

Track 6: Energy & Sustainability

Sponsors: Fluids Engineering Division

Topic 6-1: Flow Dynamics of Wind Turbines (FMITC)

Organizers:

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Descriptions:

Wind energy has rapidly become one of the fastest-growing renewable energy sources globally, playing a critical role in the transition to a sustainable, low-carbon future. This forum showcases how cutting-edge research is being used to overcome emerging challenges in optimizing wind energy design, operation, and control at both turbine and farm levels. The main areas of focus include, but are not limited to, the following topics.

- (1) Wind turbine aerodynamics and flow control,
- (2) Wind turbine aerodynamic noise reduction,
- (3) Wind turbine wake and wind farm shadow effects,
- (4) Complex interactions between turbines and atmospheric boundary layer flows,
- (5) Effects of extreme weather events on wind turbine and wind farm flows,
- (6) Airflow and sea interactions for offshore wind turbine and wind farm development.
- (7) Advances in field measurement techniques for wind turbine and wind farm flows,
- (8) Advances in wind turbine or wind farm flow visualization techniques,
- (9) Other key issues, such as similarity and scaling for wind tunnel experiments, to study turbine and farm performance with small-scale models.

Topic 6-2: Energy Applications for Micro/Nano-Fluidic Systems (MNFDTTC)

Organizers:

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Jalal Ahamed: m.ahamed@uwindsor.ca

Descriptions:

Micro/nanofluidic devices play platform roles for various energy applications such as fuel cells, enhanced oil recovery, and compressed air storage. This topic invites recent studies on the application of micro/nanofluidic systems to address critical energy-related problems.

Topic 6-3: CFD for Sustainable Innovations and Industry Applications (CFDTC)

Organizers:

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Zhongquan (Charlie) Zheng: zzheng@usu.edu

Ning Zhang: nzhang@mcneese.edu

Descriptions:

Papers and presentations are solicited in CFD applications in engineering and industrial applications. This topic will explore the role of CFD in driving sustainable innovations to achieve technological advancement, carbon neutrality, broader and long-term economic and environmental benefits. It aims to bridge the gap between cutting-edge research and real-world industrial implementation through showcasing practical applications, industry collaborations, and success stories. The CFD tools used for the applications can be in-house codes, open-source codes, and/or commercially available packages. Participation in this event will expand international cooperation, understanding and promotion of efforts and disciplines in all types of industries.

Topic 6-4: Renewable Energy (FASTC)

Organizers:

Aarathi Sekaran: aarathi.sekaran11@gmail.com

Tamy Guimaraes: guimaraes@psu.edu

Ravinder Yerram: ravinder1.yerram@ge.com

Descriptions:

This topic will showcase presentations on advances and working of wind turbines and hydroturbines and also include control, monitoring and diagnosis of associated components.

Topic 6-5: Alternative Fuels (FASTC)

Organizers:

Tamy Guimaraes: guimaraes@psu.edu

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Descriptions:

This topic focuses on the use of novel and alternative fuels and the development of the machinery associated with it, such as hydrogen and supercritical CO₂.

Topic 6-6: Environmental Flows (FASTC, CFDTC)

Organizers:

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Descriptions:

The symposium will focus on both CFD and empirical/experimental studies related to environment flows for a goal of achieving sustainable industries and economic development. The computational areas include hydrodynamic, hydrologic, ecological, climate and integrated modeling. The empirical/ experimental studies include field studies, lab experiments and natural experiments. The symposium targets studies for both air and water, including but not limited to wind storms, storm-surge and flash floods, hydraulics, surface and ground water management, and transport of pollutant, sediments, and nutrients, and their associated environmental impacts on industry, community and economic development. The symposium also welcomes discussion on policies related to environmental flows.