CORTEX

CORE MONITORING TECHNIQUES AND EXPERIMENTAL VALIDATION AND DEMONSTRATION

20	48	11	8
PARTNERS	MONTHS	COUNTRIES	TRAINING COURSES

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AIMING TO DEVELOP INNOVATIVE CORE MONITORING TECHNIQUES FOR IMPROVED REACTOR SAFETY

Launched in 2017, the European Horizon 2020 CORTEX project aims to **develop innovative core monitoring techniques that allow to detect anomalies in nuclear reactors while operating.** Because of the early detection of operational problems, the utilities will be able to take proper actions before such problems have any adverse effect on plant safety and reliability.

THE TECHNIQUES ARE BASED ON USING THE INHERENT FLUCTUATIONS IN NEUTRON FLUX RECORDED BY THE IN-CORE AND EX-CORE INSTRUMENTATION

The method is non-intrusive and does not require any external perturbation of the system. The fluctuations of the neutron flux, often referred to as neutron noise, are always present in a nuclear reactor. Most importantly, they carry valuable information on the dynamics of the reactor core. **Different anomalies will give rise to different spatial and spectral signatures of the neutron noise throughout the core.** This makes it possible to recover from the detector readings some information about the driving anomaly.

This "unfolding" is performed using Artificial Intelligence techniques relying on machine learning. The anomalies are differentiated depending on their type, location and characteristics. The training data sets, necessary to the machine learning algorithms, heavily rely of the use of ad-hoc simulation tools developed within the project.

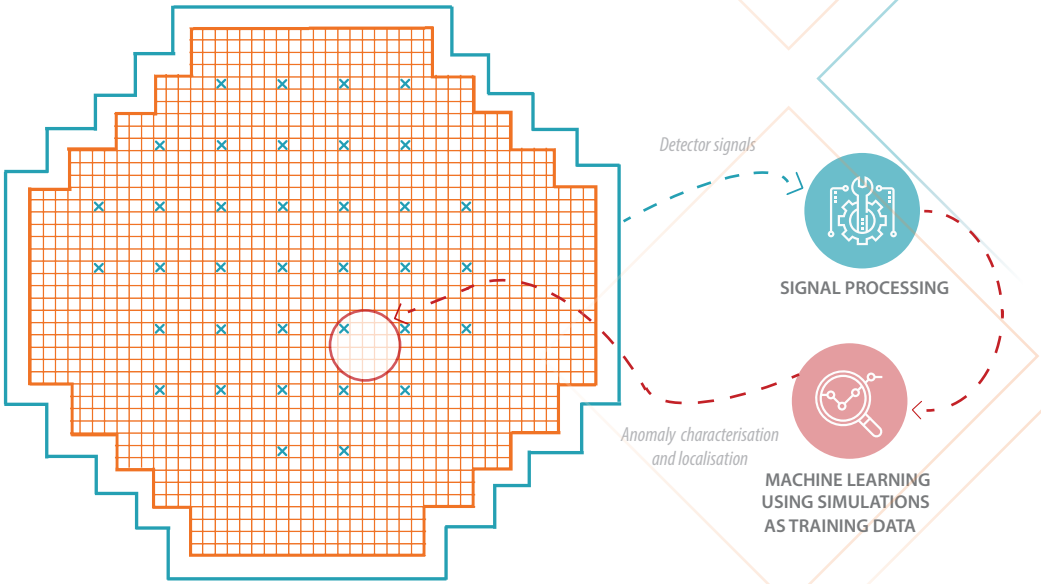
REACTOR CORE MONITORING ALLOWS TO DETECT OPERATIONAL PROBLEMS BEFORE THEY HAVE ANY ADVERSE EFFECT ON PLANT SAFETY AND RELIABILITY

OUTPUTS

Contribute to:

- The early detection of anomalies in operating reactors
- Improved reactor safety and higher plant availability
- Reducing the CO2 footprint and impact to the environment
- A higher availability of cheap base-lead electricity to consumers

Implementing this technique in the existing fleet of reactors will have a major impact. It can also be applied to future reactor types and designs.



The project aims at first identifying regions of the core (conceptually highlighted in red) where a possible anomaly is located and at thereafter characterising the anomaly. The in-core instrumentation is represented by the crosses.

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