Photovoltaic Power Based Power Quality Improvement System

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Abstract. The role of multipurpose Distributed Sparse (DS) in controlling the single-staged Solar PV Energy Generation System (SPEGS) will be explored in this research work. Solar or Photovoltaic (PV) fed systems possesses intermittent behavior. These SPEGS are linked onto a three-phase grid system as balancing equipment to the non-linear load which is further connected to a common point of connections. The SPEG is a multitasking machine. Generated power from solar system can be fed to 3 phase grid with the help of SPEGS. Moreover, Harmonics can be maintained at reduced level by providing balanced currents. Solar or PV modules, Voltage Source Converter (VSC), and a dc-link capacitance are used in SPEG system, and can be operated in grid connected or stand alone mode. Moreover, the loads can be of different types. When solar light is not available due to clouds or at nighttime, the SPEG system can be operated as a distributor static compensator. The classic perturbs and observe (P&O) approach is used here to extract maximum power from the solar system. The proposed research work also explores the tracking performance as well as the efficiency of P&O in rapidly changing environmental conditions. The DS control method can estimate the basic/fundamental components in order to find the reference current for the SPEG system. P&O scheme's behavior during the operation of SPEG system will also be studied. The DS control method can estimate the basic component needed to calculate reference grid currents. A prototype will be developed to validate the proposed work /approach experimentally. Feasibility of application of IoT (Internet of Things) and Data Science Techniques will also be explored as a future scope of the proposed work.

Keyword: distributed sparse (DS) approach, maximum power point tracking, power quality (PQ), solar photovoltaic (PV), power generation, voltage source converter (VSC).