New features and latest developments in PVsyst

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Overview

- String mismatch tool
- SolarEdge optimizers
- Multiple orientations management
- Thin object shadings
- IAM definitions, Module surface
- Pumping Systems
- Unlimited Trackers / Bifacial Tracking
- Lithium Ion batteries
New String Mismatch Tool

Mismatch losses in PVsyst

Mismatch causes:
- Shading
- Module variations (incl. ageing)
- Temperature gradients
- Non-uniform Wire length

Detailed hourly calculation
Fixed mismatch factor (has to be estimated)

The new tool allows to estimate the mismatch losses in between strings (voltage)

Module variations impact mainly on current (mismatch within one string)
Temperature and wiring variations impact mainly on voltage (mismatch in between strings)

Question: What are the possible benefits of string inverters compared to central inverters?

General comparison of voltage mismatch and current mismatch

IV/PV curve analysis

Voltage mismatch losses are generally much smaller than current mismatch losses

Loss as function of $\Delta V$
Loss as function of wire length
New String Mismatch Tool

Compare different wiring layouts

IV curve analysis

Wire length statistics

Array configuration

Loss analysis

Central Inverter

String Inverters
SolarEdge optimizers

More flexible configuration of SolarEdge architecture

Example:
Configuration with 4 inverters, 5 orientations, 3 string lengths
Multiple Orientations Management

PV modules with many different orientations may be grouped into 1-8 average orientations

Example 1:
Irregular topology with all tables averaged in one orientation group

Distribution of all table orientations
Multiple Orientations Management

Example 2:
Non-flat roof that was automatically grouped

Orientations were automatically grouped into 4 average orientations (manual adjustments are still possible)

Orientation #1

Cross-check with system definition
Thin object shading

Thin objects do not cast sharp shades.

If width of shadow > cell width, the electrical shading effect will be reduced.

The new tool allows to estimate the Fraction of Electrical Effect.

The fraction of the electrical effect needs to be specified.

This value expresses the loss of current in a shaded PV cell.

Evaluation of the shading electrical factor for thin objects.
IAM definitions, Module surface

IAM: Incidence Angle Modifier
Describes the angular reflection properties of the PV module surface
In the past, the PVsyst default was to use the ASHRAE model (empirical)

New: IAM default function is given according to PV module front surface

The surface material defines the IAM function

The IAM function is now modeled according to Fresnel refraction laws.

User-defined profiles are still possible
Pumping Systems

New dialogue for pumping systems
In line with dialogues of grid-tied and standalone systems

The simulation of pumping systems was reviewed and adapted also to larger systems (few 100 kW)
Unlimited Trackers / Bifacial Tracking

2-dimensional approach for long rows

PVsyst ‘Unlimited Sheds’ model for long rows with fixed tilt

Bifacial model for fixed tilt sheds available (since V6.6.0)

Unlimited trackers: first step towards horizontal bifacial tracking model (since V6.6.7)

Bifacial tracking for horizontal axis close to publishing

2-dimensional model neglects border effects of the rows
Lithium Ion batteries

Model for Li-Ion Batteries

Composition Hierarchy

<table>
<thead>
<tr>
<th>Main Category</th>
<th>Cells</th>
<th>Modules</th>
<th>Cabinets&amp;Racks</th>
<th>Containers</th>
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<tr>
<td>Category</td>
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<td>Pouch cell</td>
<td>Battery module</td>
<td>Rack mount module</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Rack</td>
</tr>
</tbody>
</table>

Allows to build easily large battery packs out of smaller components

In a next step it will be possible to combine battery storage with grid-tied systems
Summary and Outlook

- New features in current PVsyst Version
  - String mismatch tool
  - More possibilities for SolarEdge optimizers
  - Improved multiple orientations management
  - Tool to study thin object shadings
  - IAM definitions, Module surface
  - Larger Pumping Systems became possible
  - Simplified calculation for single horizontal axis trackers

- New features in upcoming versions
  - Bifacial Tracking for horizontal axis
  - Lithium Ion batteries
  - Grid-tied PV systems with battery storage