

Solar Energy South Africa

Matlab simulation of photovoltaic energy storage system



Overview

What is a MATLAB/Simulink energy flow model?

The model is designed for the analysis of a whole year energy flow by using a time series of loads, weather and heat profile as input. This paper provides the main set of equations to derive the component properties and describes the implementation into MATLAB/Simulink. The novel model was created for an energy flow simulation over one year.

How does a solar PV system work?

The model consists of an electrolyser, which produces hydrogen in case of PV overproduction (overproduction = present PV generation—autoconsumption), and the hydrogen is subsequently stored in a hydrogen tank via a compressor. If the energy demand exceeds the energy provided by the PV system, a fuel cell is used for reconversion of hydrogen.

How do you evaluate a grid-forming battery energy storage system?

Evaluate the performance of a grid-forming (GFM) battery energy storage system (BESS) in maintaining a stable power system with high solar photovoltaic (PV) penetration. You can evaluate the power system during both normal operation or contingencies, like large drops in PV power, significant load changes, grid outages, and faults.

Can a hybrid energy system model be used in Simulink?

Conclusions The scope of this study was to present a verified hybrid energy system model created in Simulink which can be used to prospectively size future similar energy systems where hydrogen in combination with a Li-ion battery shall be used as the energy storage type.

Why is a fuel cell used in a solar PV system?

If the energy demand exceeds the energy provided by the PV system, a fuel cell is used for reconversion of hydrogen. To guarantee fast reactions to rapid

load changes and to avoid comparatively high energy losses that arise when only using hydrogen as a storage medium, the system has to be extended by a short-term lithium-ion battery.

How does Simulink compare fuel cell energy and PV energy?

Only the produced PV energy and fuel cell energy differ due to the fact that in Simulink real data instead of averaged data were used. Figure 15. Comparison of the energy produced and consumed by Simulink and HE (in kWh/a). Figure 16 shows the energy flows over one year recorded by simulation.

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Modeling, Control, and Simulation of Battery Storage Photovoltaic...

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Design and Simulation of a PV System with Battery Storage Using

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