World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:11, No:01, 2017

Determination of the Optimal DG PV Interconnection Location Using Losses and Voltage Regulation as Assessment Indicators Case Study: ECG 33 kV Sub-Transmission Network

Authors : Ekow A. Kwofie, Emmanuel K. Anto, Godfred Mensah

Abstract : In this paper, CYME Distribution software has been used to assess the impacts of solar Photovoltaic (PV) distributed generation (DG) plant on the Electricity Company of Ghana (ECG) 33 kV sub-transmission network at different PV penetration levels. As ECG begins to encourage DG PV interconnections within its network, there has been the need to assess the impacts on the sub-transmission losses and voltage contribution. In Tema, a city in Accra - Ghana, ECG has a 33 kV sub-transmission network made up of 20 No. 33 kV buses that was modeled. Three different locations were chosen: The source bus, a bus along the sub-transmission radial network and a bus at the tail end to determine the optimal location for DG PV interconnection. The optimal location was determined based on sub-transmission technical losses and voltage impact. PV capacities at different penetration levels were modeled at each location and simulations performed to determine the optimal PV penetration level. Interconnection at a bus along (or in the middle of) the sub-transmission network offered the highest benefits at an optimal PV penetration level of 80%. At that location, the maximum voltage improvement of 0.789% on the neighboring 33 kV buses and maximum loss reduction of 6.033% over the base case scenario were recorded. Hence, the optimal location for DG PV integration within the 33 kV sub-transmission utility network is at a bus along the sub-transmission radial network.

Keywords : distributed generation photovoltaic (DG PV), optimal location, penetration level, sub–transmission network
Conference Title : ICPGDS 2017 : International Conference on Power Generation and Distribution Systems
Conference Location : Zurich, Switzerland
Conference Dates : January 13-14, 2017