

Siddiqui, M. Usama, Arif, A.F.M., Bilton, A., Dubowsky, S., and El-Shafei, M., An Improved Electric Circuit Model for Photovoltaic modules based on Sensitivity Analysis, Solar Energy, 90 , pp. 29-42, 2013.

Abstract

Fast and accurate electrical models of PV systems are crucial for their design. Electrical models of PV devices range from very simple scaling equations to complex models requiring large amount of experimental data. The purpose of the present work is two-fold. First, an optimization methodology to estimate the model parameters for the five parameter single-diode equivalent electrical circuit model of PV devices using only manufacturer supplied data is presented and compared to three electrical models from literature for six different PV modules. Second, a sensitivity analysis is carried out to identify the relative importance of the five model parameters. Using the results of sensitivity analysis, the electrical model is improved by including two additional parameters. The suggested model modification results in marked improvement in the prediction accuracy for all six modules considered.

Keywords: PV module; Five parameter model; Sensitivity analysis; Parameter estimation; Equivalent circuit