framatome

Excore Neutron Flux Instrumentation in PWRs

Framatome's excore instrumentation precisely measures neutron flux outside the core, ensuring reactor control and protection while meeting international standards.

Challenge

Safe and reliable excore neutron flux instrumentation is essential in all nuclear plant states, from sub-critical up to power operation. Continuous measurement and processing of the neutron flux provides critical data for reactor control and protection, power regulation, and safety shutdown systems.

Solution

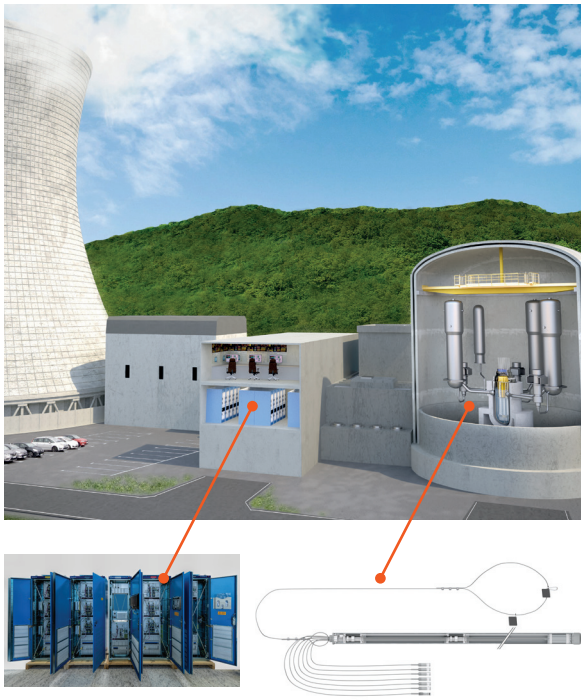
Backed by over 50 years of operational experience, Framatome's excore neutron flux instrumentation is a reliable and robust safety-classified system that ensures precise measurement across all standard excore ranges: source, intermediate, power, and wide range. It's flexible and adaptable, enabling seamless integration into specialized design environments.

Framatome takes a comprehensive approach, serving not only as the designer of the complete system but also as the developer and manufacturer of key technological components.

Conditioning and processing modules are based on Framatome's successful and field-proven TELEPERM XS platform, and processing can be performed using either an FPGA- or microprocessor-based solution. The entire architecture is integrated, either into TELEPERM XS or existing cabinets, according to Framatome safety standards that ensure proven and robust quality.

Sensors and cable are based on Framatome design and manufactured in-house, but third-party sensors are also provided if required. Instrumentation is qualified to maintain accurate performance and functionality during accident conditions.

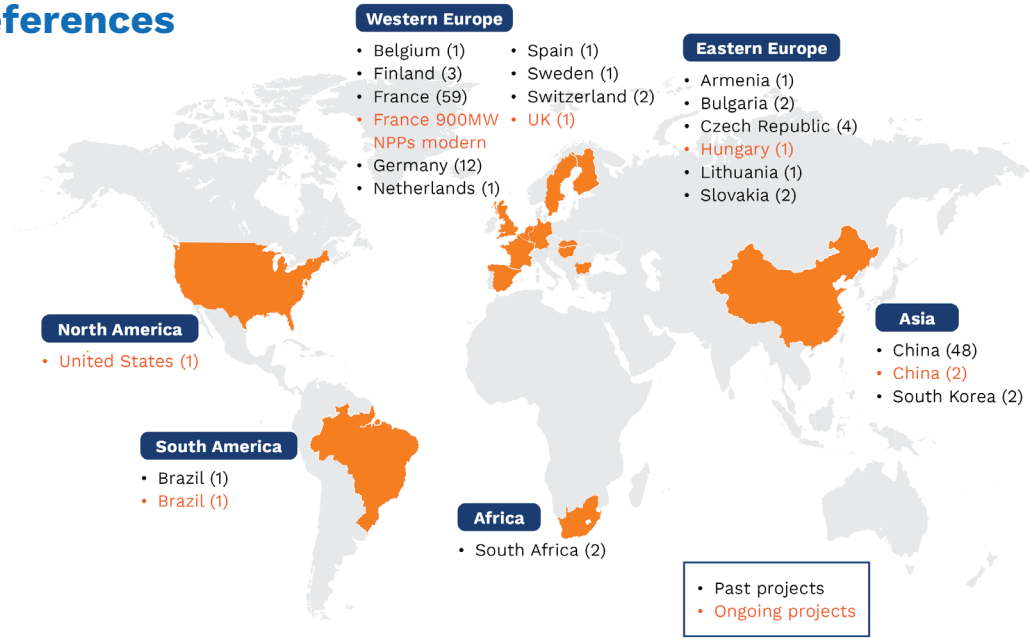
Framatome provides all services to guarantee a reliable excore neutron flux measurement chain, from qualification of sensors, hardware and software through personnel training and regular testing, monitoring and full maintenance.



Customer benefits

- Adaptable to plant- specific operational needs
- Qualified for extreme conditions
- User-friendly: Simple operation, easy diagnostics and maintenance
- Comprehensive personnel training
- Engineering, services and troubleshooting over the complete I&C lifecycle
- Customized maintenance program and on-site support : From equipment qualification to recurring testing and operational maintenance

Excore references

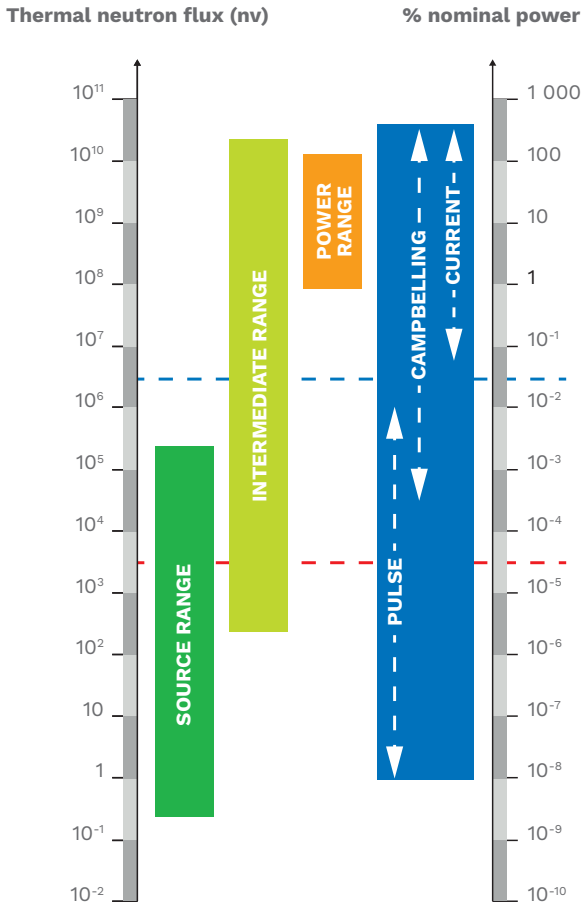


Technical information

Qualified combinations of coaxial cable assemblies, detectors and analog or digital signal conditioning offered to meet plant specific requirements:

- Coaxial (super-screened, low noise, metal sheath mineral-insulated) or triaxial cables
- Detectors (counter tubes, ionization chambers with or w/o gamma compensation, fission chambers)
- Analog or digital signal conditioning including customized software and customized maintenance equipment
- Neutron flux coverage over several decades (~5 10-2 to 2·1010 cm-2·s-1) with high sensitivity
- Solutions developed and qualified for CAT-A safety functions according to IEC 61513, and IEC/IEEE 60780-323 and IEC 60880, and national regulations RCC-E:2019. In the U.S., the NRC certification process is under way
- Digital processing with advanced noise filtering — safety software-based neutron flux noise reduction for improved signal clarity

Excore measuring ranges



Key Figures

More than **50** years of operational experience in various types of reactors.

More than **140** PWR nuclear power plants worldwide equipped with Framatome excore neutron flux instrumentation, the largest global installed base of excore monitoring solutions

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

Contact: IC@framatome.com
www.framatome.com

A0705-P_US_G_EN-811_06-25-Excore-Neutron-flux