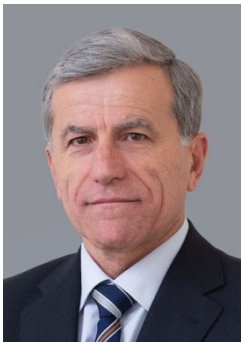
Panel Session at ICREPQ 2020
Granada, Spain

Title: **Recent experiences on the application of AI techniques to distribution systems**

Chair: **Antonio Gomez-Exposito**



Antonio Gomez-Exposito is the "Endesa Chair" Professor at the Department of Electrical Engineering, University of Seville, Spain. He is a Fellow of the IEEE and past editor of several journals, including the IEEE Transactions on Power Systems. Among other recognitions, he received the 2019 IEEE/PES Outstanding Power Engineering Educator Award and the 2011 Research and Technology Transfer Award, granted by the Government of Andalusia.

Panels and speakers

Application of neural networks to determine the customer connectivity based on smart meters

Panelist: **Adolfo Gastalver Rubio**, Ingelectus

Abstract: Along with the massive installation of Smart Meters in the distribution grid, new applications, e.g. state estimation, have been developed in order to improve the operation of the electrical network. Such applications require a faithful knowledge of the network topology, specifically the feeder and phase where the customers are connected to. Classical solutions for this complex combinatorial problem usually fail in such mission. Fortunately, with the development of artificial intelligence techniques, such as machine learning through neural networks, this kind of problems can be solved much more efficiently. This works shows the results of applying, to different currently-operating distribution grids, artificial neural networks which discover the customer connectivity to the network using smart meter measurements.

Adolfo Gastalver-Rubio received the B.E. and M.E. degrees in computer science and engineering, and M.Sc. degree in electrical engineering from the University of Seville, Spain, in 2012, 2013, and 2017, respectively. In 2013, he joined Ingelectus SL, Seville, Spain, as CS engineer and CIO. Since 2018, he is a Ph.D. student in electrical engineering at the University of Seville. His work focuses on renewable energy integration and the application of artificial intelligence in electrical power systems.

Ensemble Forecasting for Distributed Energy Integration

Abstract: Modern power systems, embedding ubiquitous distributed energy resources, such as electric vehicles and storage systems, increasingly need to resort to advanced forecasting techniques, from generation to demand. In this context, the accuracy of the results is generally proportional to the benefits for the involved utilities. This has led the stakeholders to test and compare different prediction techniques in order to identify the most accurate one. An alternative approach, consisting of an ensemble method which dynamically weights all algorithms over time, is presented and discussed. Tests with actual time series related to generation and demand have shown improvements in the mean and the standard deviation of the prediction errors.

Panelist: **Catalina Gómez-Quiles,** University of Seville

Catalina Gómez-Quiles received the electrical engineering degree from the University of Seville, Spain, in 2006, the Msc. Eng. degree in electrical engineering from McGill University, Montreal, QC, Canada, in 2008, and the Ph.D. degree from the University of Seville, in 2012. Her research interests include mathematical and computer models for power system analysis, risk assessment in competitive electricity markets, and forecasting in power systems.

Monitoring of MV/LV transformers by applying data analytics to electrical and thermal sensors information

Panelist: **Jacob Rodriguez Rivero**, Endesa

Abstract: The possibility of correlating information from electrical, image and other kind of sources, such as the dissolved gas concentrations in transformer oil, with several simultaneous measurements, could be useful to distinguish the root cause of failures. This is actually the main goal of the MONICA and PASTORA projects developed by Endesa-Enel and other international companies, which are aimed at accurately determining the actual situation of low and medium-voltage distribution grids in real-time, preventing and accelerating the solution of network failures.

Carlos Gaitán Poyatos received the B.E and M.E in Computer Science and Marketing and Marker Research from the University of Jaen and UOC respectively. He is currently pursuing
Ph.D degree in Computer Engineering at
University of Granada. His research interests include deep generative models, machine learning and process analytics for industry 4.0.
He has been working in the energy sector for more than 15 years, holding a variety of technical roles, including Risk Management and Energy Measurement and

Recovery Operations Europe at ENEL. He is currently working as an Innovation project manager in ENDESA, in charge of the PASTORA project at the Smart City/living Lab Málaga. In addition, he collaborates as a Lecturer in the Big Data and Bussines Intelligence Master at UOC, University of Barcelona.

Detection of non-technical losses through machine learning techniques

Panelist: **Madalina Buzau**, University of Seville

Abstract: Non-technical electricity losses due to anomalies or frauds are accountable for important revenue losses in power utilities. Recent advances have been made in this area, fostered by the roll-out of smart meters. The objective of this work is to explore the capabilities of machine learning algorithms and smart meter data for non-technical losses detection in electricity utilities. The goal of these algorithms is to detect any type of non-technical losses, regardless of their source. This research was focused on two types of customers: industrial/large commercial (contracted power > 50 kW) and residential/small commercial (contracted power < 15 kW).

Madalina Buzau received a B.Eng. degree in power systems from the Politehnica University of Bucharest and a M.Res. degree in electrical engineering and sustainable development from the Lille University of Science and Technology. She is currently pursuing the Ph.D. degree with the Department of Electrical Engineering, University of Seville. Her main research focus is on the usage of smart meter data and machine learning algorithms for non-technical loss detection in the utilities.