Distribution Line Parameter Estimation Under Consideration of Measurement Tolerances

State estimation and control approaches in electric distribution grids rely on precise electric models that may be inaccurate. This work presents a novel method of estimating distribution line parameters using only root mean square voltage and power measurements under consideration of measurement tolerances, noise, and asynchronous timestamps. A measurement tolerance compensation model and an alternative representation of the power flow equations without voltage phase angles are introduced. The line parameters are obtained using numeric methods. The simulation demonstrates in case of the series conductance that the absolute compensated error is −1.05% and −1.07% for both representations, as opposed to the expected uncompensated error of −79.68%. Identification of a laboratory distribution line using real measurement data grid yields a deviation of 6.75% and 4.00%, respectively, from a calculation based on the manufacturer's cable specifications and estimated line length. The transformed power flow equations deliver similar results despite the reduced problem complexity.

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