Fraunhofer IZFP

FRAUNHOFER INSTITUTE FOR NONDESTRUCTIVE TESTING IZFP

PRESS RELEASE

Fraunhofer IZFP acquires lucrative EU project for increasing nuclear power plant safety

In the European Union, about 200 nuclear power plants that feed electricity into the grids are currently in operation. Extending their period of operation will require reliable technology systems for calculating the residual life of the reactor components; the safety of existing nuclear power plants thus continues to remain a relevant research topic. An EU project that will make a significant contribution to ensuring long-term safety of nuclear power plant operation has recently been acquired by researchers from the Fraunhofer Institute for Nondestructive Testing IZFP in Saarbrücken.

According to current German law, the use of nuclear energy for producing power will be discontinued by 2022. Extending the operational lifetime of existing nuclear power plants outside of Germany – including those in locations directly bordering Germany – has been accepted in many countries as a strategic goal for ensuring a sufficient supply of power in the coming decades. Consequently, the safe operation of European nuclear power plants continues to be necessary and essential. Within the framework of a research program tendered by the European Commission and the European Atomic Energy Community (EURATOM), Fraunhofer IZFP has been awarded a lucrative EU project.

Detecting material damage in a focused and timely manner

The Fraunhofer IZFP was tasked with coordinating a consortium of a total of 10 European partners collaborating on technological solutions for testing material damage in reactor pressure vessels. "The goal of the *NOMAD** research project is to develop a nondestructive evaluation system that is to be used in periodic

**Nondestructive Evaluation System for the Inspection of Operation-Induced Material Degradation in Nuclear Power Plants*

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safety reviews of the reactor pressure vessel of nuclear power plants. Its purpose is to allow determining the location and characterizing the nature of material damage in reactor pressure vessel steels," explained Dr. Madalina Rabung, the lead responsible for this project at Fraunhofer IZFP. The reactor pressure vessel protects our environment from radioactive radiation; inside this vessel are the fuel elements, whose radioactive radiation can result in the vessel wall embrittlement over the long term. Sudden failure of a reactor pressure vessel due to embrittlement would be disastrous for humanity and our environment.

Safe reactor pressure vessels with intelligent sensing and evaluation systems

So far, safety routines have been based on monitoring concepts in which small samples are already taken during the manufacture of the reactor pressure vessels. These small samples are then intentionally exposed to increased radioactive radiation in order to detect – in anticipation of reality – potential deterioration of the material properties. "However, the material of a reactor pressure vessel is not always homogeneous; thus, such samples cannot be considered a solid reference for the entire pressure vessel," added Dr. Rabung. Fraunhofer IZFP will increase safety significantly by looking at the reactor pressure vessel in its entirety, evaluating it regularly and non-invasively using intelligent sensors based on ultrasound and *3MA***. With regard to the extension of operational lifetime, NOMAD will provide additional parameters to supplement the current invasive tests. The nondestructive characterization of material properties in essential, non-replaceable nuclear power plant components such as the reactor pressure vessel can thus make a significant contribution to improving the safety and the safe long-term operation of nuclear power plants.

Partners involved

The research project, which is scheduled to last for four years and is funded with a total of almost 5 million euros, was evaluated positively by the European Commission and started on June 1, 2017.

*** Micromagnetic Multiparameter Microstructure and Stress Analysis*

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In addition to Fraunhofer IZFP, the following partners are participating in this research project: SCK•CEN Belgian Nuclear Research Centre (Belgium), VTT Technical Research Centre of Finland Ltd. (Finland), SVTI Swiss Association for Technical Inspections (Switzerland), Coventry University (Great Britain), HEPENIX Technical Service Ltd. (Hungary), Hungarian Academy of Science Centre for Energy Research (Hungary), Paul Scherrer Institut (Switzerland), Tecnatom S.A. (Spain), and Eurice GmbH (Germany).

Grohnde/Lower Saxony nuclear power plant
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