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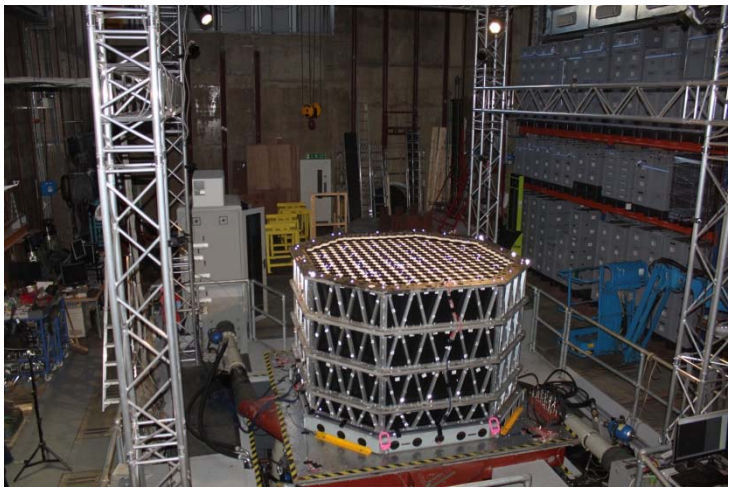

Creation of a physical model of an AGR nuclear reactor graphite core for shaking table explorations of seismic behaviour

This is a unique, highly innovative and technically challenging earthquake engineering project that has provided vital evidence to underpin the seismic safety assessment of EDF Energy's ageing Advanced Gas-cooled Reactor (AGR) nuclear power station fleet.

In a £6.4m programme, a complex, high precision, ¼ sized physical model of a representative AGR graphite core assembly has been developed over a period of seven years. This work culminated in 2016 with a fully commissioned rig, which can be shaken on the earthquake shaking table at the University of Bristol to reveal important insights into an aged graphite core's seismic behaviour and integrity. Information from the experimental programme now provides essential validation of the complex numerical models that are used to underpin the AGR seismic safety case arguments for life extension to 2023 of the oldest AGR stations.

The bespoke rig contains over 40,000 components and 3,200 sensors in a package measuring approximately 2.5x2.5x2.0m. It enables exploration of the non-linear dynamic responses of many different types and patterns of cracked graphite bricks, representing anticipated ageing effects.

The rig development involved integration of high precision structural engineering and manufacturing, innovative electronic sensor development, cutting edge data analysis and experimental techniques. The programme was carefully managed through an iterative, learning-focused approach that de-risked the design, justified the incremental investment case, and assured cost, quality and safety control.

The project is one of the most complex shaking table experiments ever attempted anywhere in the world.

The project was commissioned by EDF Energy. The rig was designed and built by the Department of Civil Engineering at the University of Bristol with the support of Atkins.

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