

PV INVERTERS TO ENHANCE THE UTILIZATION OF AC NETWORKS

**U.M.T.D. Udagedara, M.R.I D. Senevirathne^{*}, A.F.M. Shameel,
P J. Binduhewa and J.B. Ekanayake**

Faculty of Engineering, University of Peradeniya, Sri Lanka
^{}isuruee@gmail.com*

In many LV distribution networks, voltage drops in distribution lines causing many problems for sensitive equipment connected to these lines. The issue of poor voltage profile on distribution lines may be severe with the connection of electric vehicles as users will start charging them after returning home. As a solution to this problem, in this paper a reactive power compensation mode of PV inverters is investigated. Number of PV installations is rapidly growing and grid tie PV inverters operate only during the day time. In this project PV inverters are to be used to inject reactive power to the system at night, thereby enhance the voltage profile of distribution lines.

During the day time, active power generated by PV panels is delivered to the system through the PV inverter. Any excess capacity is used to supply reactive power. At the night since PV panels are inactive, full capacity of the inverter is used to generate reactive power.

The flow of active power through the PV inverter is controlled by applying an appropriate phase shift to the inverter output voltage with reference to the line voltage. In order to control the reactive power flow, the magnitude of the inverter output voltage is varied with respect to the magnitude of the distribution line voltage. If inverter output voltage magnitude is maintained above that of the distribution line, inverter can be operated as a reactive power generator. And also it can be operated as a reactive power consumer if necessary.

A controller for the PV inverter which regulates the active and reactive power was developed. Inverter output current was measured and depending on the measured current, two orthogonal time invariant dc components as direct component and quadrature component were derived. These components were controlled to follow the given current references such that active and reactive power flow can be regulated independently. The operation of the concept was proved by simulations. Accordingly, PV inverters can be used to maintain a proper voltage profile along distribution lines by supplying reactive power on demand. It will also enhance the utilization of distribution network and the productivity of PV inverters.