

# edgeFLEX course on advanced power grids operations

28-29.04.2022

**Online (Zoom)**

Registrations: <https://www.eventbrite.com/e/318463471817>

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# edgeFLEX course on advanced power grids operations



Join the edgeFLEX course on advanced power grids operations. The modules will be directed by various energy and power systems experts from edgeFLEX consortium partners, including academia, research institutions and industry backgrounds.

You will have the chance to dig into advanced research concepts for new fast dynamics services for grid management, such as voltage and frequency control in low-inertia power systems, and learn about the application of information and communication technologies to power grids, including 5G communication and edge cloud applications.

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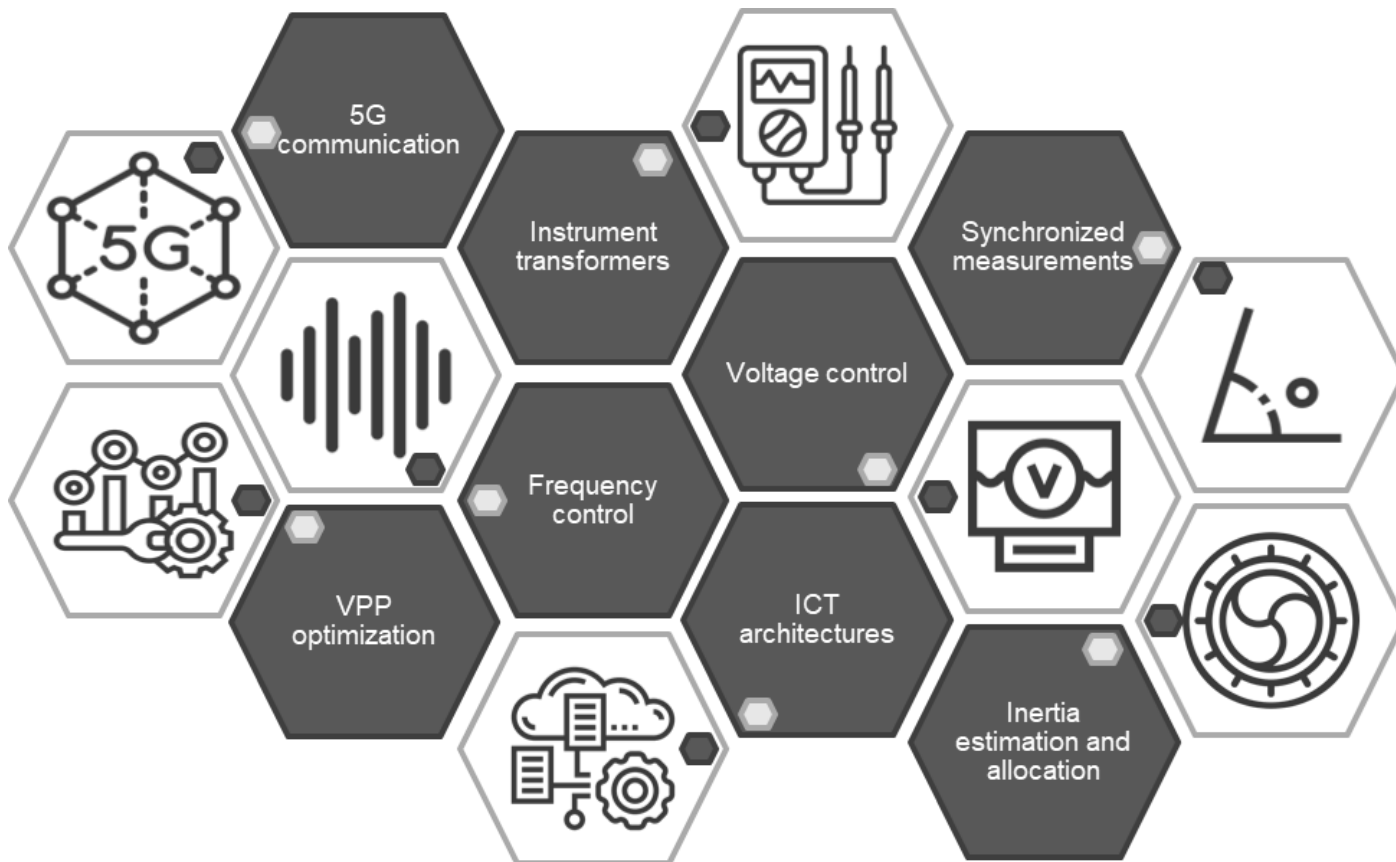
The edgeFLEX project aims to further develop the concept of Virtual Power Plants (VPPs) to manage a wider range of generation and storage assets in a new way, by offering a set of fast and dynamic services for flexible grid operations.

This course will address different aspects related to the future grids, spacing from power systems aspects and related research activities to ICT infrastructures supporting and fostering their adoption and deployment. The course will present the developments and results of the edgeFLEX project with respect to research and innovation concepts developed through the project.

The course is offered to energy systems professionals and students. It will provide a free online course making the edgeFLEX results available to any person who would like to follow the project.

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# Course modules



# Day 1 agenda – 28.04.2022 (09:00-13:00)



Session	Presenter	Start	End
Welcome of participants	Gianluca Lipari (RWTH Aachen University)	09:00	09:10
Introduction to edgeFLEX course	Prof. Antonello Monti (RWTH Aachen University)	09:10	09:30
5G in the energy sector	Fiona Williams and Robert Farac (Ericsson)	09:30	10:20
Coffee break		10:20	10:30
ICT Architectures in the Smart Grid	David Ryan (Walton Institute)	10:30	11:20
Voltage control to mitigate overvoltage events in active distribution network	Edoardo De Din (RWTH Aachen University)	11:20	12:10
Instrument transformers for Smart Grids	Alessandro Mingotti (University of Bologna)	12:10	13:00

# Day 2 agenda – 29.04.2022 (13:00-17:00)



Session	Presenter	Start	End
Welcome of participants	Gianluca Lipari (RWTH Aachen University)	13:00	13:10
Frequency Control of Low Inertia Systems	Prof. Federico Milano (University College Dublin)	13:10	14:00
Inertia Estimation and Allocation of Frequency Support Services in Low-Inertia Power Systems	Diala Nouti (RWTH Aachen University)	14:00	14:50
Coffee Break		14:50	15:00
Optimal balancing of RES with VPPs in a market environment	Vadim Omelčenko (Alpiq)	15:00	15:50
Cloud-based data processing and low cost synchronized data acquisition	Manuel Pitz (RWTH Aachen University)	15:50	16:40
Conclusion of the course	Gianluca Lipari (RWTH Aachen University)	16:40	17:00

# 5G in the energy sector



This module will provide an overview of what 5G is and offers to energy use cases and the typical requirements which 5G has to fulfil to support these use cases.

The typical configurations of 5G networks for energy use cases will be described and several examples of such solutions will be provided.

Finally, the results of tests of performance tests of 5G supporting energy use cases of 5G in the energy sector will be described.

# ICT Architectures in the Smart Grid



The module will be centred on common ICT architectures (Centralised, Decentralised and Hybrid Mobile edge architectures) and the different scenarios in which they can be deployed.

Additionally, it will be explained how modern software architectures, like micro-service ones, can facilitate such deployments.

Then the edgeFLEX architecture, as one that is designed to be flexibly deployed in Centralised, Decentralised and Hybrid Mobile edge architectures, will be presented and how, with the implementation of PBGM, it can even be instantiated across company boundaries in a safe and managed way.



# Voltage control to mitigate overvoltage events in active distribution network



This module will present an overview of voltage control solutions applied to distribution networks with a high number of distributed generators (DG) installed.

Starting with a problem description, the module will classify different control implementations and present simulation results.

In addition, the module will address the integration of voltage control in a cloud environment.

# Instrument Transformers for Smart Grids



Smart Grids are possible only if measurements are performed. It is essential, though, to perform accurate measurements with accurate instrumentation.

Therefore, this module introduces the main technologies adopted for the measurement of current and voltage signals in the nodes and branches of the Power Network.

Pros and cons of the different solutions are described to better understand which instrument is suitable depending on required applications.

# Frequency Control of Low Inertia Systems



The module is organized into two parts.

The first part provides an overview of low inertia systems and the challenges that have to be solved for an efficient frequency control through converter-interfaced generation and energy systems.

The second part describes the novel concepts of complex and geometric frequency and show some applications to distributed energy resources and virtual power plants.

# Inertia Estimation and Allocation of Frequency Support Services in Low-Inertia Power Systems



This module will be focused on the research concepts developed within edgeFLEX on topics related to inertia in future power systems with a high penetration of distributed energy resources.

An overview of inertia estimation and system-level inertia allocation algorithms will be presented.

# Optimal balancing of RES with VPPs in a market environment



This module will present an overview of optimization methods applied to portfolios of assets within a VPP.

The role of price and RES production forecast will be discussed. Such forecasts are key inputs into the optimization.

The module will thus focus on the scalability of the balancing and forecasting methods with respect to the rising number of the assets.

# Cloud-based data processing and low cost synchronized data acquisition



This module will present the hardware and software stack used for the edgePMU design and implementation and will provide insights in modern cloud and container-based data processing as well as infrastructure management.

The advantages and challenges of different types of data samples synchronization with a focus on cloud-based data processing will be discussed.

In addition, a commercial PMU will be compared to the edgePMU.

[www.edgeflex-h2020.eu](http://www.edgeflex-h2020.eu)



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