

INTEGRATION OF RENEWABLE ENERGY TO THE DISTRIBUTION NETWORK



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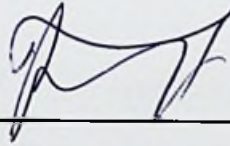
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ABSTRACT

The advanced era needs continuous supply of electricity. Since the depletion of fossil fuels could not fulfill the increased demands, hence Integration of Renewable Energy sources with the Distribution Network can provide sustainable and continuous supply of electricity. Depending on the scale there are various issues in integration that is needed to be resolved. Both technical and non-technical aspects of integration are serious concerns that leads to voltage instability in distribution network, fluctuation in the frequency of the system, protection of the system from faults.

In Sindh region of Pakistan, currently RE is integrated to only two areas that is Gharo and Jhimpir. Although there is potential of DG penetration to Sindh region yet no such power plant is established. Many researches are done in this area but most of them are analyzing economical and regional benefits. This thesis comprises of selecting optimal DG placement and its size required for penetration at that selected region represented as buses. Load flow at the buses analyzed the voltage instability and its mitigation with and without hourly loading conditions also with respect to the variation in season for optimal improvement in certain challenges.

Sensitivity analysis is done to calculate the voltage deviation at different loading factors to find out the appropriate place for interconnecting DG to the network. Size of the DG is also a main factor to maximize the system voltage. DG's are placed at selected location of different size and their voltage improvement is analyzed. The size of the DG that gave maximum output voltage are chosen for integration.

The network condition is analyzed with and without load by simulating it in Power factory tool. Open circuit network is simulated in the first step to analyze the losses of the present network. Some of the buses that are away from the grid showed power losses. From observation it was analyzed that voltages are improved after integrating DG units but some buses are also showing over voltage condition violating 70 % voltage limit considering it not suitable for connection point.

The proposed method is validated by implementing it on CIGRE Task force and IEEE-33 bus system. Both network validates the method by selecting suitable site and size decreasing the network losses and improving bus voltages.

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