

Distributed Generation Systems Modeling and Simulation Visual Library (DGS)

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Abstract

The increased utilization of Distributed Generation Sources (DGS) have imposed serious challenges to electric utilities. The integration of DGS with power electronics-based devices has traditionally posed greater risk to stability and reliability of the power grid. Advancements in system modeling and simulation can help maintain the integrity of power systems with significant DGS penetration. In this paper, a computer package library for multi-purposes alternative sources has been developed and presented as an effective technique for designing and modeling DGS systems. The proposed computer package library can be implemented with the aid of Graphical User Interface (GUI), MATLAB/Simulink, and Artificial Neural Network (ANN) model. The library is user friendly and can be implemented by switching between different blocks according to the user needs. The main blocks of the package are: Photovoltaic (PV) Solar Panel Characteristics Model, Optimum PV Model Block, Solar Installation Panels Design, DC-DC Converter with Maximum Power Point Tracking (MPPT) for resistive loads, Horizontal Wind Turbine Design & Simulation, Georgia ANN Prediction Solar Power Unit, and Georgia ANN Prediction Wind Energy Power Unit. A desirable feature of this package is the ability to be used for both research and education purposes. It has also the ability to provide users with the options to implement different configurations by simply selecting the desired blocks on the computer screen. Furthermore, the proposed package can provide easy interface to help analyze different parameters such as power, energy, cost, installation, performance prediction, design, selection, placing and various characteristics. Finally, a typical DGS system model was provided for each block including calculation and validation figures to demonstrate the library's reliability and ability to model any proposed system.

Biographies

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