Faculty of Science & Engineering

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Control of a Microgrid in Islanded Mode

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Abstract

Economic, technological and environmental issues are affecting the electrical power generation and transmission. A microgrid is a new technique that can provide electricity with less impact on the environment and is, at the same time, economically attractive. Basically, the concept of a microgrid is to use small-scale renewable generator sources instead of upgrading the main utility grid. This thesis presents a complete microgrid model and investigates the operational behaviour by using simulation software. The proposed control strategy described in this thesis is based on controlling the generators' output power to match the required power from the loads. This can be achieved by using the active vs. reactive power droop control method, which will make each generator independently controlled. In other words, the generators' output will adjust without requiring any data from other microgrid components. The main advantage of this technique is it increases the security and stability of the system by providing a supply of backup energy for the load in case one of the distributed generators shuts down.

If there is no synchronous machine to balance between supply and demand under microgrid disconnected mode, the inverters must take the responsibly of controlling the voltage and frequency. The voltage source control method that uses the P/Q Droop control technique is used in this thesis. The results proved that the P/Q droop control method is able to provide the loads with the required power and at the same time maintain the voltage and frequency within acceptable limits during island operation mode.

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