

ASSAS project: Creating Infrastructure and Training Database for Surrogate Models for a Severe Accident Simulator

Anastasia Stakhanova, Fabrizio Gabrielli, Jonas Dressner, Markus Götz, Charlotte Debus - Karlsruhe Institute of Technology (KIT), Germany; Ivo Kljenak, Saso Dzeroski - Jožef Stefan Institute (JSI), Slovenia; Joan Fontanet Sáez - Unidad de Seguridad Nuclear (CIEMAT), Spain; Alessandro Longhi - Delft University of Technology, Netherlands; Marcello Savini - Alma Mater Studiorum University of Bologna, Italy; Christophe Jean Lino D'Alessandro - Paul Scherrer Institute (PSI), Switzerland; Gaëtan Blondet - PHIMECA ENGINEERING, France; Bastien Poubeau - Autorité de sûreté nucléaire et de radioprotection (ASNR), France

ASSAS - Artificial Intelligence for the Simulation of Severe Accidents

- Euratom project (Nov-22 to Oct-26)
- 14 partners - €3.7 million budget
- Coordinator: Bastien Poubeau (ASNR) (till March 2026), Ricaud Jean Marc (ASNR) - currently

Speed-up severe accident simulations with:

- Input deck simplification
- Parallelization and code optimization
- Substitute parts of the code with surrogate models

Database for surrogate model training:

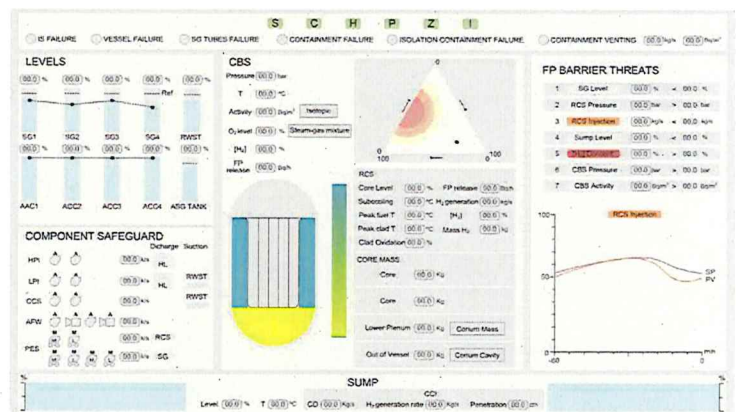
- Station blackout and medium break loss-of-coolant scenarios
- 10 operator actions as uncertain input parameters. Other model parameters fixed at their best estimate values.
- More than 1000 simulations performed
- Outputs: Scalar, 1D and 2D time dependent variables
- High saving frequency: all timesteps (1-10s)

Create a prototype simulator for a Western-type PWR

Severe accident code *ASTEC* (Accident Source Term Evaluation Code) developed by ASNR



Commercial simulation environment *TEAM_SUITE®* developed by Tecnatom



Simulator interface – Severe accident dashboard

DataHub

- Developed by SCC KIT
- Data stored at the Large Scale Data Facility (LSDF)
- Based on FAIR principles – Findable, Accessible, Interoperable, Reusable
- ASSAS partners can upload, download and explore data
- Potentially reusable for future collaborations beyond ASSAS

70-100 Gb binary ASTEC file (one sequence)



1-2 Gb HDF5 file

By identifying the variables relevant for surrogate models training

17

Registered users

Researches with platform access

1102

Available Datasets

ASTEC simulation datasets

76.56 TB

Binary storage size

Binary simulation data

2.3 TB

HDF5 storage size

Hierarchical data format

204

ASTEC variables per dataset

Typical number of variables per dataset

Platform Statistics & Capabilities



Project partners



Artificial intelligence for
Simulation of Severe Accidents
<http://assas-horizon-euratom.eu>
info@assas-horizon-euratom.eu



Karlsruher Institut für Technologie