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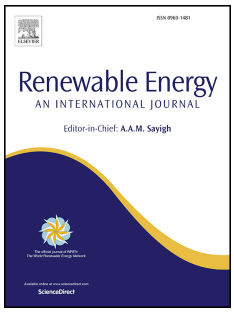

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Solar irradiation from the energy production of residential PV systems

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Abstract

Considering the dense network of residential photovoltaic (PV) systems implemented in Belgium, the paper evaluates the opportunity of deriving global horizontal solar irradiation data from the electrical energy production registered at PV systems. The study is based on one year (i.e. 2014) of hourly PV power output collected at a representative sample of roughly 1500 residential PV installations. Validation is based on ground-based measurements of solar radiation performed within the network of radiometric stations operated by the Royal Meteorological Institute of Belgium and the method's performance is compared to the satellite-based retrieval approach.

Our results indicate that the accuracy of the derived solar irradiation data depends on a number of factors including the efficiency of the PV system, the weather conditions, the density of PV systems that can be used for the tilt to horizontal conversion, other data sources that can be accessed to complement the PV data. In particular, the computed solar irradiation data degrade as the information about the orientation and tilt angles of the PV generator becomes more inaccurate. It is also found that there are certain sun positions (i.e. low solar elevations) for which the method fails to produce a valid estimation.

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