Tutorial 3:

PMUs for Distribution Grids: a Comprehensive Guide for Distribution System Operators

# Background

Distribution grid monitoring, control and optimization is typically achieved via complex control room solutions such as Advanced Distribution Management System (ADMS). Such systems, in order to properly function, typically require the availability of high-quality grid measurements, which are typically scarce at the distribution level.

To increase the amount and quality of the data managed and processed by ADMS and improve their performance, Distribution Phasor Measurement Unit (D-PMU) seem an extremely viable technology, on one hand for their inherently higher data quality, on the other hand for their capability to server multiple use cases simultaneously.

# Aim of the tutorial

As the D-PMU technology becomes more mature and adopted, this tutorial aims at providing an in- depth analysis of Distribution PMU technology and explaining how it can help Distribution System operators to accelerate the grid digitalization process.

# Contents (preliminary)

The tutorial is structured as follows:

* **D-PMU basics**: Basic concepts about D-PMU technology and main differences from conventional transmission PMUs.
* **PMU Standards**: review of PMU Standard history and focus on currently active PMU Standards
* **D-PMU deployment at the convergence of IT & OT**: analysis of D-PMU enabling technologies, including sensing, communication, time synchronization and cloud computing technologies. Presentation of different system architectures able to address different use cases.
* **D-PMU use cases**: review of distribution PMU use-cases and their integration with existing control room solutions.
* **D-PMU user experience**: return of experience from 2 DSOs who decided to invest in the D- PMU technology.
* **The future of D-PMU technology**: overview of major technology trends which are expected to facilitate the adoption of D-PMUs.

# Expected benefits

Participants will gain an understanding of the D-PMU technology and its application to monitoring, protection and control of moder power distribution systems, with reference to real applications.

# Who should attend

* Distribution System operators or Private grid/microgrid operators
* Companies/industries interested to develop a D-PMU product portfolio
* Regulators
* Academics interested in real applications of PMU technology at the distribution level.

# Support material

A copy of all the presentation material used in the tutorial will be supplied to delegates (electronic version).

# About the presenters

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| **Paolo Romano**: | |
|  | Paolo Romano is the Chief Product Officer at Zaphiro Technologies,  an innovative company in the smart grid domain that develops PMU-based solution for the distribution/transmission industry.  Paolo holds a M.Sc. in Electronic Engineering from the University of Genoa, Italy, received in 2011 and a PhD in Energy from the Swiss Federal Institute of Technology of Lausanne (EPFL), received in 2016. Within Zaphiro Paolo currently drives the company product portfolio growth and manages strategic partnerships with key  players in the energy industry. |

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| **Kenneth Martin**: | |
| A person wearing sunglasses and smiling  Description automatically generated | **Kenneth Martin** is a principal engineer at Electric Power Group.  Working with synchrophasor measurement since 1987, he developed the phasor measurement system at Bonneville Power in 1997-8. He chaired the development of the IEEE C37.118 Synchrophasor standard series from the 2005 original, through the 2014 version. He convened IEC JWG1 that developed the IEC-IEEE 60255-118-1 standard and was a lead for developing the TR 90-5 for IEC 61850. Mr. Martin is a Fellow of the IEEE and a registered PE. |

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| **Lukas Cesky**: | |
|  | Lukas Cesky holds a doctor’s degree in Power Engineering from the  Slovak University of Technology. Since 2016 he has been working for ABB s.r.o. in Czech Republic. Lukas’ power industry experience includes design of LV networks, medium-voltage switchgears, R&D of medium-voltage instrument transformers & sensors. Currently he works as the Global Product Manager responsible for Medium- Voltage Sensors (LPITs). Lukas is an active member of IEC, IEEE working groups, which focus on Medium-Voltage instrument  transformers and sensors. He continues to lecture within industry, including at universities and international conferences. |

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| **Robert Farac**: | |
|  | Robert is focused on enabling power grids to smoothly overcome  the challenges they face by leveraging the capabilities and solutions offered by mission-critical mobile networks. He has nearly 30 years of experience in mobile networks, and for over 10 years, he has worked with hundreds of partners in the utilities sector. His work has been centered on exploring innovative solutions for power grids, supported by mobile networks, most of which are now standardized. In recent years, he has provided global support to Ericsson's market and customer units, assisting them in offering  mission-critical mobile networks to utilities |

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| **Marc Vuarnet**: | |
|  | Marc Vuarnet is an experienced electrical engineer with around 20  years of national and international experience in high-voltage infrastructure, power generation and energy distribution networks. Currently serving as Head of Energy Networks at the Société Electrique Intercommunale de la Côte (SEIC) in Switzerland, he oversees multidisciplinary teams managing electricity distribution and district heating networks, hydropower production, and geographic information systems (GIS). He is also a member of the executive board and the safety officer at company level.  Marc holds a Master’s degree from the École Supérieure de Chimie  Physique Electronique de Lyon and completed advanced studies at  EPFL in Switzerland. |

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| **Giuseppe Cappai**: | |
| A person standing in a grassy field  AI-generated content may be incorrect. | Giuseppe Cappai is an electrical engineer with over 25 years of  experience in high-voltage power systems and equipment in companies like CESI and Weidmann Electrical Technology AG. Since 2017, he has served as Equipment and Maintenance Manager at CERN (European Organization for Nuclear Research), where he is responsible for the strategic management of high-voltage assets and the development of preventive and predictive maintenance frameworks. His current work focuses on the integration of Phasor Measurement Units into monitoring and decision-making processes, with applications ranging from dynamic system diagnostics and grid  power quality to immunity analysis of the particle accelerator complex, within the European Research Facility 2.0 (RF 2.0) project. |

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| **Isabel Amundarain Argüello:** | |
| A person smiling at camera  AI-generated content may be incorrect. | Isabel Amundarain is a multidisciplinary electrical engineer,  specializing in power distribution systems, with expertise in energy systems planning, distributed energy resource (DER) integration, and grid reliability. She currently works as an Electrical Engineer at CERN (European Organization for Nuclear Research), where she contributes to the Research Facility 2.0 (RF 2.0) European project. In collaboration with the Karlsruhe Institute of Technology (KIT), her work focuses on developing design guidelines for the next generation of sustainable particle accelerators, particularly the  electrical networks that will supply future research facilities. Before joining CERN, Isabel worked at Commonwealth Edison (ComEd), the electric utility serving the Chicago metropolitan area. |