The Energy-Oriented Center of Excellence

Fostering the European Energy Transition with Exascale

EoCoE-III aims to accelerate Europe's decarbonized energy transition by leveraging HPC technologies. As a key player in the European HPC ecosystem, it highlights the role of computational science in achieving net-zero energy goals. Focused on five exascale applications across four energy domains-Energy Materials, Water, Wind, and Fusion-the project unites 18 partners from six countries, including leading supercomputing centers. Through cutting-edge simulations, EoCoE-III fosters innovations in photovoltaic design, wind farm modeling, and fusion reactors, showcasing HPC's transformative impact on energy research and industry.

Background

EoCoE supports Europe's carbon-neutral goals, leveraging HPC to advance renewable energy. Since its inception in 2015, the initiative has brought together partners from research institutions and SMEs to develop simulation tools for wind, solar, materials, and hydroelectric energy. Building on previous successes, EoCoE-III refines energy codes and transversal tools, enhancing scalability and efficiency on modern HPC platforms. These efforts contribute to Europe's green energy revolution while driving innovation in scientific computing.

Objectives

- Develop five exascale lighthouse codes addressing challenges in Fusion, Materials, Water, and Wind energy.
- Demonstrate scalability and societal relevance through large-scale simulations on European exascale infrastructures.
- Provide exascale-optimized tools for addressing bottlenecks like I/O and linear algebra, making them available to the broader community.
- Strengthen a pan-European network for HPC and energy sector collaboration, bridging the skills gap through training and dissemination.



WP7: Communication, dissemination & training



WP6 : Adv

nced

EoCoE-III exemplifies how HPC accelerates the energy transition, reinforcing Europe's leadership in sustainable innovation.

Path to Exascale:

EoCoE-III integrates expertise from HPC, performance analysis, and workflow optimization, defining clear pathways to exascale readiness

Multidisciplinary Collaboration:

The project fosters interaction between energy domain researchers and HPC experts to co-develop optimized tools, maximizing scientific

Co-Design:

A robust co-design methodology connects flagship applications with hardware providers. Collaborative efforts with industry leaders (e.g.,

User Community:

Flagship applications like ParFlow and Alya serve large user bases and drive innovation in hydrology and Earth systems simulations.

European Collaboration:

EoCoE is a pillar of the European HPC ecosystem, collaborating with CoEs and NCCs within CASTIEL 2, and EERA. It contributes to the HPC strategy, fosters technical expertise, and trains young scientists, helping bridge the skills gap in exascale computing.

for each application.

output. This approach remains a cornerstone of Nvidia, AMD) and European HPC centers enhan-EoCoE's success. Characteria content of the project actively expands this community through dissemination and training.



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