

This paper considers multiple robust estimators with different robustness properties to improve the overall cyber-security of power state estimation. The approach could reduce the investment in expensive secure sensors. Specifically, we propose to run several robust least trimmed squares estimators with different breakdown points in parallel to improve the detection of cyber-attacks targeting the state estimation of the grid. Attacks on both the measurement vector and the measurement function are considered. The proposed method is compared with the usual detection methods such as the largest normalized residual analysis and the parameter error detection based on the Lagrangian analysis. Benefits of considering multiple scans in the state estimation are studied as well. Simulations on IEEE test beds illustrate the practical effectiveness of the proposed method.