Efficiency of post-processing in PMU based state estimation of renewable energy microgrids

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ABSTRACT
Power System State Estimation (SE) is a process for determining the state of all the buses in a power system (voltage magnitude and angle) based on measurements taken at a selection of a few buses. Traditionally, the only information that measurement devices could provide was the magnitude of the measured signal. On the other hand, the Phasor Measurement Unit (PMU) can measure the current phasors of the directly linked lines as well as the voltage phasors (both angle and magnitude) of the bus at which it is located. However, achieving observability of the system using only PMU devices is very expensive. In order to determine the condition of a power system, phasor measurements are employed in addition to conventional measurements. In this paper, the use of PMU measurements to estimate the state of a renewable energy microgrid (REM) has been explained and the proposed method has been verified on IEEE 21 bus microgrid. The method makes use of PMU voltage and current data after post-processing, as well as a separate linear state estimator model that makes use of the state estimate from Weighted Least Square (WLS). Using the WLS state estimation approach from conventional data, the model first estimates the state in polar coordinates. This state is then combined with PMU measurements in rectangular coordinates, to predict the system's final state.

KEYWORDS
Phasor measurement Unit; Post-processing method; State estimation; Weighted least square

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