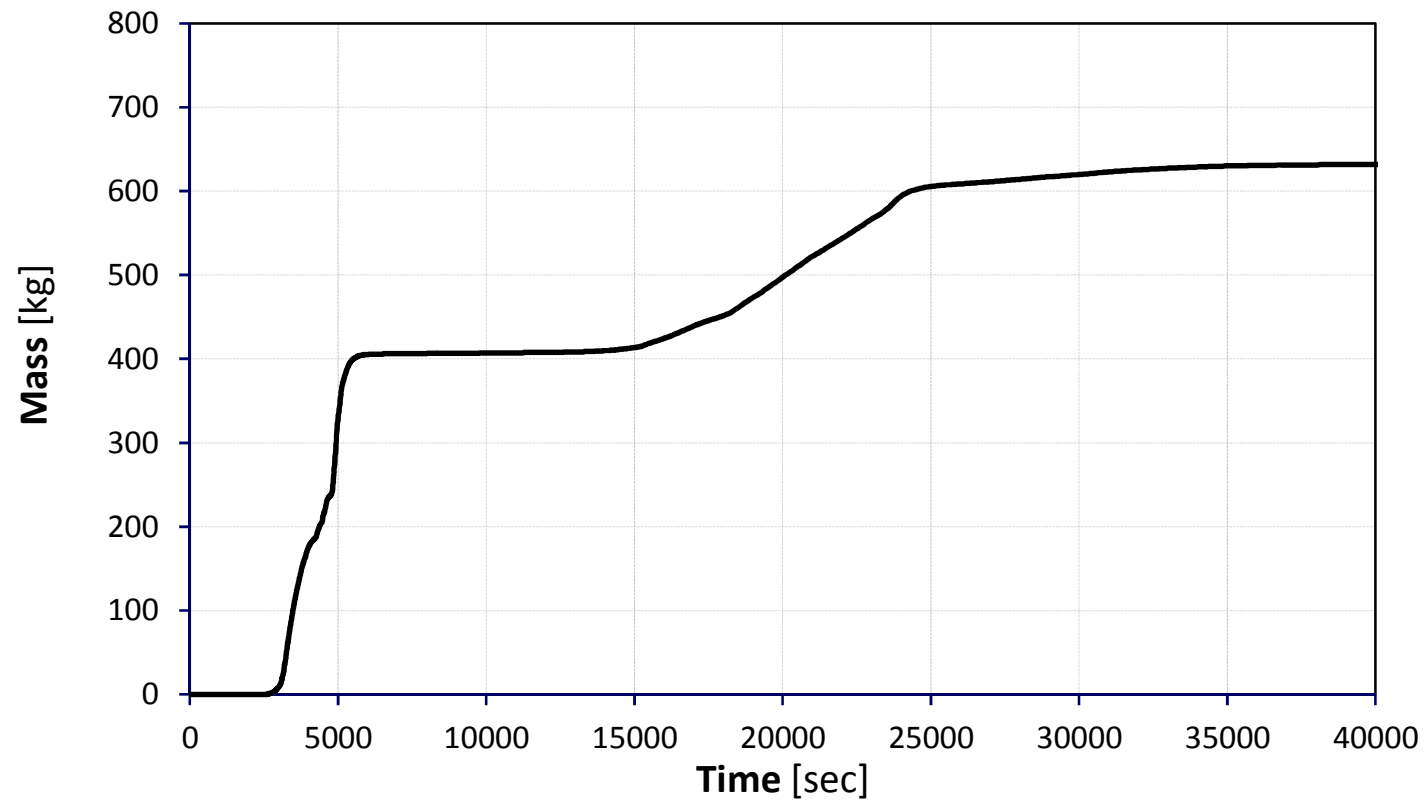


- Some results of SBO



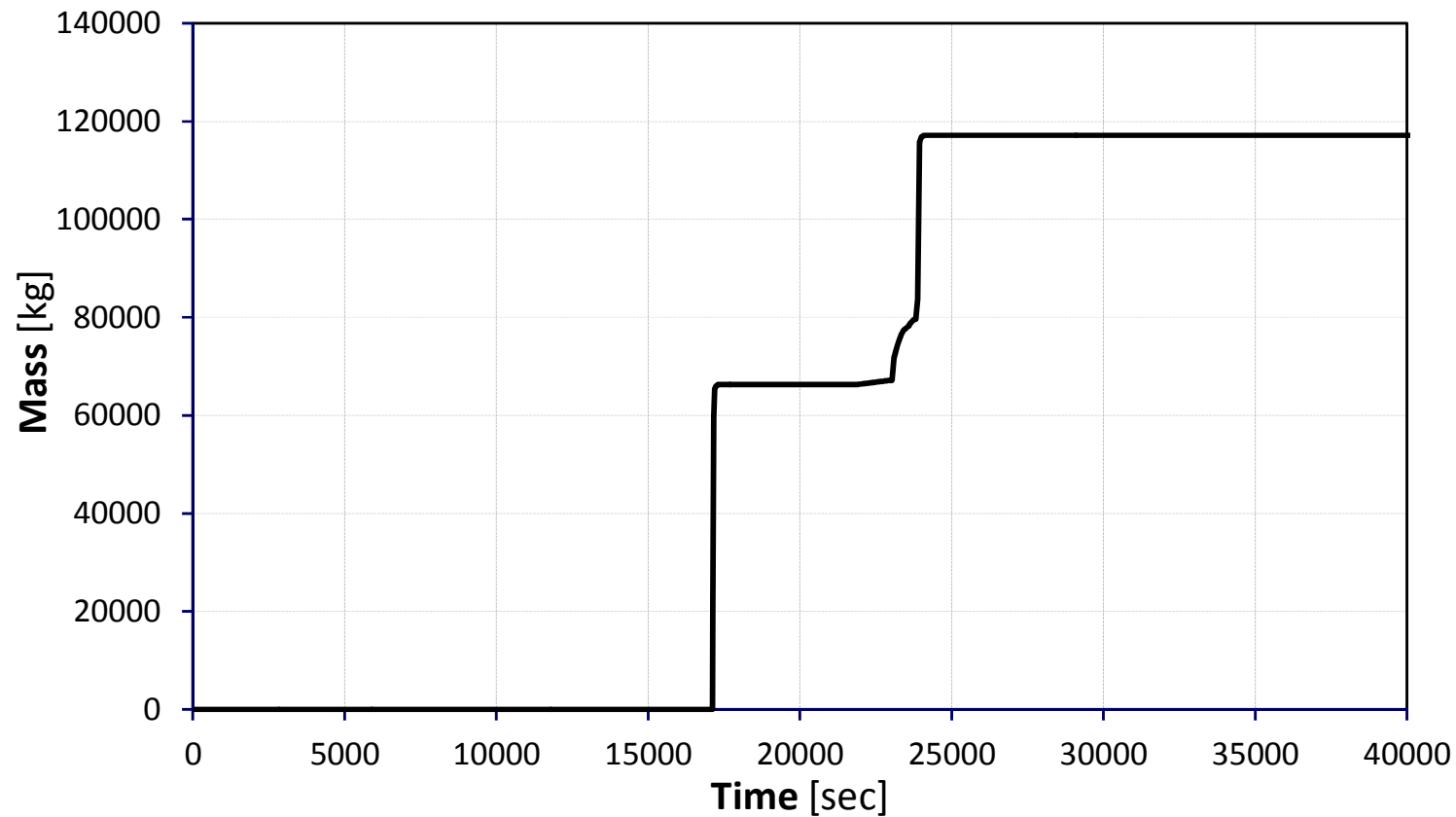
Pressure in the vessel

- Some results of SBO



H2 generation in the core

- Some results of SBO



Corium ejection

➤ Motivation

The goal of SA research at KTH is to resolve two long-standing severe accident issues of Nordic BWRs:

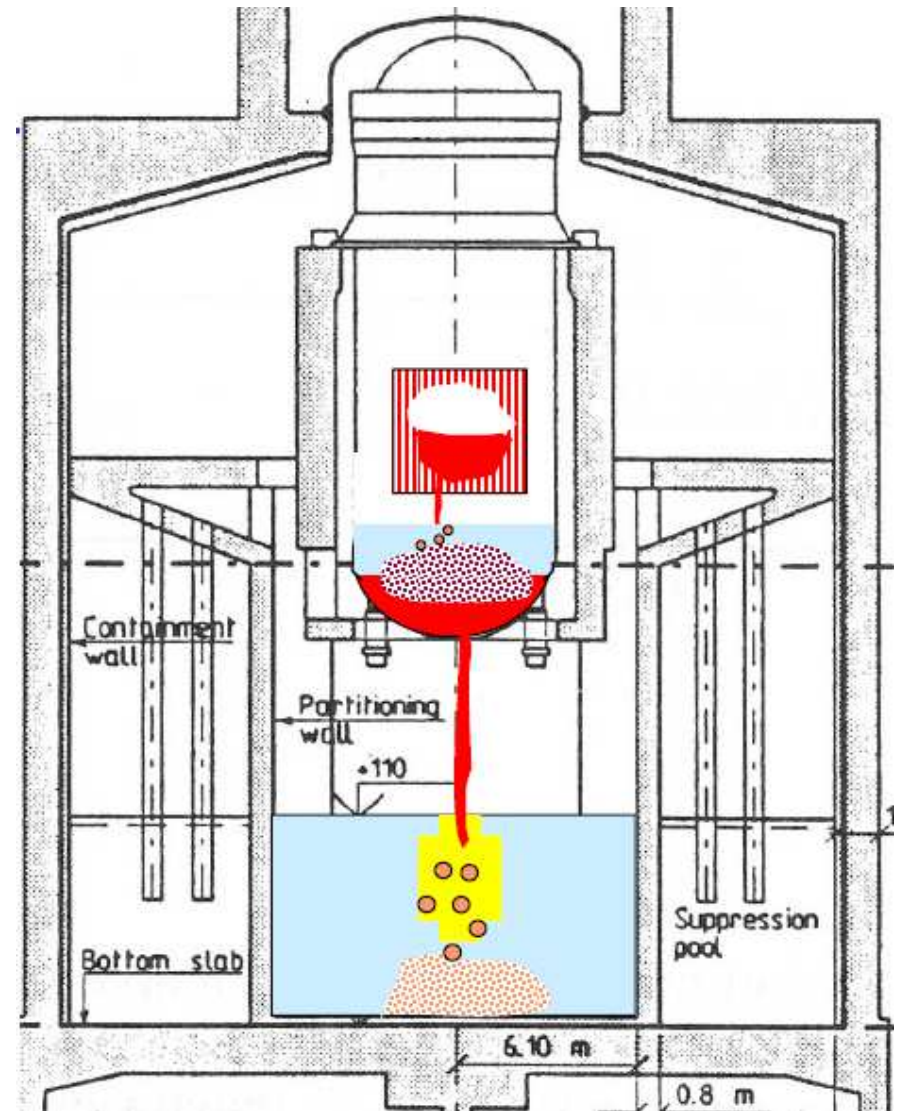
- *Ex-Vessel Corium Coolability (EVC)*
- *Steam Explosion Energetics (SEE)*

The issues are closely related to

- *In-Vessel Corium Coolability (IVC) - -- Mechanistic modeling, e.g., PECM/ANSYS Mechanic coupled simulation, DECOSIM simulation.*

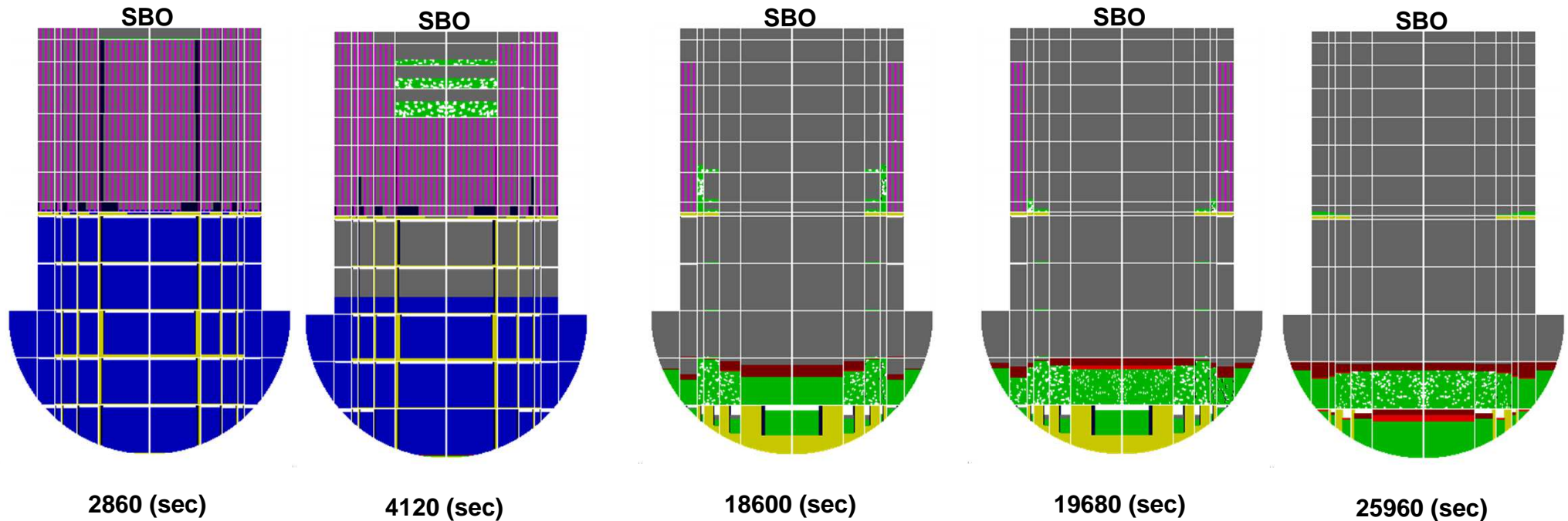
which determines

- *Melt ejection conditions (timing, location, mass, composition, temperature, rate, ...)*



Analaysis of In-vessel Corium Progression

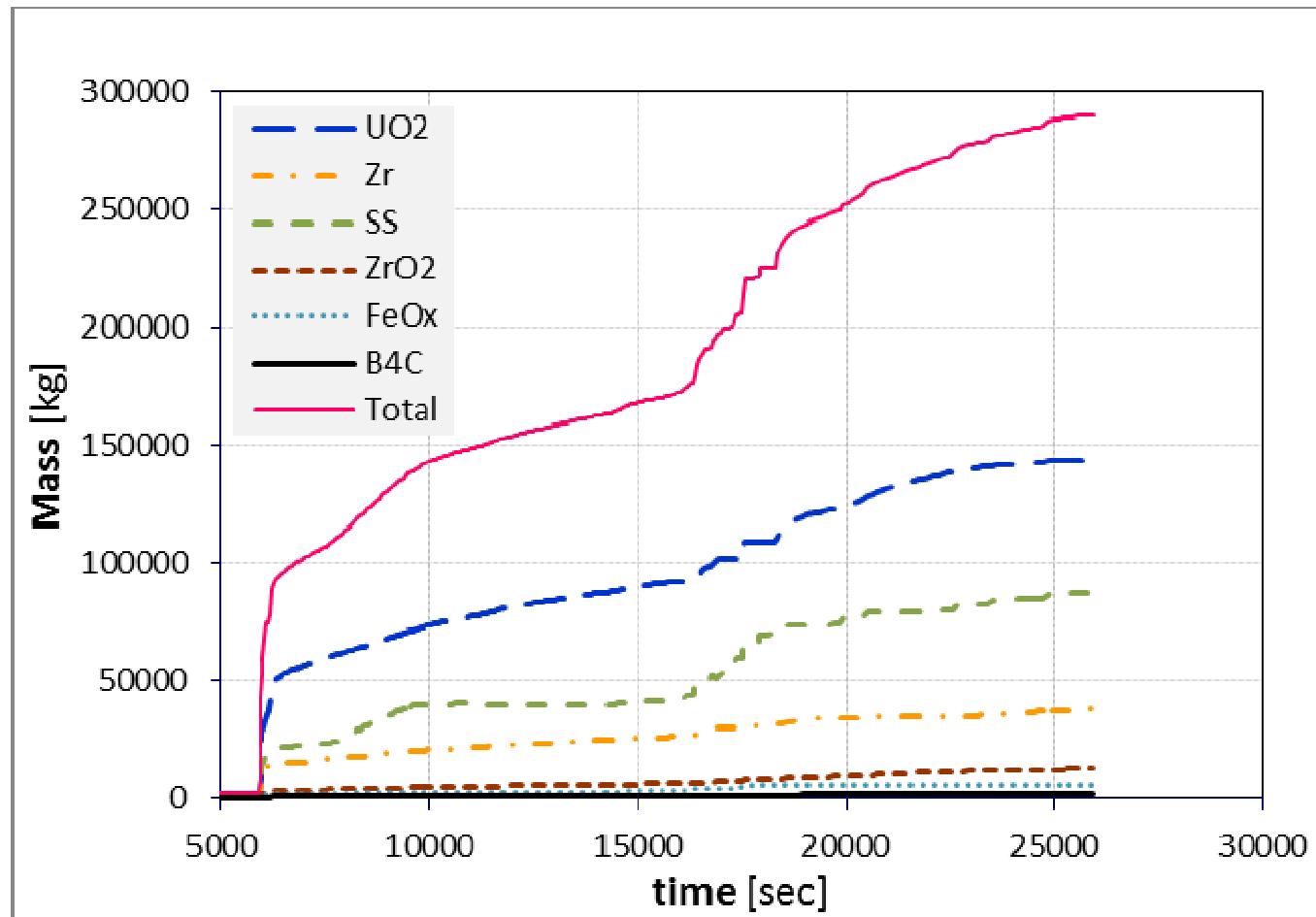
- Reference plant: a BWR with the capacity of 3900 MWth.



Melt progression in the vessel

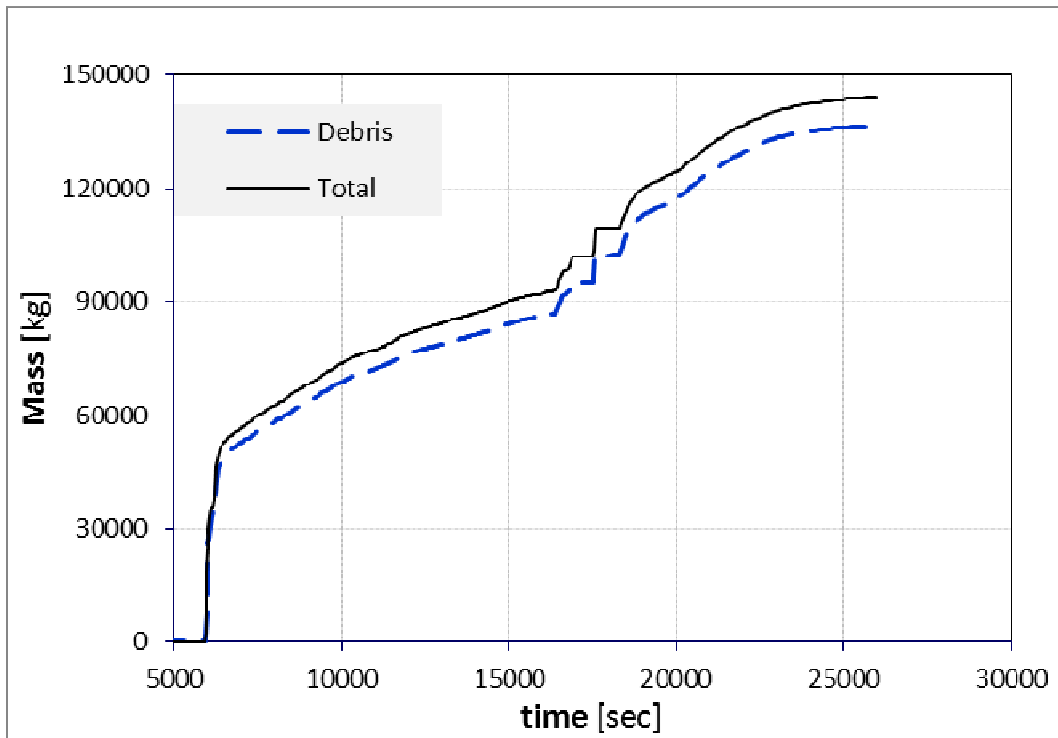


➤ Some results of SBO

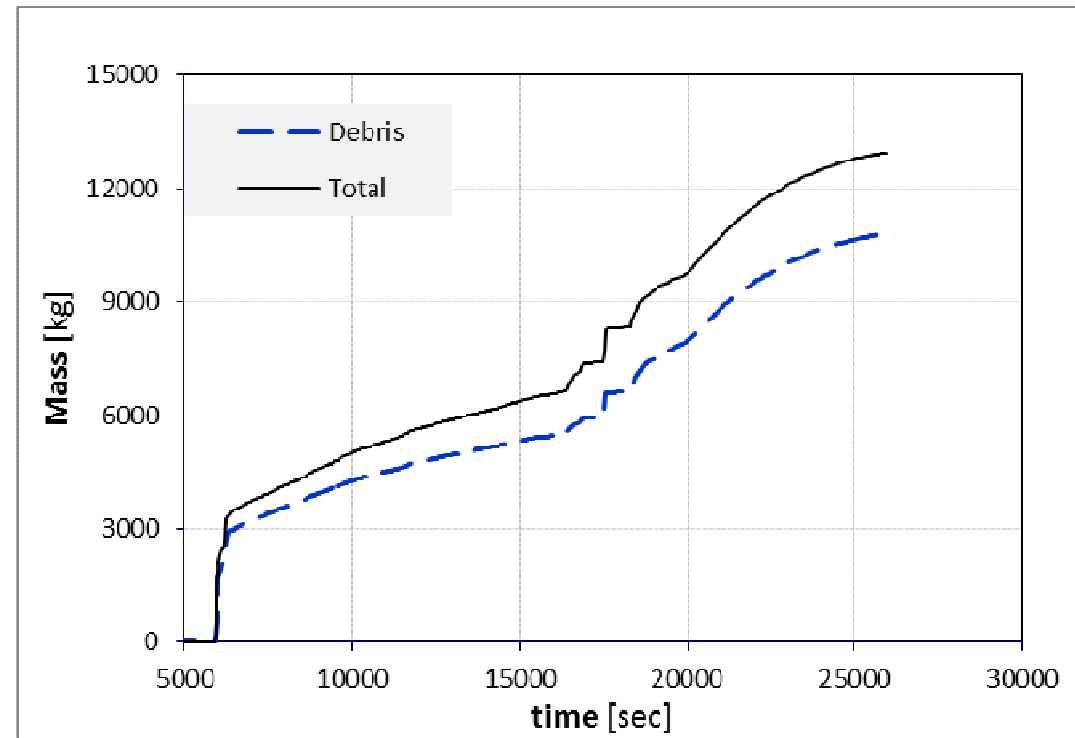


Melt materials and mass in the lower head

➤ Some results of SBO

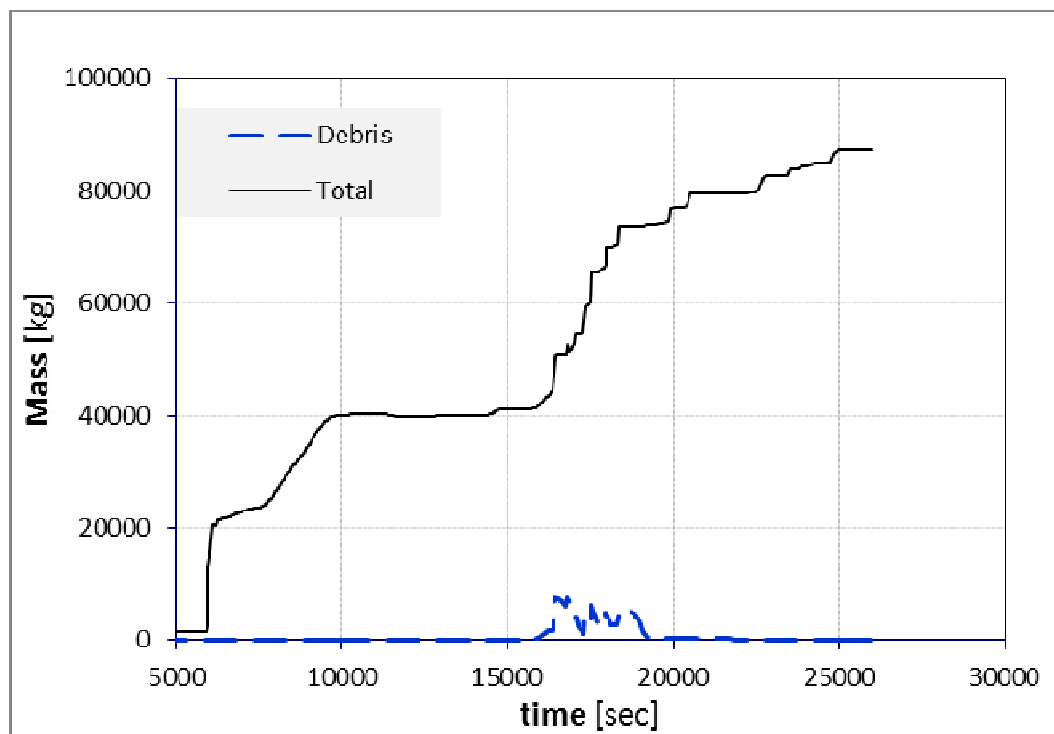


UO₂ mass in the lower head

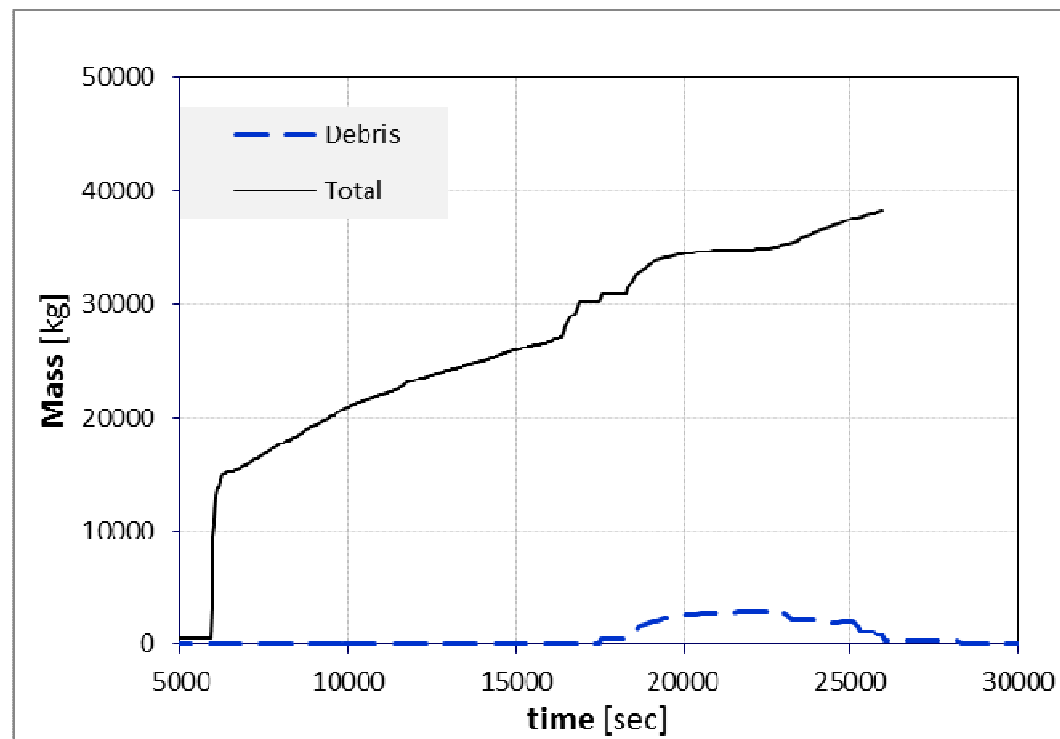


ZrO₂ mass in the lower head

➤ Some results of SBO

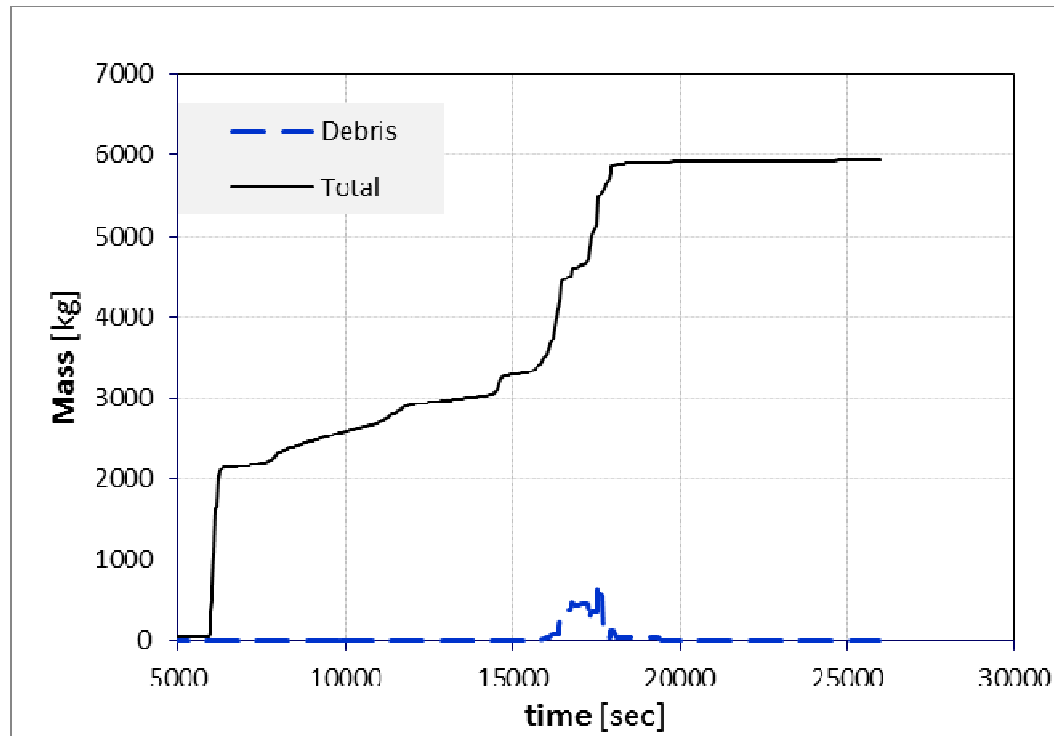


Steel mass in the lower head



Zr mass in the lower head

➤ Some results of SBO



FeOx mass in the lower head

- Severe accident analysis of Oskarshamn-2 BWR: Sensitivity and uncertainty study.
- Further investigation on in-vessel melt progression of the Reference BWR Plant.
- All input decks for Swedish NPPs will be adapted to MELCOR 2.1.
- Apply SNAP to MELCOR simulation (*model development and dynamic visualization of results*).
- MELCOR simulation for SFP.
- Analysis of Fukushima accidents: Input improvement and documentation for Unit-2 and Unit-3.
- Comparison of MELCOR with MAAP for severe accident simulations of Oskarshamn-3 BWR (*collaboration with OKG*).