Newsletter

29/04/2019

Management of Voltages in LV Networks

The increased penetration of solar photovoltaic (PV) systems in low voltage (LV) networks can create technical challenges such as voltage rise and reverse power flow that have not been experienced previously by distribution network service providers (DNSPs). Due to low visibility of LV networks, most DNSPs acquire necessary information about voltage issues, if any, through customer complaints. However, LV networks exhibit unique characteristics and require specific voltage management strategies, which could be a challenging task.

This project aims to develop a flexible modelling tool for LV networks using the network data readily available with the associated distribution network service providers (DNSPs). With minimal time and efforts, different LV networks can be modelled with the addition of multiple solar PV and energy storage systems at customer connection points. With this, the current and future inrush of renewable and distributed energy resources in different types of LV networks can be correctly modelled and their effects on network parameters such as voltage and losses can be examined.

The flexible modelling tool allows the user to run snapshot based and sequential simulations, enabling time varying loads and generation. In addition, different voltage regulation devices and/or strategies can be applied to the existing networks such as on-load tap changer (OLTC) at the distribution substation, leading/lagging operation of PV inverters, energy storage and LV regulators. The outcomes of different voltage management strategies can be easily studied and compared against each other.

Funded by the Energy Networks Australia (ENA), this 18-month project is led by the University of Wollongong along with the industry partners from different parts of Australia, including Energy Queensland, Jemena, SA Power Networks and United Energy. Almost 9 months into the commencement of the project, the proposed modelling/network building tool is in the advanced stage and still being developed further. Currently, the tool has the following capabilities:

- The tool can model 3-phase 4-wire overhead and underground systems with minimal user input
- Users can select from a range of available/user defined overhead and underground conductor configurations
- The tool allows users to include multiple PV and energy storage systems in a network
- Users have the option to vary the loads, PV power output and the controllable voltage level at the distribution substation from modelling perspective
- As a part of visualisation, users can view the schematic diagram of the network in the background while building a network
- The tool can run either snapshot based or sequential simulations

- The tool provides different voltage regulation strategies by means of OLTC, voltage regulator and inverter control

Project contact details:

Nurul Izzah Mohammad Afandi, nafandi@uow.edu.au, 0242213520