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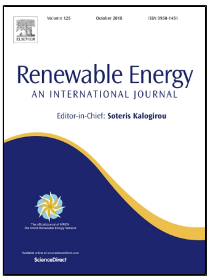

Pre-feasibility of wind and solar systems for residential self-sufficiency in four urban locations of Colombia: implication of new incentives included in Law 1715

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Pre-feasibility of wind and solar systems for residential self-sufficiency in four urban locations of Colombia: implication of new incentives included in Law 1715

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Abstract

This paper analyses the implications of incentives included in Law 1715 for the pre-feasibility of a small-scale wind system and a solar photovoltaic (PV) system for energy self-sufficiency of an average household in four urban locations of Colombia. A meteorological station was implemented at the Universidad Antonio Nariño to obtain measurements including global solar radiation, wind speed and wind direction. For the wind system, a 3.5 kW small-scale wind turbine was considered, while for the solar PV system design, an average household consumption of 200 kilowatt-hours per month and adverse effects from the PV cell temperature were taken into account.

The results show that the wind system fails to obtain a desirable financial result from investment at any location under study, even when considering new legal incentives. However, the solar PV system can be amortized in all locations within its lifetime. By applying the incentives of Law 1715 (Value Added Tax and customs tax exclusions), it was possible to obtain a payback period for the proposed system between 11.3 and 13.8 years depending on the socioeconomic strata where implemented. Implementation of the legal incentives represents approximately four years of additional economic utility for the investor.

Keywords: self-sufficiency; wind power; solar potential; renewable system profitability; residential; urban