Electric Power and Power Electronics Institute

WEEKLY SEMINAR SERIES – SPRING 2015
Monday, Mar. 9th, 2015, 3:00 – 3:50 p.m., ETB 1037
(Special Time, Location Changed)

SINGLE-PHASE QUASI-Z SOURCE INVERTER MODULE FOR CASCADE MULTILEVEL INVERTER

Baoming Ge, Ph.D.
TEES Research Engineering, Dept. ECE, Texas A&M University

Abstract

The single-phase quasi-Z source (qZS) inverter module topology is attracting attentions for the cascade multilevel inverter based grid-tie photovoltaic applications. However, due to the inherent double line-frequency power flow in a single phase system, a large qZS network is required to mitigate its negative effect. Minimization of this qZS network remains an open research topic. This talk will present two solutions to deal with the double line-frequency power:

1) A design method is proposed to minimize the qZS capacitance and inductance. A double line-frequency power flow model is derived and ripple power is analyzed for the minimization solution of the qZS network. A current ripple damping control is proposed to ensure suppression of the double line-frequency power flow in the inductor.
2) An active filter integrated single-phase qZS inverter topology is proposed to transfer the double line-frequency power ripple directly from the ac load to the ac capacitor of active filter. Thus low-frequency power ripple will not be present at the dc side, and constant inductor current and constant capacitor voltage are ensured. The qZS impedance is small because only high frequency switching ripple is present and the active filter supports ac voltage (large ripple) enabling small values of capacitance - both of these characteristics result in low size and low weight.

This talk investigates their analysis, modeling, parameter designs, and control methods. Comparative evaluation and experimental results verify the proposed two solutions.

Biography

Dr. Baoming Ge is Research Engineer in TEES Research Engineering, Dept. ECE, Texas A&M University, College Station, TX. He received the Ph.D degree in Electrical Engineering, Zhejiang University. His main research interests are the renewable energy generation, electrical machine drives, and power electronics.