Title: Advanced Voltage Positive Feedback Control for Anti-islanding of a Distribution Generation Inverter

Abstract:

Active anti-islanding schemes inject additional disturbance into DG output and destabilize an islanded system so that the system frequency or voltage can deviate from the detection limits. There have been various active methods proposed [1]-[7]. Positive feedback methods based on dq- control have little NDZ, negligible power quality impact, and minimal implement-ation cost, and are also very robust to grid disturbances [7]. Such advantages are available when the positive feedback gains are optimally designed for certain purposes.

This paper presents analytical methods for design of voltage positive feedback control. Design criteria are presented for meeting anti-islanding requirements of international standards and limiting power fluctuations owing to use of the active method. Gain design is considered for a constant-power controlled inverter (CPCI) and a constant-current controlled inverter (CCCI). Analytical expressions for lower and upper bounds of the VPF gain are derived by small signal and step response analysis, which derives that the conventional VPF control[7] significantly depends on output level of DGs. This means that anti-islanding effect and network disturbance impact varies with power output of an inverter, which makes it complicated to design an optimal gain. In order to remove real power dependence of the conventional scheme, a modified voltage positive feedback control is proposed.

Digital time-domain simulation was carried out in PSCAD/EMTDC, an electromagnetic transient analysis package, to validate the proposed design method. Simulation results show that the proposed analytical design is accurate and reliable.