

Why do we need an equivalent model for PV power plant?

The establishment of the equivalent model simplifies the detailed model, which is convenient for the planning and simulation analysis of the PV power plant, and can also accurately characterize the operating characteristics of the PV power plant, which is of great significance.

1. Introduction

What is the equivalent model of a PV unit?

The considered equivalent model of the PV unit is composed of a four-parameter static model and a dynamic part. In the paper by Ge et al. (2014), the sensitivity of the parameters are calculated under irradiance disturbances, reactive power reference disturbances and grid voltage disturbances.

Can a single-machine equivalent model be used in a PV power plant?

Using the single-machine equivalent model obtained by parameter identification to replace the detailed model of the large-scale PV power plant has higher accuracy and meets the real situation; however, this method cannot take into account the type of inverter or the internal structure of the PV power plant.

How to validate the equivalent model of a PV plant?

Model validation Through the clustering of PV units, aggregating of a cluster of PV units and allocating of the collector network, the equivalent model of a PV plant can be established. The final step is to validate the equivalent model by the dynamic response consistency between the PV plant and its equivalent models.

What are the equivalent models of large-scale PV power plants?

The equivalent models of large-scale PV power plants include steady-state equivalent models and transient equivalent models [13]. Steady-state equivalent models are used for power flow calculations and static stability analysis, and can be further extended to the planning, scheduling, and evaluation of PV systems.

What is a generic PV inverter model?

The term generic is used to describe a model that is not specific to any manufacturer, which means that a dynamic model should be able to represent PV inverters from different manufacturers and not be specific to only one manufacturer.

The feeder equivalent and parameter equivalent are used to establish the simple equivalent model. Following the above researches, we propose a hybrid equivalent model combining the data-driven correction model with physical ...

A photovoltaic emulator (PVE) has been proposed based on a physical equivalent photovoltaic cell model. It has fast dynamic performance that is compatible with a real PV system.

By and large, PV generation belongs to the big family of inverter-based generation technologies. There have

been reported contingencies in the operation of real power systems with a high penetration of inverter based renewable energies including both wind power and solar power, such as the 2016 South Australia blackout (AEMO, 2017, Yan et al., 2018), ...

goal is to obtain an EIBR model that can represent different IBRs (like photovoltaic, wind power and storage resources), being easily adapted to emulate IBR control schemes, such as fault ...

Reference studied the equivalent method of photovoltaic arrays, transformers, and collector lines for the equivalent model of a large-scale photovoltaic (PV) power plant. They validated the proposed method using a ...

The deduction of the output dynamic characteristics of the photovoltaic inverter provides a basis for the subsequent research to model the comprehensive load of photovoltaic access to the ...

The PV array model allows predicting with high precision the I-V and P-V curves of the PV panels/arrays. Moreover, the control scheme is presented with capabilities of simultaneously and independently regulating ...

The Norton equivalent model of the PV inverter was established in, where the resonance phenomenon of large-scale PV power plant was analyzed, and the parameters of the inverter were equivalently aggregated. As above-mentioned, idealized capacity equal weighted situations can be equivalent to the single-machine model only on the basis of equivalent ...

In this paper, a discrete-time equivalent model of PV (PDEM) is established based on the third-order dynamic differential equation of the PV power generation system and the parameters of the PDEM are identified using the least squares (LS) and the bat algorithm (BA). ... a single capacity of 500 kW PV grid-connected inverter and LC filter are ...

Currently, solar energy is one of the leading renewable energy sources that help support energy transition into decarbonized energy systems for a safer future. This work provides a comprehensive review of mathematical modeling used to simulate the performance of photovoltaic (PV) modules. The meteorological parameters that influence the performance of ...

Illustration of a PV inverter equivalent circuit representing a three -phase current source connected to the grid and the corresponding terminal voltage phasor, V_{pv} , and the output ...

In order to facilitate the study of the impact that large-scale photovoltaic power plants have on the power system while avoiding the need to establish a detailed model for each inverter, it is ...

and plant controller modules to represent positive sequence solar PV plant model for grid interconnection studies. This work performs the validation of these PV plant models against the field measured data. Sheer purpose of this validation effort is to authenticate model accuracy and their capability ... Equivalent impedance

for a group of ...

The estimation of the photovoltaic (PV) inverter model parameters could lay the foundation for analyzing the grid-connected operation of PV generation system. ... the dynamic discrete equivalent ...

The fault current calculation model of photovoltaic (PV) power stations is usually treated as a capacity weighted equivalent model of a single PV generation unit (PVGU). However, in the same PV power station, different PVGUs have various fault current characteristics. As a result, there are significant differences in fault current characteristics ...

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