

Vissavakorn Khunikakorn 2014: Optimal Phasor Measurement Unit (PMU) Placement for 115 kV Power Systems. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Associate Professor Vichai Surapatana, M.Eng. 120 pages.

This thesis presents an optimal placement method of Phasor Measurement Unit (PMU) in the 115-kV grid of the Provincial Electricity Authority (PEA) using the Improved Greedy Method (IGM) in order to achieve a minimum number of PMUs for complete observability of all bus voltages. The proposed method presents the criteria of bus selection for PMU placement, regarding a number of branches connected to the bus as well as the length of those branches. Consequently, the mismatches of the observed voltages resulted from the proposed method are compared with those resulted from the Depth First Search (DFS) using the PSAT and the original Greedy method (GDY) to illustrate the effectiveness of the placement methods.

For the DFS and GDY methods, the bus with the highest number of connected branches is selected as the first bus. However, if there is more than one, the first bus will be randomly selected from those qualified. On the other hand, the PMU bus selected by the IGM is to have the highest number of connected branches as well as the minimum of total distance or total impedance of all observable buses. The findings resulted from the IGM are the optimal PMU placement with the total distance of the connected branches less than the other methods, especially for, large-scale networks. According to the comparison results among the DFS, GDY and IGM, the mean absolute error (Mean Absolute Error: MAE) of the angle and the magnitude voltage of all buses resulted from the IGM is the lowest for a wide range of load conditions, while the MAE resulted from the DFS is the highest.

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