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Summary:

Low voltage distribution grids are currently undergoing substantial challenges in terms of power quality and efficiency. This work proposes a coordination scheme for grid-tied photovoltaic inverters, equipped with advanced functionalities, to simultaneously provide reactive power, current imbalance, and harmonic compensation at building level. The intensity of provision for each ancillary service is adaptively regulated according to the loading characteristics of the building. The load current is analyzed by the grid-tied inverter to extract three sharing coefficients, which are used by the flexible ancillary services provision scheme. The proposed scheme decides the level of compensation for each ancillary service and ensures that the inverter ratings are not violated. Simulation and experimental tests are carried out to validate the operation of the proposed control strategy. The results indicate significant improvements in the operation of distribution grids in terms of power quality, energy losses, and utilization of available grid capacity when the proposed strategy is utilised.

