

Disaggregating Distributed PV Power from Aggregate Measurements in Transmission Systems

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The growing integration of Photovoltaic (PV) systems into distribution networks has limited visibility for system operators, as the power output of low-power PV systems is not typically monitored. The study presented in this paper introduces a novel approach for disaggregating PV generation from net-load measurements recorded at the transmission system level. The proposed technique is applied to actual data from an existing transmission line feeder to identify PV generation from net demand measurements. The developed methodology incorporates Geographical Information Systems (GIS) for detecting PV panels based on an algorithm that provides an accurate estimate of solar PV capacity. These estimations are validated against actual data from a local utility, showing a close match between the two. This information is then utilized in reliable software tools to simulate PV power generation in the studied region, which is then used to estimate and disaggregate the generated power from net-load data by applying multiple Machine Learning and Deep Learning models. The results demonstrate that, with the proposed approach, it is feasible to adequately disaggregate PV power generation from transmission feeder net-load measurements with minimal or no additional sensor infrastructure.