

NEW CONCEPT FOR POWER QUALITY MANAGEMENT IN MICROGRID WITH ENERGY STORAGE BASED POWER QUALITY COMPENSATOR

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ABSTRACT

Power quality, stability and energy balance issues of the microgrid are essential for realizing future microgrids. This paper presents a new advanced concept to improve the quality of power within the microgrid and also the quality of currents flowing between the microgrid and the utility grid. The developed concept utilizes power quality compensator (PQC) with energy storage for power quality management in microgrid. PQC consists of a shunt and a series converter. The shunt converter is implemented in PSCAD with an adaptive configuration and control system to obtain the best possible power quality in the microgrid during island operation. First the main points of the developed PQC control principles and power flows in different operation modes are presented. Then the studied PSCAD simulation model and simulation results are shown. The simulation results confirmed that the PQC with energy storage can solve many of the power quality problems: i) The shunt converter of the PQC can compensate the microgrid current harmonics and reactive power, ii) The series converter of the PQC can eliminate the utility grid voltage dips and voltage imbalance and iii) Islanding and island operation is possible due to faults in the utility grid or intentionally using the instantaneous voltage control and power balance management of the PQC shunt converter.