LITHUANIAN ENERGY INSTITUTE

ADMISSION TO PHD STUDIES FOR THE YEAR 2024

DOCTORAL RESEARCH TOPIC:

New nuclear installations' reliability study and possible hazards' probabilistic safety assessment to reduce risk of extreme events

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

The safety case and application plans for the new nuclear installations (such as small fission power plants, international fusion reactors ITER, DEMO or a cyclotron in Lithuania used for medical and research purposes) and their infrastructure and sites are closely linked to all postulated extreme events' (especially external events') assessment considering the frequency and their consequences. Typically, the frequency of internal events for a new device is minimized, resulting in the predominance of external extreme hazards, events (caused by nature or human). However, despite various scientific researches, there is still no common methodology for conducting safety analysis of new nuclear installations (such as so-called fusion or thermonuclear installations) that considers both the likelihood of extreme events and the severity of their consequences, when the uncertainty of the results obtained is also assessed. Therefore, new research to assess the reliability and safety of the essential equipment and its environment (including operators' workplaces, sites) is particularly relevant, focusing on combinations of extreme events, the impact of human errors, cause and effect dynamics, and integrated consideration of uncertainty and sensitivity analysis. Such a methodology would not only allow the level of risk to be assessed, but would also lead to more accurate risk-based decision-making to reduce risk.

This research objective is to investigate the reliability of new nuclear installations and the probabilistic safety assessment, reducing the uncertainty in the reliability and safety estimates and reducing the risk of extreme events when operational data are not available at all or only limited information is available.

Tasks:

1. Clustering of new nuclear facilities and their reliability issues;
2. Equipment and hazards' probabilistic assessment methodology;
3. Uncertainty and risk minimization research and their modeling;
4. Determining the significance of new equipment and extreme events;
5. Development of a common methodology for safety estimates increase.

Expected results are a methodology and pilot calculations with research to assess the reliability and probabilistic safety of new nuclear installations and to reduce uncertainty and risk. The research and expected results are significant in Lithuania and abroad.

SCIENTIFIC SUPERVISOR:

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