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Enhanced safety by nondestructive testing of cable insulation in European nuclear power plants

Despite the German phase-out from nuclear power, this technology still plays a major role in Europe. Due to this fact, it is all the more important for Germany to be able to assess the condition of international nuclear power plants. In a nuclear power plant (NPP) an average of 25,000 cables with a total length of 1,500 km are installed. These cables are partially exposed to harsh environmental conditions such as increased temperature or radiation: Under these circumstances, the cable insulation deteriorates with the risk of cracks occurring as a result of embrittlement. How can nondestructive procedures detect possible fatigue processes of the cables at an early stage? And how can these procedures be brought in line with practical aspects? A team of engineers and scientists at Fraunhofer IZFP in Saarbrücken is working on these questions.

Within the framework of an EURATOM project funded by the European Union which focuses on both research and innovation, the Fraunhofer Institute for Nondestructive Testing IZFP will contribute to the determination of the exact state and age of the cable insulation. The institute is part of a consortium of 13 partners from Germany, Finland, France, Italy, Poland and Czech Republic.

Currently, the cables are replaced preventively on the basis of experience, but without reliable information on the actual condition. Thus, the actual condition can vary in a wide range: Maybe an expensive replacement is not yet required, but maybe a critical condition has already been reached before the scheduled replacement. To date, few nondestructive methods have been used to investigate cable insulation. However, the economic and safety-related benefits could be significant. This will be examined in detail by Fraunhofer IZFP within the framework of the EU project "TeaM Cables", and the results will be transferred to the application-oriented practice in the long term.

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FRAUNHOFER INSTITUTE FOR NONDESTRUCTIVE TESTING IZFP

“Using an enhanced terahertz approach on the basis of high-frequency electromagnetic waves, we are going to identify the aging state and the condition of the insulation,” explains Christopher Stumm, responsible project engineer at Fraunhofer IZFP. Additionally, these terahertz-based examinations provide information which allow for revision scheduling and timely inspection of the cable insulation. Hence, brittle cables can be replaced promptly while sound cables can stay in operation safely. This way, Fraunhofer IZFP has a significant share in increased safety and cost savings – also in the context of nuclear decommissioning – at increased economy and competitiveness.

The “TeaM Cables” project has a total duration of 4.5 years with 682,000 € of research funding for Fraunhofer IZFP.

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Nuclear Power Plant
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