framatome

KOPRA - Core Component Test Section (KVA)

Qualification of Primary-System Components

Testing under real operating conditions for fuel assemblies, rod cluster control assemblies and control rod drive mechanisms

Challenge

Core components are critical pieces for the safety and availability of a nuclear power plant and need to be tested under conditions which are as close as possible to the real boundary conditions.

Solution

Framatome operates the KOPRA Core Component Test Section (KVA) which is exclusively designed for full-scale tests on nuclear core components, matching coolant temperature, pressure and volumetric flow with the conditions of a pressurized water reactor. The test channel contains a model of the central core position in the reactor pressure vessel (RPV) with complete geometry at a 1:1 scale.

The fuel assembly (FA) is inserted in a fuel assembly channel between the lower support plate (LSP) and the upper core plate (UCP).

The control rod guide assembly (CRGA) is fixed in place by the upper support plate (USP).

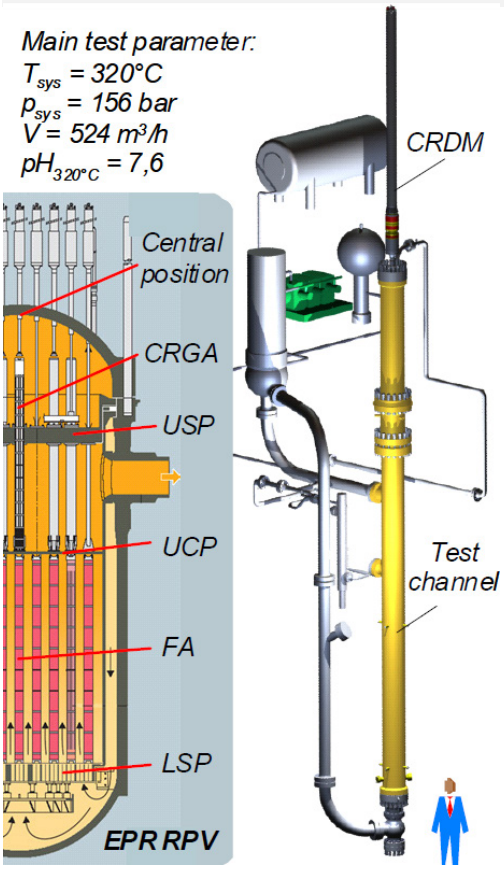
The test-channel vessel head matches the RPV head configuration with its CRDM (Control Rod Drive Mechanism) adaptor and flange.

The flow enters the test channel through the LSP, flows through the FA and the UCP and leaves the test channel via the openings in the lower support column of the CRGA at the same level as the hot legs of the RPV.

Instrumentation of CRDM during qualification test

Customer benefits

- Avoid extrapolation : designed for full-scale tests on nuclear core components at specific PWR flow, pressure and temperature conditions, flexible test section for component qualification, endurance testing and functional testing
- Reliable test results through accreditation as test and inspection body in accordance with ISO 17025 and 17020, accepted by ILAC



KOPRA core component test section

Your performance
is **our** everyday **commitment**

Technical information

Fuel assembly testing

• Functional tests of entire fuel assembly with simulation of LSP, UCP, USP, CRGA and operational flow conditions.

• Investigations of fuel assembly and RCC-A (Rod Cluster Control Assembly) behavior under normal and abnormal operating conditions.

• Fuel assembly pressure drop measurements under operation conditions and wear measurements.

• Endurance testing of flow-induced vibrations of fuel assemblies and fuel rods.

• Special investigations for new designs, e.g. RCC-A insertion tests, fuel assembly floating tests.

CRDM testing

• Functional tests to verify adequate performance, e.g., latch-unit closing and opening times, mobile set effective weight, drive rod loads during stepping operation, RCC-A drop times.

• Endurance tests to demonstrate that proper functioning can be reliably achieved over the specified number of CRDM steps and RCC-A drops with no damage.

• Special investigations for new designs, e.g. velocity and vibration measurements of drive rod during stepping operation.

Test set-up CRDM qualification for EPR™

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