OVERVIEW OF MELCOR ACTIVITIES IN CIEMAT (2012)

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Scenarios Addressed

- **Plant analysis**

BWR:

Spanish NPP (CSN) ⟶ MELCOR 2.1

BSAF (CSN, OECD project) ⟶ MELCOR 2.1

PWR:

Spanish NPP (ARTIST-Ext) ⟶ MELCOR 2.1

- **Fuel degradation in the presence of air**

SFP (OECD-SFP project) ⟶ MELCOR 1.8.6 YV 3084 SFP

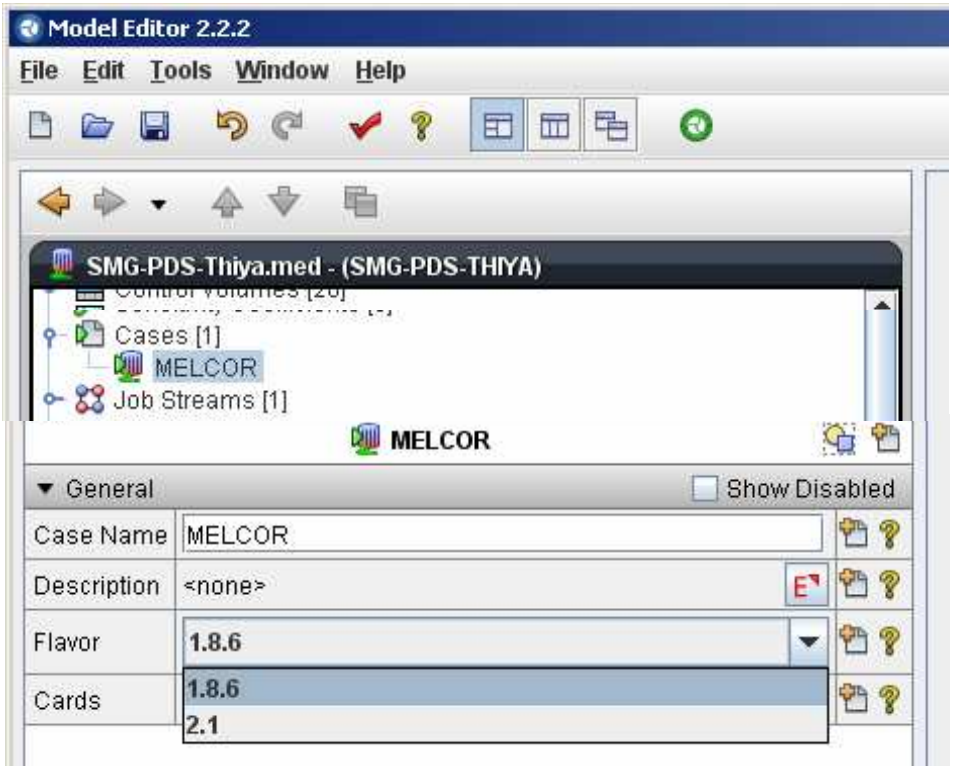
Inputs updating: Plant analysis BWR, PWR

1.8.4 ✓→ *1.8.5* → *1.8.6* → *2.1*

✓COR
✓Converter
✓ SNAP

Automatic conversion to 2.1:

- **MELGEN** ✓
- **MELCOR** × ***"by hand"***



Execution

	M2.1.3226	M2.1.4206	M2.1.4803
BWR	☑	☑	☑
PWR	☑	☑	☑
Post-processing:			
PTFread1.76.xla	☑	☒	☒
PTFread1.77.xla	☒	☒	☒
PTFread *.xlam	Not supported (Office 2003)		

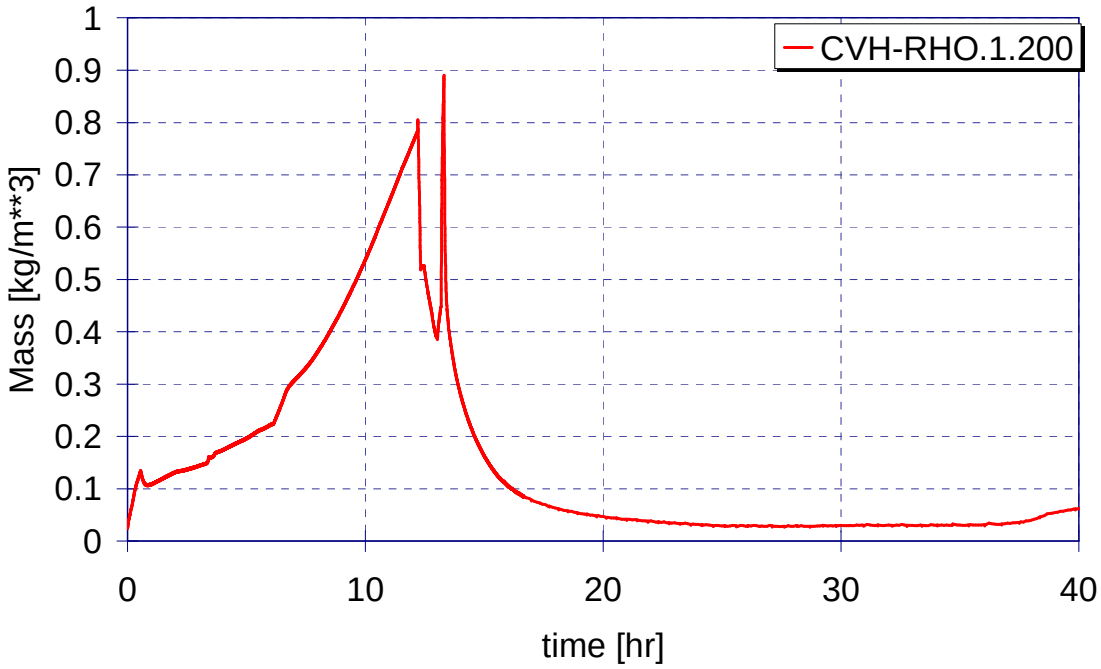
Others:

- Corruption of files sent by e-mail:

  license.request → *.zip

- Post-processing of MELCOR 2.1 case with PTFread1.76:

  - water density



→ **Output** ✓

Others:

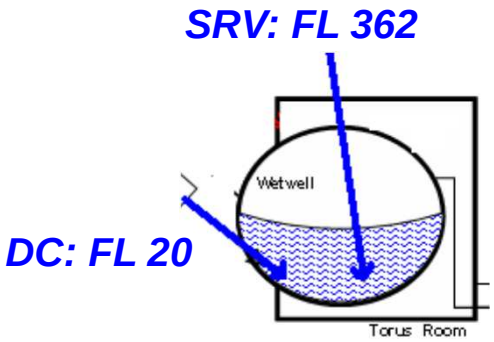
- Corruption of files sent by e-mail:

  license.request → *.zip

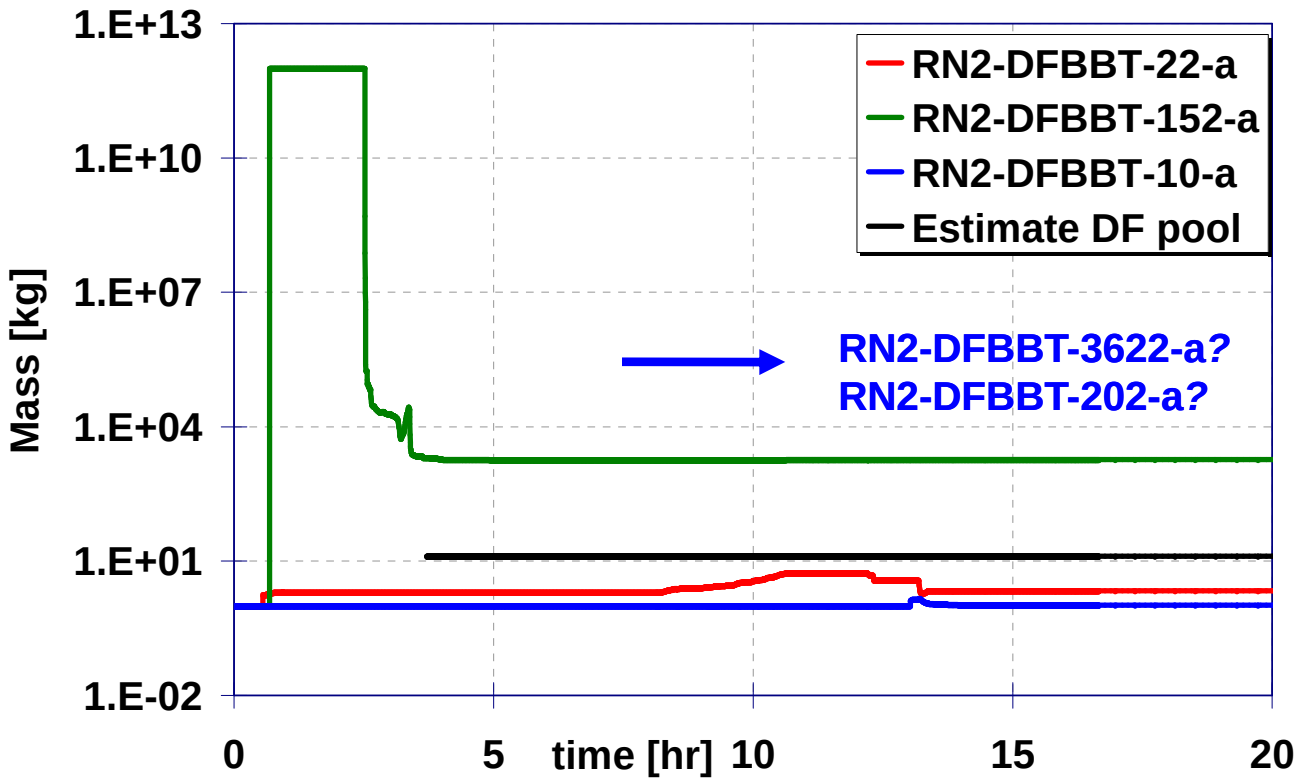
- Post-processing of MELCOR 2.1 case with PTFread1.76:

  - water density

  - Cumulative DF



RN2-DFBBT-ip-a ip=10*NFL+2 for the *to* volume



Others:

- Corruption of files sent by e-mail:

  license.request → *.zip

- Post-processing of MELCOR 2.1 case with PTFread1.76: *?*
  - water density
  - Cumulative DF

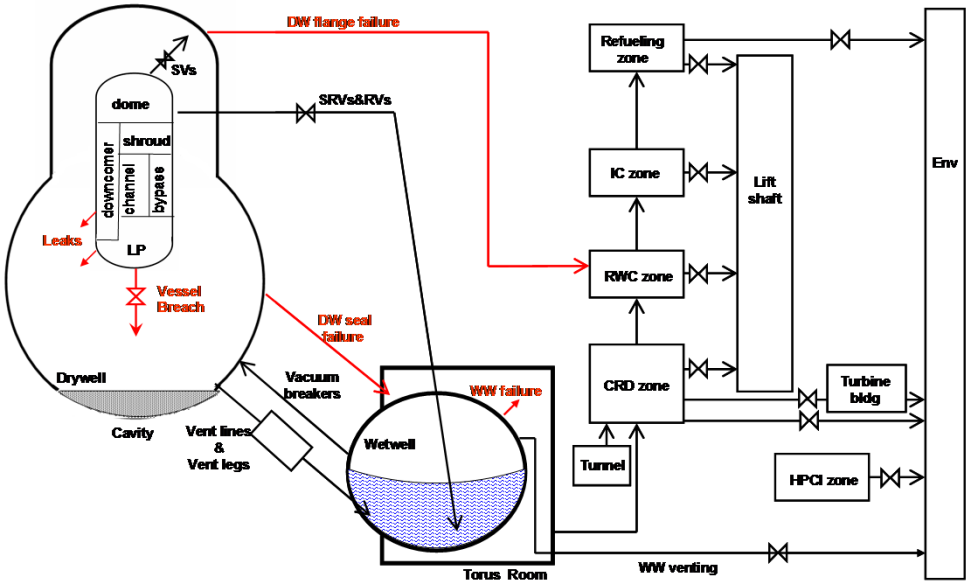
THANK YOU FOR YOUR ATTENTION!!

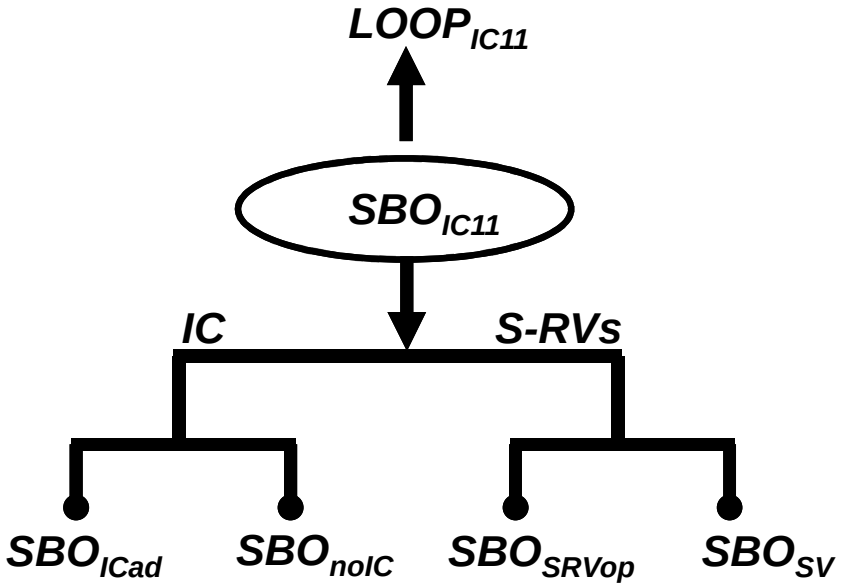
1. BWR: CSN

Spanish NPP
BWR-Mark I
1400 MWth

⟷

Systems analyses:
Unit 1 Fukushima-like scenario



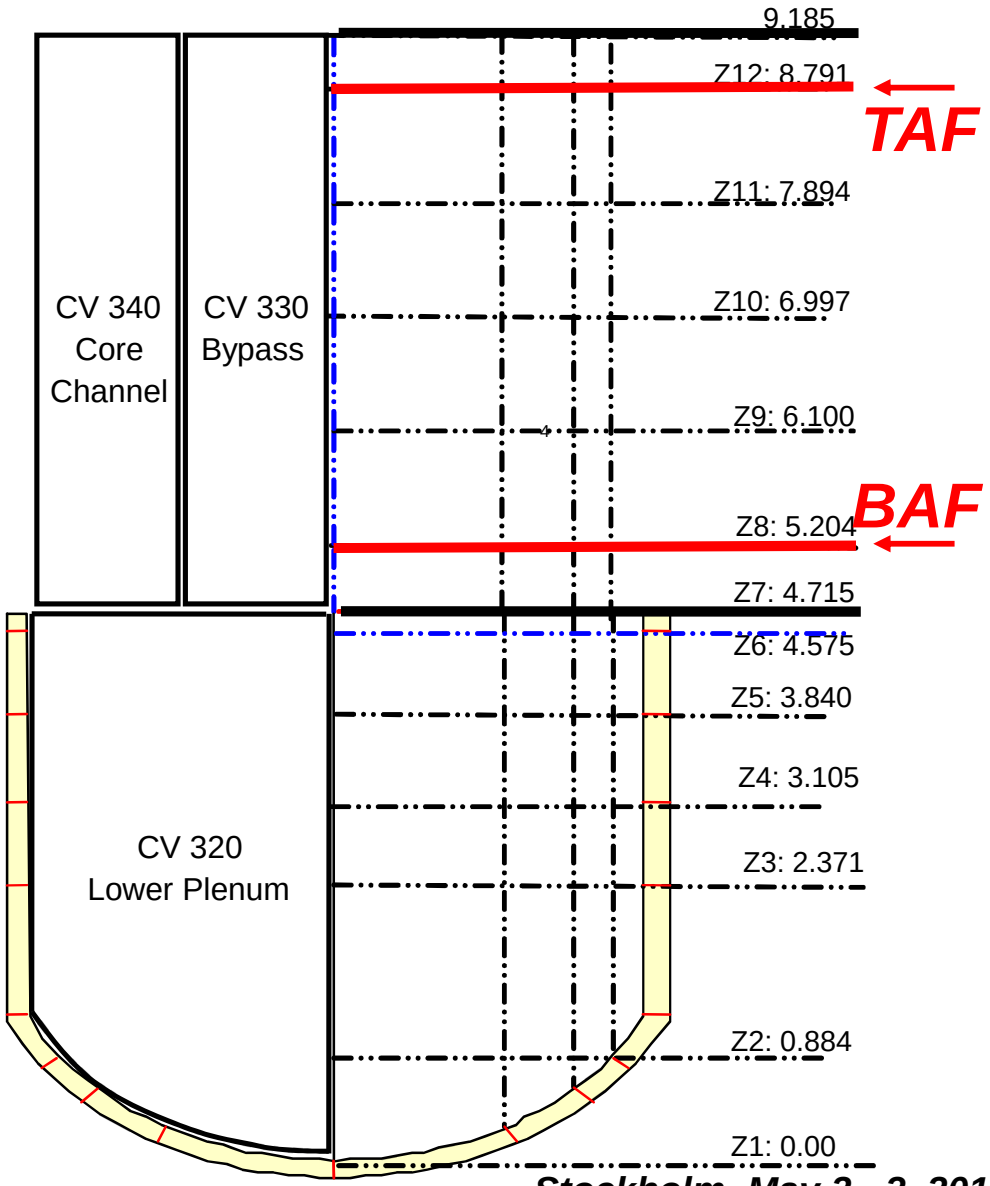


1. BWR: CSN

	Core & RPV	PCV	Reactor Building	Total
COR cells	41	-	-	41
CVs	6	3	11	20
FLs	8+5	4+3	15	35
HSs	14	7	25	46

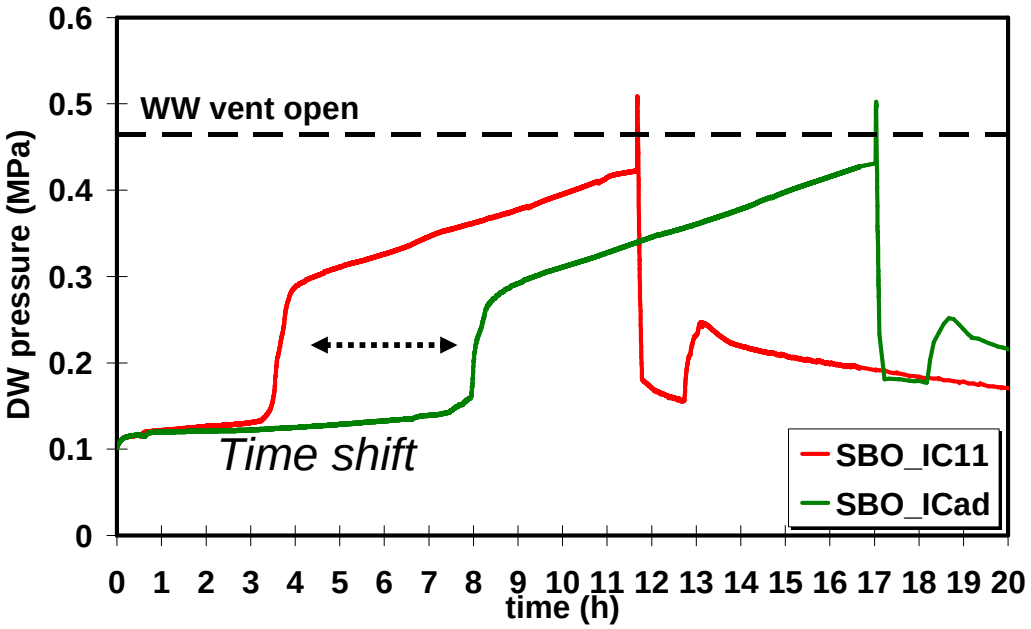
SRVs
SVs
Failures
→ FL (Valve, TF)

IC → CF (Steam Sink)
(Water Source)



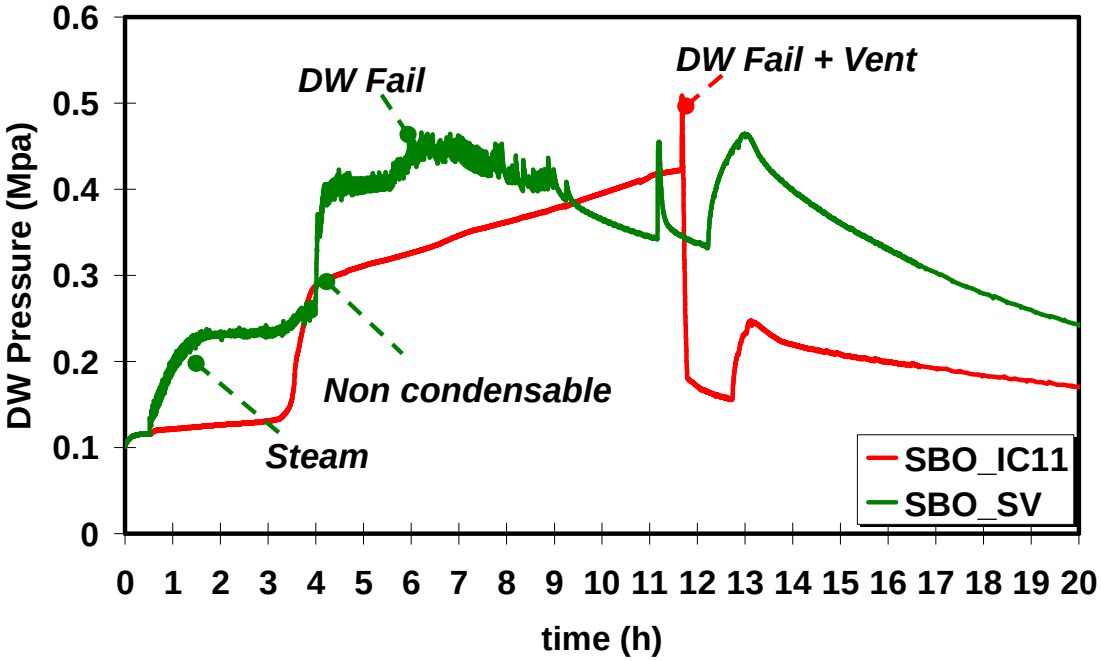
1. BWR: CSN

IC Effect



IC performance → late and slower degradation of fuel.
→ similar Containment evolution

SV Effect

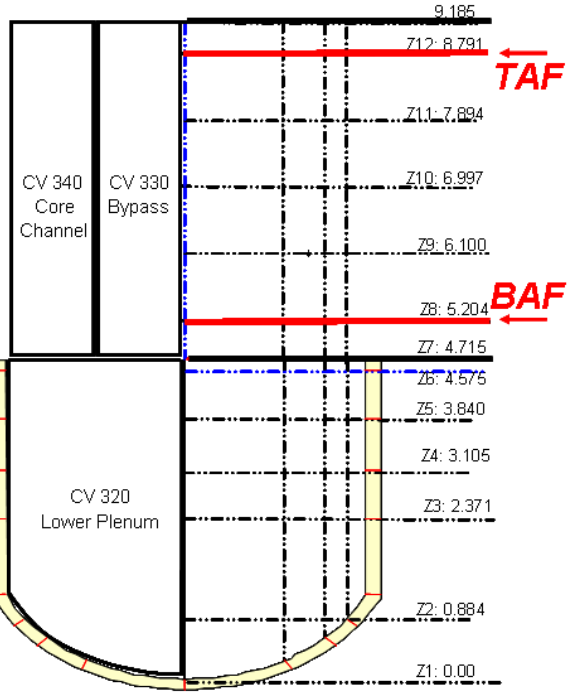


SV operation → similar fuel degradation.
→ different Containment evolution.

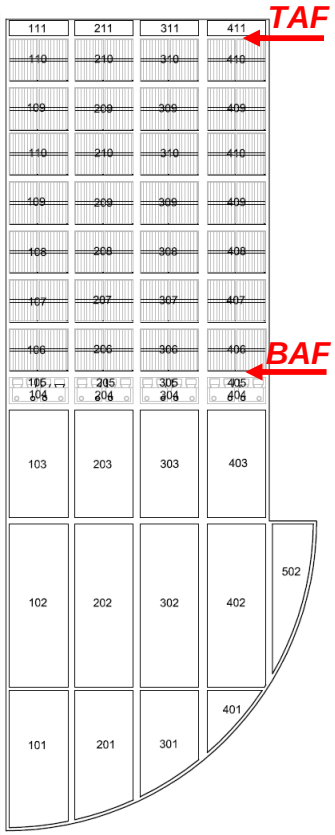
2. BWR: CSN, BSAF Project

Starting point: previous BWR NPP

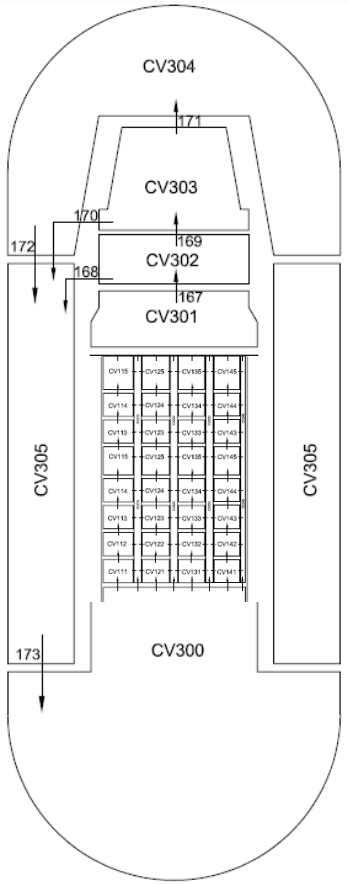
- *Detailed plant model*



COR: 3 x 12

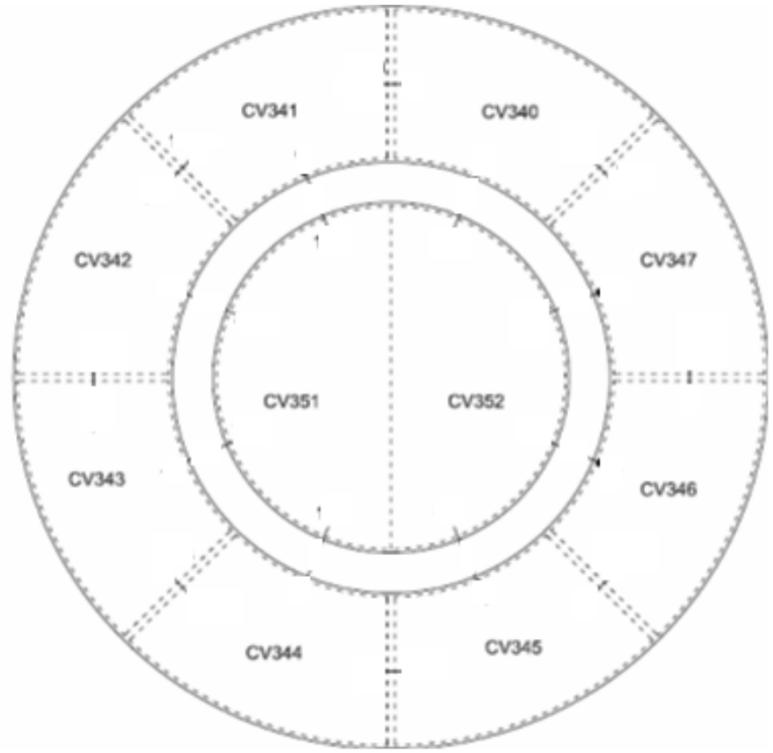


COR: 4 x 13

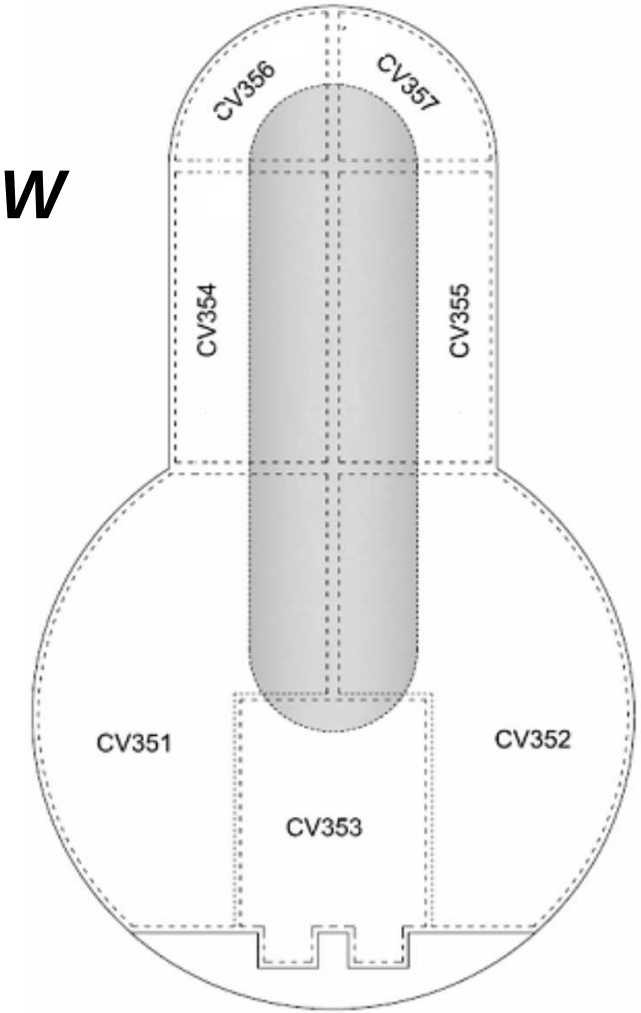


2. BWR: CSN, BSAF Project

WW

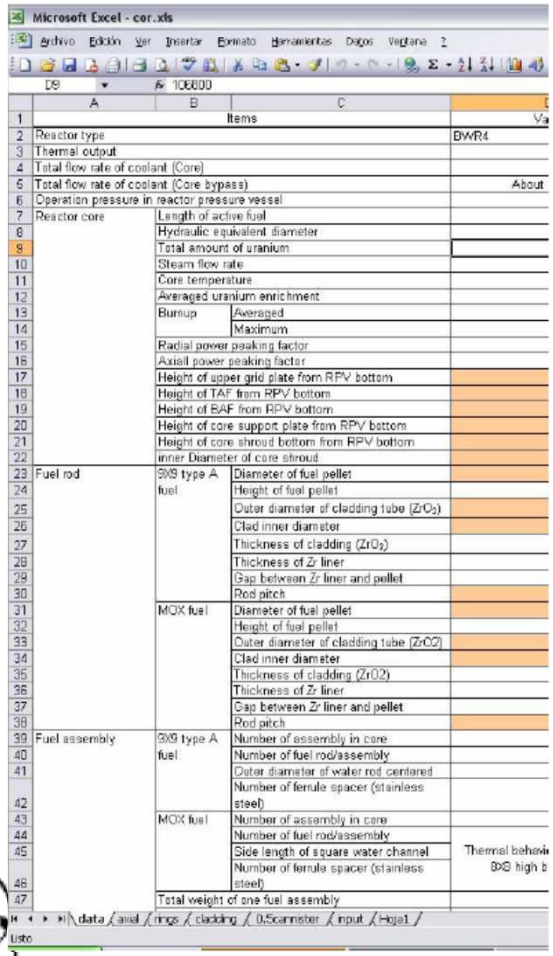


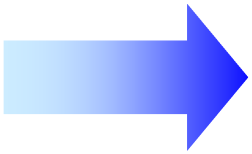
DW

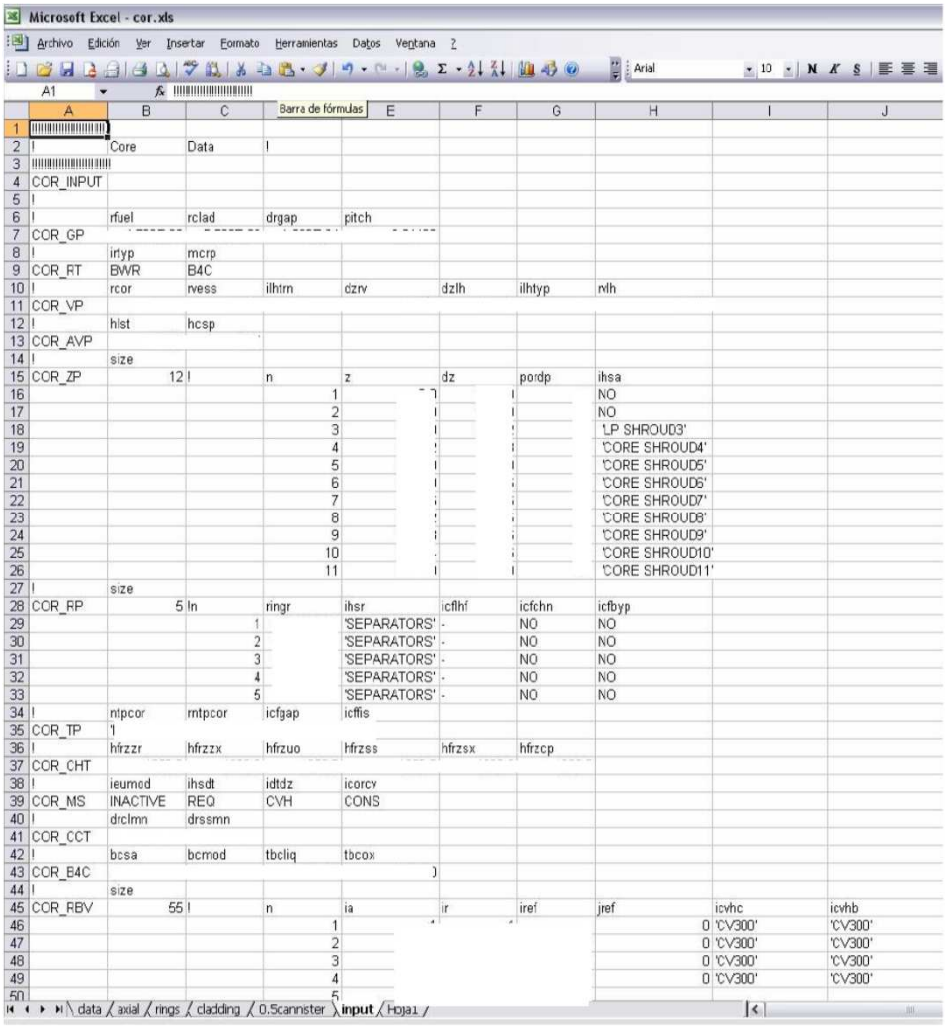


2. BWR: CSN, BSAF Project

Input development of the 3 NPP→ Excel worksheet







3. PWR: ARTIST-Ext Project

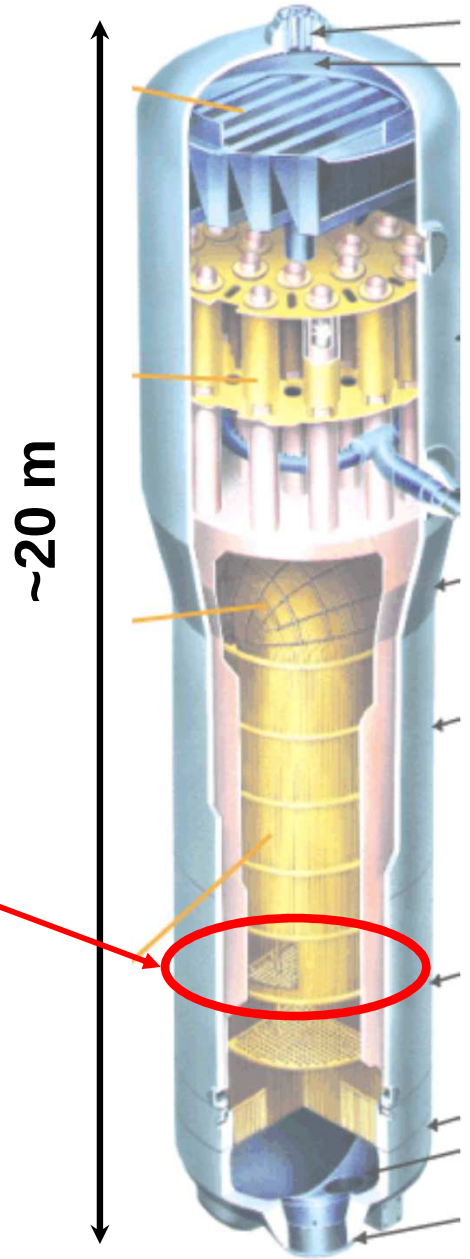
Objective: *Aerosol retention in the Secondary Side of a Steam Generator.*

Focus: *Implementation of the ARI3SG correlation in MELCOR 2.1:*

$$\eta_{TB} = 0.47 \cdot \exp\left[-0.009 \cdot \left(\mathrm{Re}_p^2 / \mathrm{Stk} \right)^{\frac{1}{2}} \right] \cdot \mathrm{Stk}^{\frac{1}{4}}$$

Scope:

- *"Near field" deposition (break stage)*
- *"Dry conditions" (no pool scrubbing)*



3. PWR: ARTIST-Ext Project

Spanish PWR: 2614 MWth
3 loops

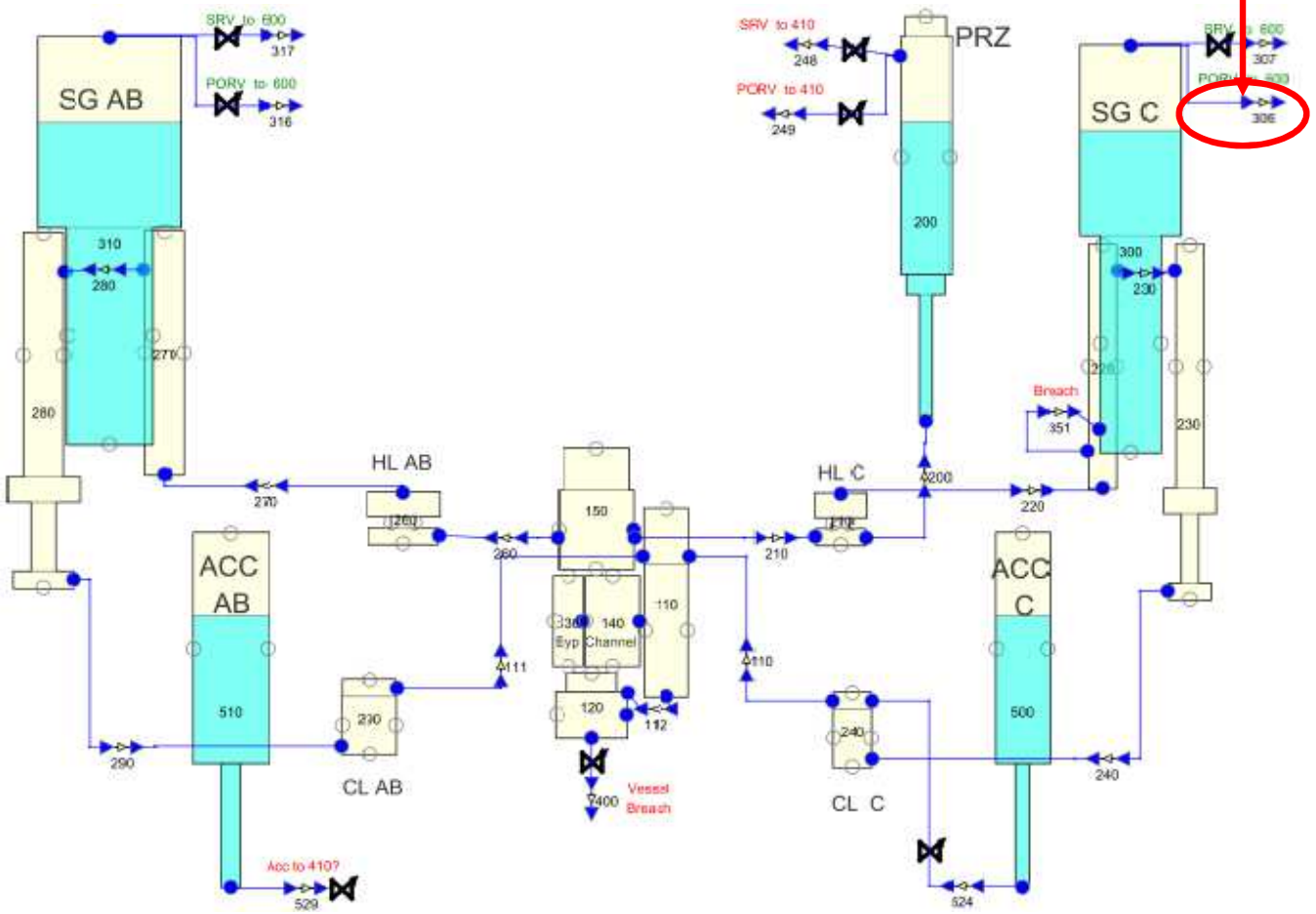
Scenario:

SGTR:

- ***Double-ended rupture SG.***
- ***SG PORV failed Open.***
- ***Bypass sequence.***

Approach:

- ***Filter implementation by Control Function***



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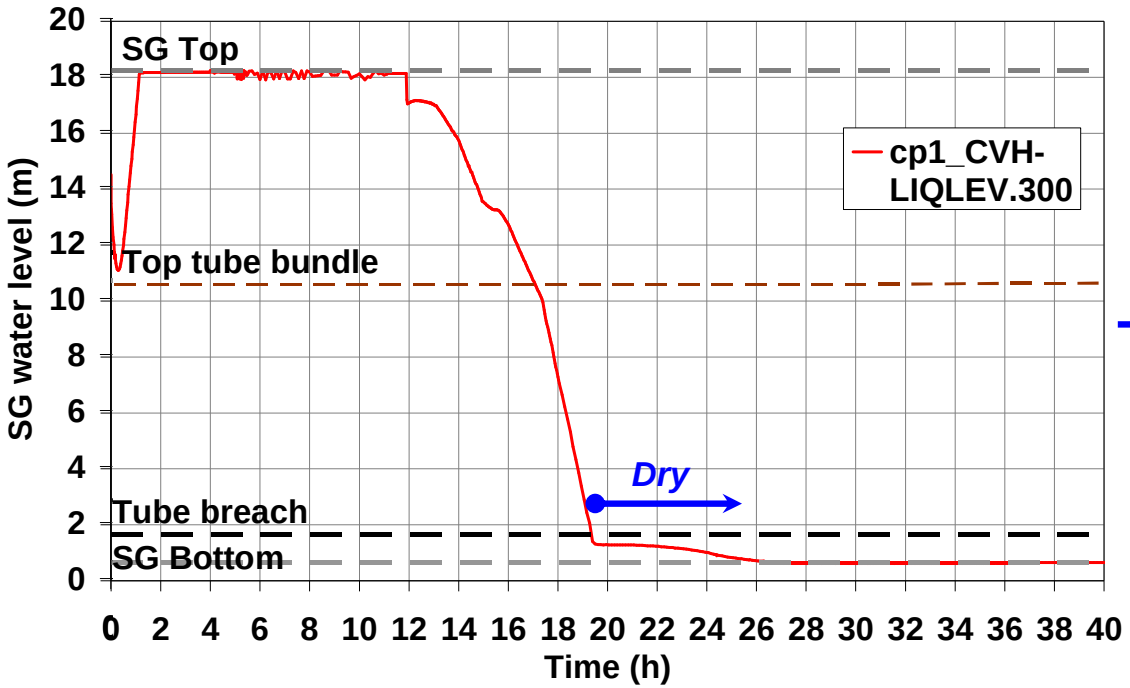


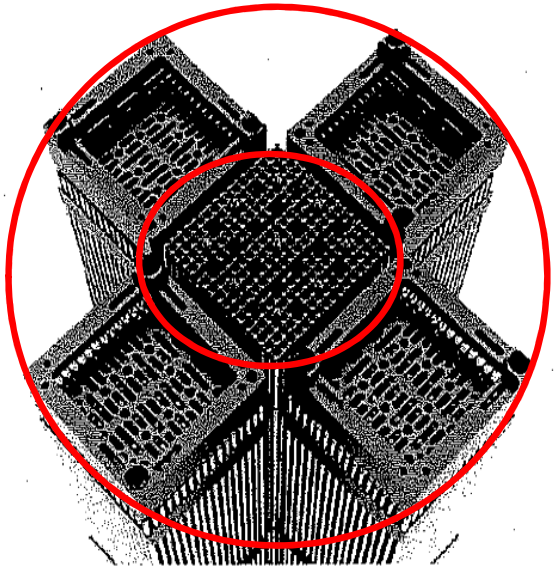
ONGOING ANALYSES

4. SFP: OECD-SFP Project

SFP tests:

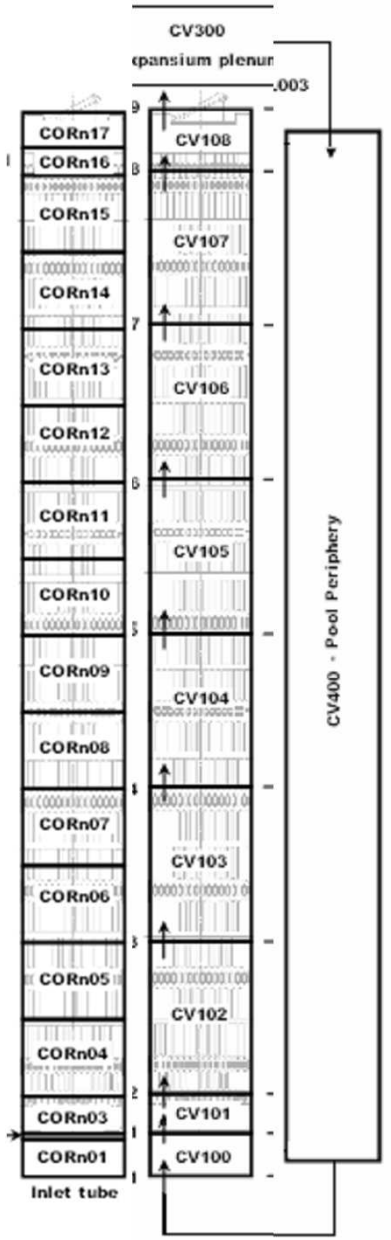
- Complete LOCA in SFPools
- BWR/PWR fuel assemblies
- Zr air oxidation leading to cladding ignition

2 Scenarios modeled:



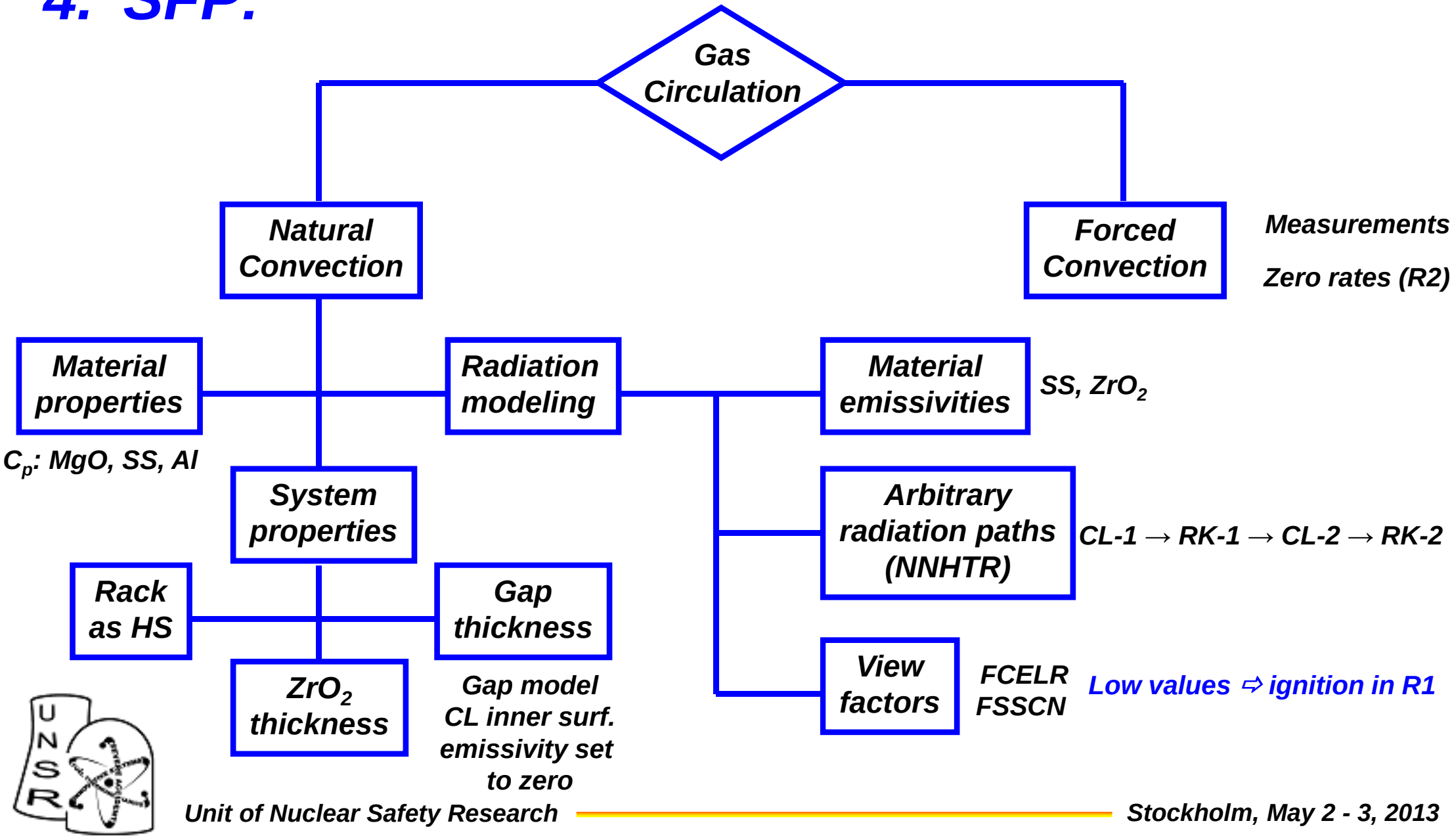
- 1x1
- 1x4

1x1:

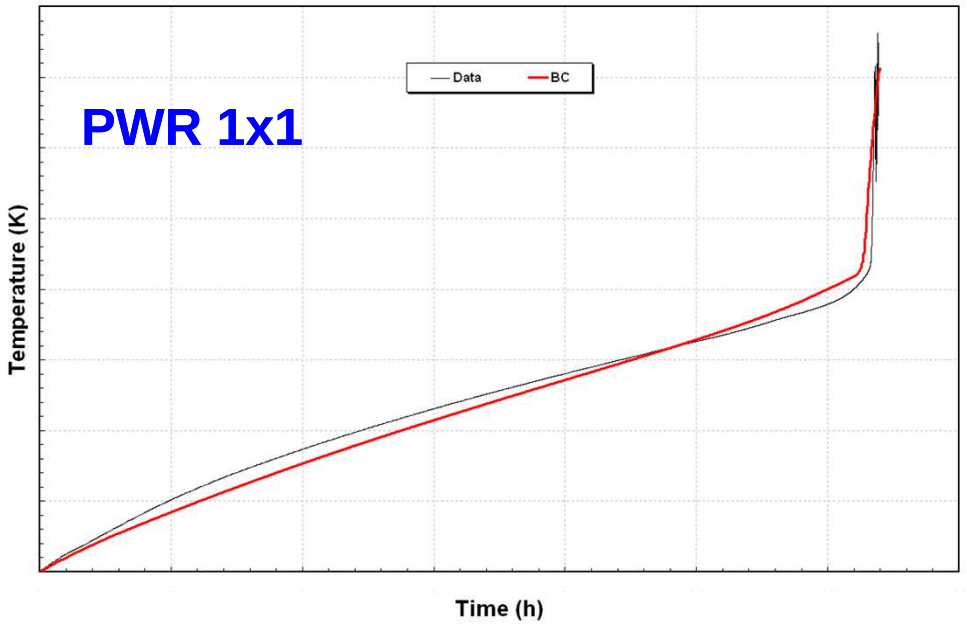


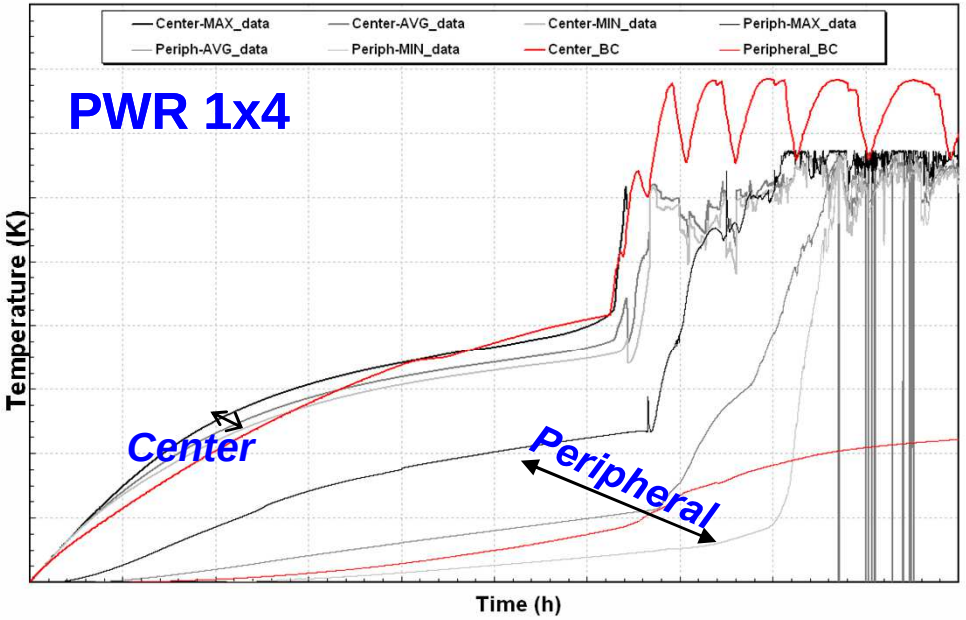
4. SFP:

SFP-PWR 1X4



4. SFP: OECD-SFP Project





- *The ignition onset time well captured.*
- *Discrepancies on ignition onset location or propagation.*