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Effect of Wind Generation System Rating on Transient Dynamic Performance of the Micro-Grid during Islanding Mode

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ABSTRACT

Recently, several types of distributed generations (DGs) are connected together and form a small power system called Micro Grid (MG). This paper developed a complete model which can simulate in details the transient dynamic performance of the MG during and subsequent to islanding process. All MG's components are modeled in detail. The developed model is used to investigate how the transient dynamic performance of the MG will be affected by increasing the rating of wind generation system installed in the MG. Two cases are studied; the first case investigates the dynamic performance of the MG equipped with 10 kW fixed speed wind generation system. The second studied case indicates how the dynamic performance of the MG will be affected if the wind generation system rating increases to 30 kW. The results showed that increasing of wind generation rating on the MG causes more voltage drops and more frequency fluctuations due to the fluctuation of wind speed. Increasing voltage drops because wind turbine generator is a squirrel cage induction generator and absorbs more reactive power when the generated active power increases. The frequency fluctuations due to power fluctuations of wind turbine as results of wind speed variations. The results proved that when the MG equipped with large wind generation system, high amount of reactive power must be injected in the system to keep its stability. The developed model was built in Matlab® Simulink® environment.

KEYWORDS

MG, Distributed Generators, Wind Power Rating and Dynamic Performance

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