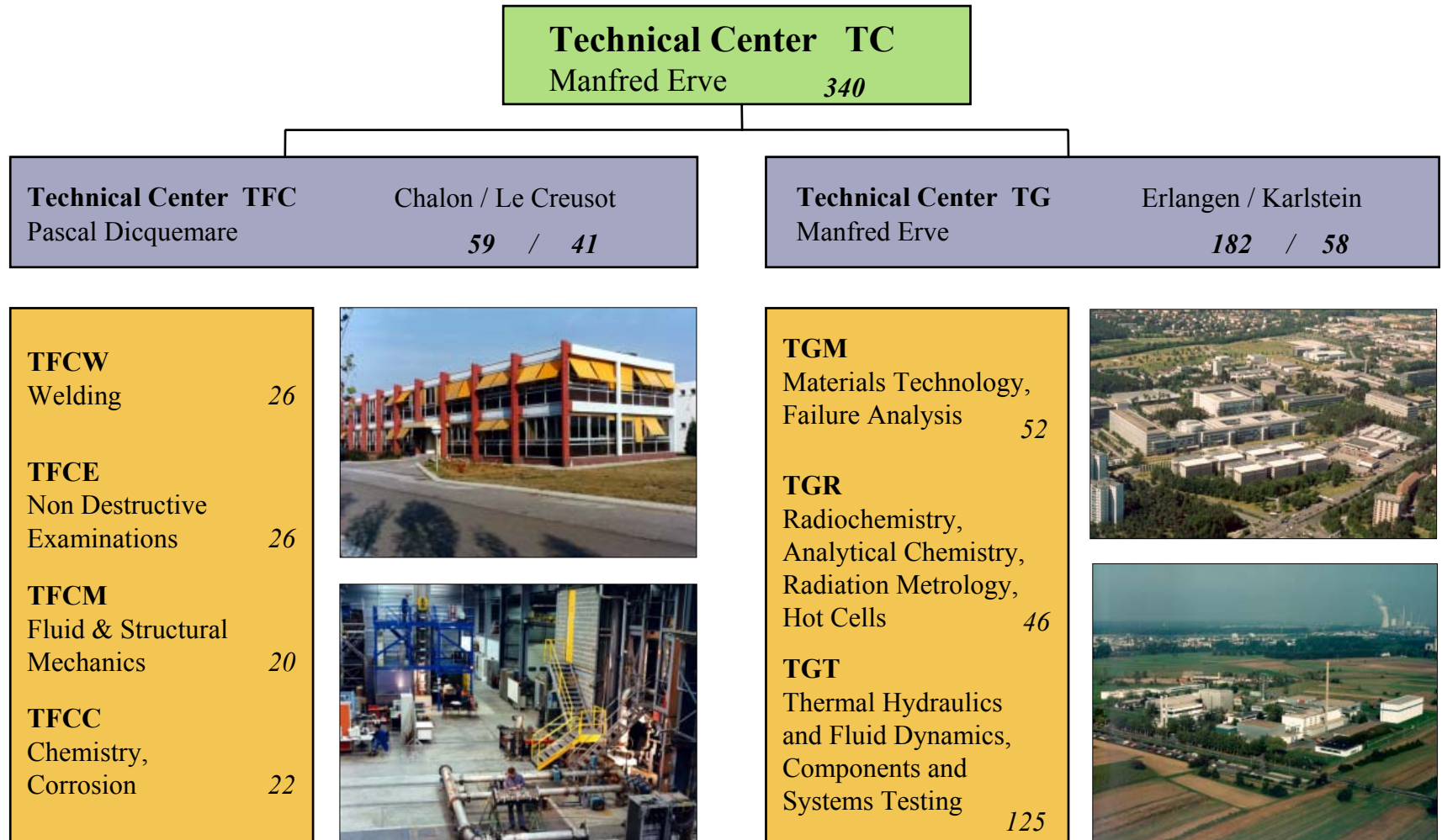


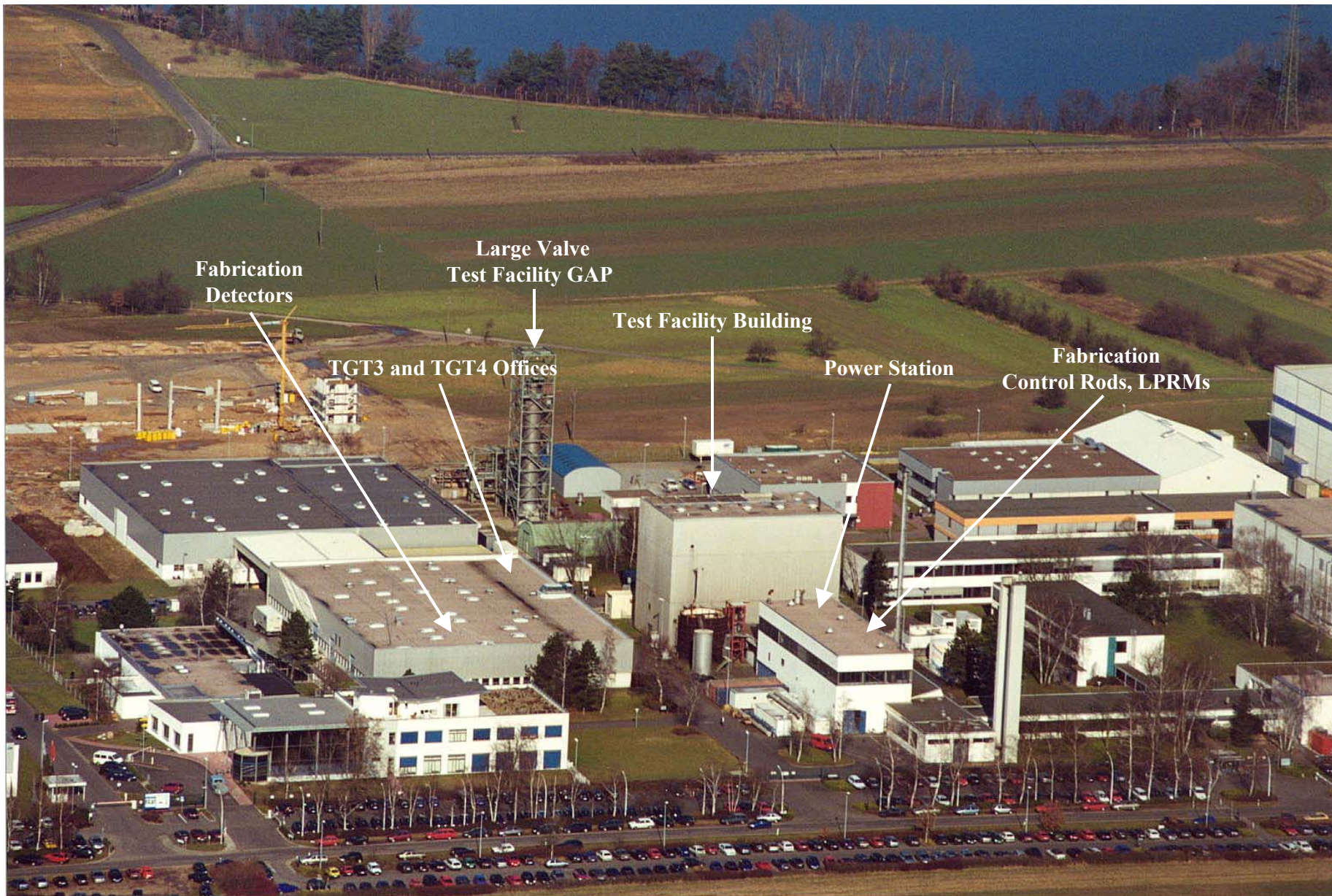
Technical Center of Framatome ANP GmbH



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TGT3 NRC Meetin 24.06.2003

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Tasks and Resources

- **Thermal Hydraulic Investigation of Reactor Fuel Elements**

Measurement of critical heat flux under steady state and transient conditions, single phase and two phase pressure drop measurement, stability tests of BWR fuel elements.

- **Valve Qualification**

Experimental investigation of safety, emergency stop, pressure relief and non-return valves up to sizes of 28" together with connected systems. Realisation of reactor transients including pipe rupture conditions.

Main steam flow

steady state 45 t/h / 160 bar

transient 2000 kg/s steam

4000 kg/s steam / water mixture

- **Environmental Qualification**

Ageing and investigation of components under LOCA conditions according to KTA and IEEE regulations.

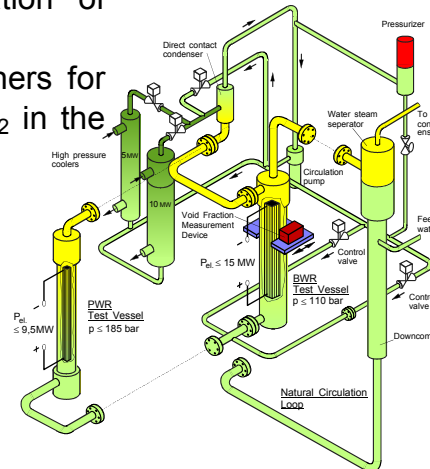
- **Investigation of Integrity of Containment**

BWR: Development of quencher, investigation of pressure suppression system

PWR/BWR: Investigation of sensors and recombiners for measurement and recombination of H₂ in the containment

- **Components Testing**

BWR: Internal recirculation pumps
Control rod drive
Steam-water separator



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Safety and Reliability of Nuclear Power Stations

Thermal hydraulic investigation with BWR and PWR fuel assemblies

■ Task

Reactor fuel elements must not be operated up to the critical heat flux. A lawful safety margin must be observed.

■ Performance of TGT3

- Measurement of the critical heat flux of BWR and PWR fuel assemblies under real operating conditions.
- Measurement of the transient behavior of BWR fuel assemblies, e.g. after pump trip or turbine trip.
- Measurement of the stability behaviors of BWR fuel assemblies.
- Adiabatic and diabatic two Phase flow measurement of fuel assemblies.

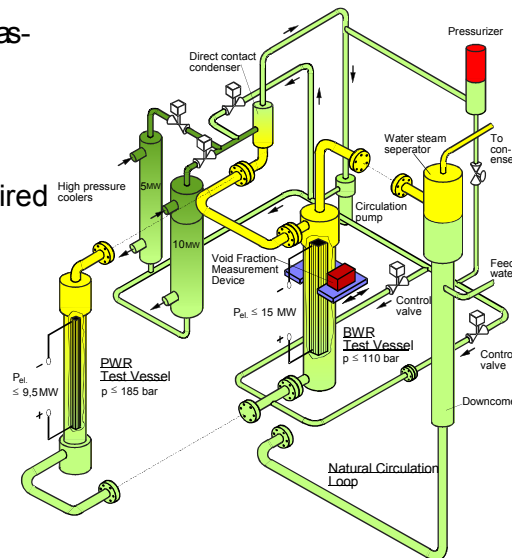
■ Technical Importance

Test results are imperatively necessary for documentation required by regulatory agencies.
Data base for thermalhydraulic reactor core design.

■ Economical importance

Improvement of fuel burn-up

Assembling a BWR
Test Bundle



Multifunction
Thermal Hydraulic
Test Loop

Large Valve Test Facility GAP



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Safety and Reliability of Nuclear Power Stations

Example: Recirculation pumps for BWR

▪ Task

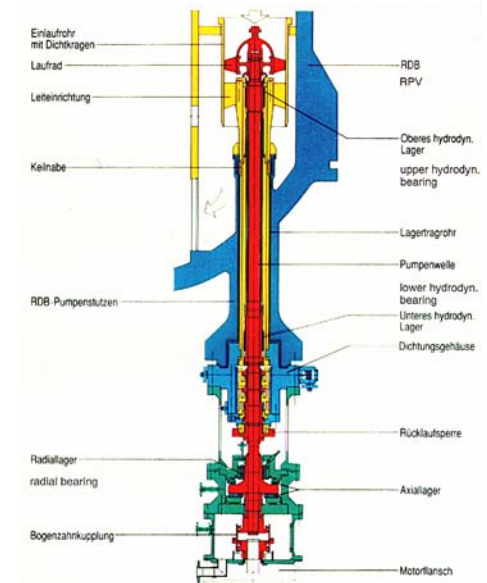
BWR recirculation pumps are safety related components of the reactor coolant circuit. The reliability influences the availability of the nuclear reactor.

▪ Performance of TGT3

- Qualification of BWR recirculation pumps (prototype tests)
- Acceptance tests of each pump at reactor operating conditions.
- Measurement of the hydraulic performance under reactor flow and operating conditions.
- Measurement of the operating reliability of the pumps with vibration measurements.

▪ Economical importance

- Preoperational tests.
- Risk avoidance of damages of sealings, bearings etc. during commissioning.
- Improvement of availability of the power plant.



Pump Test Loop

Safety and Reliability of Nuclear Power Stations

Example: Environmental qualification of electrical-mechanical components

■ Task

Electrical and electrical-mechanical components for nuclear power stations must be designed for operating conditions as they may occur after a LOCA in the containment.

■ Performance of TGT3

- Examination of electrical and electrical-mechanical components according to KTA 3504 and IEEE 2238L-1980 under LOCA conditions.
- Climate and corrosion tests.
- Aging and radiation of the components to simulate reactor operating time.

■ Technical importance

Lawful tests of components before installation in the nuclear reactor plant as well as after several years of operating.

