



Updates and improvements in the latest PVsyst versions

**PVPMC Workshop
9,10 May 2023
Salt Lake City, USA**

B. Wittmer on behalf of the PVsyst development team
PVsyst SA, Switzerland

PVSYST SA - Route de la Maison-Carrée 30 - 1242 Satigny - Suisse
www.pvsyst.com

Overview

Last PVPMC in August 2022 -> PVsyst 7.2.18

Today ->  PVsyst v 7.3.4

Major version 7.3 introduced:

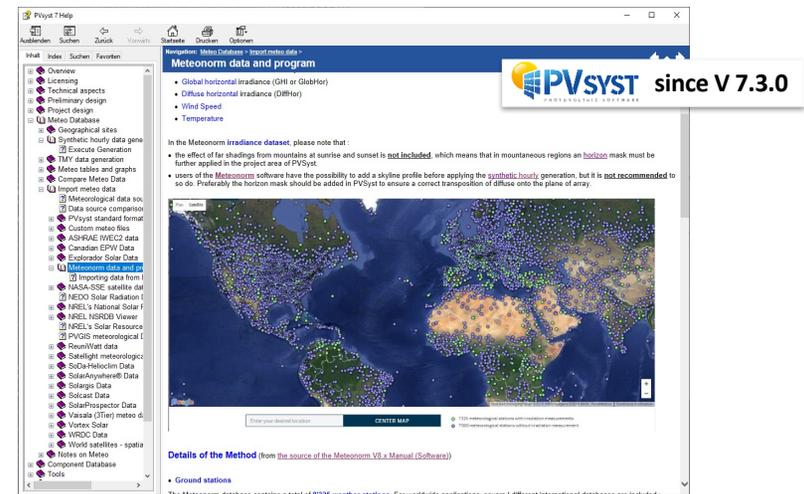
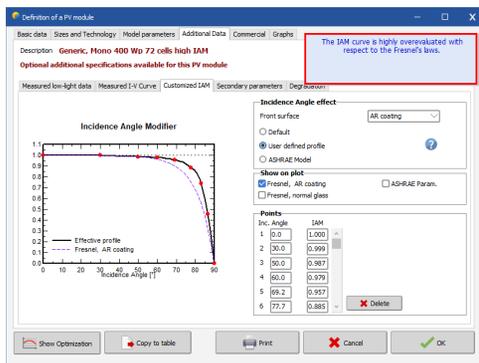
- . Upgrade to Meteonorm 8.1 libraries
- . Single line diagram

- Database updates
- Shadings in large systems
- Electrical shading calculations
- Single line diagram
- Grid limitation (curtailment)
- Sub-hourly clipping losses
- Other developments
 - More details and customization in results and report
 - More flexibility with orientations
 - Generalized bifacial model
 - Tracker wind stow position
 - Glare analysis



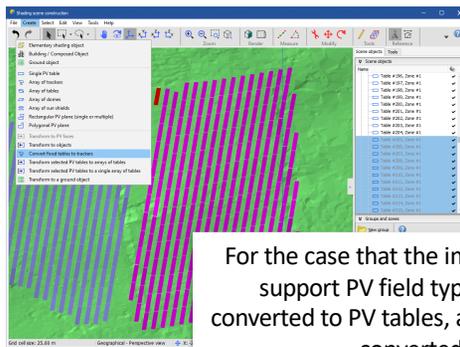
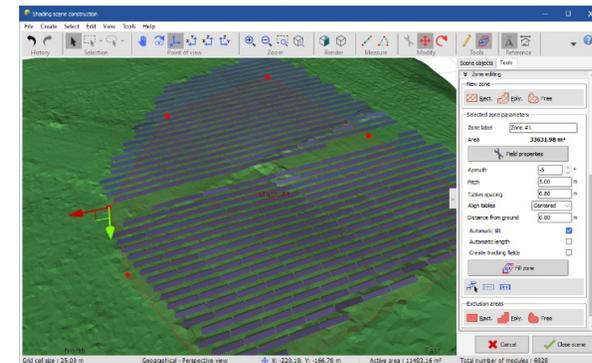
Databases

- Meteonorm 8.1 libraries
- Easier importing of data from 3E and NEDO Japan
- Meteo APIs (Solcast, SolarAnywhere, Solargis)
- More power optimizer brands:
 - AMPT
 - Huawei
 - Maxim
 - SolarEdge
 - Sungrow (upcoming)
 - Tigo
- Improved guidance with custom PAN files

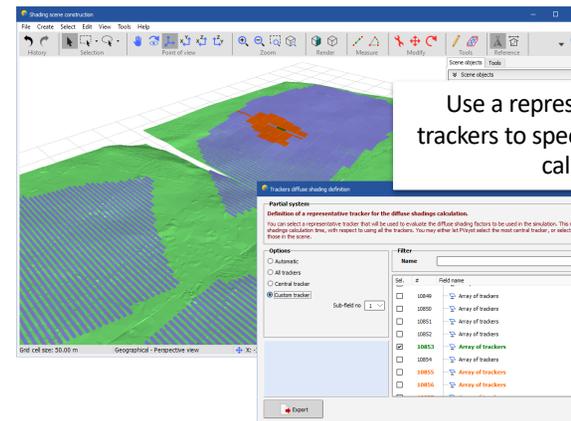


Shadings in large systems

- Improved importing of drawings supported formats : DAE, 3DS, PVC
- Improved tools
 - Table conversion (trackers, table groups)
 - More flexibility with diffuse shading calculation (trackers)
 - More possibilities with ground objects (topography)
 - More options with editing of multiple selections (list of tables with parameters)
 - Performance improvements for large drawings
 - API for Importing of ground image and topography from coordinates



For the case that the imported format does not support PV field types, rectangles can be converted to PV tables, and fixed tilt tables can be converted to trackers

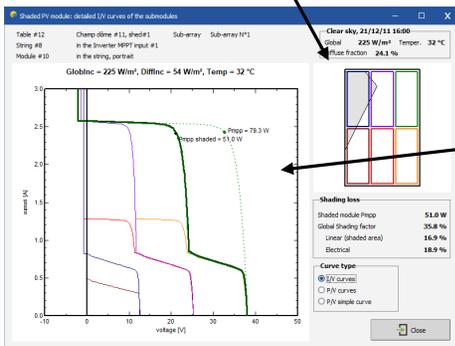
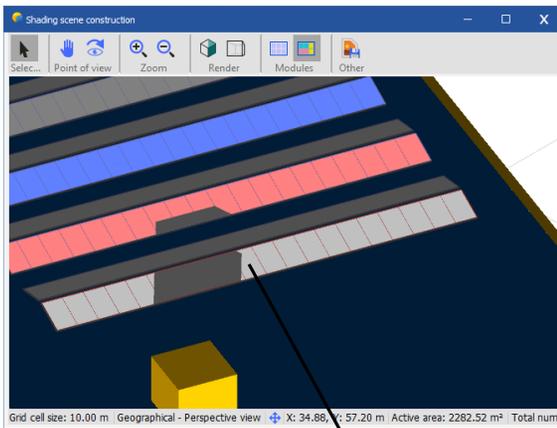


Use a representative subset of trackers to speed up diffuse shading calculations



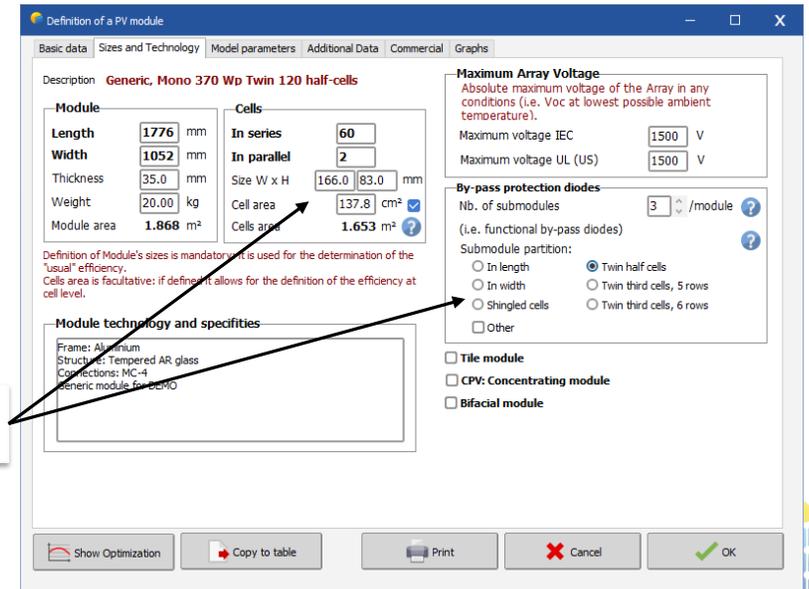
Electrical shadings, PV cell size

- To allow the detailed computing of the IV-curves in partially shaded PV modules, the PV cell size must be known
- For PV modules with non-square cells width and height can now be different
- The grouping of cells with by-pass diodes has diversified



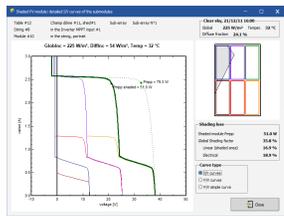
The transition between an unshaded and shaded sub-module happens as a single cell gets shaded

To compute the IV-curve of the sub-module, the size of one cell and its orientation must be known



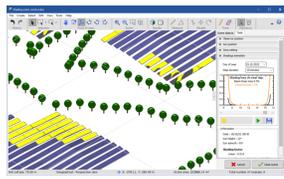
Electrical shadings, simplified models

- Improved simplified electrical shading calculations
- Improved user guidance on when simplified models are suitable



Detailed model

'Module Layout'
computes each sub-module in 3D model (group of cells protected by one bypass-diode)



Simplified models

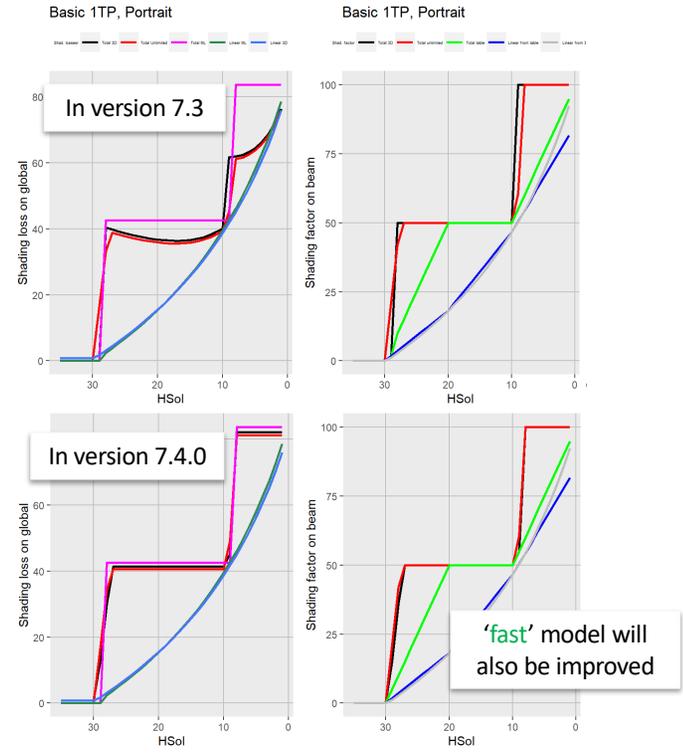
'According to Strings', slow
shadings calculated in each simulation step

'According to Strings', fast
look-up tables for shading factors in simulation

'Unlimited Sheds/Trackers'
2D – models

rectangular strings in 3D drawing

Simplified models have been improved to follow 'Module Layout' model



Single Line Diagram

Configuration of PV system

PV field detailed losses parameter

DC circuit ohmic losses for the array

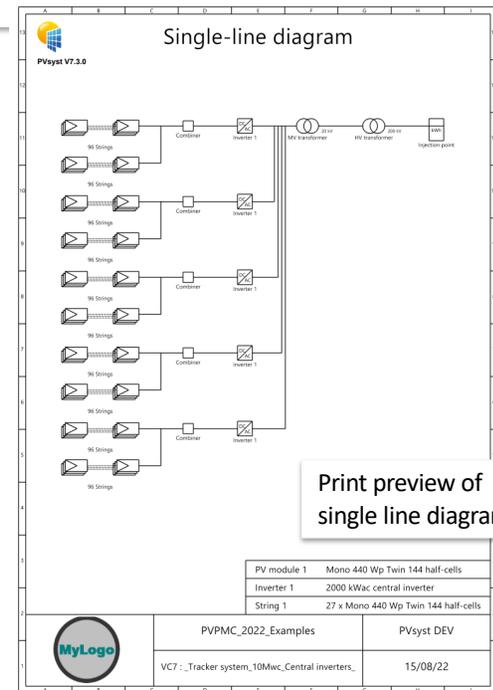
AC losses after the inverter

Medium Voltage external transformer

System overview

SincePVsyst V7.3.0

Editor for single line diagram

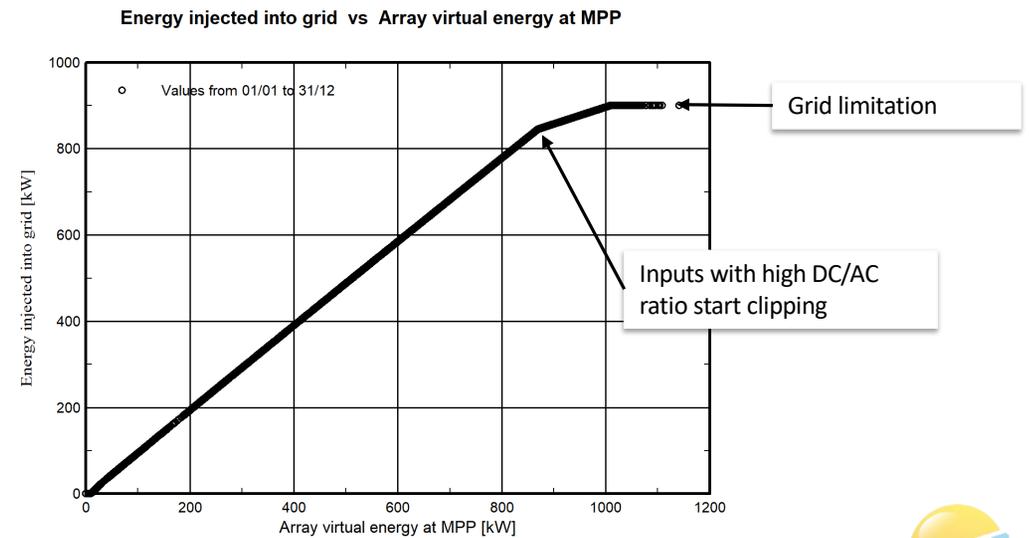
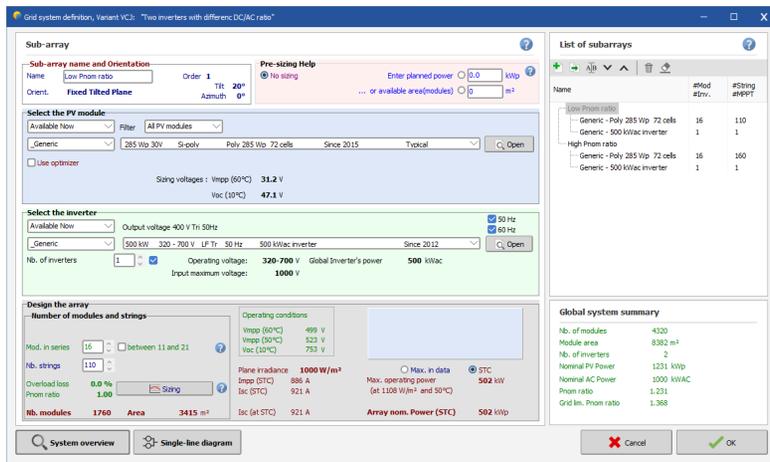


- Power optimizers to be included
- On long term allow editing of system from within SLD



Grid injection limitation

- If curtailment is imposed on PV systems with inverters that have different DC/AC ratios, it is non-trivial to propagate the curtailment to the MPPT inputs
- The modeling of curtailment has been reviewed and improved for several special cases



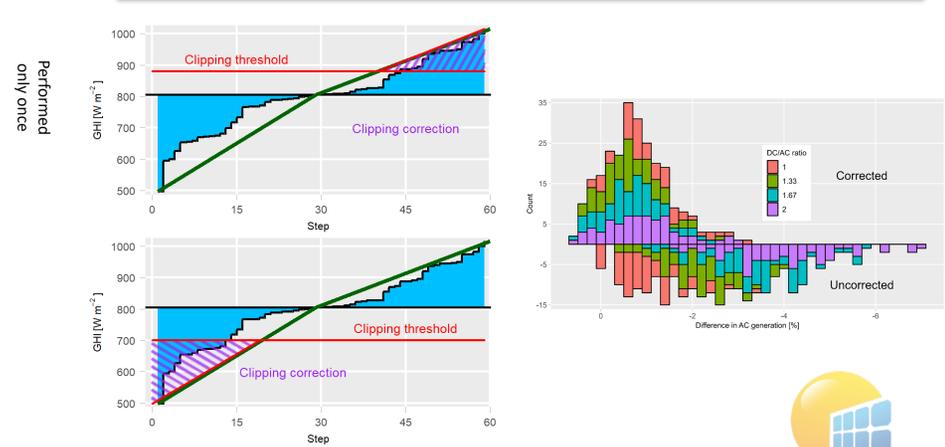
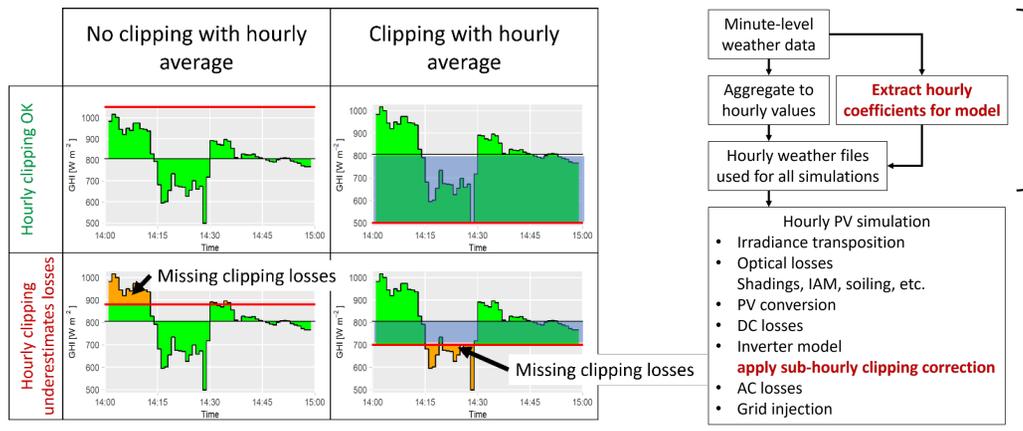
Sub-hourly clipping losses



- Sub-hourly clipping losses can be significant with high DC/AC ratios
- We have developed a model that can effectively account for these losses in hourly simulations
- The model requires a one-time pre-analysis of minute-level weather data
- The model will be implemented in PVsyst V8

See also poster of Michele Oliosi:
Accounting for sub-hourly irradiance fluctuations in hourly performance simulations

Model published in:
A. Viloz et al., 2022. *A Model Correcting the Effect of Sub-Hourly Irradiance Fluctuations on Overload Clipping Losses in Hourly Simulations.*
8th World Conference on Photovoltaic Energy Conversion



Other Developments

- Many Minor Improvements in Results and Report
 - More detailed information
 - More options for customization
 - US date format is now well supported in Pvsyst
- Economic evaluation
 - improved management of pricing (feed-in and self-consumption)
 - added the internal rate of return (IRR) value and the possibility to define detailed depreciation parameters
- Improved orientations

Orientation ID	Type	Tilt (Tt)	Azimuth (Az)	3D PV area (m²)	System PV area (m²)	Status
1	Fixed, Tt 25.0°, Azm. 0.0°	25.0°	0.0°	7899 m²	5206 m²	OK
2	Dome front face, Tt 10.0°, Azm. 90.0°	10.0°	90.0°	0 m²	2603 m²	OK
3	Dome backface, Tt 10.0°, Azm. -90.0°	10.0°	-90.0°	0 m²	2603 m²	OK
4	Tracking horizontal axis, Azm. 0.0°	-	-	0 m²	5206 m²	OK

Possibility to mix fixed tilt and tracking

Limit of 8 orientations per simulation will fall

Bifacial model no more limited to a single orientation

- System summary and notes



Custom notes can be added to projects and variants, optionally included in report

Detailed summary of the system and possible issues

- General bifacial model based on 3D model
- Solar glare analysis
- Tracker wind stow
- Pvsyst command line (CLI)



Summary

- Database updates
 - Built-in Meteonorm 8.1 libraries
 - Improved importing of weather data
 - More power optimizer brands
- Shadings in large systems
 - More options for importing 3D models
 - Improved editing tools
 - Improved performance for large 3D models
- Electrical shading calculations
 - More detail for modern PV module cell layouts
 - Improved simplified models used for large PV systems
- Single line diagram
- Grid limitation (curtailment)
- Pvsyst training, video tutorials, social networks, Chinese platforms
- Single line diagram
- Grid limitation (curtailment)
- Sub-hourly clipping losses
- Other developments
 - More details and customization in results and report
 - More flexibility with orientations
 - Generalized bifacial model
 - Tracker wind stow position
 - Glare analysis
 - Pvsyst command line

