E U R O S A F E

Towards Convergence of
Technical Nuclear Safety Practices in Europe

ASTEC: a multi-design reactor code for severe accident applications

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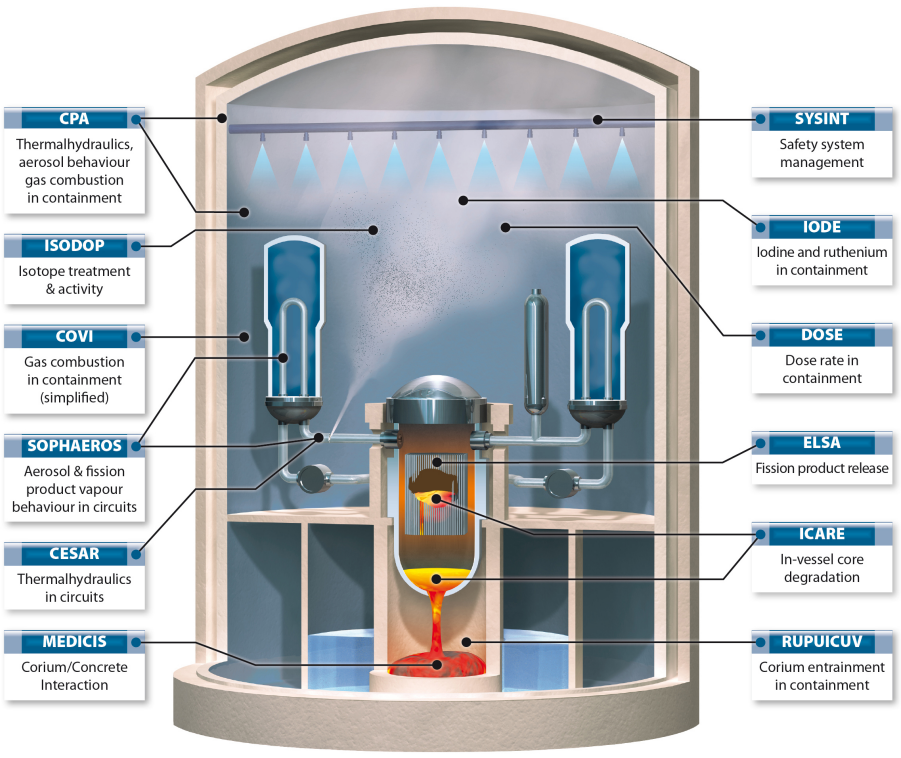
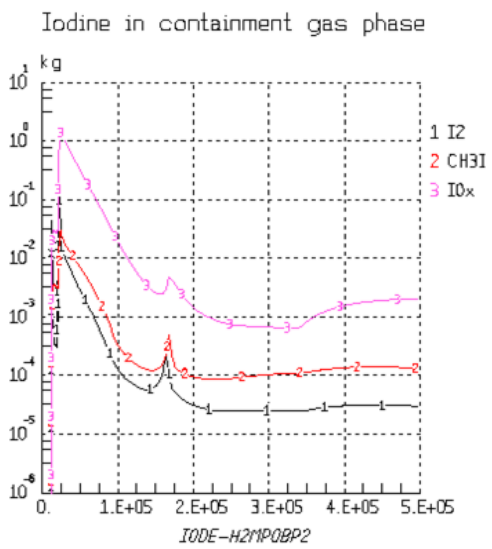
ASTEC objectives and status

- **ASTEC (A**ccident **S**ource **T**erm **E**valuation **C**ode) developed by **IRSN (France)** and **GRS (Germany)**
- **Severe accident (SA) sequences** from initiating event up to fission product release into the environment, initially only for water-cooled reactors
- **Integration** of EU SA research capacities mainly through EC co-funded projects SARNET and CESAM
- **Validated** versus many experiments and OECD / NEA ISP exercises over more than 15 years
- **V2.0 version used** by organizations in Europe (incl. most TSOs) and outside (Russia, Belarus, India, Canada, China)



Main PWR applications

- **Accident Management and Source Term** determination studies for SA diverse scenarios (SBO, LOCA….)
- **Probabilistic Safety Assessment** level 2 studies
- **Current applications to EPR** by IRSN
- Use of CESAR module for very rapid but reliable evaluation of SGTR scenarios in **emergency response**

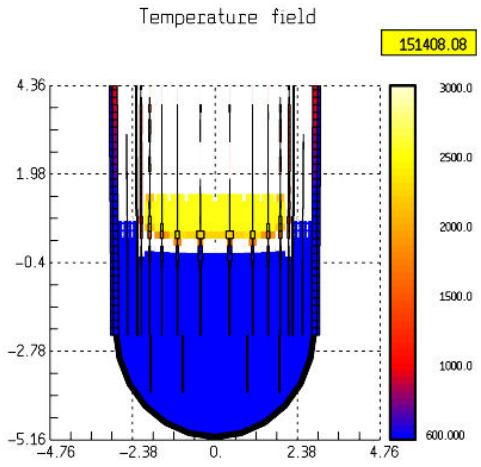


Iodine calculated evolution in containment for LFWSG scenario on PWR

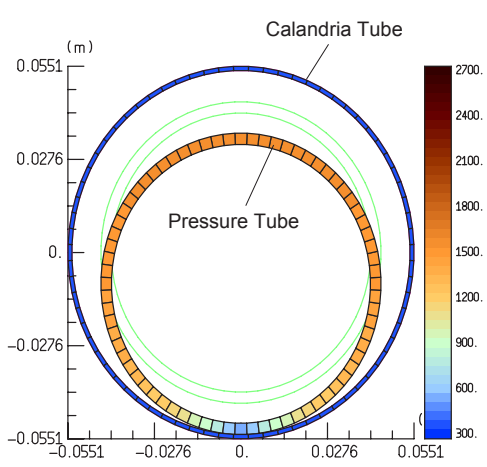
Status of BWR and PHWR model development

- **BWR**: **ASTEC V2.0 applications to Fukushima accidents in OECD/NEA BSAF project**

  IRSN is implementing models to account for BWR core characteristics like canisters and multi coolant flows
- **PHWR: BARC development of models for Limited Core Damage Accidents and validation vs. Indian experiments**



Calculated degraded core of Fukushima 1F3

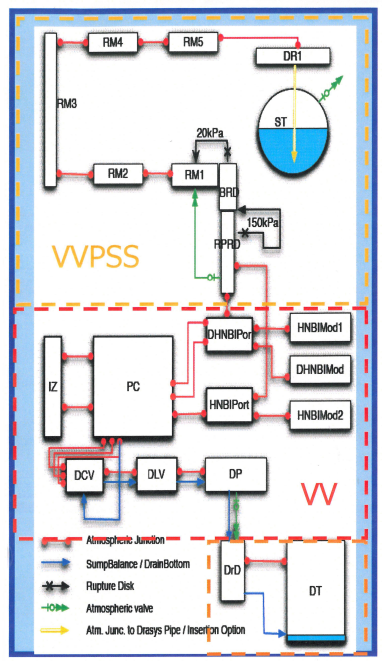


Calculation of LBLOCA in 220 MWe PHWR: contact between pressure tube and calandria tube

Extension to other nuclear installations

- Extension **to naval propulsion** by IRSN
- Current extension **to SFR** within EC project JASMIN to simulate the primary phase of core meltdown accidents; validation on past CABRI experiments
- ASTEC applicable to accidents of water or air ingress in vacuum vessel of **Fusion installations like ITER**

  Future models planned by IRSN on Tritium chemistry and on accidents in cryostats



Model of ITER vacuum vessel and pressure suppression system

Main perspectives

- **Reference datasets** for main generic NPP European types (PWR, BWR, CANDU) and **analyses of SAM**, accounting for Fukushima lessons within CESAM
- New **BWR and PHWR** core degradation models **in next major version V2.1 end of 2014**
- Larger use in support to **emergency response teams,** incl. coupling with tools for biosphere dispersal

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