



**Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska (UZ3)  
Departament Badań Układów Złożonych (DUZ)**

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**11:30**

**CYFRONET (bud. 39) – sala 172 (III piętro)**

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**Assessment of high performance computing for nuclear reactor design  
and safety applications**

**Abstract:**

Over the last decade, High Performance Computing (HPC) has become an attractive tool in nuclear safety analysis due to the fast progress in building large computing clusters. In particular, Computational Fluid Dynamics (CFD) technique is recognized as a valuable research tool for the analysis of the thermal-hydraulics phenomenon. However, the more advanced the code and the research problem, the time needed to obtain final results is respectively longer. Therefore, it is important to consider not only computational capabilities but also an efficient use of the available resources.

The aim of this work is to present technical aspects of scalability of the spectral element code NEK5000 and the feasibility to run a large-scale Direct Numerical Simulation (DNS) using HPC cluster. The presentation is divided into three parts. The first one contains a detailed description of the Świerk Computing Centre (CIŚ) infrastructure, while the second one is devoted to the genuine and sophisticated performance tests done at CIŚ. The first set of tests checked the scalability of NEK5000 code on the hardware installed at CIŚ. Further tests checked the efficiency of use of the available resources by means of CPU configuration and network configuration options. The efficiency in every case is calculated based on the execution time of a standardized test case. The third part presents the large-scale simulations performed using this HPC cluster. In this regard, a highly scalable CFD code NEK5000 has been used to perform the DNS of two important thermal-hydraulic problems within the nuclear industry, i.e. pressurized thermal shock and inter-channel mixing in a bare rod bundle configuration.

Serdecznie zapraszamy,  
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