

**2019 European MELCOR User Group (EMUG) Meeting  
Paul Scherrer Institute (PSI)  
Würenlingen, Switzerland  
April 3 – 5, 2019**

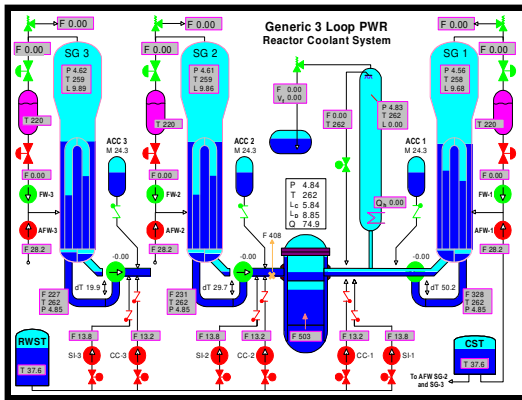
# **MELSIM: A MELCOR Driven Severe Accident Simulator and Visualization Package**

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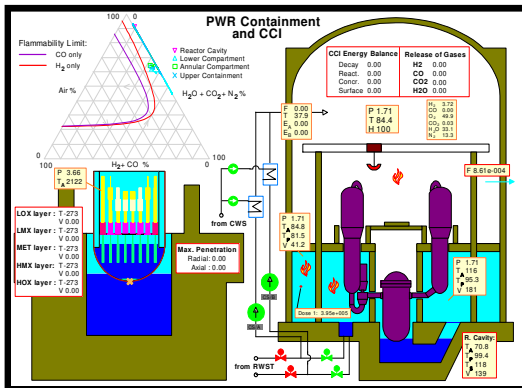
**Focus of Presentation:**

- MELSIM Features
- Demonstration of MELSIM Features and Uses

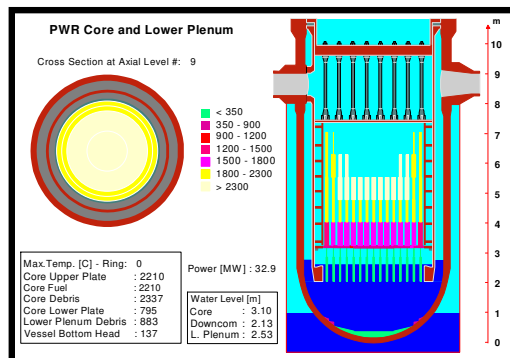
**PWR SYSTEM SCREEN**



**PWR CONTAINMENT SCREEN**



**VESSEL SCREEN**



**SIM**

**SIMULATION AND INTERACTIVE MODELING**

**TVP**

**TRANSIENT VISUALIZATION AND POST-PROCESSING**

FOR

**ACCIDENT ANALYSIS,  
SIMULATION, VISUALIZATION,  
ACCIDENT MANAGEMENT  
AND TRAINING**

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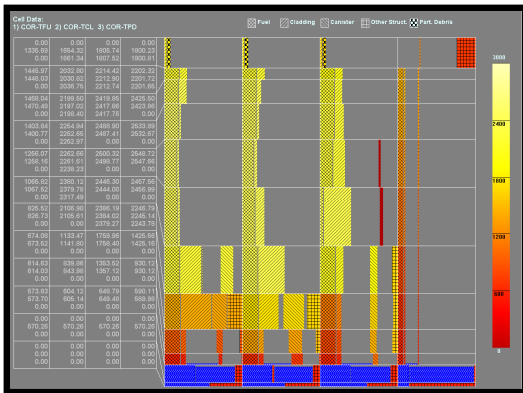
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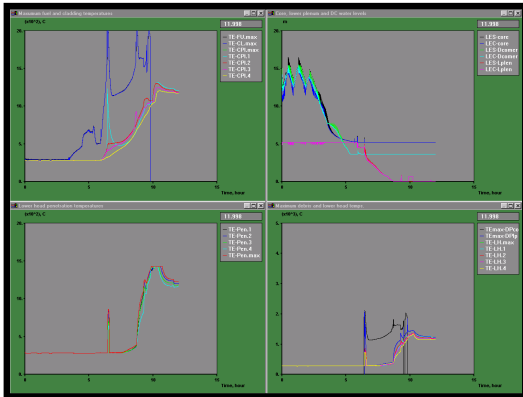
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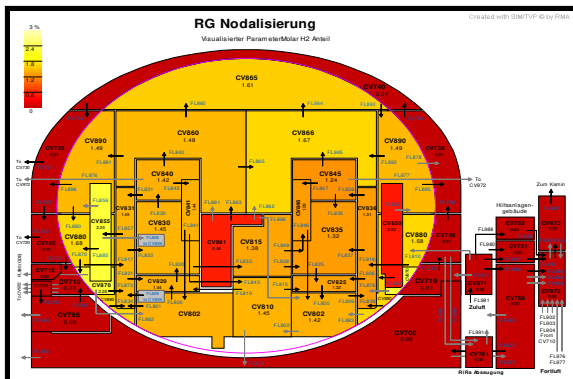
## CORE DAMAGE SCREEN



## SIM/TVP PLOT PAGE



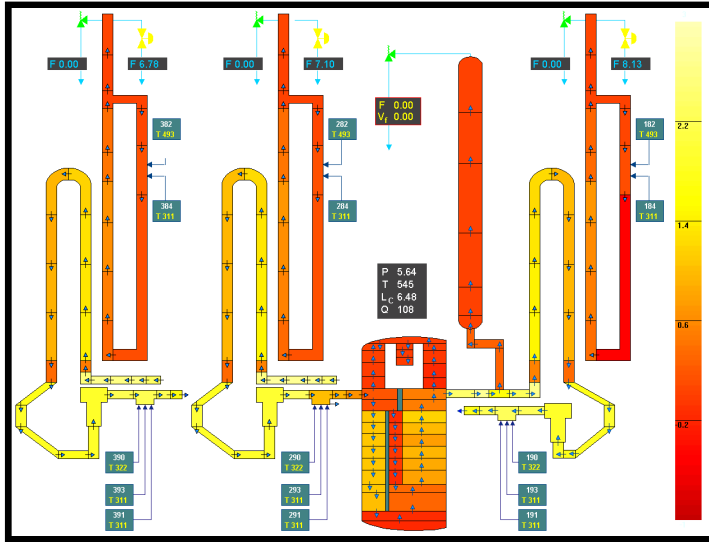
## CONTAINMENT NODALIZATION SCREEN



# SIM/TVP - a plant-specific simulation and visualization environment

- interactive accident analysis with MELCOR, MAAP, RELAP, RELAP/SCDAPSIM
- visualization of plant status and severe accident phenomena using screens and plots
- On-Line (interactive) Status Change of Active Components
- Post-processing of accident analyses
- SAMG development, validation and training
- Conduct Emergency Plan Drills in a realistic Environment (with or without active AM Charts)
- Classroom or Individual Training for Plant Transients & Accidents
- Desktop Self-Study System

## NODALIZATION SCREEN



## SIM/TVP Components

**SIM** turns a safety analysis code into a two-way interactive desktop simulator system for **analysis**, **visualization** and **training**. Interactive screens, x-y-plots.

**TVP** stand-alone **replay** for pre-run sequences from **SIM replay file** or **code plot file** for post-processing and training.

**TVP Viewer** packages all files for replay into a single exe file for easy archiving

**ScreenBuilder** Tool for user to create screens & **link components** to code objects. All Screens on left created with ScreenBuilder.

**Plots** On-screen 2x2 time plots. Paperless export of **report ready graphs**. Produce side-by-side plots from multiple runs. Data extraction utilities.

**Dose** Calculate and display the **dose rate** at specified locations.

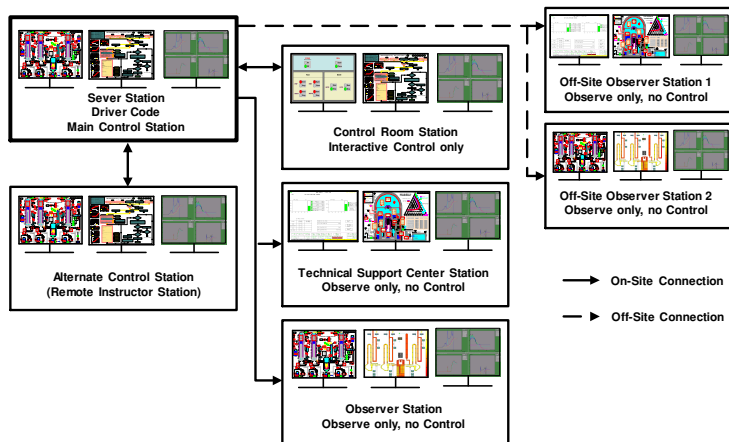
**ActivRel** Calculate and display the **activity release** in flow paths.

**ActiveChart** **Activated EOP/SAMG charts**. Link Chart decisions to simulation status. Execute Chart actions in running simulation.

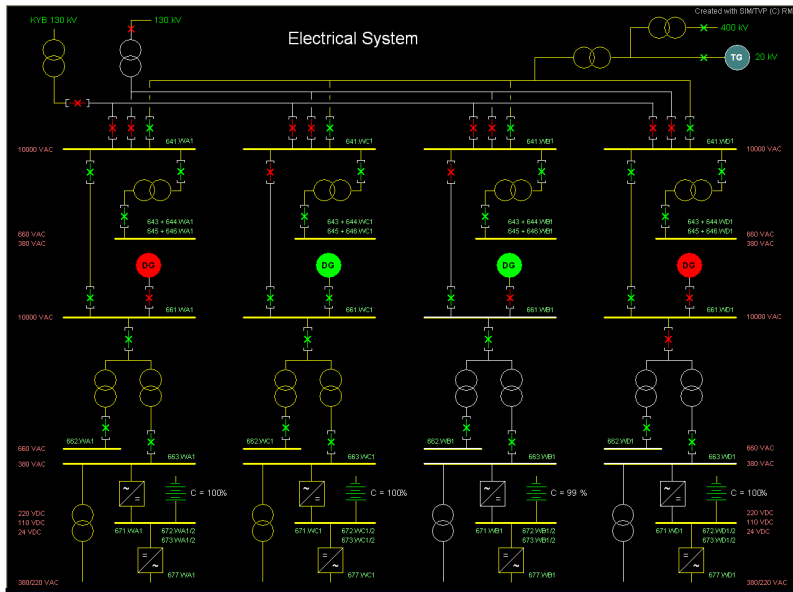
**Multi-Station Training Setup** Distributed customized stations for **server/instructor** (full control), **control room** (interactive), **TSC/Observer** (passive) and **off-site technical support teams**.

**MELSIM\_R** RASCAL, NRC's 3-d Diffusion code for offsite consequences dynamically linked to MELCOR under SIM.

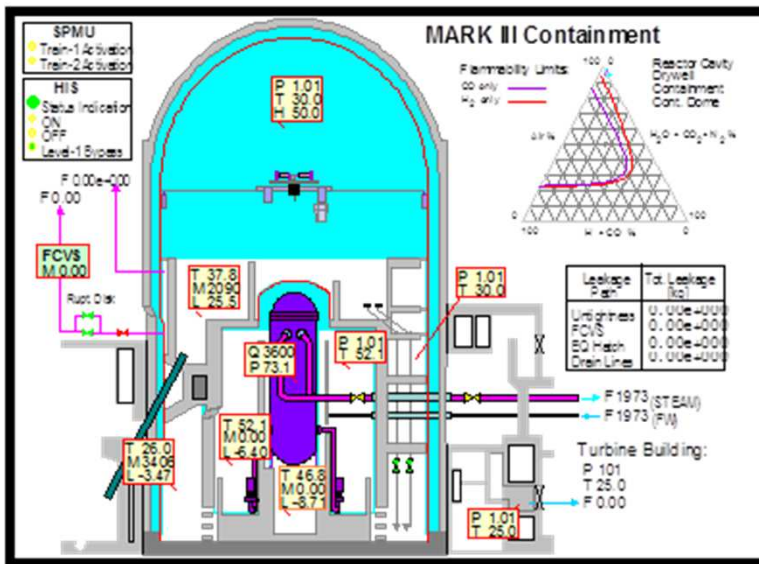
## SIM/TVP MULTI-STATION SYSTEM FOR EPG/SAMG TRAINING AND DRILLS



## ELECTRICAL SYSTEM SCREEN



## BWR CONTAINMENT SCREEN



## Other SIM/TVP Components:

**Didactic Messages** displays didactic messages based on accident status

**ATWS Package** combines ANS 94 decay heat, a point kinetics model and the fission product generation from fission during the ATWS phase of a transient for multiple batch cores with an actual power history for each batch (MAAP and MELCOR).

**Network Installation** available as dedicated PC installation or as network installation accessible from any authorized PC on network

**Compile Option** allows recompilation and linking of driver code

**Multi-Monitor Display** displays screens and plot pages on multiple monitors

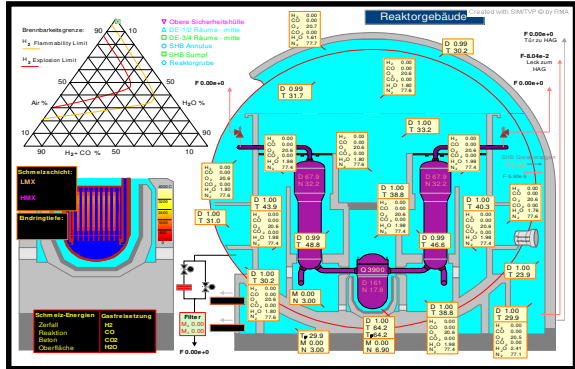
**Multiple Parallel Executions** allows 4 to 6 simultaneous runs on same PC without loss of speed

**Electrical Module** Model the plant electrical system with bus hierarchy, supply logic, component power dependencies and power recovery behavior.

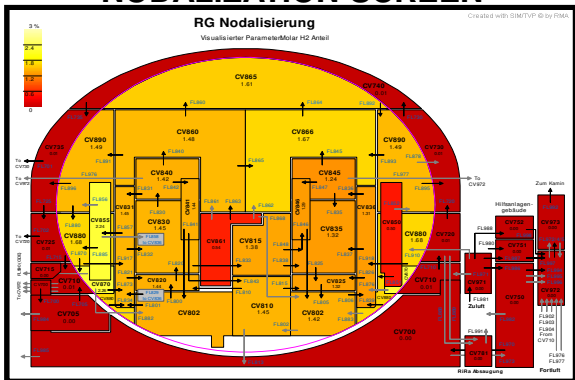
**Chain Executions** Define a List of Execution cases that execute sequentially when a prior execution completes and is archived.

**RMA**

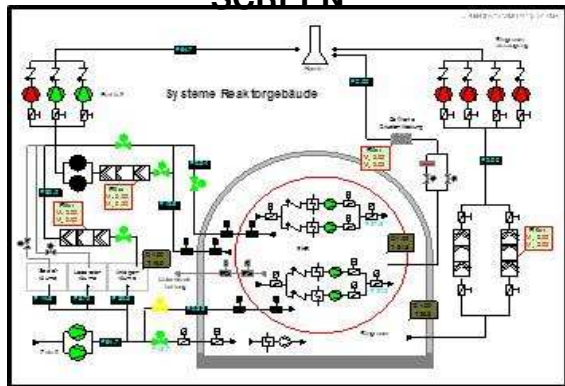
## GERMAN PWR CONTAINMENT SCREEN



## GERMAN PWR CONTAINMENT NODALIZATION SCREEN



## GERMAN PWR CONTAINMENT SYSTEM SCREEN



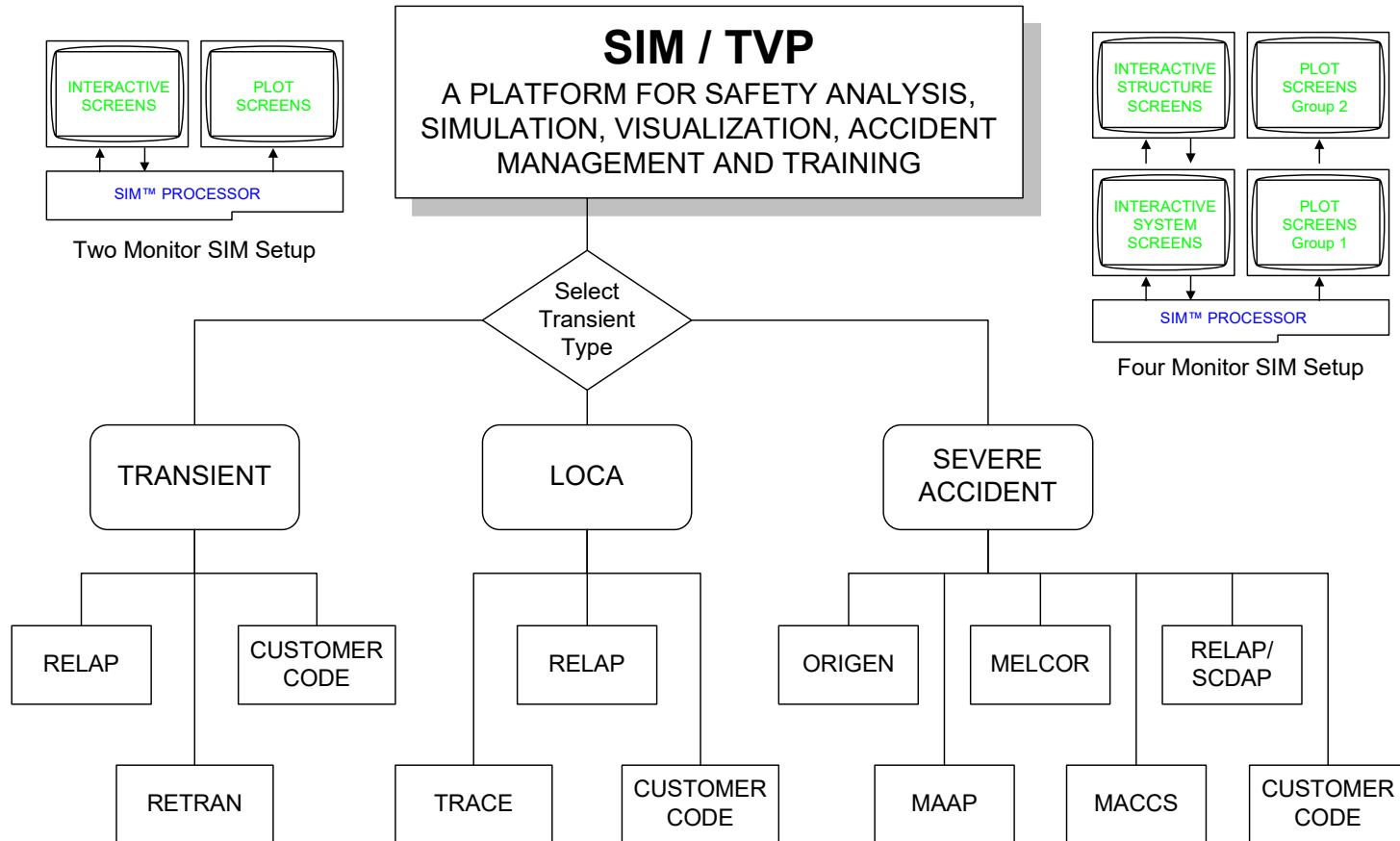
## SIM / TVP FEATURES

- Works with MELCOR, MAAP, RELAP, RELAP/SCDAPSIM
- Can be coupled to any time-dependent analysis code
- Intuitive and Interactive ScreenBuilder
- On-Line display and visualization of plant status
- On-Line Status Change of Active Components
- On-Line Display of Transient Parameter Plots
- Didactic Messages and Tutorial Review Text
- Time and Parameter based Malfunctions
- User Defined Variables

## SIM / TVP USES

- Establish Accident Analysis Library for Training and Replay
- Develop, Evaluate, Requalify Emergency Procedures
- Train Senior Safety Staff in Accident Response
- Develop Simulator Training Scenarios
- Pre-Simulator Review of Training Scenarios with Shift
- Develop, Optimize and Train SAMGs
- Develop AM Aids (Fill Curves, Limit Range Curves, etc)
- Conduct Emergency Plan Drills in a realistic Environment including active AM Charts
- Classroom or Individual Training for Transients & Accidents
- Desktop Self-Study System

# SIM / TVP DESKTOP ANALYSIS AND TRAINING SYSTEM



- User-friendly and Time-saving Safety Analysis System
- AM guidelines development, implementation and training
- Single Interface for all Codes
- Adapt other Codes and Models to SIM/TVP Environment