Simultaneous Placement of D-STATCOM and PV Power Plants by Goal of Distribution Network Loss Minimization Using Gravitational Search Algorithm

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Abstract In recent years, restructuring process in power system causes distribution networks to play an important role in power system planning. For above challenging situation, of the important subjects in optimal planning and operation planning of electrical distribution system are loss reduction, voltage and current profile improvement. Nowadays, photovoltaic resources, because of high importance in energy generation process, are vastly applied in the electrical distribution systems. Photo voltaic resourcess are one of the most applicable types of DGs that are installed in the medium and low voltage systems. By development in modern control techniques and power electronic devices technology, use of D-FACTS devices would be inevitable to improve the power quality of distribution network operation. Here, it is assumed that optimal locations and sizes of D-STATCOMs and maximum power generation of photovoltaic resources should be simultaneously determined in radial distribution network. Four load levels with corresponding duration are considered for demands along to the radial distribution feeders which are constant power type. Objective function is defined in term of active power losses in presence of D-STATCOMs and PVs simultaneously in different network load levels. Optimization problem consist of equalities and inequalities constraints such as under/over current and voltage limits, minimum and maximum active and reactive power generation of PVs, the locations and size of D-STATCOMs. Forward-backward power flow is applied for network study and for this goal Photovoltaic resources has been modeled as PQ bus and voltage magnitude for D-STATCOM buses has been fixed on 1p.u. To validate performance and effectiveness of proposed Gravitional Search Algorithm (GSA),

simulation studies are applied on the 13-bus and 30-bus IEEE radial distribution test feeders.

Keywords : (GSA), simulation studies are applied on the 13-bus and 30-bus IEEE radial distribution test feeders.