Research project and supervisor team

Supervisory Team	Dr. Nadia Tan ; Dr. Giampaolo Buticchi
Short introduction & description of research project	With the proliferation of renewable energy generator such as rooftop photovoltaics (PV) generators in smart grids, the power conversion systems of the PV generator have to be efficient, safe, give high power yield even in partially shaded conditions, and have the control algorithm to charge and discharge energy storage devices and provide ancillary support to the distribution network among others. A PV module integrated with a microinverter mitigates losses and low yield due to manufacturing tolerances and shading, is modular, and allows for higher flexibility in system design. The two typical functions of the microinverter and its control is to extract the maximum power from the PV module and to convert the dc voltage into suitable ac current to the grid at unity power factor and total harmonics current and voltage less than 5% in low voltage network (IEEE 519). With increase of distributed PV generators, distribution system operators are requiring that PV inverters have the so called “smart” functionality, where it is able to ride-through low voltage (LVRT) and provide ancillary services such as voltage and frequency support (IEEE 1547-2018). In addition, energy storage devices can improve the intermittent PV output power. This project proposes to design and develop an energy storage device integrated PV isolated microinverter. The PV microinverter controller should be controlled to extract maximum power from the PV module for charging the energy storage device and supplying power to the distribution network. The PV microinverter is also to provide real and reactive power in the case of system disturbances. Finally, considerations of the thermal properties in the PV module should be given in optimizing the integration of all components in the module.
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