

Students meet Swiss Nuclear Industry

11. März 2010, 18:15, HG D7.1

Apéro



Horst-Michael Prasser
Kernenergiesysteme

New Nuclear Power Plants in Switzerland



Gösgen II

Common characteristics:

LWR, Gen-III (III+)

Power 1000 - 1600 MW

Hybrid cooling tower



Mühleberg II



Beznau III



Aufsichtsbehörde



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Nuklearsicherheitsinspektorat ENSI

Forschung

PAUL SCHERRER INSTITUT



Nuklearabfall

nagra aus verantwortung

Dienstleistungen

ZWILAG



Industrie



international





PhD Positions at PSI and ETHZ

- Two-phase flow induced by a steam generator tube rupture
- Neutron cross-section uncertainty propagation in LWR criticality safety evaluations based on Monte-Carlo codes
- Cyclic Plasticity and Crack Initiation in Fatigue
- Advanced Nuclear Fuels (novel fuel kernel production method)
- Density functional theory calculations (High temperature materials)

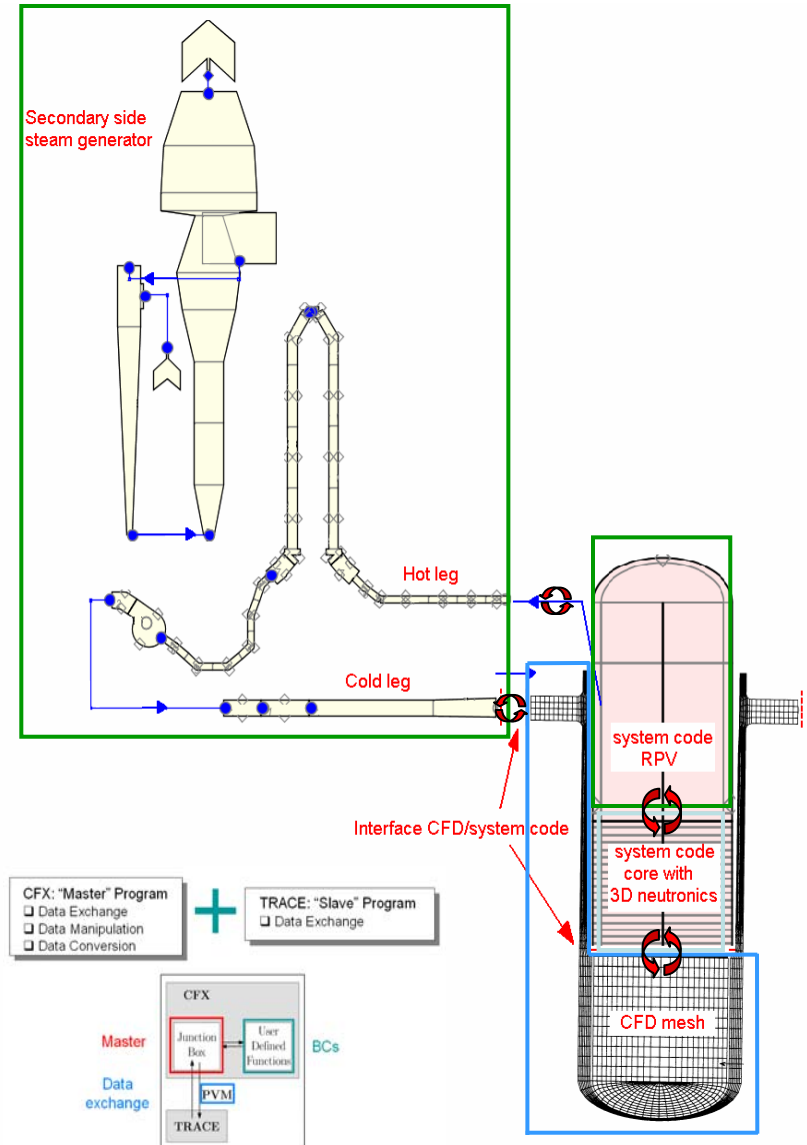


PhD Positions at PSI and ETHZ

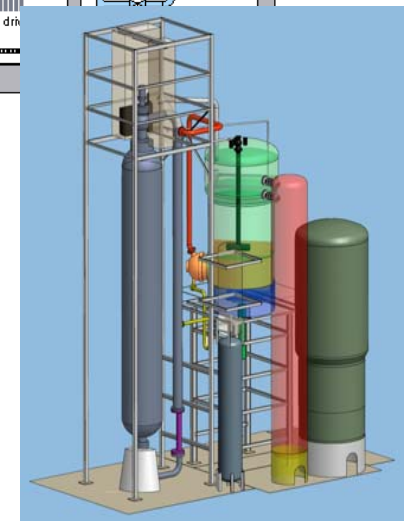
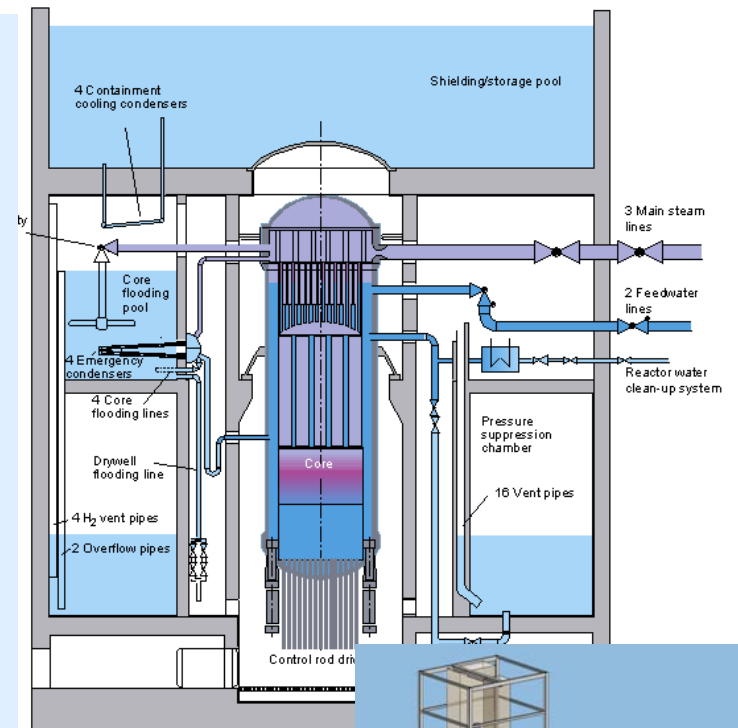
- Coupling of thermal-hydraulic codes with 3D CFD*
- Condensation module for a best-estimate thermal-hydraulic code to model the Emergency Condenser of the SWR-1000*
- Efficient detectors for tomography with fast neutrons*
- Temperature Fluctuations in Fluid and Pipe Walls induced by Turbulent Mixing*
- Thin liquid film dynamics in a condensing re-evaporating environment*

* *in acquisition*

- **COUPLING OF THERMAL-HYDRAULIC CODES WITH 3D CFD**
- **Combination of strengths of TH codes and CFD**
 - 1D TH codes (mature for two-phase plant applications and safety analyses)
 - 3D CFD code (effects of turbulence/ 3D effects)
- **More realistic safety analysis (where 3D effects are of relevance)**
 - Boron dilution scenarios (SBLOCA)
 - Main Steam Line Break
- **Investigations on coupling numerical schemes**
 - Explicit coupling
 - Semi-implicit coupling
- **Validation against experimental data**
- **Work within the STARS team (<http://stars.web.psi.ch>) and within the EU international project NURISP**

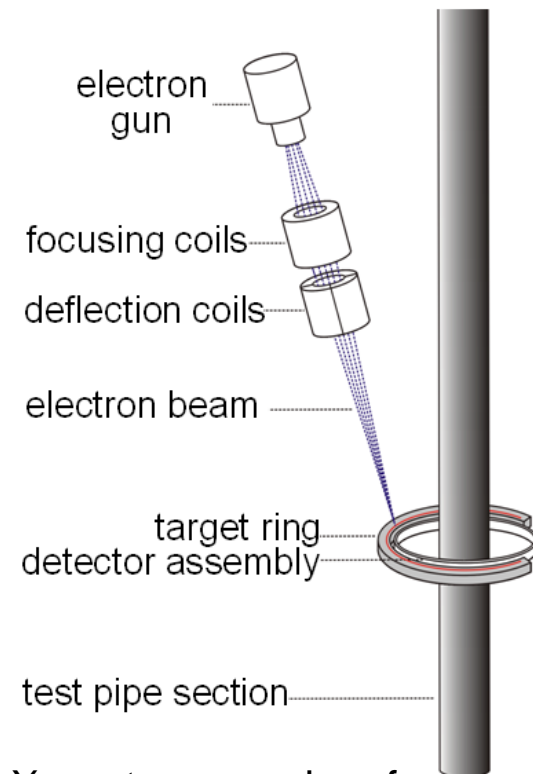


- Condensation Module for a best-estimate thermal-hydraulic code to model the Emergency Condenser of the SWR-1000
- **PROJECT FINANCED BY AREVA**
 - Experimental data measured at the AREVA INKA facility
 - Experimental data measured in Rossendorf-Dresden
- **Development of models for the simulation of SWR1000 passive system (emergency condenser)**
- **Validation of model against experimental results**
- **Implementation of model in the US NRC best-estimate thermal-hydraulic system code TRACE**
 - Explicit coupling
 - Semi-implicit coupling
- **Application to SWR1000 safety analyses**
- **Work within the STARS team (<http://stars.web.psi.ch>) and in strong collaboration with AREVA (Karlstein, Germany) and Research Center Dresden-Rossendorf**

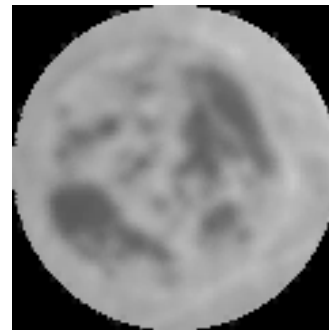
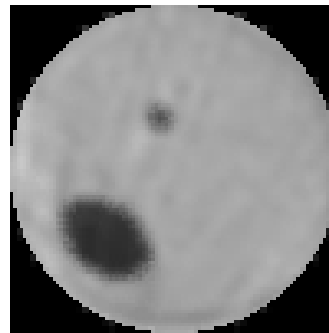


Feasibility Fast Neutron Tomography (TwoFast)

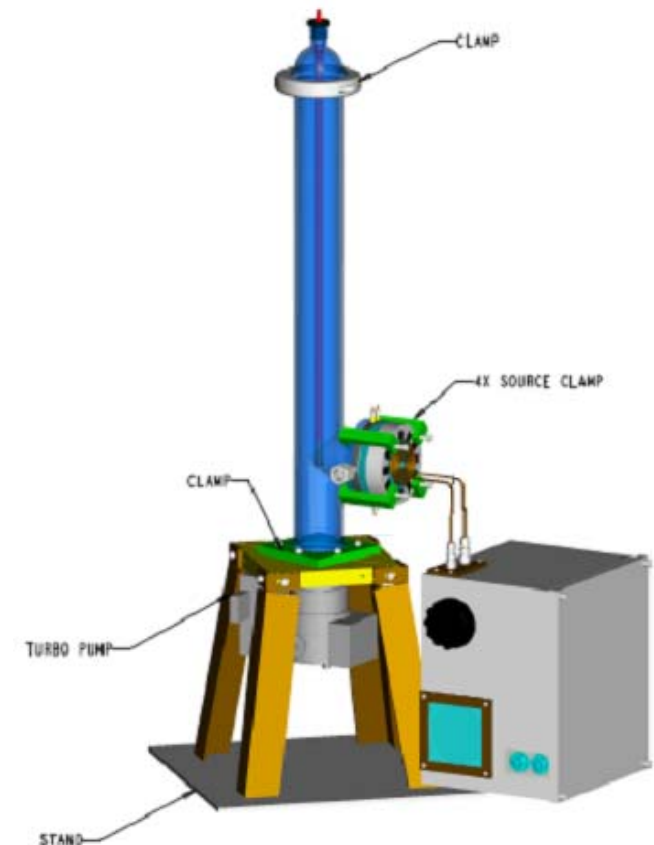
- "TwoFast" = fast neutrons \times fast imaging
- Goal: Repeat time resolution of ultra-fast X-ray tomography (FZ Rossendorf) with fast neutrons \Rightarrow perspective alternative for fuel rod bundle experiments

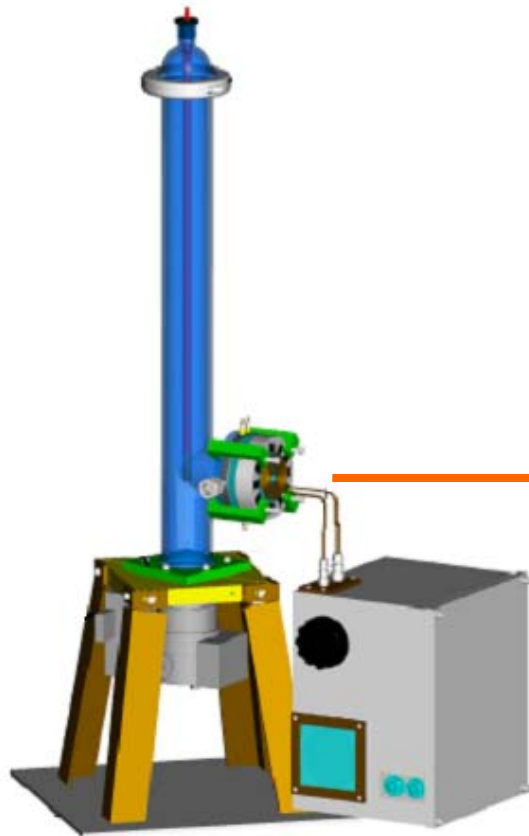


X-ray tomography of
FZ Rossendorf

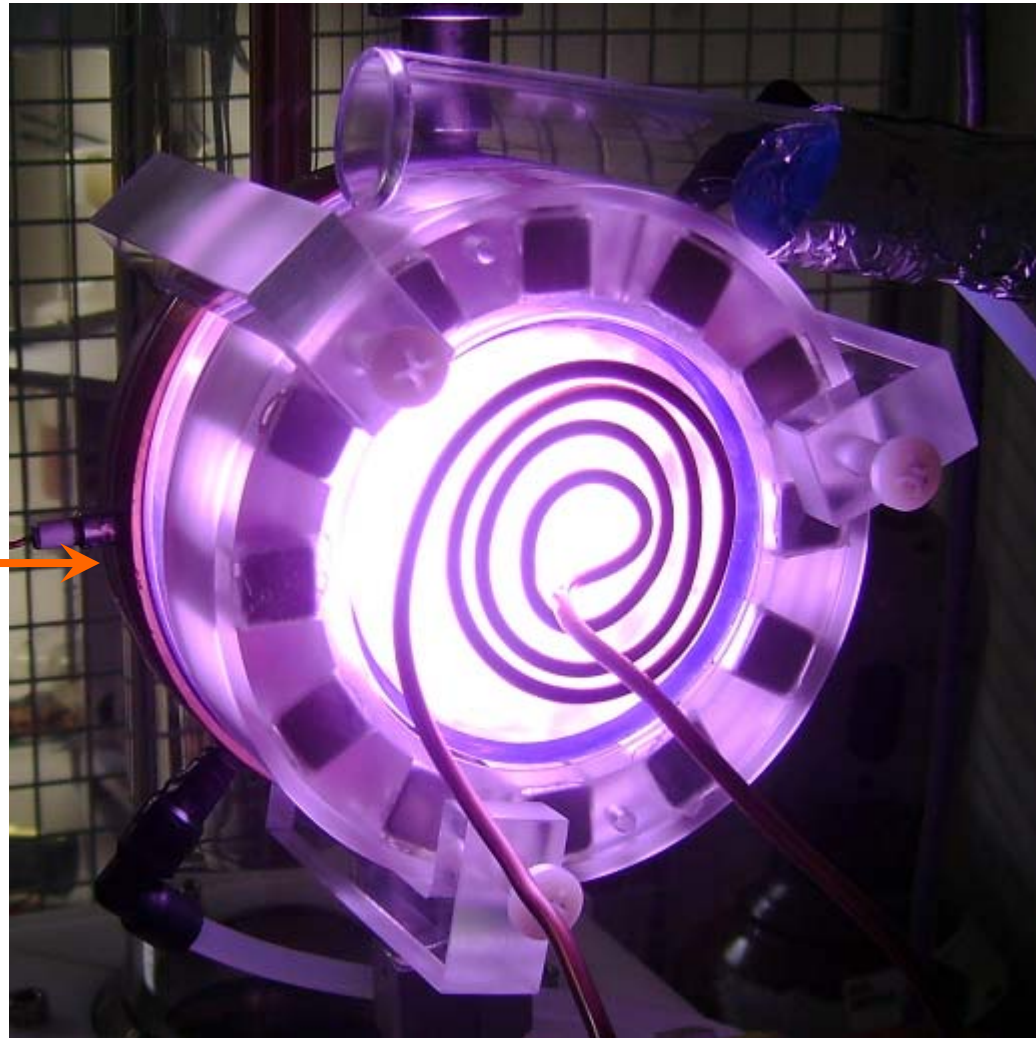


5-10 kfps

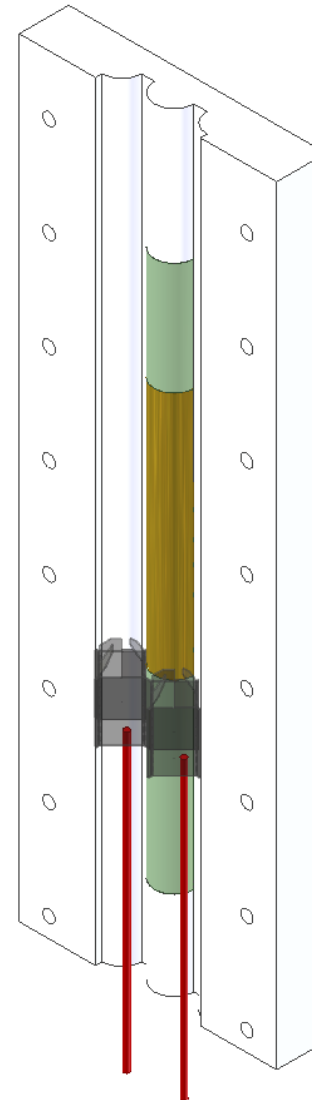
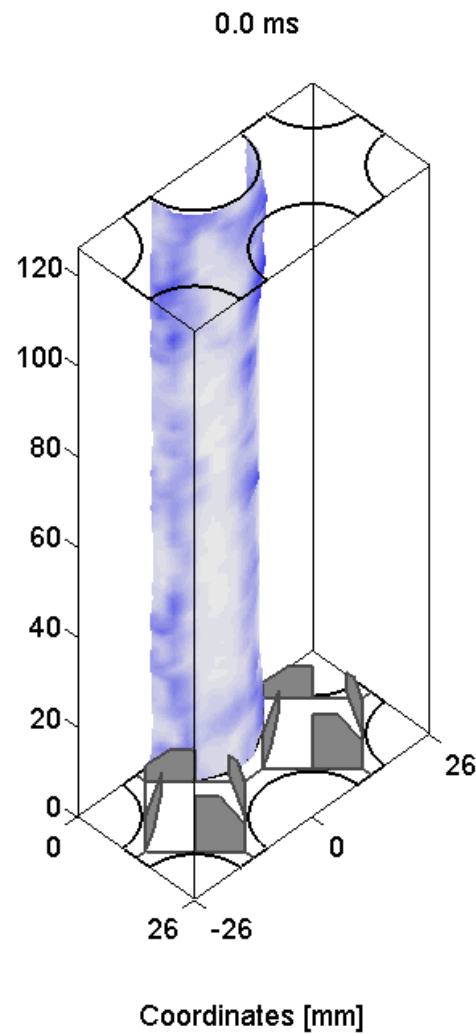
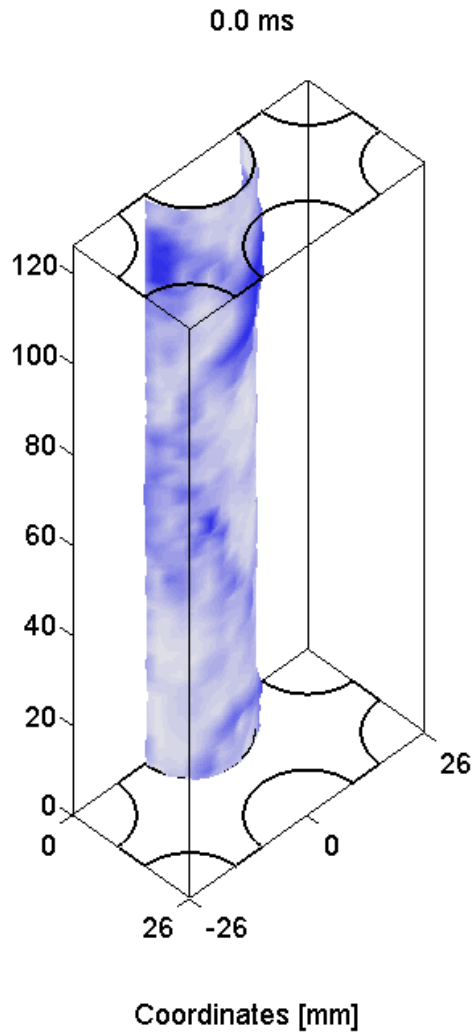




Fusion neutron source



Burning test plasma



**Superficial
velocities**

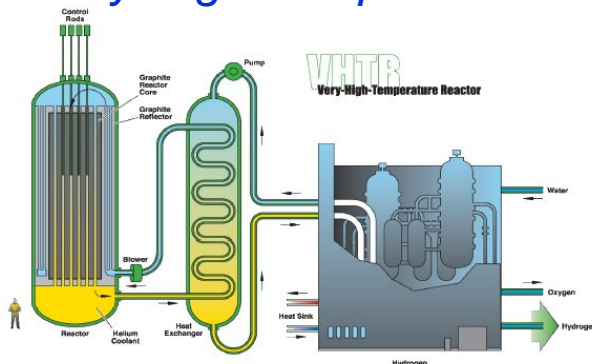
40 m/s air

0.3 m/s water

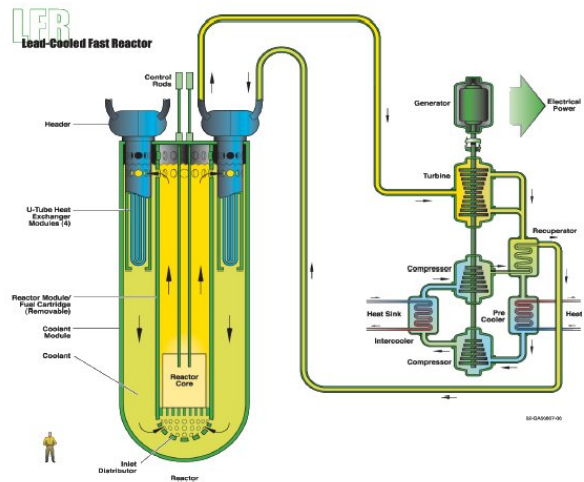
Nuclear energy: Old fashioned, boring, hostile to innovation... ?

Six Selected GIF Reactors:

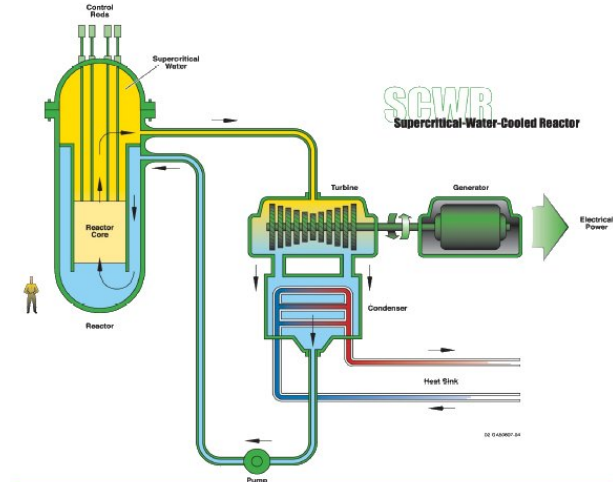
Very-High Temperature R.



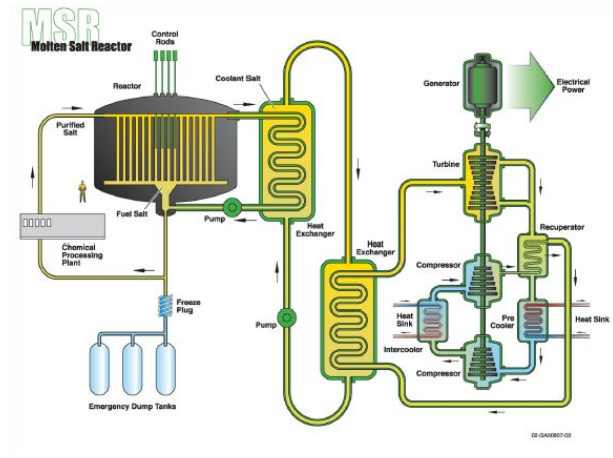
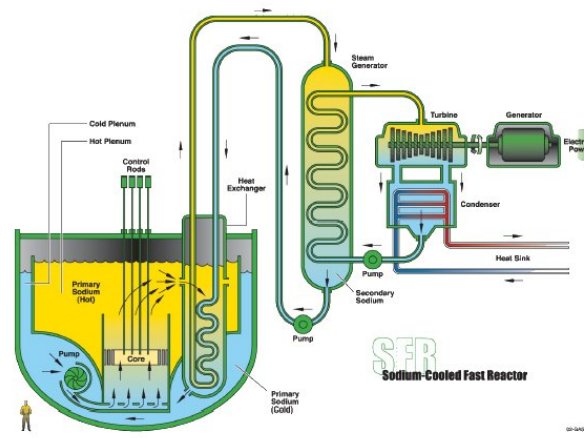
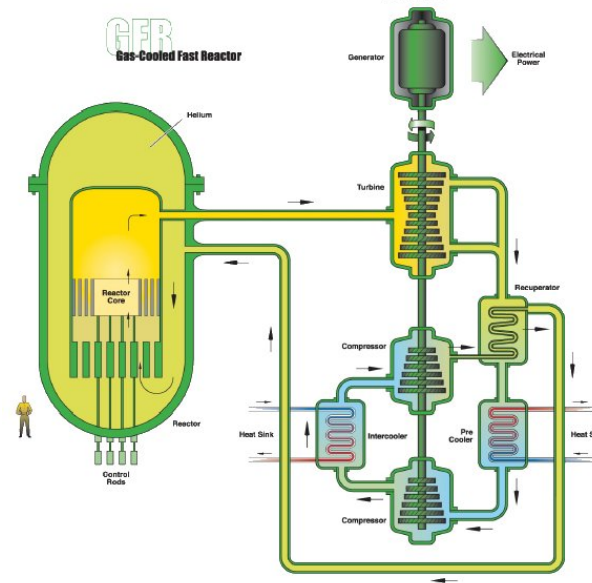
Lead-Cooled Fast R.



Supercritical-Water-Cooled R.



Gas-Cooled Fast Reactor



Gas-Cooled Fast Reactor

Sodium-Cooled Fast Reactor

Molten Salt Reactor



Dr. Patrick Miazza (BKW/KKM):

Working fields and challenges for academic graduates in a nuclear power plant

Dr. Michael Plaschy (Alpiq, Nuklearforum Schweiz):

Working fields and challenges in the power industry

Sönke Hacker (Resun):

Challenges for young graduates in new nuclear power plant projects