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Datum: 22.04.2024

Aushang

Einladung zum Seminar über „Nukleare Energieerzeugung“

Zeit: **Montag, 29. April 2024, 11:00 Uhr**

Ort: Karlsruher Institut für Technologie, Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen, INR, Bau 521, Kolloquiumsraum (R. 302)

Referent: Herr **Dr. Kanglong Zhang**, Karlsruher Institut für Technologie, INR

Titel: Multi-physics and multi-scale activities of KIT within the European McSafer project

Abstract:

The utilization of multi-scale and multi-physics simulation systems has become increasingly pivotal in nuclear safety analysis. These systems integrate various codes or software, such as neutronics, thermal-mechanics, and Thermal-Hydraulics (TH) codes, to dynamically address the inherent multi-scale and multi-physics complexities within nuclear power systems. This physically grounded approach enhances simulation accuracy significantly. Over the years, KIT-INR has been dedicated to developing and validating such systems. Drawing from this expertise, KIT-INR launched the European project McSAFER (September 2020 – February 2024) to explore the application of these systems in Small Modular Reactors (SMRs).

SMRs are highly promising nuclear reactors due to their modularity, flexibility, and safety features, including innovative designs like integrated Reactor Pressure Vessels (RPVs) and passive safety systems. However, the effectiveness of these features requires thorough examination. The multi-scale and multi-physics approach offers an advanced perspective on understanding the physical processes within SMRs, a primary focus of the McSAFER project.

Within the framework of McSAFER, KIT-INR has developed a versatile multi-scale multi-physics system incorporating various codes: the TH code TRACE, the sub-channel TH code SCF, the CFD code OpenFOAM, the nodal neutronic code PARCS, and the Monte Carlo code SERPENT. This system employs a uniform coupling scheme and allows flexible code pairing. As a result, different coupling configurations have been utilized to analyze various scenarios in different SMRs, including:

1) SCF/SERPENT for the core overcooling transient in the CREAM-like core, at pin level.
2) SCF/SERPENT for the Rod Ejection Accident (REA) in the KSMR core, at pin level.
3) SCF/PARCS for the REA in the KSMR core, at pin level.

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4) TRACE/SCF for an Anticipated Transient Without SCRAM (ATWS) in the SMART reactor.
5) TRACE/PARCS/OpenFOAM for an ATWS in the SMART reactor.
6) TRACE/PARCS for the Steam Line Break (SLB) accident in the SMART reactor.
7) TRACE/PARCS/SCF for the Steam Line Break SLB accident in the SMART reactor.
8) TRACE/PARCS/OpenFOAM for the Steam Line Break SLB accident in the SMART reactor.

These simulations provide comprehensive insights into neutronic and TH processes across different physics and scales, demonstrating the safety of the selected SMRs.

Hinweis: Alle auswärtigen Besucher des Seminars werden gebeten, ihren gültigen Personalausweis oder Reisepass mitzubringen