PVsyst Simulation

NORTHERN ELECTRIC

NEP-AMERICA

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Note 1:

- PVsyst versions 6.64 and above use different NEP inverter OND files. To ensure correct results, delete any existing NEP OND files from the PVsyst inverters folder.
- Download newest NEP OND files: https://es-la.northernep.com/productos/#descargar

- PVsyst requires adjustment of the **Hidden PVsyst Parameters** for NEP system modeling.

General parameters

- Select geographical location and climate file have, define the array's azimuth and tilt. PVsyst offers different options for various types of projects, including simple fixed tilted plane, multiple orientation, seasonal tilt adjustments, 'unlimited sheds' for large systems, sun shields (modules mounted to facades of buildings) as well as various kinds of tracking arrays, both single and double-axis.
- Set the main system parameters, such as modules, inverter, DC size, string lengths, etc.
- Select the NEP microinverter to choose

Low Limit Power Threshold

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NEP Microinverters can convert available energy of a PV module at very low power levels with higher conversion efficiency due to a feature called “burst mode”. This feature captures the available energy from a PV module at very low light levels (for example, during dawn and dusk) and bursts this energy into the grid when enough energy is available for one or more full AC cycles. This takes advantage of the available PV module energy when the light conditions are too low to operate the microinverter in the MPPT operating range.

PVsyst has a hidden parameter that discards any power production in the model output that is below a certain low limit threshold of the nominal power rating of the inverter. The default value in PVsyst is 0.5%. Set the Power Threshold / PNom lower limit parameter to 0.01% so that the PVsyst calculations include power production to essentially zero output for microinverter systems.

- From the main page click on Preferences and select Edit hidden parameters.
- Select the Regulators and converters from the Category drop down menu.
- Scroll to the bottom and change the MPPT converters: Power Thresh./ PNom lower limit value to
- 0.01 %. The default check mark will disappear.
- Set this value back to default when modeling non-NEP systems.

Maximum DC to AC Ratio

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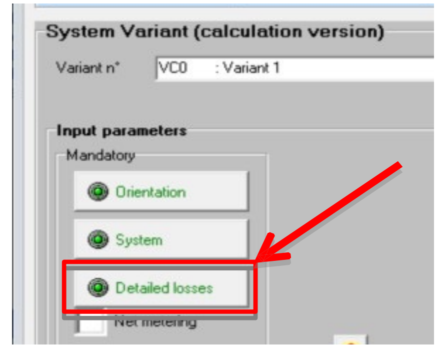
- When modeling systems with a DC to AC ratio of greater than 1.3 of PV module STC rating to nominal microinverter output power, you must adjust the Maximum PnomRatio for inverter sizing parameter. The default value in PVsyst is 1.3.
- From the main page click on Preferences and select Edit hidden parameters.
- Select the System design parameters from the Category drop down menu.
- Adjust the Maximum PnomRatio for inverter sizing parameter to a higher value (for example, 1.5 or 1.6).

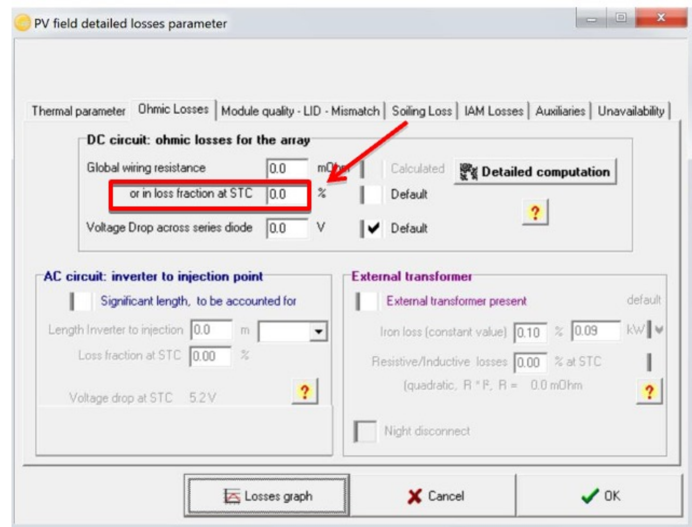
Detailed Losses: Adjust Ohmic Losses

Click Detailed Losses to modify the input values to accurately represent performance calculations when using NEP Microinverters.

DC Circuit Losses

- Because NEP Microinverters is connected to each PV module and mounted directly under the module, there are no long DC runs to the inverter. This eliminates any DC wire losses. To adjust for this:
- Click on the Ohmic losses tab in the Detailed losses parameter window.
- Adjust the value for DC circuit: ohmic losses for the array to 0%. This causes the Default check box to become unchecked automatically.
- Adjust the Global wiring resistance value to 0 mOhm.

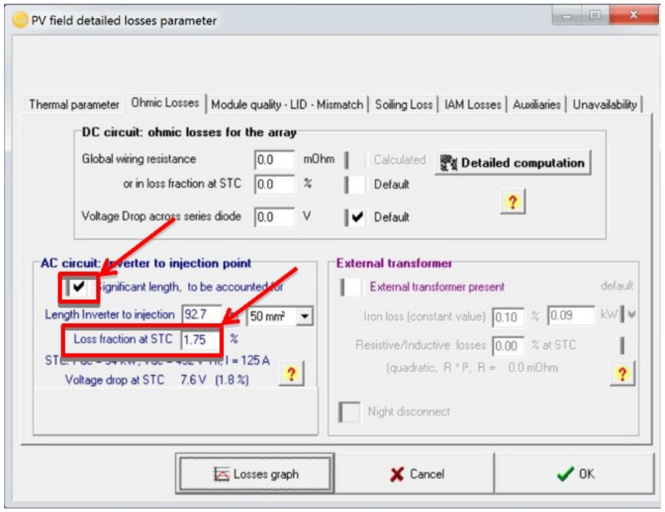




Detailed Losses: Adjust Ohmic Losses

AC Circuit Losses for Microinverter Systems

- To adjust the model for AC circuit losses, in the Ohmic losses tab, select the check box Significant length, to be accounted for in the AC Circuit: inverter to injection point section.
- Since the highest recommended voltage drop is 2% for the furthest AC branch circuit from the injection point and since there are AC branch circuits in any system with shorter wire runs (adequately sized conductors and lower losses), we recommend entering 1.75% or lower for Loss Fraction at STC.
- If the exact voltage drop, averaged across all AC branch circuits, is known for your design, use this number in this field.



Adjust Module Mismatch Losses

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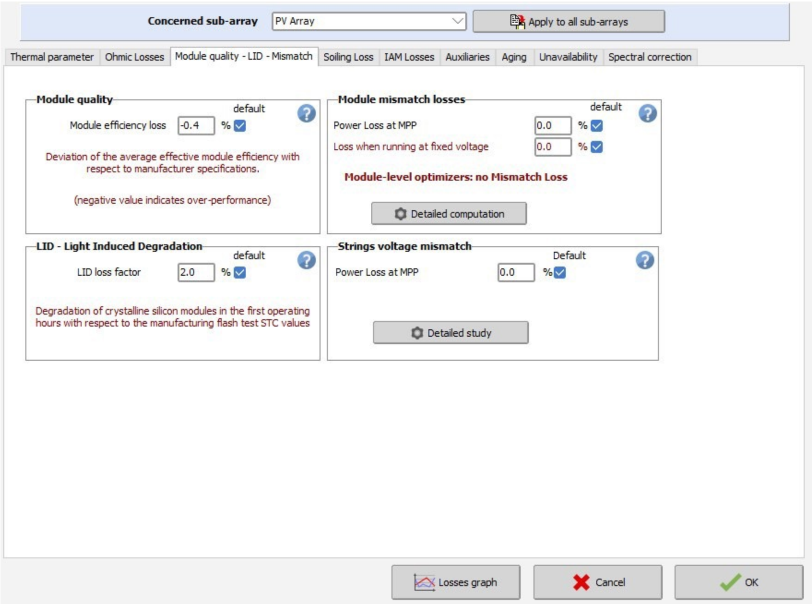
- Microinverters eliminate the PV module mismatch losses that otherwise affect a string, compared to a 2% first-year loss in a traditional system.
- Mismatch losses are caused by the manufacturing tolerance of the modules, temperature differences during operation, uneven soiling and other environmental factors such as overcast weather conditions, partially melted snow, fallen leaves, etc.
- Verify that PVsyst sets the mismatch losses to 0 with microinverters. For traditional systems, the default value is 2% for the modules and an additional 0.15% for the string voltage mismatch.
- String or central inverters operate PV modules in series strings, in which the lowest performing module limits the performance of all the other modules in its string and parallel strings that are connected on the same DC input bus.

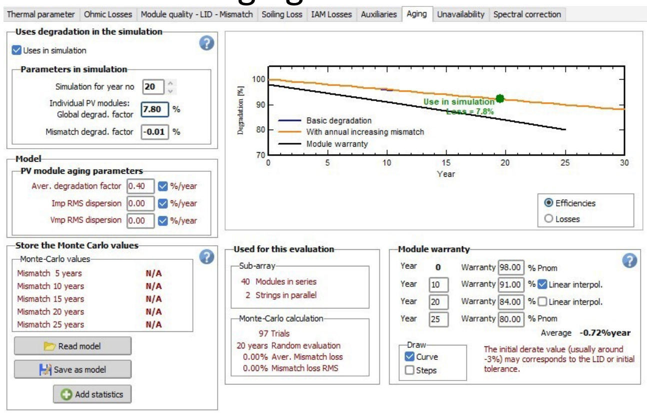


https://www.pvsyst.com/help/mismatch_loss.htm

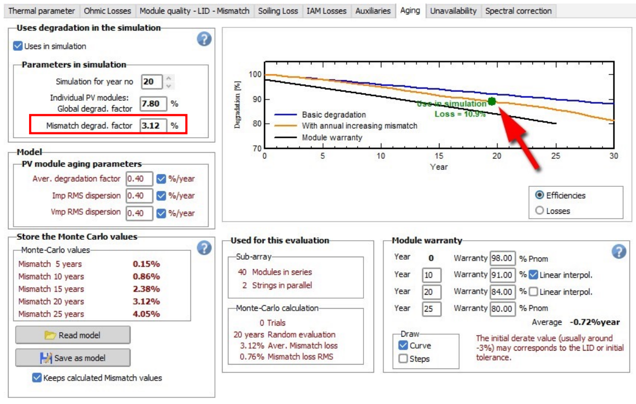
Note 2: Mismatch Growth over Time

- PVsyst offers a tool that simulates the growth of mismatch loss and module degradation over time.
- The mismatch loss of a traditional system will grow over time due to the un-even rate of degradation between modules in a string. NEP experiences no losses due to mismatch over the life of the system.
- The NEP system is, however, subjected to the modules' degradation over time (as are all PV systems).
- 1. Go to the main interface screen.
- 2. Click the Detailed Losses button.
- 3. Select the Aging tab.
- In this example we used year 20. Note the additional loss due to the growing mismatch suffered by the traditional system.

Aging Tool: NEP



Aging Tool: String Inverter



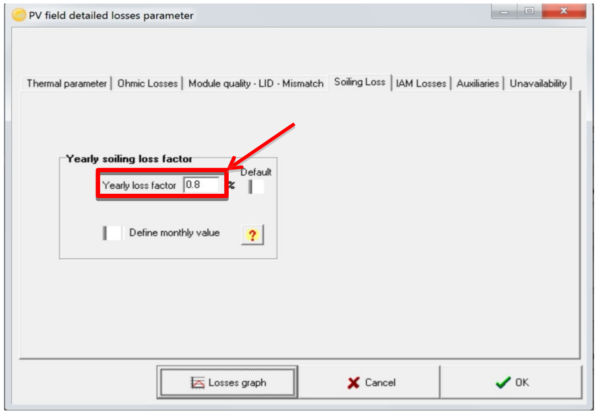
Adjust Soiling Loss

- PV module soiling depends on the geographic region and the local environment. While an NEP System does not impact the degree of soiling on a module or string, it does mitigate some of the loss by maximizing the performance of each individual module independently and preventing modules compromised by snow, dirt, or debris from dragging down the performance of other modules.

- NEP assumes that soiling in a PV system can be largely non-uniform. Such variance in soiling across a string or entire array creates module mismatch much like direct shading. Accordingly, to capture the impact of NEP Microinverters on soiling mitigation, we recommend designers take into account the impact of mismatch due to soiling and roughly halve the losses. A representative table of soiling losses changes for different soiling rates follows:

Dirt loss factor in string inverters	NEP-Dirt loss factor	Difference
2 %	0.8 %	-1.2%
5 %	3 %	-2 %
8 %	4.8 %	-3.2 %
10 %	6 %	-4 %

To adjust this parameter, select the **Soiling Loss** tab and change the **Yearly loss factor** to the adjusted loss factor.



Module Layout & Shading

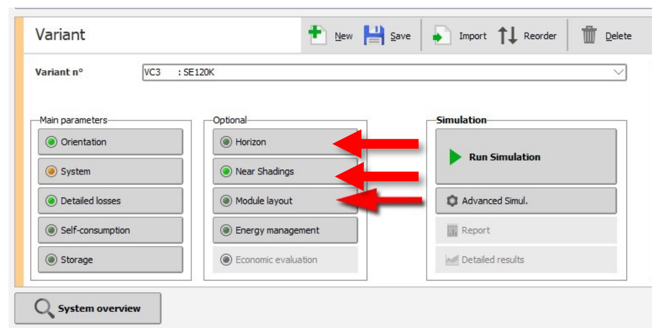
- NEP system minimizes the energy loss due to partial shading when compared to a traditional inverter. If the system in question has shading of any kind (trees, chimneys, inter-row shading, cables) the 3D physical system layout should be designed to account for the energy loss due to shade. An accurate shading simulation will ensure the NEP advantage is reflected in the annual energy output of the system.
- Unlike a traditional system, in which the production of entire strings may be affected by partial shading of as little as a few cells of one module, NEP confines the effects of partial shading to the shaded modules only, thanks to its module- level MPPT. The module-level optimization in PVsyst is taken into account when using the Module Layout method for calculating shading electrical losses.
- For the 3d design add obstructuions and buildings to simulate losses by shading accurately.
- You can enter far obstruction curves of far obstructions like mountains or buildings, in the horizon option.
- If you find cables try to simulate them as well, this will have a clear impact in production of energy, specially in a string inverter system.

https://www.pvsyst.com/help/modulelayout.htm

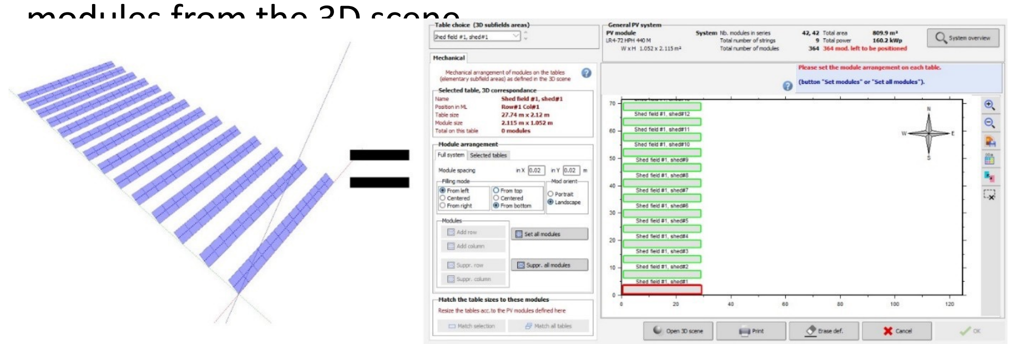
https://youtu.be/eeU2HmxJ8jk

To activate the Module Layout functionality:

1. Once the 3D scene is constructed, click the Module Layout button in the main interface:



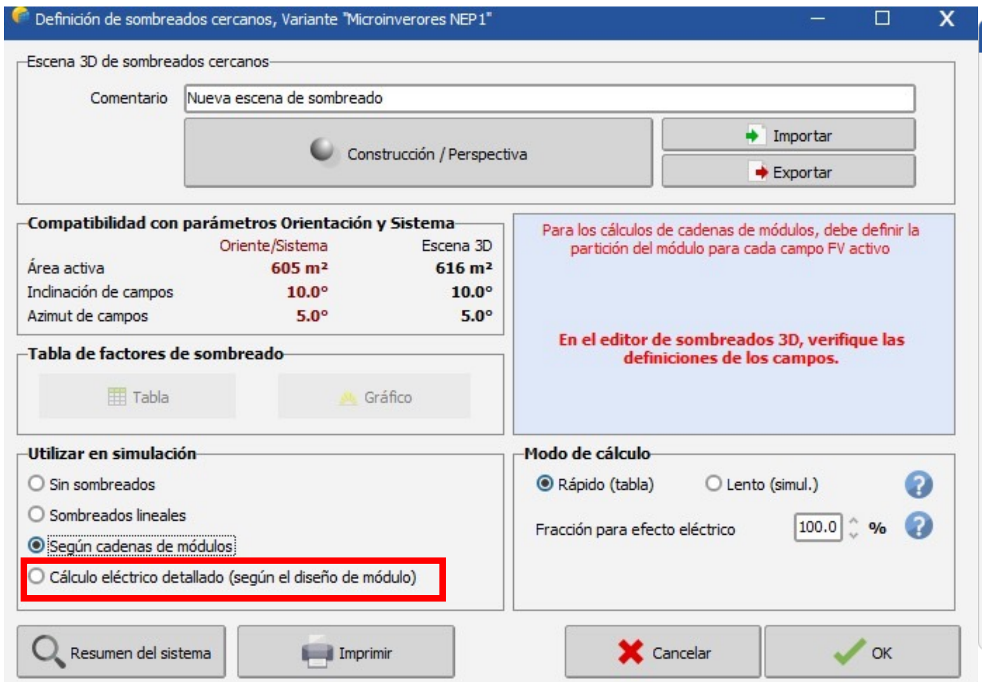
The Module Layout interface shows a schematic layout of the modules from the 3D scene

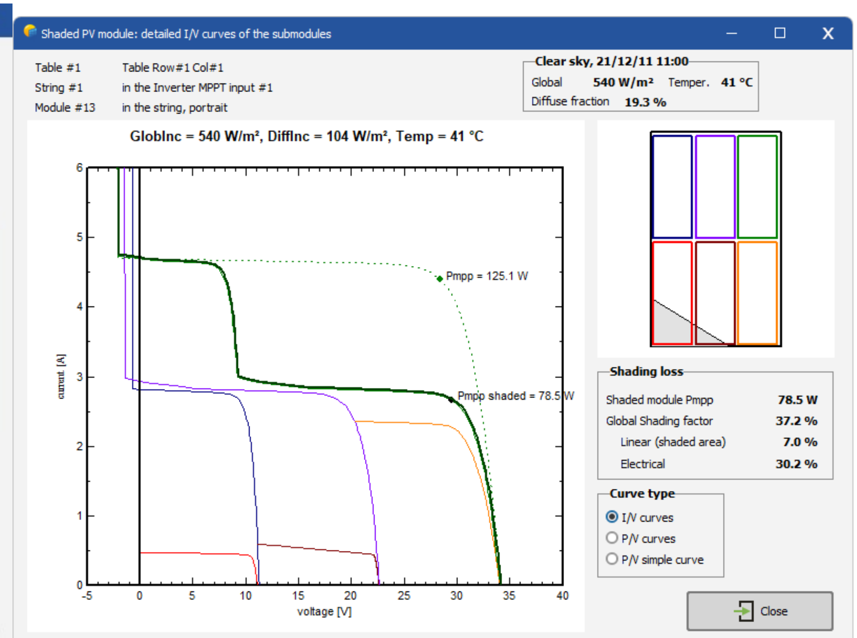


https://www.pvsyst.com/help/near_shadings_partition.htm

Module Layout & Shading

For a correct shading and shadowing analisys please make an analisys per module defining every module as individual string



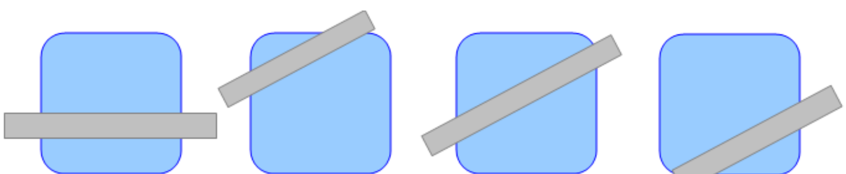


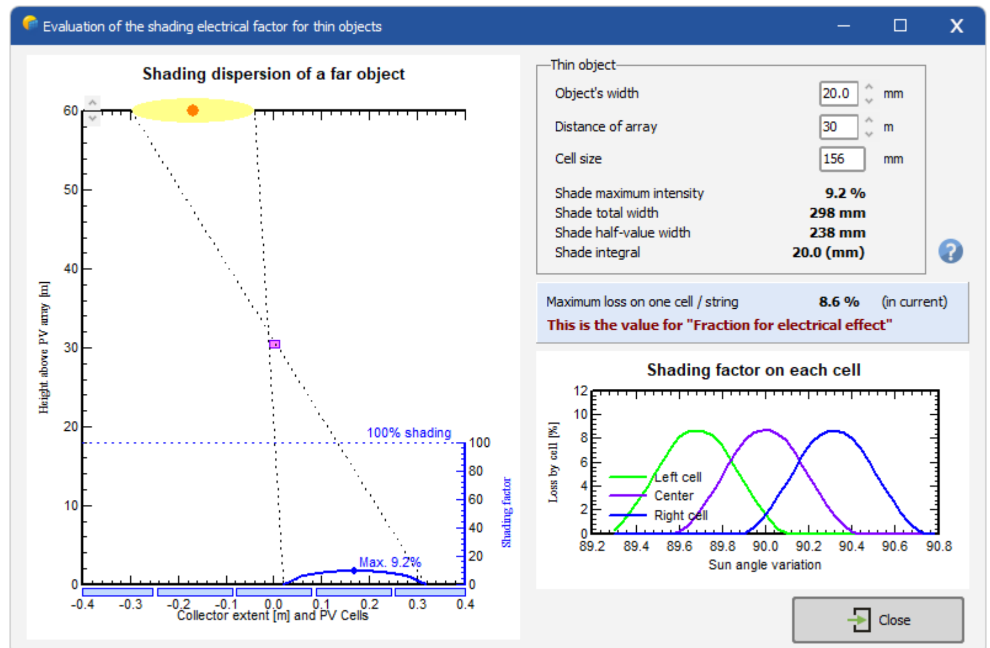
https://www.pvsyst.com/help/modulelayout_shadings3d.htm

https://www.pvsyst.com/help/near_shadings_electrical.htm

Shades by cables around and thin objects

- If a shading object is sufficiently thin, its shade will not cover a full cell. Even if it is rather far and produces a broad semi-shading it is important to take this effect in account.
- This is the case of electrical wires above the array, handrails, etc. The case of electrical wires is particularly important, as it affects the array during the whole day.





You will find this tool in the 3D editor menu, "Tools > Thin Objects Analyze tool".

https://www.pvsyst.com/help/shadings_thinobjects.htm
https://forum.pvsyst.com/topic/2642-thin-object-shading/
https://www.pvsyst.com/help/shadings_partitioninstrings.htm