Distinguished Lecturer Program WEBINAR SERIES (Part 1/2)

14TH April 2021 | 1:00PM – 2:00PM (GMT+8)

IEEE Power & Energy Society SINGAPORE CHAPTER

Smart Meter-Driven Approaches for Rich-PV Low Voltage Network Modelling, Operations, and Planning

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Part 1/2: Live Webinar on "Smart Meter-Driven Approaches for PV-Rich Low Voltage Network Modeling, Operations, and Planning"

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University of Melbourne, Australia

Date: 14th April 2021, 1 – 2PM (SGT)/ (GMT+8)

Organized by: IEEE Power & Energy Society Singapore Chapter

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Abstract:
Residential solar PV is installed behind the meter of mainly single-phase customers connected to three-phase low voltage (LV) feeders (e.g., 400V line-to-line). This means that for distribution companies to adequately quantify the impacts from reverse power flows due to excess solar PV generation, the corresponding electrical models are required. These models are critical when calculating voltages given the non-linear and unbalance nature of LV feeders. However, the task of producing electrical models of thousands of LV feeders is already a significant challenge for distribution companies around the world, which, in turn, makes the operation and planning of PV-rich LV networks even more challenging. It is in this context that the exploitation of historical smart meter data can not only help distribution companies with their modelling tasks but also provide radical alternatives to how they operate and plan future PV-rich LV networks.

This talk presents and discusses the findings of three advanced smart meter-driven approaches using realistic case studies from Victoria, Australia. The first, enhances LV models. Using simplified three-phase voltage drop equations and multiple linear regression, is able estimate three-phase and single-phase line impedances which, in turn, allows for the quick and accurate calculation of customer voltages for operational purposes. The second, a more radical approach, goes LV model free. It

demonstrates that neural networks can be trained to capture the physics of three-phase LV feeders with dozens of single-phase customers; making it possible to have fast and accurate voltage calculations. The last one, from a planning perspective, also demonstrates that regression techniques and data from early solar PV penetrations can be used to quickly estimate the hosting capacity of LV networks without the need of complex and detailed network studies.

Biography

Luis (Nando) Ochoa is Professor of Smart Grids and Power Systems at The University of Melbourne, Australia and part-time Professor of Smart Grids at The University of Manchester, UK. His expertise in network integration of distributed energy resources (DER) and smart grids as well as his extensive portfolio of industrial and academic projects have led to 180+ research papers, 70+ technical reports, and two patents, one filed by Psymetrix Ltd (now part of GE) and one filed by The University of Melbourne. Prof Ochoa is an IEEE PES Distinguished Lecturer and is also Editorial Board Member of the IEEE Power and Energy Magazine. Prof Ochoa is an IEEE Senior Member since 2012. He holds a bachelor's degree in Mechanical and Electrical Engineering from UNI (Peru), and a Research MSc and a PhD in Electrical Power Engineering, both from UNESP Ilha Solteira (Brazil). More info: https://sites.google.com/view/luisfochoa/

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