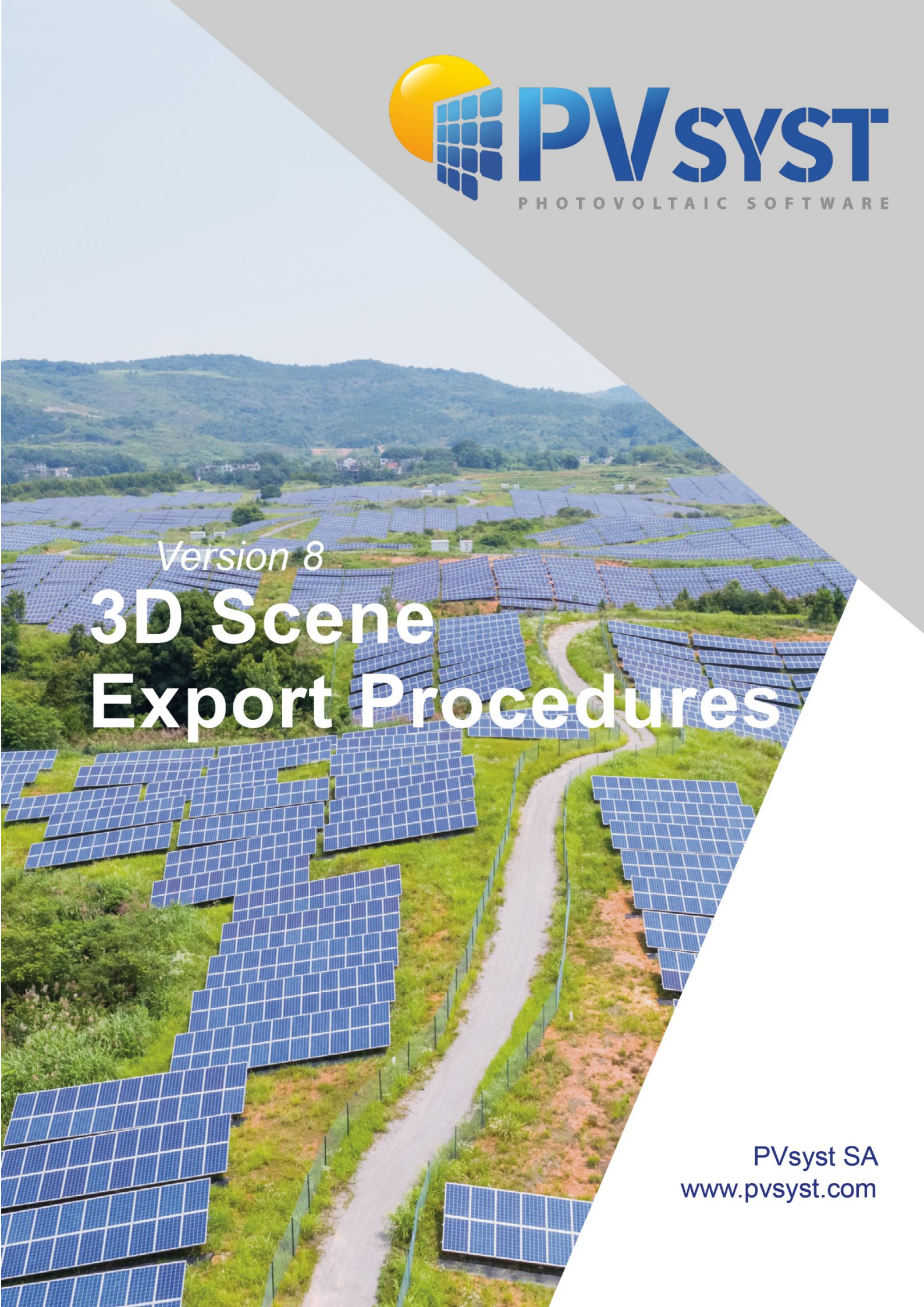
PVsyst
PHOTOVOLTAIC SOFTWARE



Version 8

3D Scene Export Procedures

PVsyst SA
www.pvsyst.com

Contents

1 SketchUp

1.1 The 3D scene in SketchUp

It is possible to model a 3D scene in SketchUp with buildings, trees and other objects that may shade the PV modules.

First you need to define the 3D scene, for example a simple building with a 25° sloping roof.

Here are the dimensions of the example below:

- Length: 20 meters
- Width: 12 meters
- Height under roof: 6,10 meters
- Total height: 8,89 meters

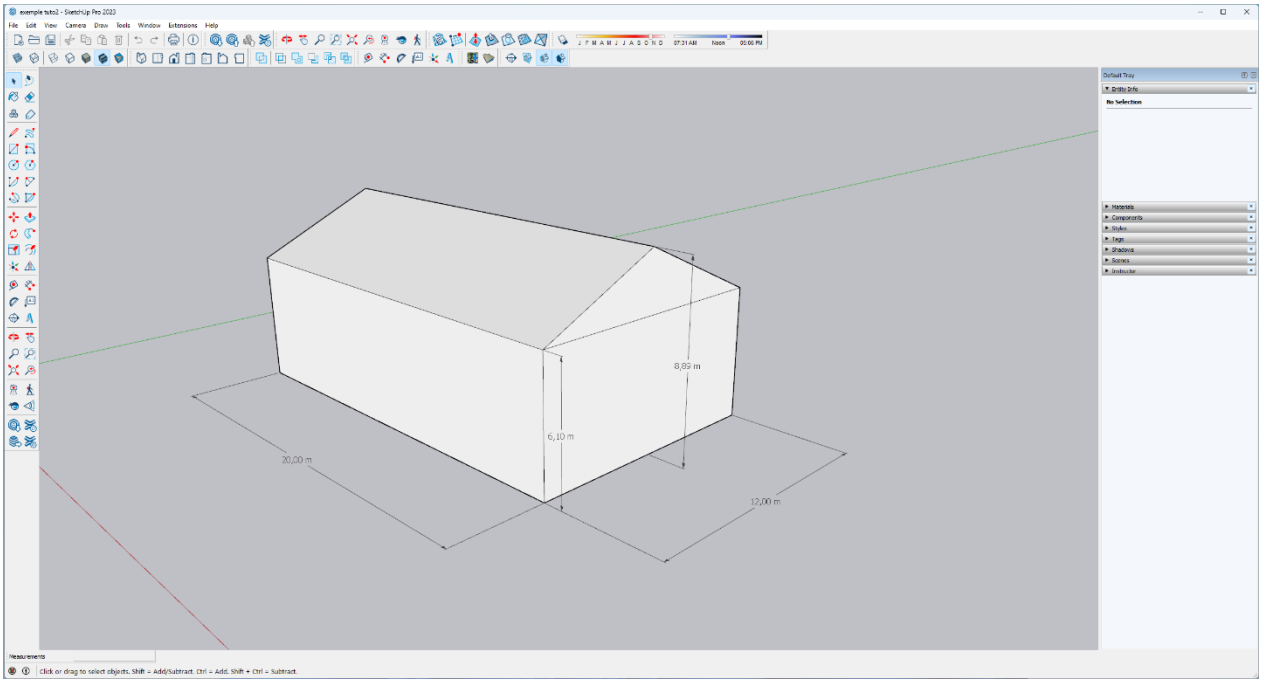


Figure 1 : 3D Scene in SketchUp

Once you have drawn the structure, you can create the PV module.

For this tutorial, a 300Wp PV module is considered with the following dimensions:

- Length: 1,640 meters
- Width: 0,99 meters
- Thickness: 0,09 meters

Draw the PV module using the dimensions shown.

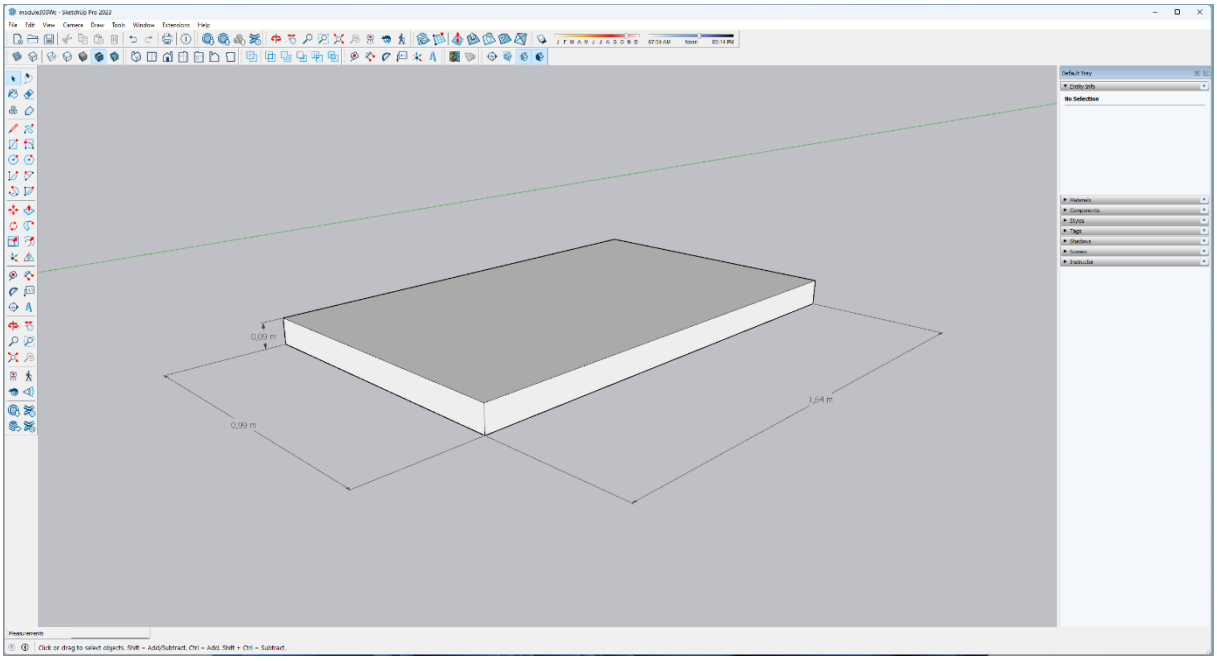


Figure 2 : 3D scene of a PV module in SketchUp

1.2 Defining material

After the dimensioning, it is important to define the material of the active surface of the PV module. This is created using the *Material* palette on the right of the window.

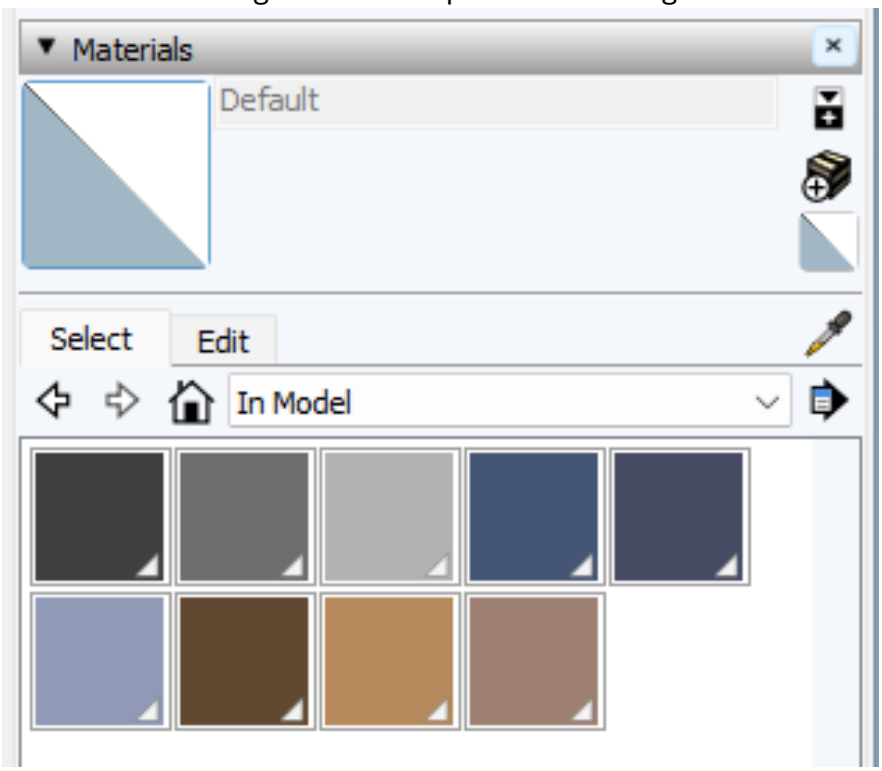


Figure 3 : Material palette in SketchUp

Click on the logo  to create a material.

Assign it a colour and a name. Give it the colour blue and the name *PVmodule*.

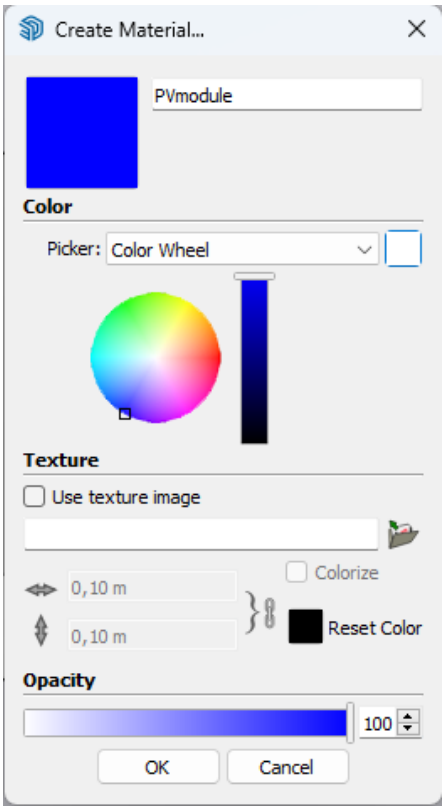


Figure 4: Create a material in SketchUp

Assign the material to the surface of the PV module using the colouring tool  .

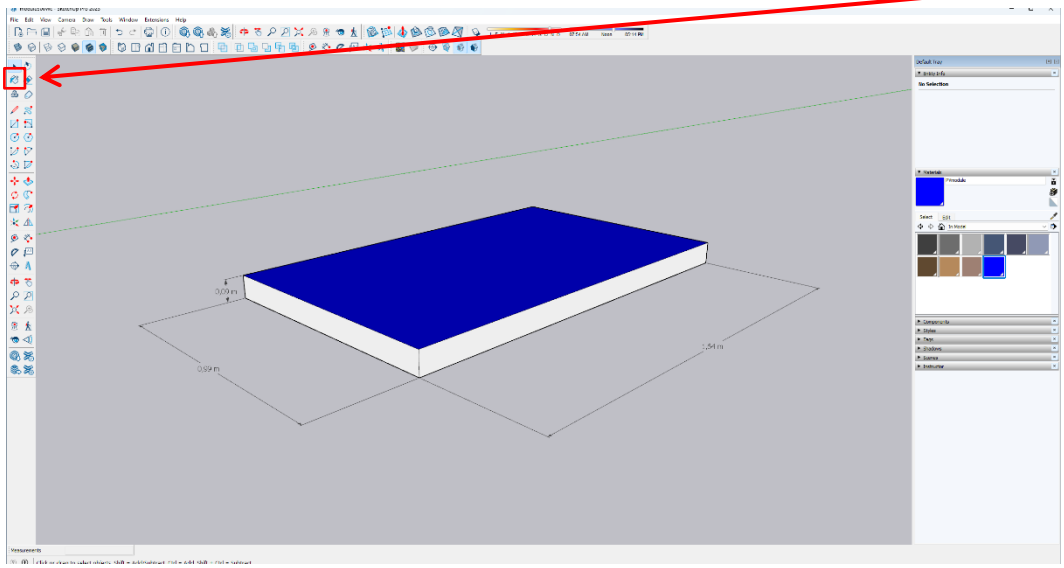


Figure 5 : Colouring the surface of the PV module in SketchUp

1.3 Defining a component

It is important to define the PV module as a component.

Click 3 times on the drawn object.

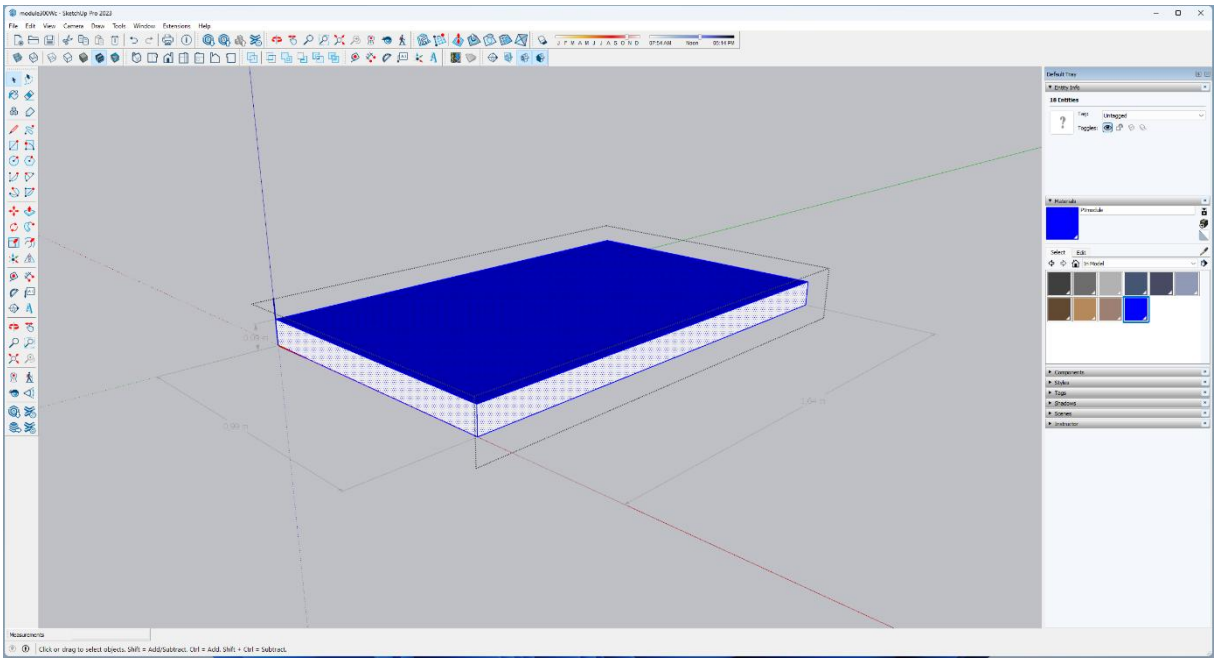


Figure 6 : PV module selection in SketchUp

Right-click and select "Make Component"

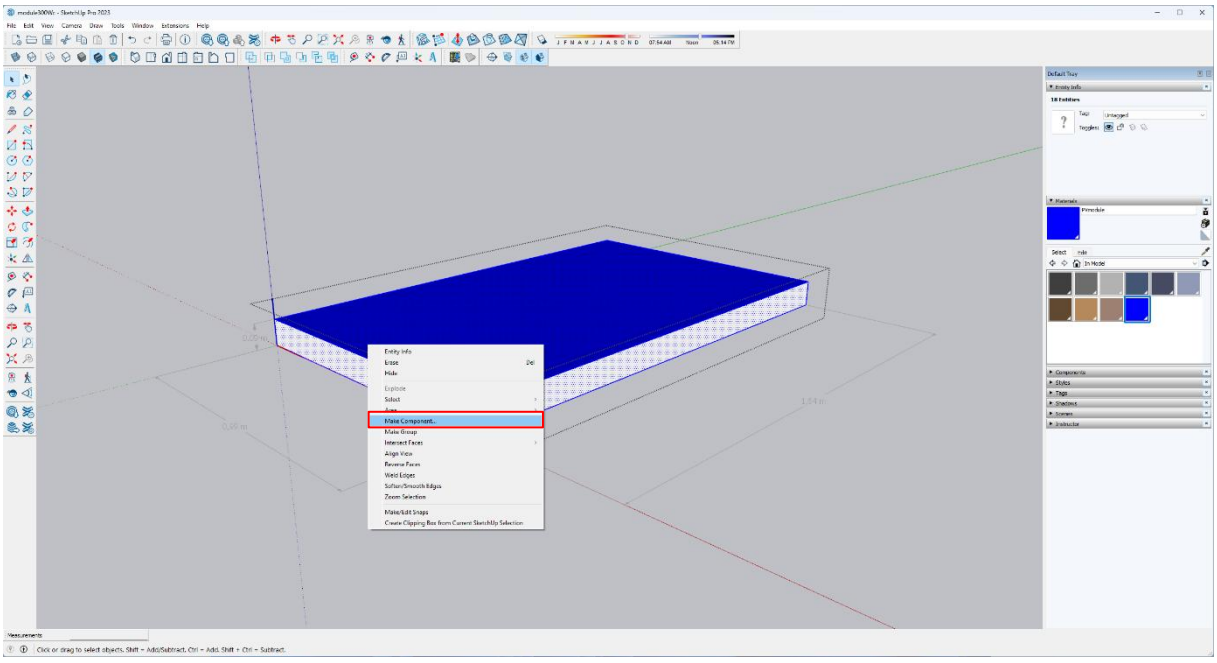


Figure 7 : Creating a component in SketchUp

Complete the definition by giving a name (for example *modulePV300Wc*).

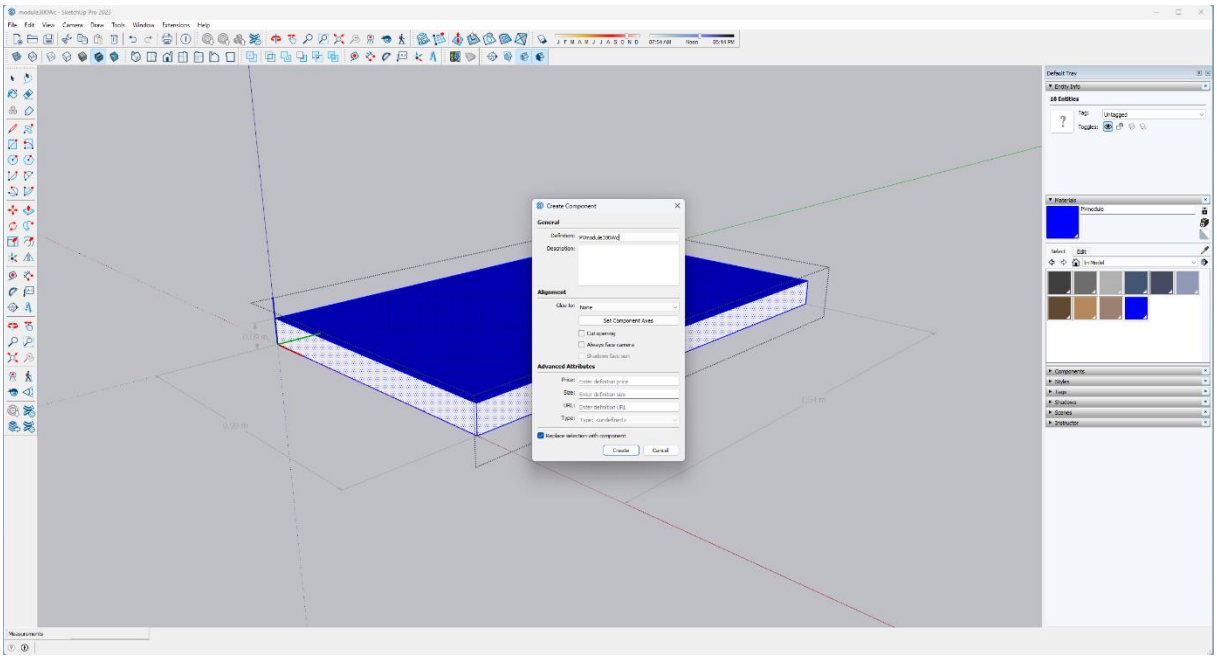


Figure 8 : Defining a component in SketchUp

Place a 9kWp PV array on the roof as shown in the drawing below.

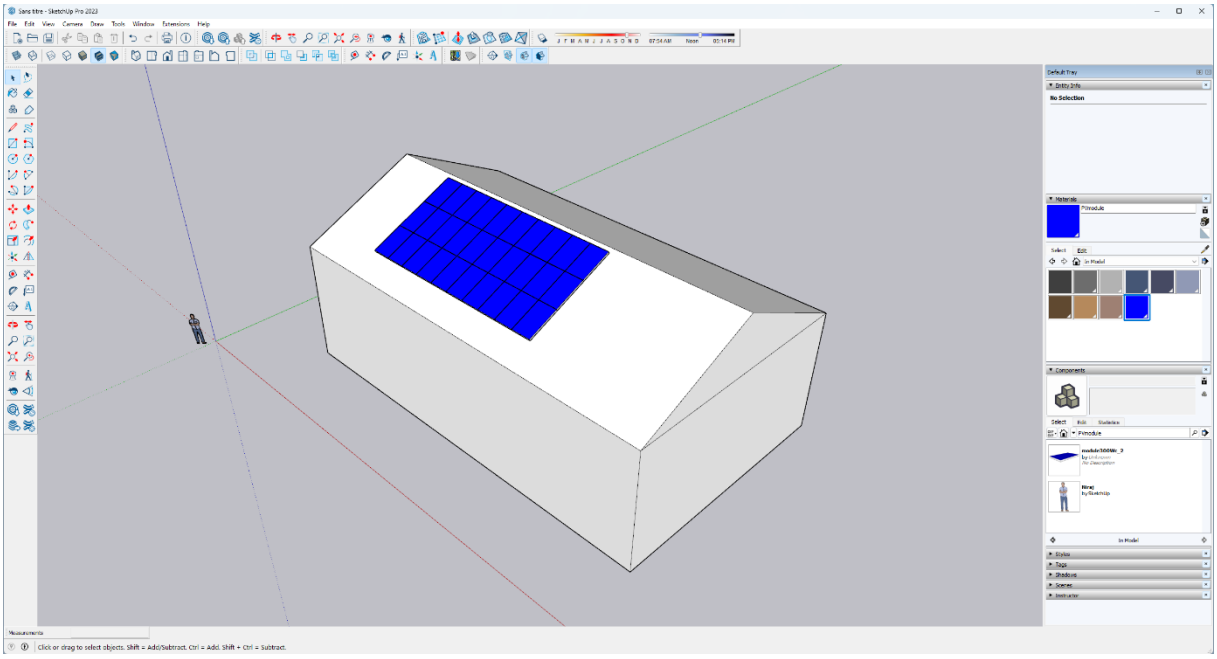


Figure 9 : PV field in SketchUp

1.4 Exporting the 3D scene in SketchUp

Once the final positioning of the PV modules on the roof has been defined, you can export the 3D scene.

Click on "*File*" in the top left corner.

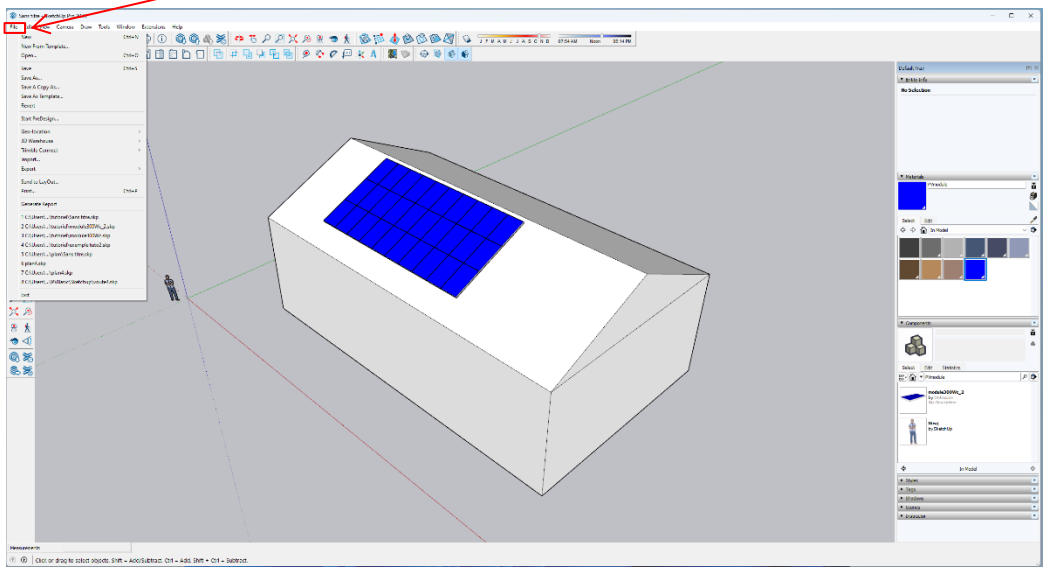


Figure 10 : Exporting the 3D scene in SketchUp

Choose "*Export*", then "*3D Model*".

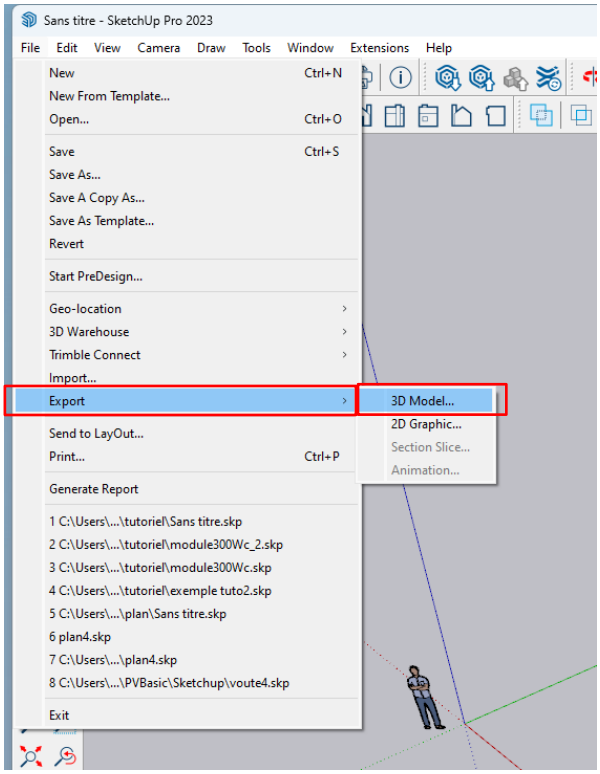
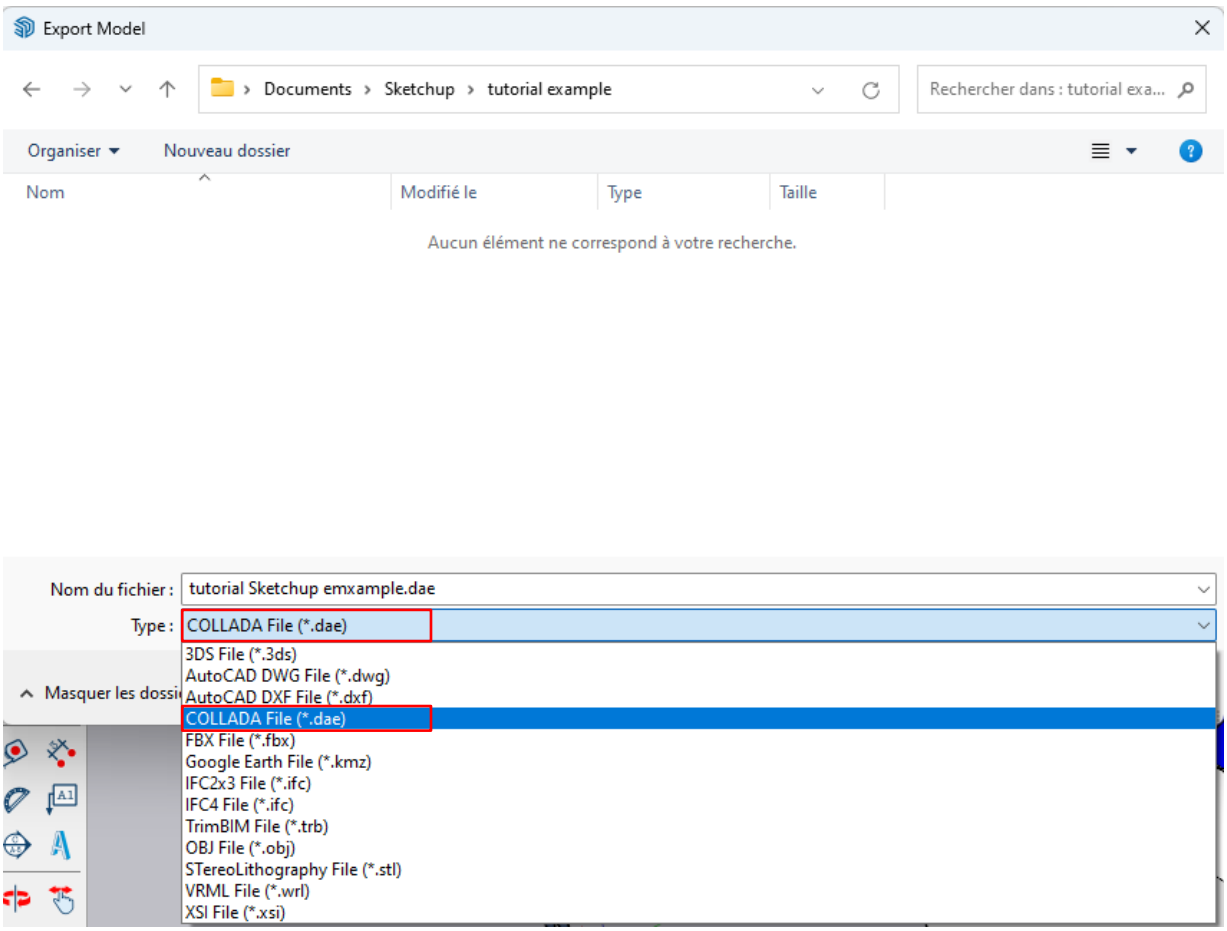


Figure 11 : Exporting the 3D scene to SketchUp

PVsyst recognizes the 3DS and DAE format from SketchUp.

Choose the *COLLADA(*dae) file* format and save it in a folder provided for this purpose.



NB : PVsyst prefers the *DAE* format because it is an open source format dedicated to the exchange of 3D drawings.

Figure 12: Choosing the format for exporting the 3D scene in SketchUp

1.5 Importing the 3D scene into PVsyst

In PVsyst, open the *DEMO Residential system at Geneva* variant VC0 project.

1.5.1 Defining the 3D scene in PVsyst

To import your 3D scene into PVsyst, follow the steps below.

Click on "*Near shadings*" in the optional PVsyst parameters.

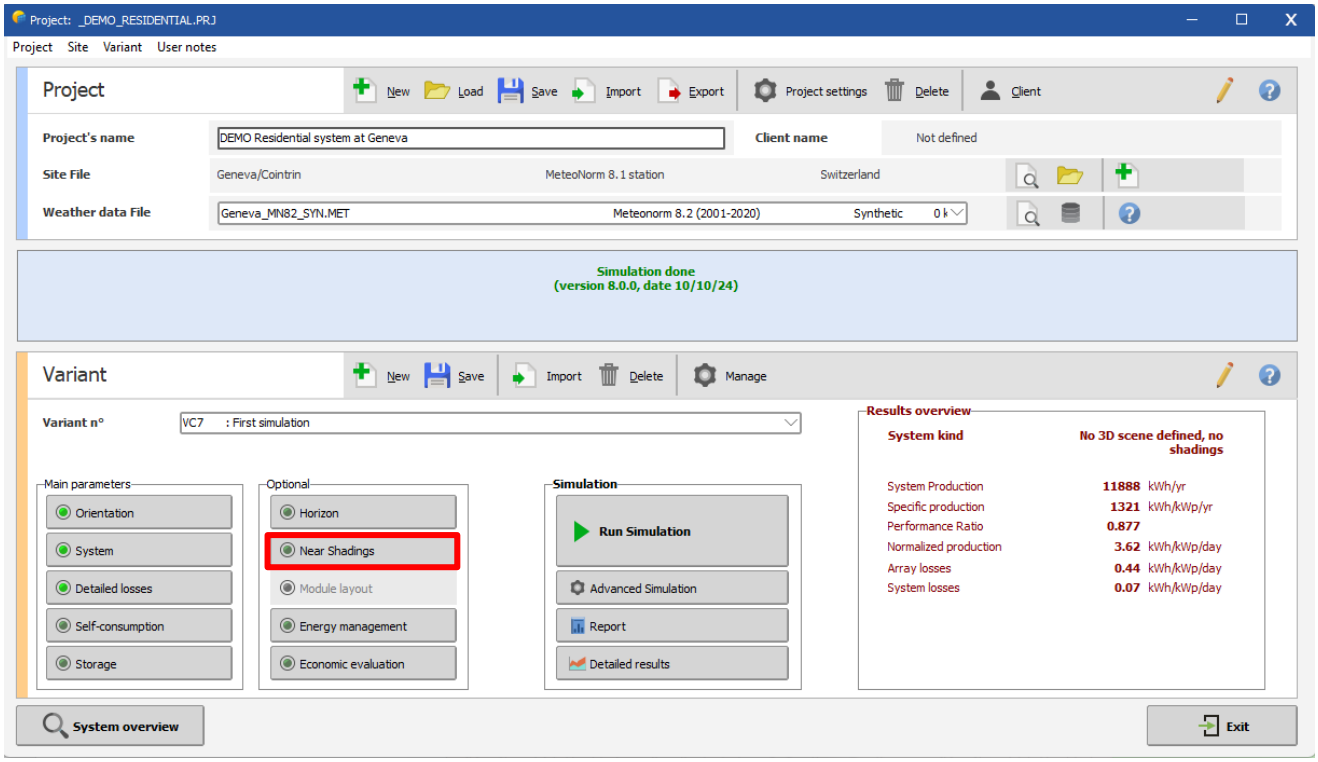


Figure 13 : Demo Residential project in PVsyst

Click on "*Construction/Perspective*".

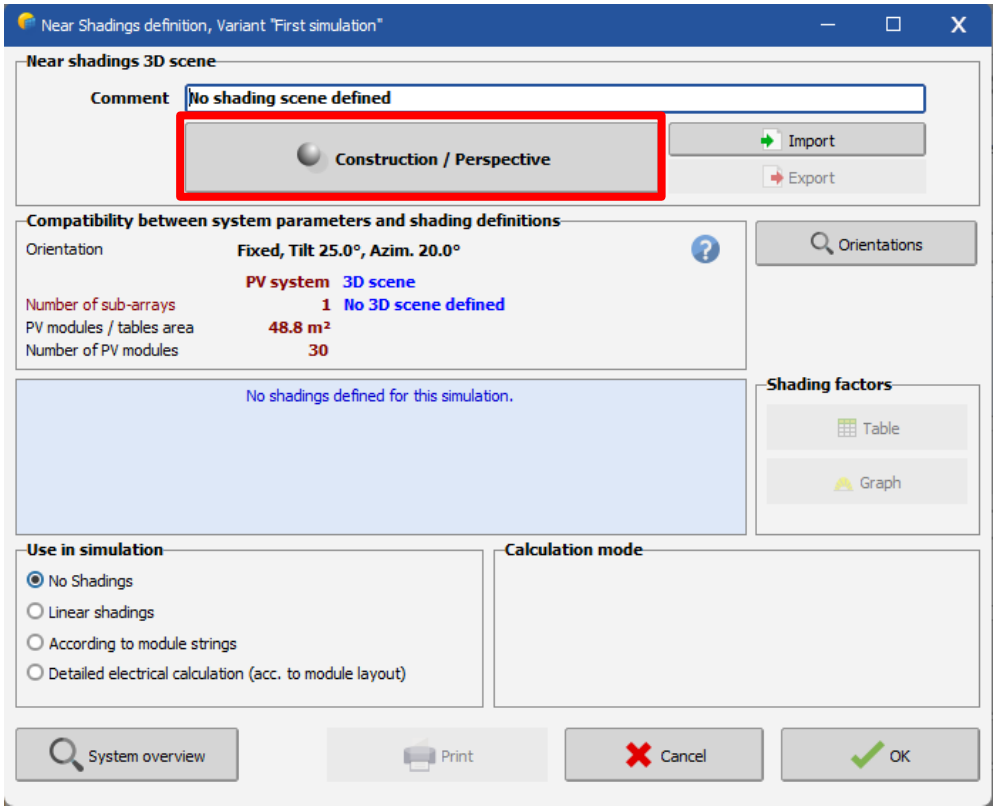


Figure 14: Close shading in PVsyst

Click on "*File*", "*Import*" and "*Import a 3D scene (3DS, DAE, PVC)*"

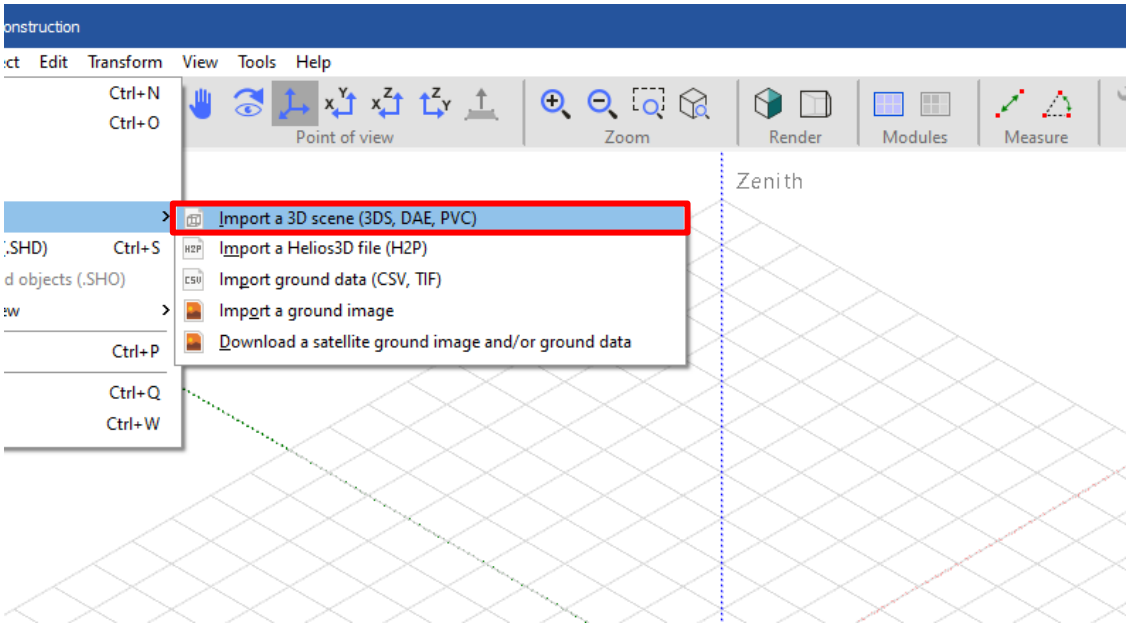


Figure 15: Importing a 3D scene into PVsyst

Choose the file exported from SketchUp in *DAE* format.

Once you have selected the *DAE* file, the window below appears.

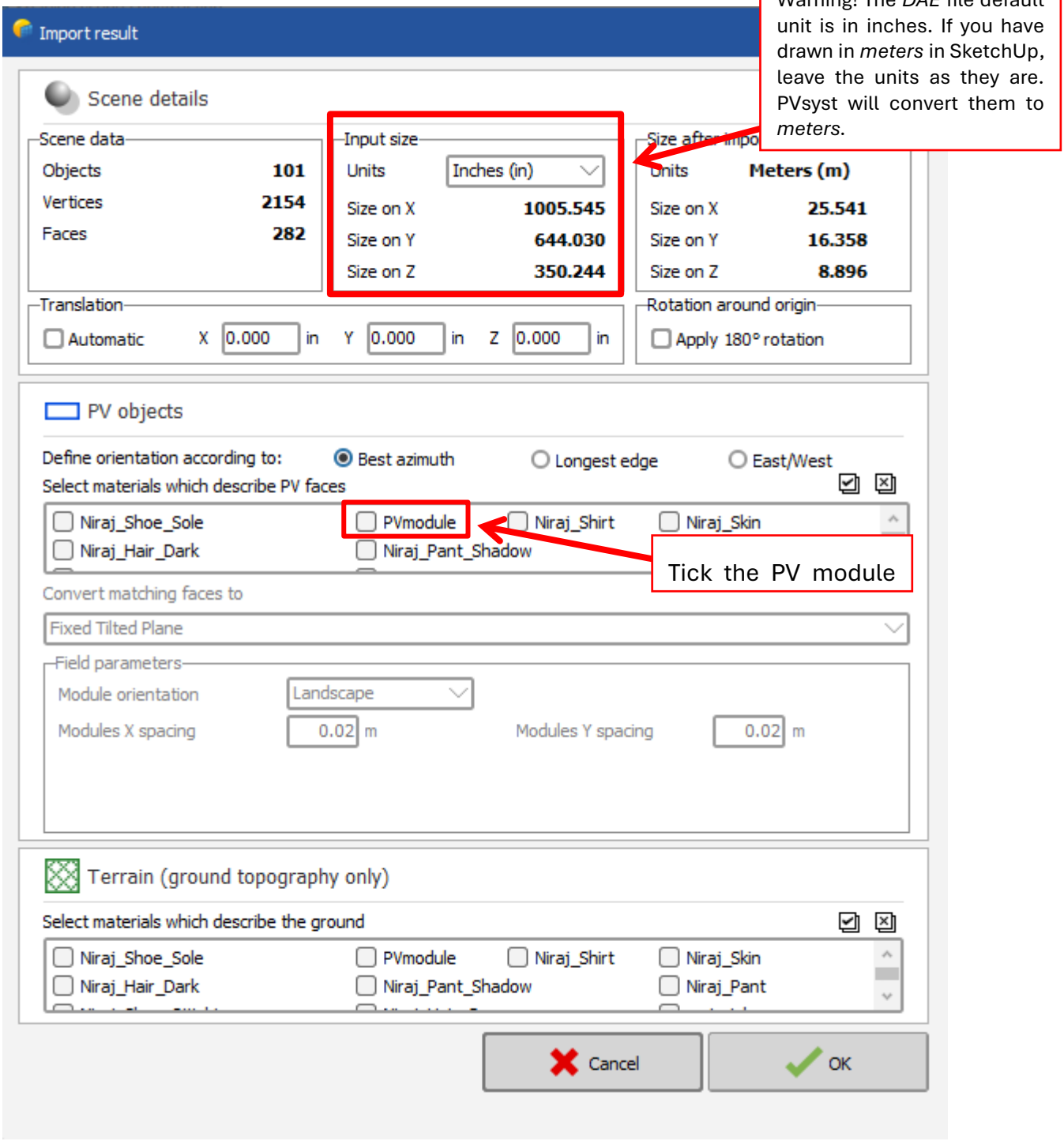


Figure 16 : The results of the import into PVsyst

By ticking the *ModulePV* box, you define the *ModulePV* material as a PV object.

1.5.2 Setting up the 3D scene in PVsyst

Once the 3D scene has been imported into PVsyst, there are several steps to complete before finalization.

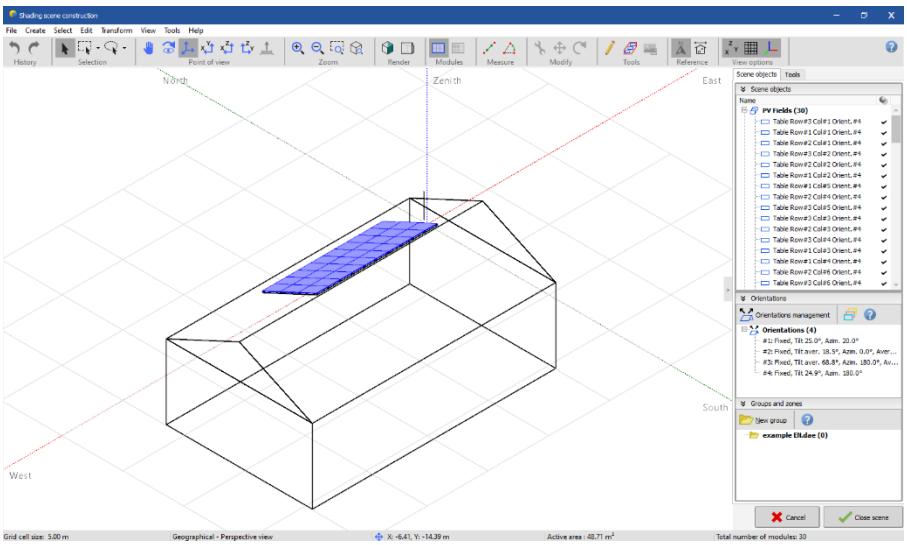
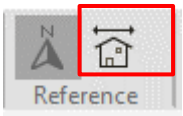


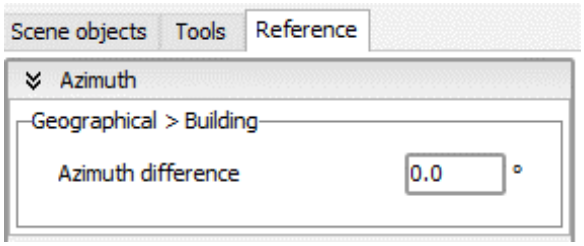
Figure 17 : The 3D scene oriented North in PVsyst

1. The orientation of the 3D scene is not defined in the same way as in SketchUp. After the import into PVsyst, it is reversed by 180°. To alter it, you need to shift the reference.

   Click on the button at the top right:



2. Change the reference shift in the azimuth difference box; by indicating 160°: the resulting azimuth will be 20°. Click on « Confirm button » .



3. Click on:

4. The scene orientation is now correct. The scene and modules are oriented at 20° as defined in the "*Orientation*" tab.

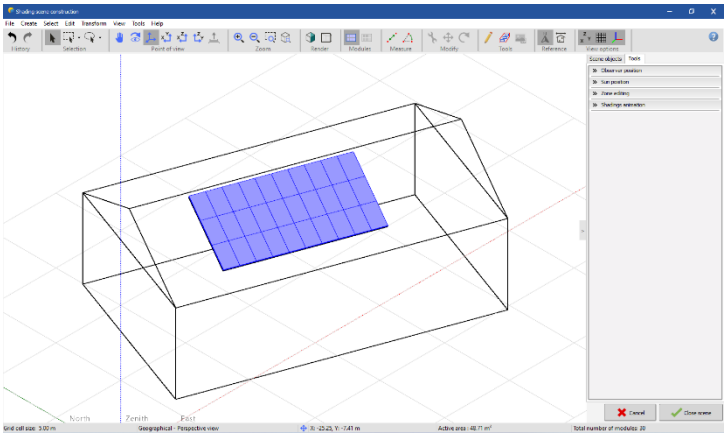


Figure 18 : The 3D scene oriented 20° South in PVsyst

5. In the "*Tools*" tab, check "*Deactivate verification of field interpenetration*" and confirm.

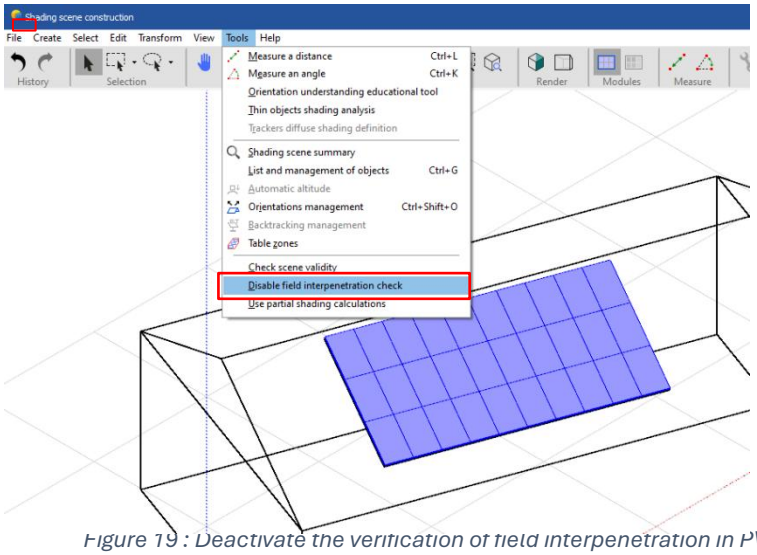


Figure 19 : Deactivate the verification of field interpenetration in PVsyst

This parameter is useful for checking the interpenetration of the PV field with other objects drawn in the 3D scene. This parameter must be ticked, otherwise PVsyst will display an error message. The active surface is located 1 cm above the drawing of the frames and PVsyst requires a minimum safety margin of 2-3 cm. If the 3D drawing has been done correctly, you can tick this box, and no problems will arise in calculating the scene.

The import of the 3D scene into PVsyst is now complete. The project simulation can begin.

2 Plug-in Archelios Pro

The Archelios Pro plug-in offers a wide choice of PV modules. You are advised to access the tutorials produced by Archelios Pro on their website.

Take the previous example with the house scene. Choose a PV module model and implement the configuration as shown in the following image.

Below is the 3D scene drawn in SketchUp with the PV modules from the Archelios Pro plug-in:

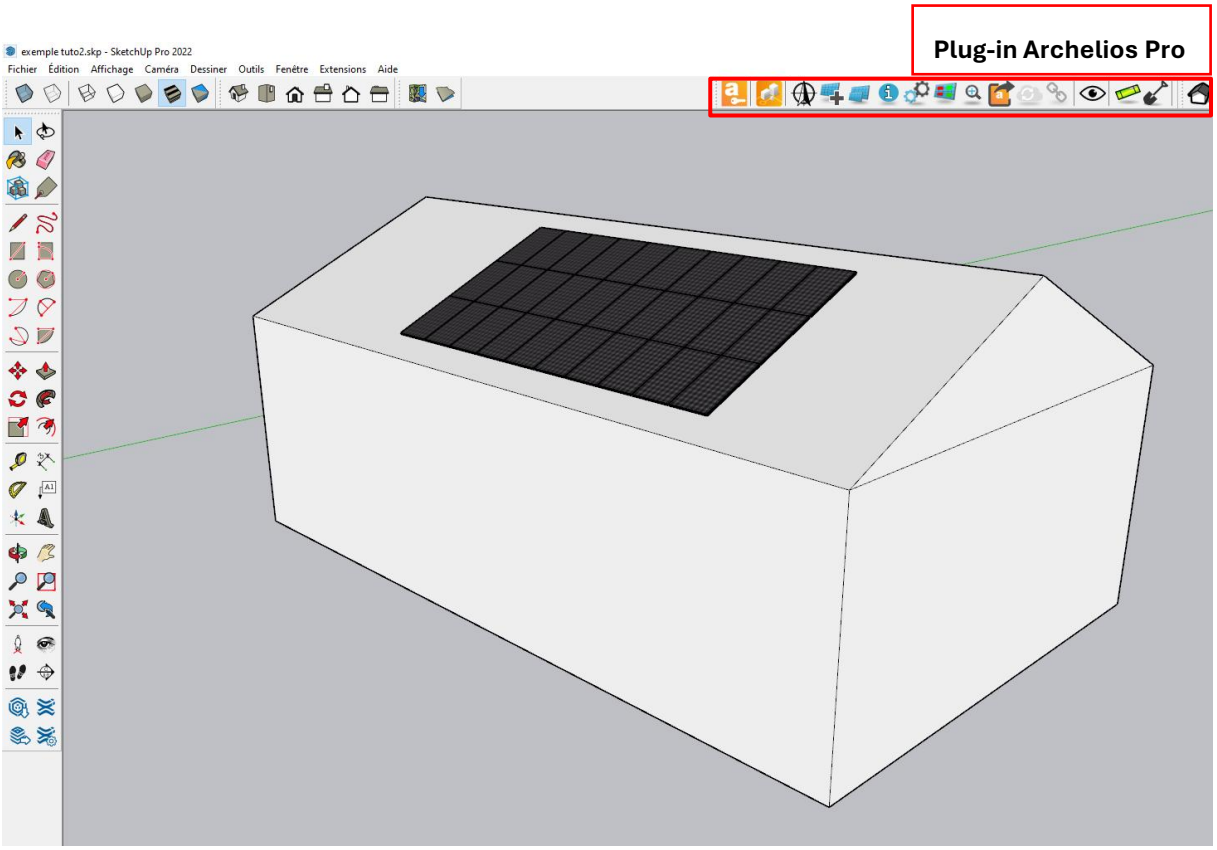


Figure 20 : 3D scene with the Archelios Pro plug-in in SketchUp

Once you've finished drawing in SketchUp, simply export your design in *3DS* or *DAE* format.

It is important to respect the dimension of the active surface between the defined system and the 3D scene. PVsyst accepts a tolerance of 8%.

2.1 The project on PVsyst

You need to carry out the same procedure as in Chapter 2.

When importing, it is important to select the box that will activate the material(s) as an active surface. It is not necessary to assign a material as the Archelios plug-in has already

done this. Depending on the imported format, the name of the assigned material is different.

2.2 The 3DS format

For the *3DS* format, it is important to *check the units* and click on *PV_singl*

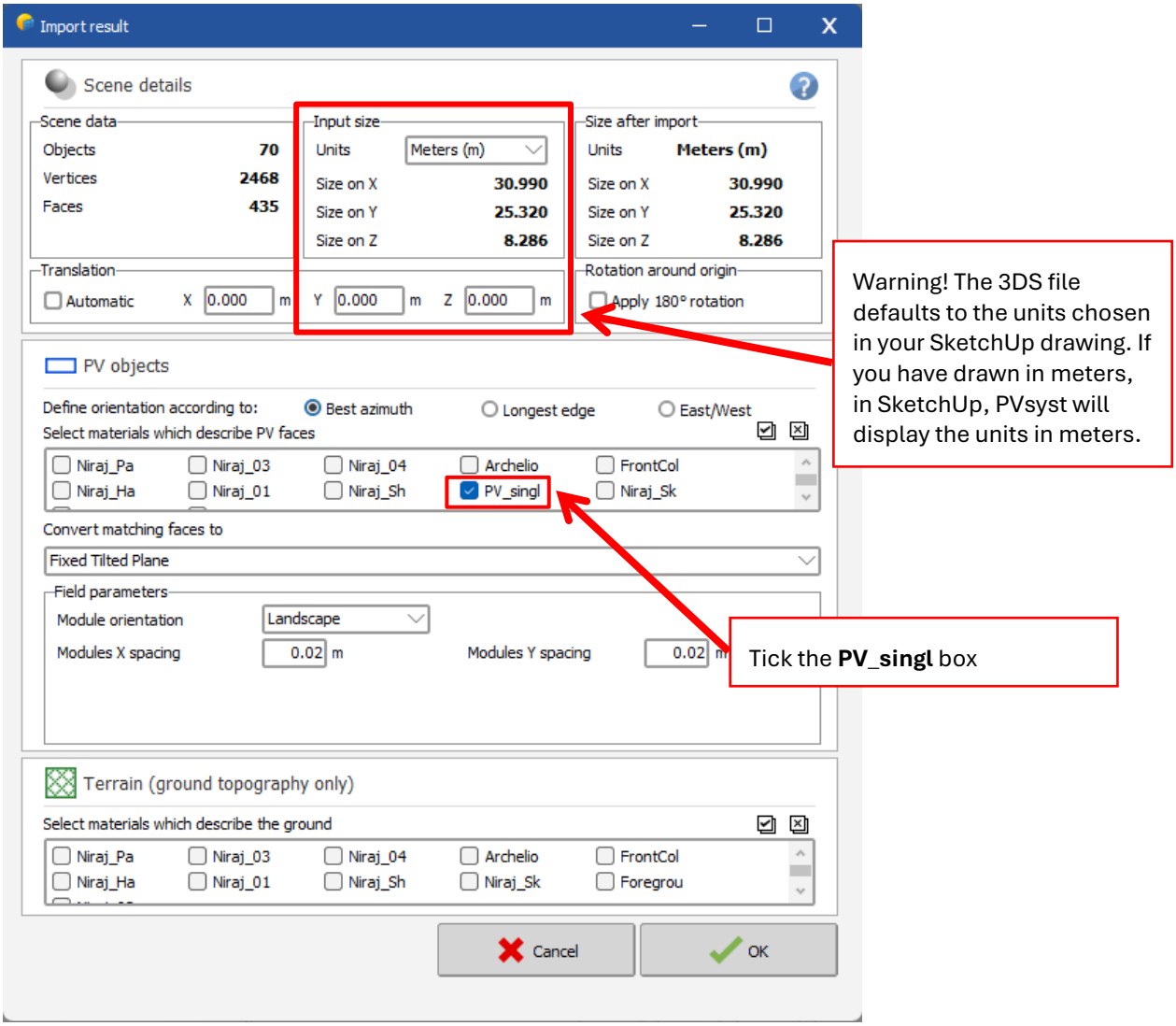


Figure 21 : Importing a 3DS file into PVsyst

Once you have imported the SketchUp 3D scene in the format of your choice, follow the same process as in *chapter 2.2*.

2.3 The *DAE* format

For the *DAE* format, it is important to check *the units* and click on *PV-singlecrystaline*.

Once you have imported the SketchUp 3D scene in the format of your choice, follow the same process as in *chapter 2.2*.

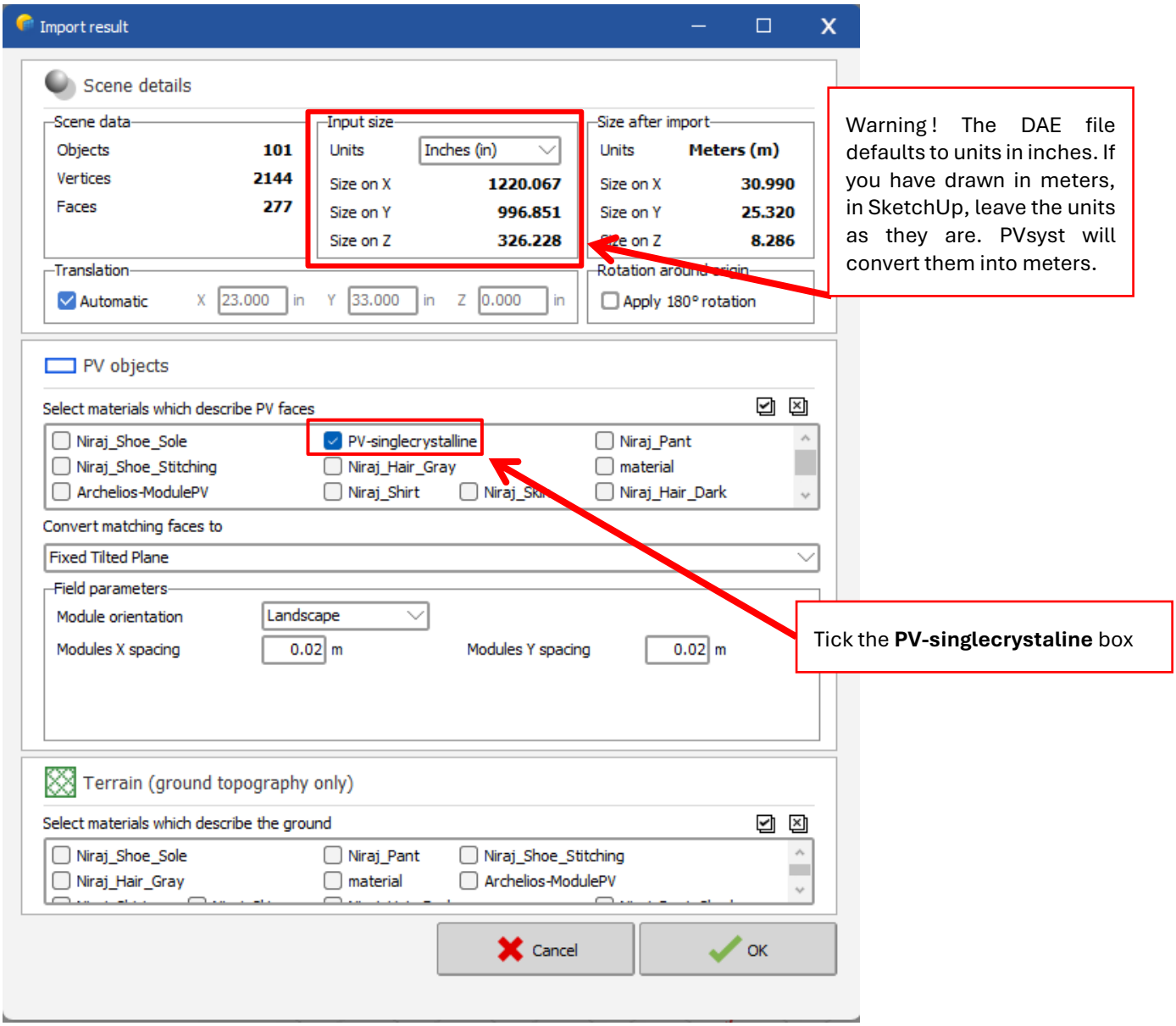


Figure 22 : Importing a DAE file into PVsyst

3 PVcase Ground Mount

You can export a project created in PVcase to PVsyst. There are two PVcase plug-ins for AutoCAD:

- PVcase Ground Mount
- PVcase Roof Mount

In the first part of this tutorial, we will show an example using PVcase Ground Mount and in the second part, an example using PVcase Roof Mount.

For this tutorial, we will create 2 example projects in PVcase Ground Mount:

1. Project without a plot of land or topography
2. Project with land and existing topography imported from the internet.

3.1 Example of a project without land and topography

3.1.1 Defining the project in PVcase

For this tutorial, you will first need to create a project in PVcase with no imported plot of land or topography.

Below is an example of a plot of land measuring 400 meters long and 300 meters wide.

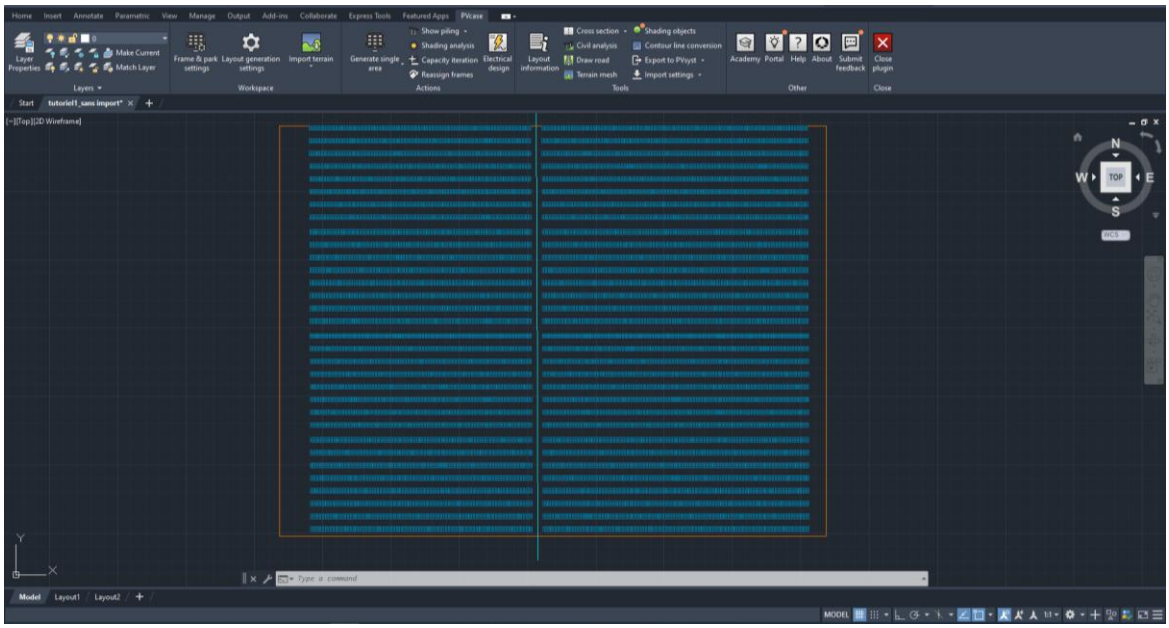


Figure 23 : Scene without imported plot of land in PVcase

3.1.2 Exporting the project to PVsyst

In the main menu, go to the *Tools* bar.

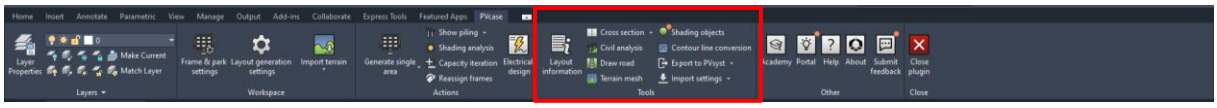


Figure 24 : PVcase menu bar

Click on "*Export to PVsyst*".

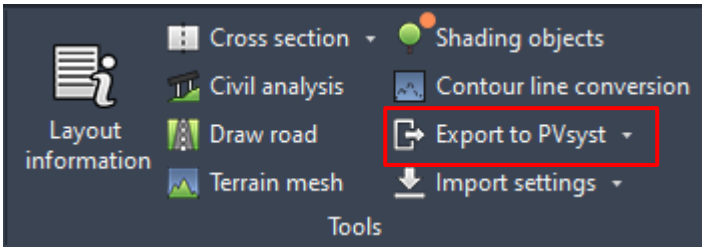


Figure 25 : Tools menu

A new window appears from which you can choose the format to export to PVsyst.

The choice of format depends on your version of PVsyst:

- If your version of PVsyst is 6.8 or lower, you must export in **.***DAE*. format.
- If your version of PVsyst is 7.0 or higher, you should export in **.***PVC*. format.

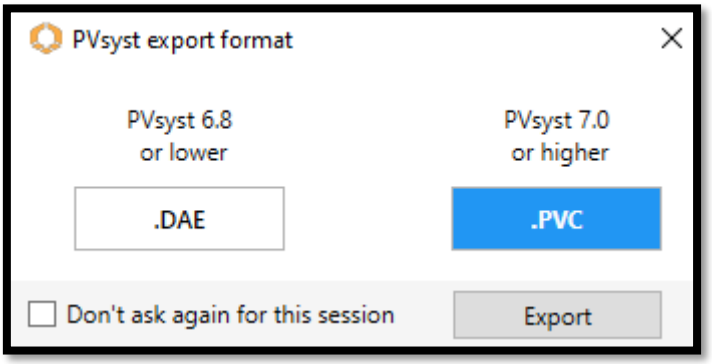


Figure 26 : Window for choosing the export format

NB: For this tutorial, *.PVC* format will be chosen.

Click on "*Export"* and choose the location.

3.1.3 Importing the *PVC* file into PVsyst

Click on *"Near shadings"*.

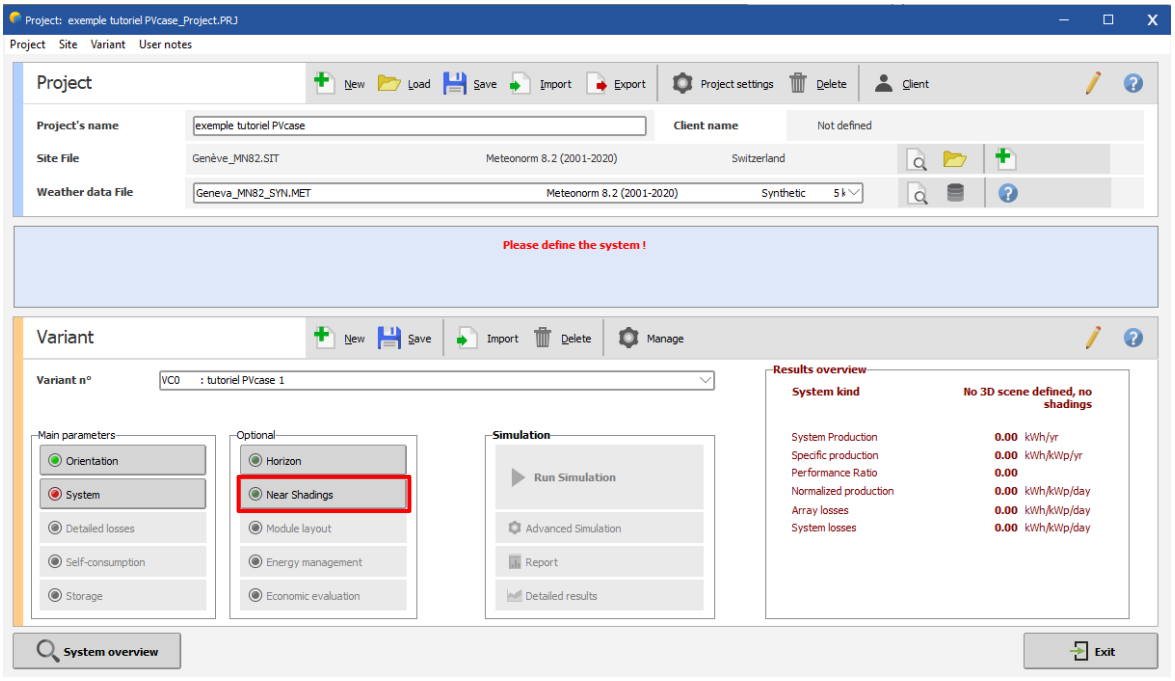


Figure 27 : Projet in PVsyst

The "*Near shadings definition* " window opens. Click on "*Construction/Perspective*".

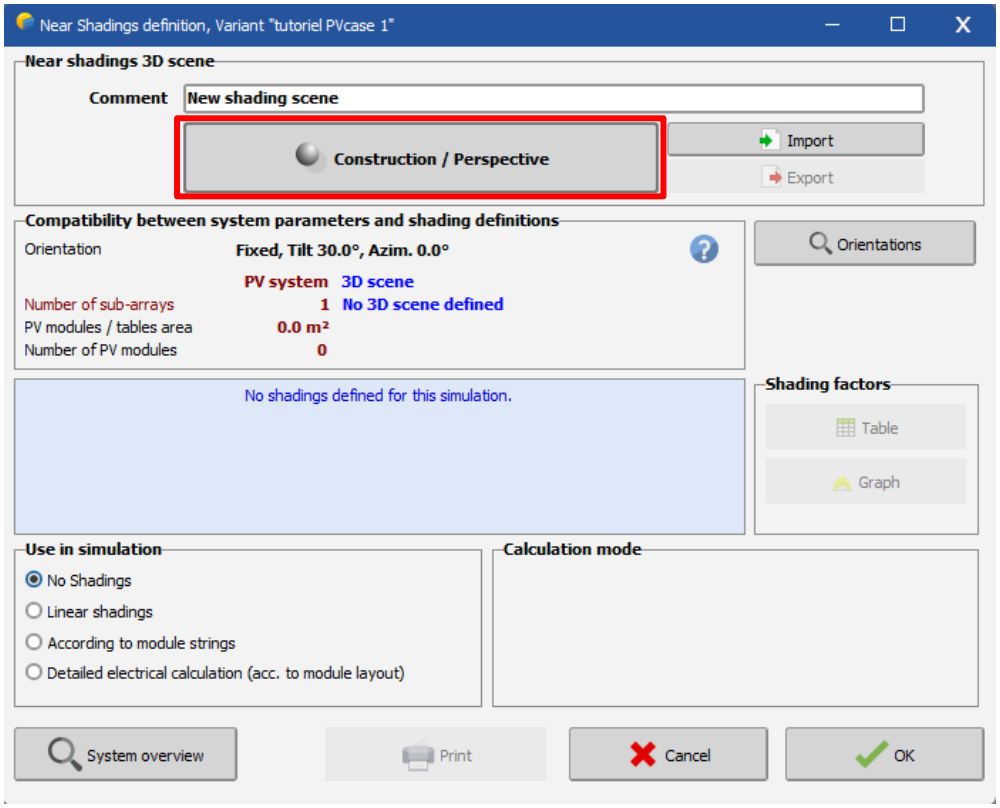


Figure 28 : Defining near shading

The 3D scene window opens. This is where you import the .PVC file.

Click on "*File*".

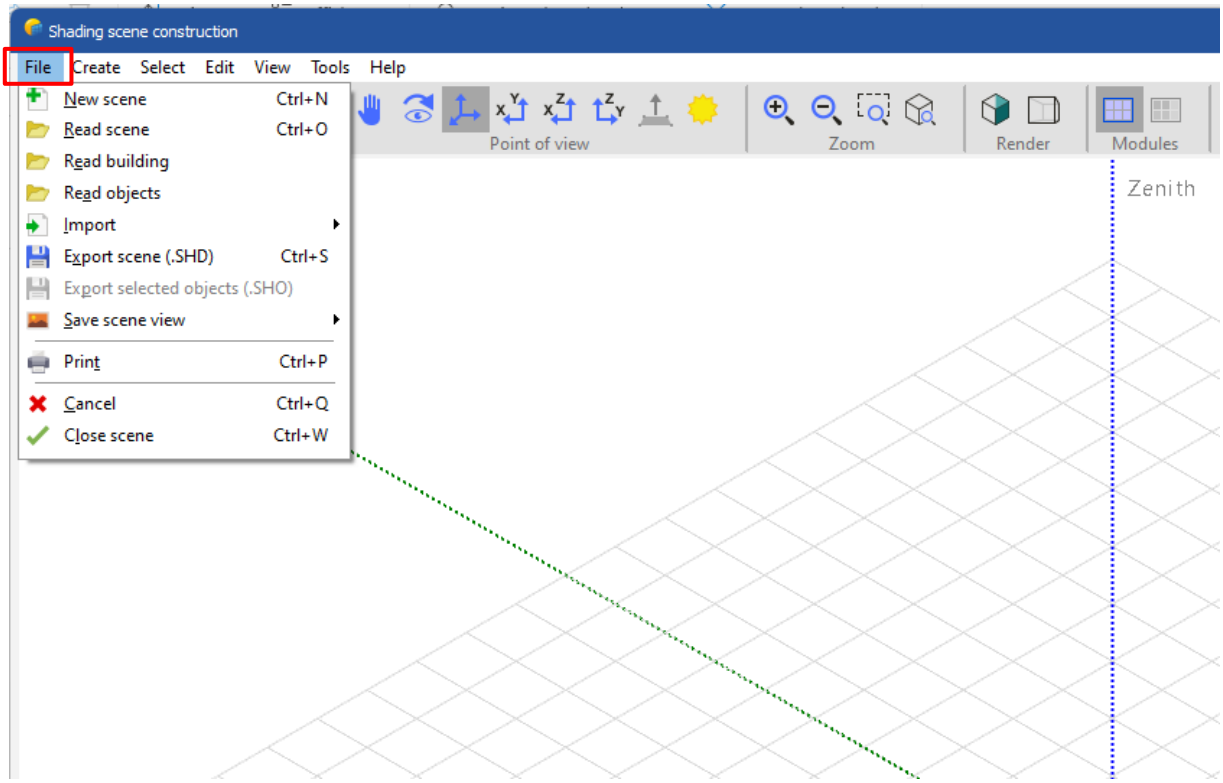


Figure 29: Import PVC file to the 3D scene

Click "*Import*" and "*Import a 3D scene*".

A file explorer opens. Select the PVC file.

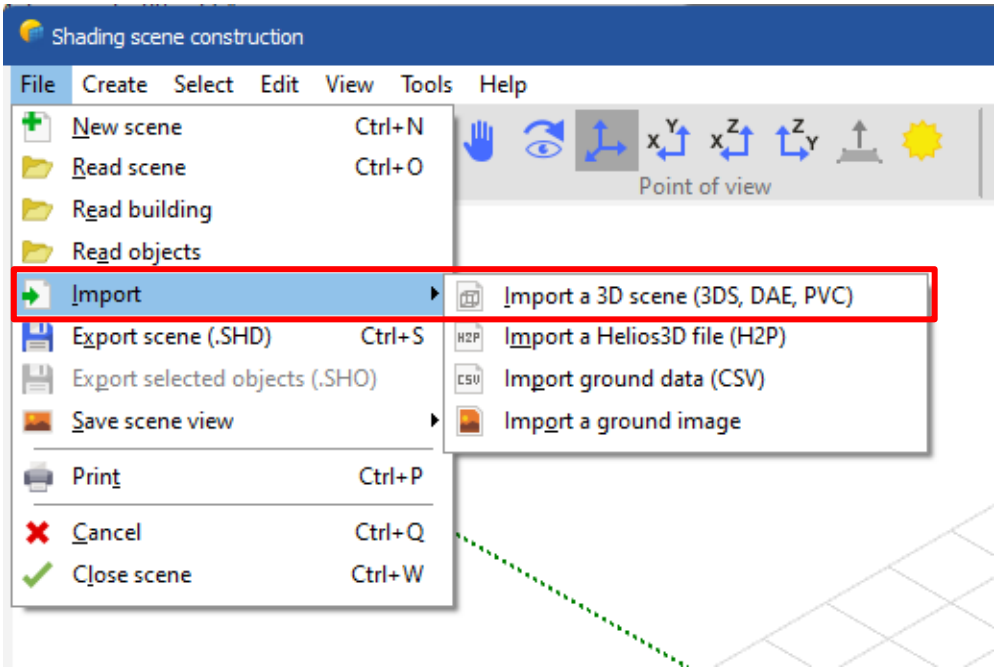


Figure 30 : Selection of PVC file to import to the 3D scene

A window allows you to check the details of the scene. The input file unit is selected automatically but you can change it if it is not the correct one:

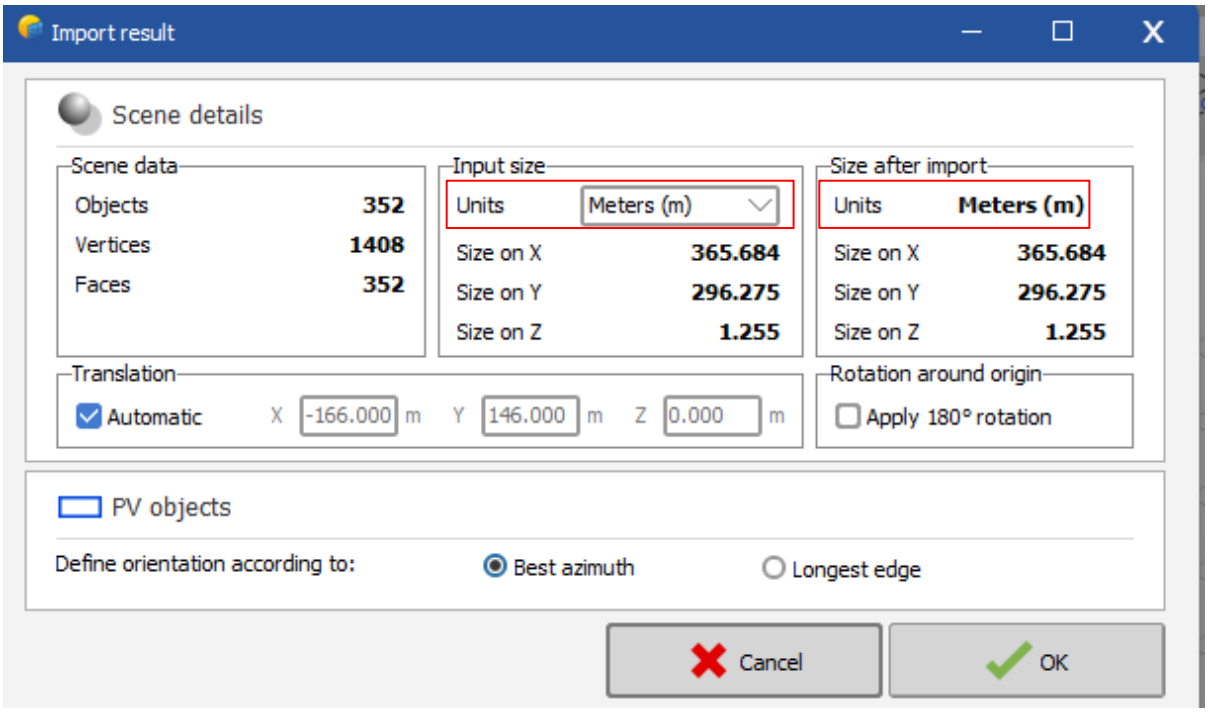


Figure 31 : Import results

Click on the "*OK*" button.

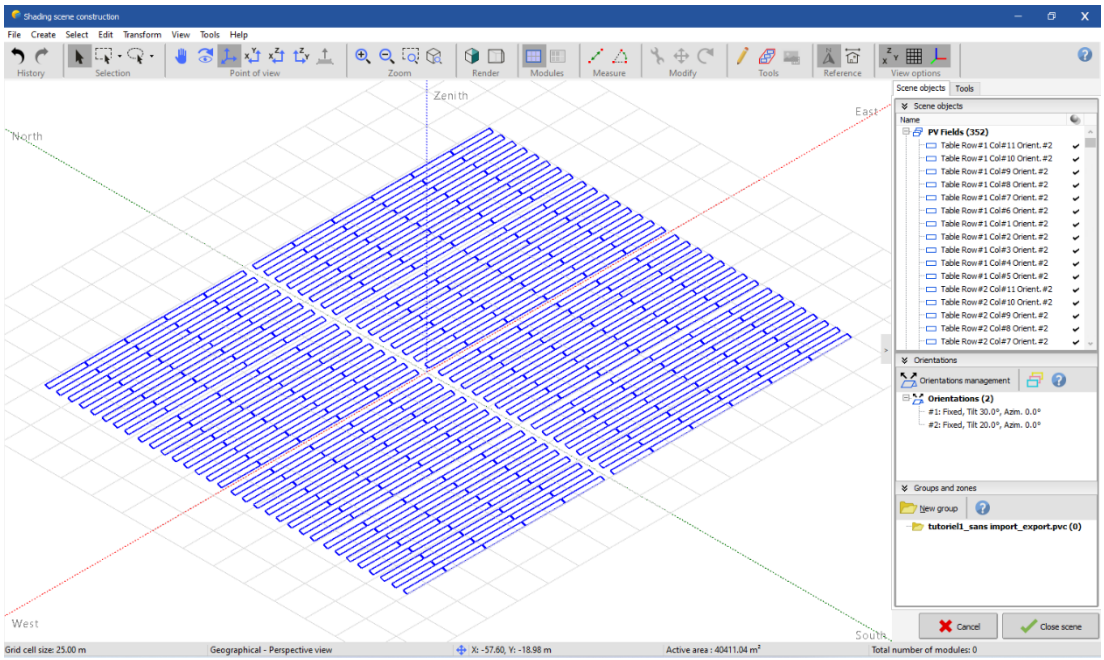


Figure 32 : Imported 3D scene in PVsyst

The scene precisely matches the predefined scene in PVcase. Click on *"Close scene"*.

3.2 Example of a project with a plot of land and topography

3.2.1 Defining the project in PVcase

The project will be created in PVcase with:

- The site with the satellite photo of the imported site
- The topography imported from the internet or created by yourself
- The generated mesh for the plot
- A few trees positioned on the lower side

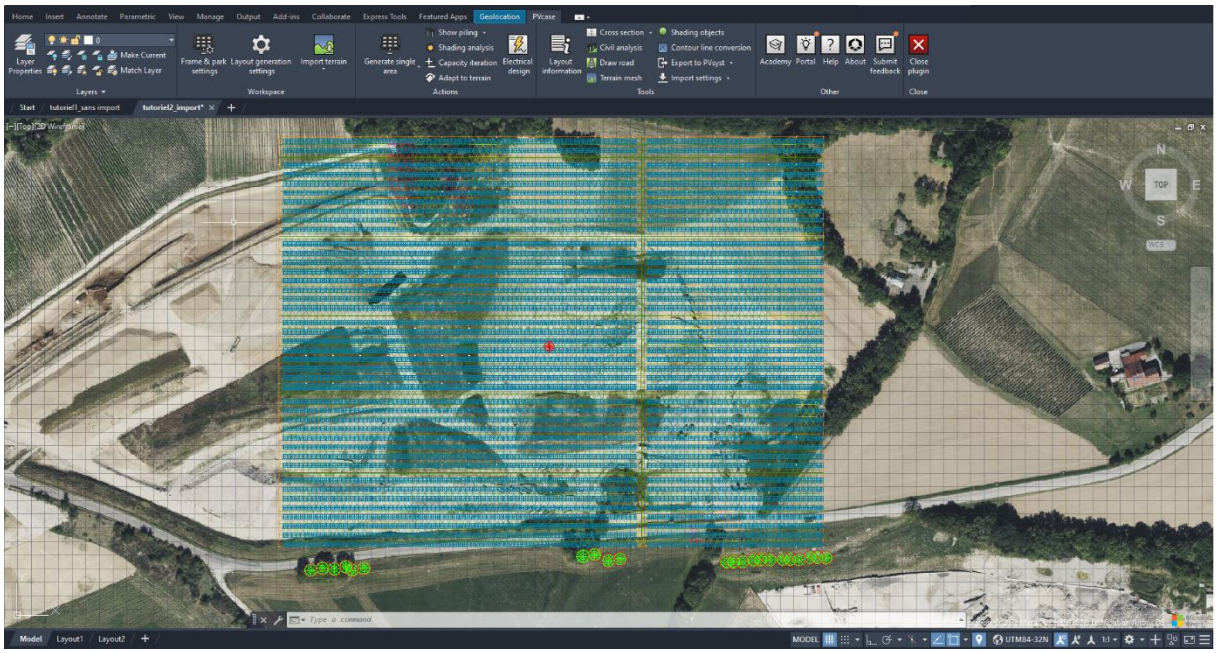


Figure 33 : PVcase project window on a topography imported from the Internet

The targeted zone represents a rectangle measuring 400 meters by 300 meters.

3.2.2 Exporting the project to PVsyst

Exporting occurs in the same way as before (see 3.1.2), except for two details, as defined below.

When you click on "*Export to PVsyst*", you have a choice between two export modes:

- the PV field only, "FRAMES"
- the PV field with topography, "TERRAIN AND FRAMES".

By selecting "TERRAIN AND FRAMES", you export the topography with the PV field.

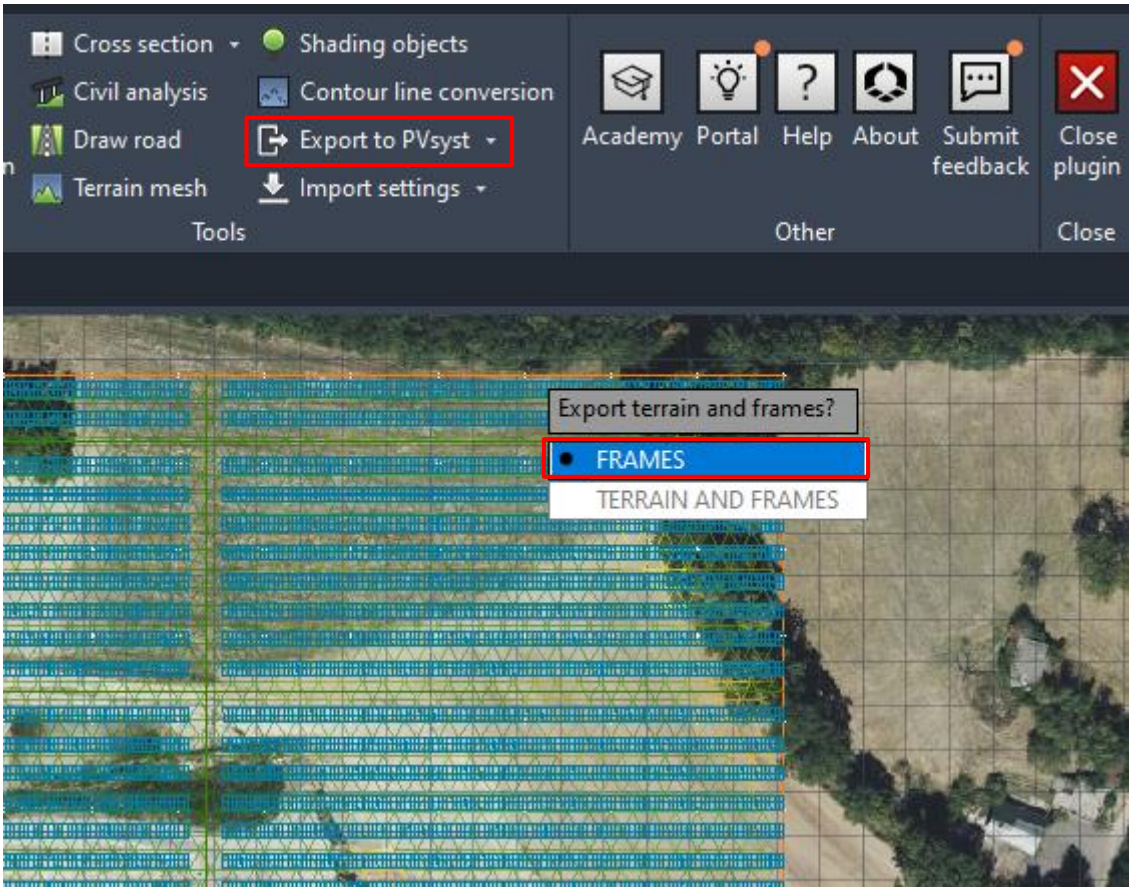


Figure 34 : Choix export sur PVcase Ground Mount

For this tutorial, only the "FRAMES" PV field will be imported.

Click on "FRAMES", then select the file output format *PVC* and finally select the file location.

3.2.3 Importing the *PVC* file into Pvsyst

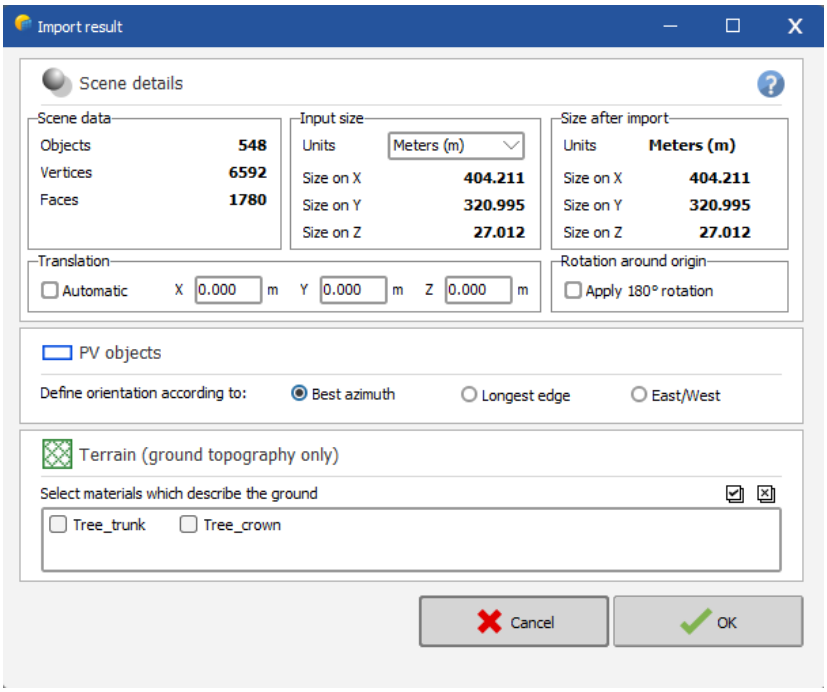


Figure 35 : Import results

The procedure for importing a PVcase project into PVsyst is the same as above (see 3.1.3)

Once the project has been successfully imported, you can see that the scene precisely matches the same scene defined in PVcase.

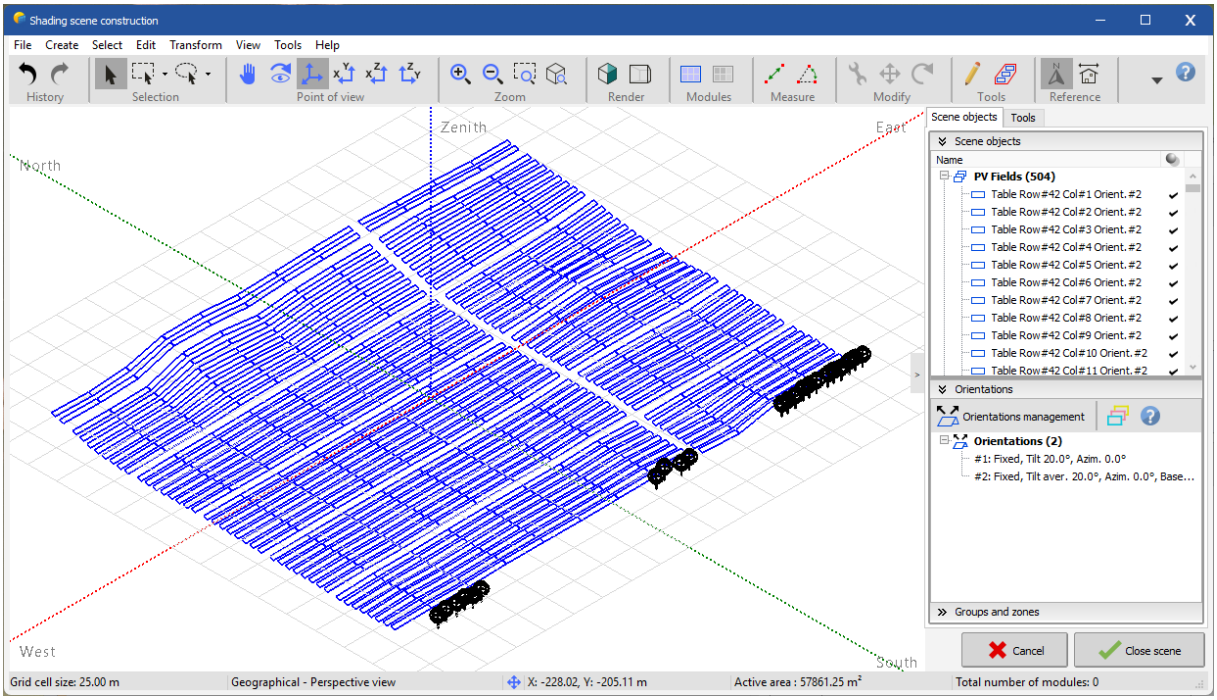


Figure 36 : Imported 3D scene in PVsyst

In this configuration, depending on the topography, the PV tables might have several orientations, but in this example, PVsyst has grouped all the tables and averaged them to create a single orientation. In addition, the trees defined in PVcase have also been imported.

4 PVcase Roof Mount

4.1 Defining a project

First you must define a project with the PVcase Roof Mount plug-in.

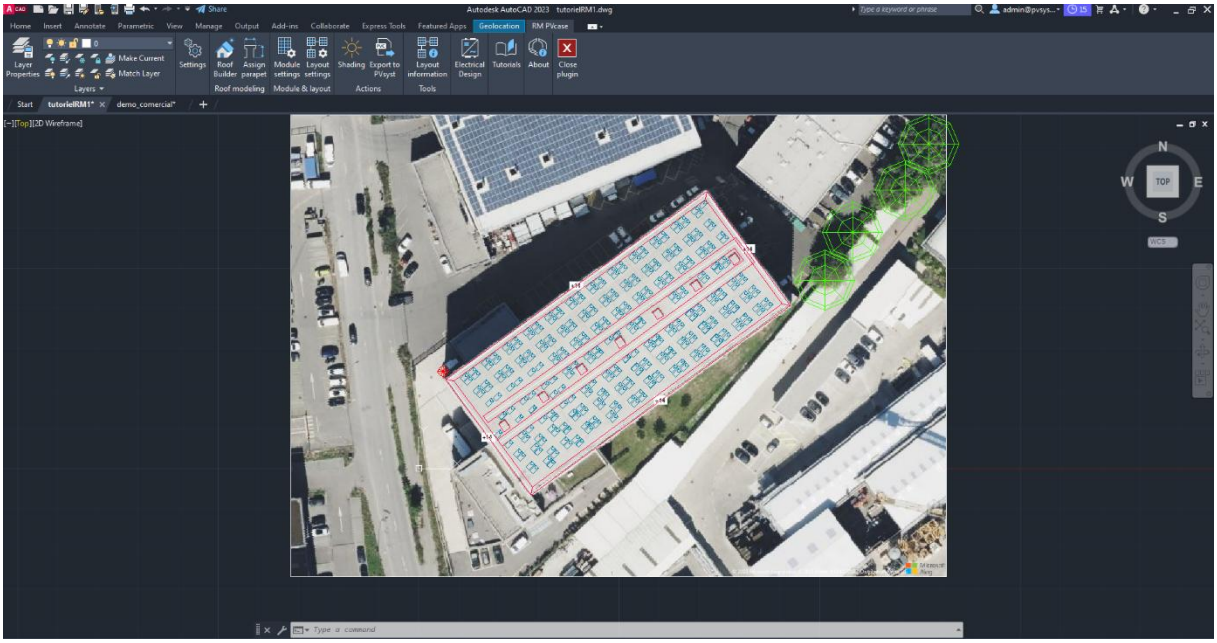


Figure 37 : Example of a 3D scene project in PVcase Roof Mount

A building with a large roof was selected. Using PVcase, PV modules were automatically placed with an azimuth of 45° and a tilt of 20°. Also, 4 trees were placed in the top right-hand corner. The azimuth configuration in PVcase is the same as in PVsyst.

4.2 Export procedure

In the main menu, go to the "*Actions*" toolbar.

Then click on "*Export to PVsyst*".

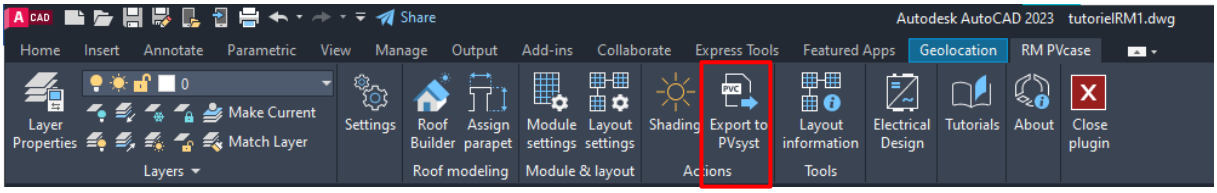


Figure 38 : PVcase Roof Mount menu toolbar

AutoCAD will ask you to select the elements to be exported. Select the entire 3D scene.

The window will open and ask you to choose the format. Click on *.PVC* format, then on "Export"..

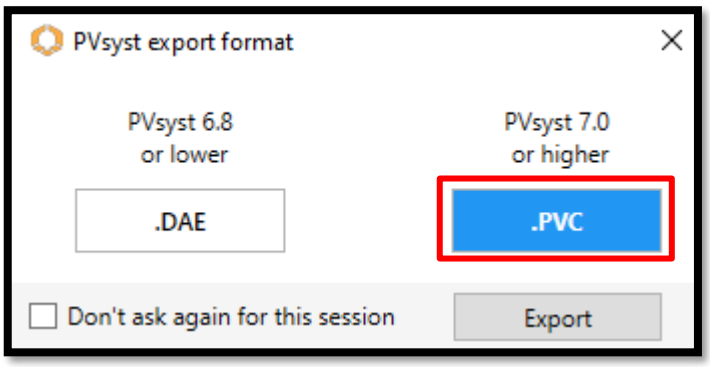


Figure 39 : PVsyst export format

Select the file location, and the export is complete.

4.3 Import to PVsyst

In PVsyst, click directly on *"Near shadings"* without defining "*Orientation*" nor "*System*".

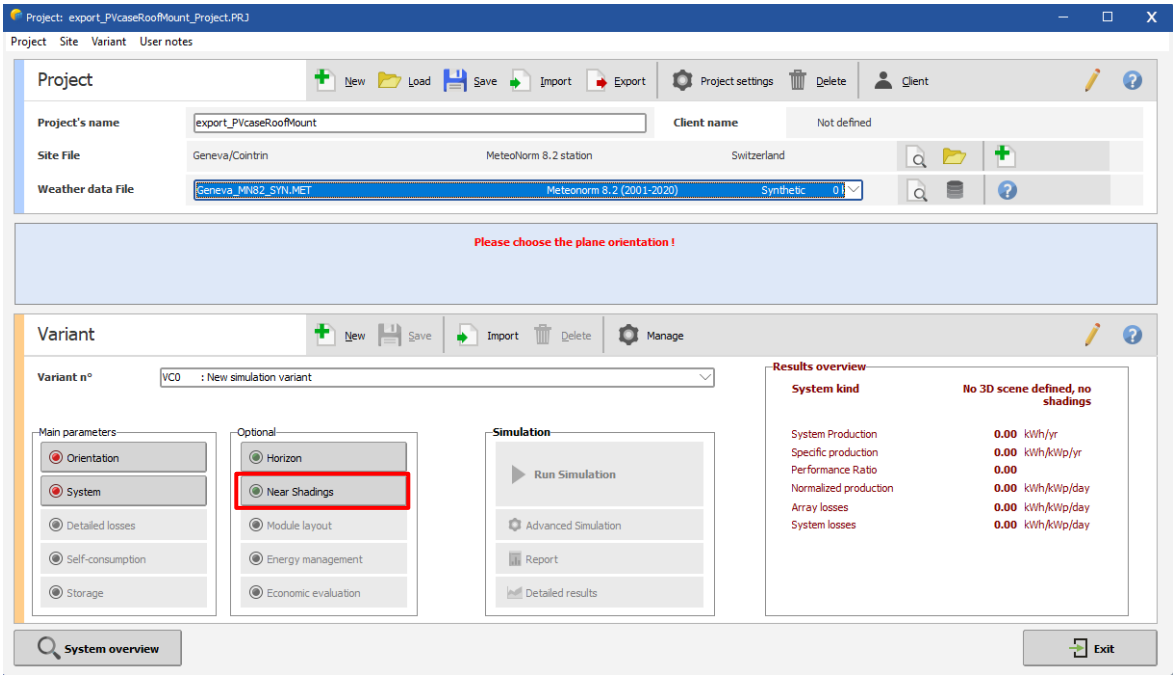


Figure 40 : PVsyst window

Click on "*Construction/Perspective*".

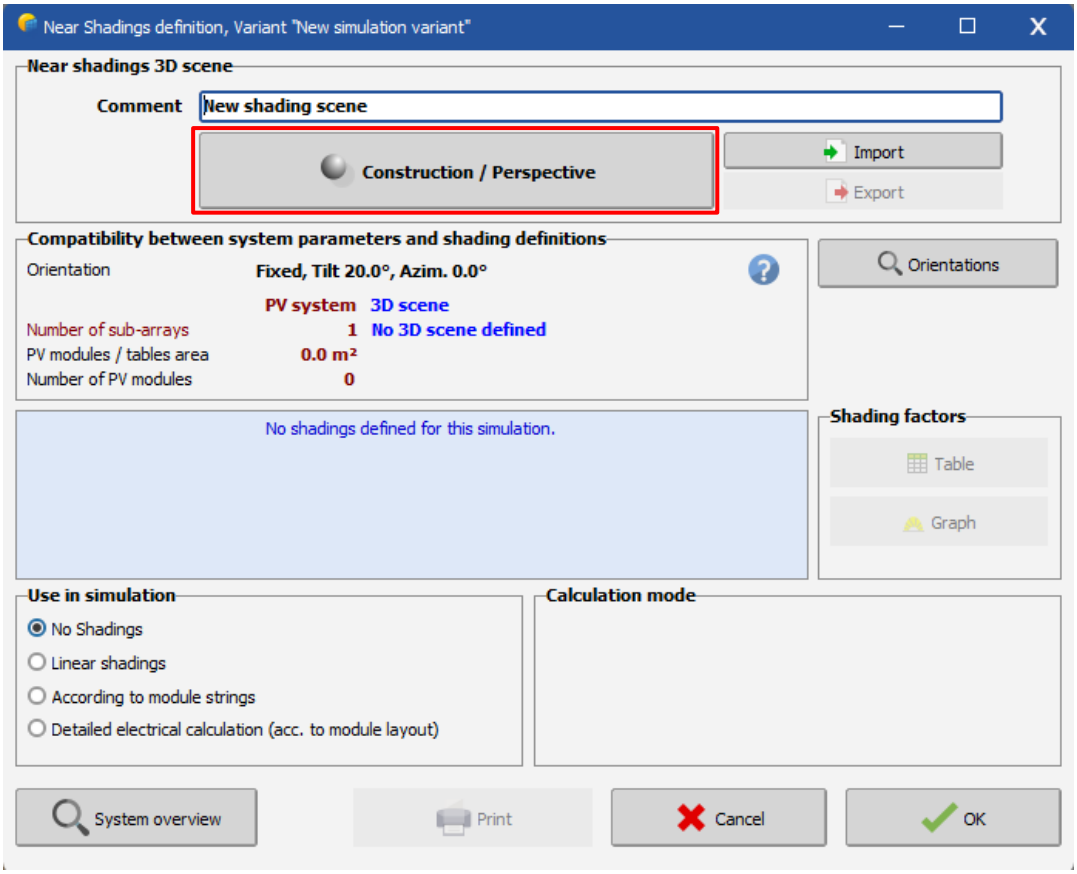


Figure 41 : "Near shading" window

Then click on "*File*", "*Import*", and finally "*Import a 3D scene (*3DS, CAD, PVC)*"

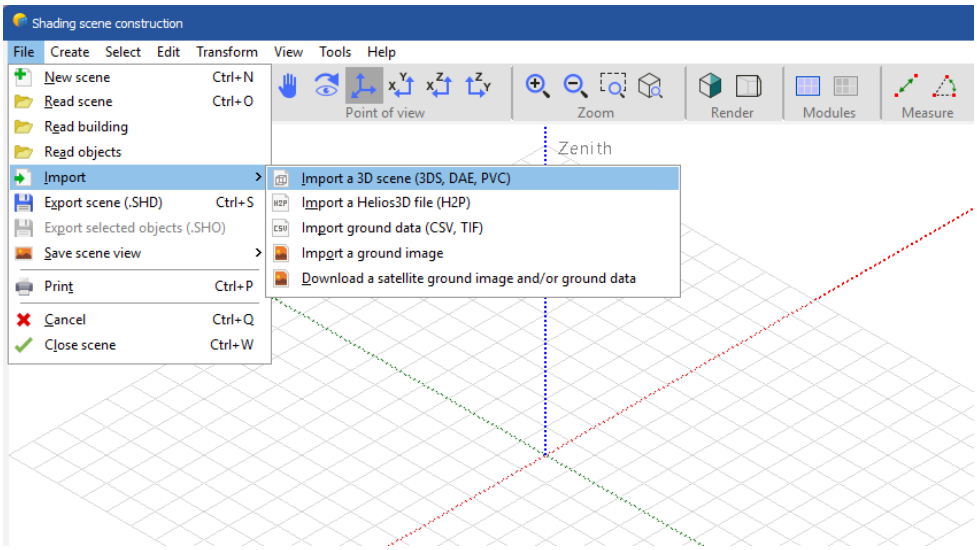


Figure 42 : 3D scene before import

Click on "*OK*".

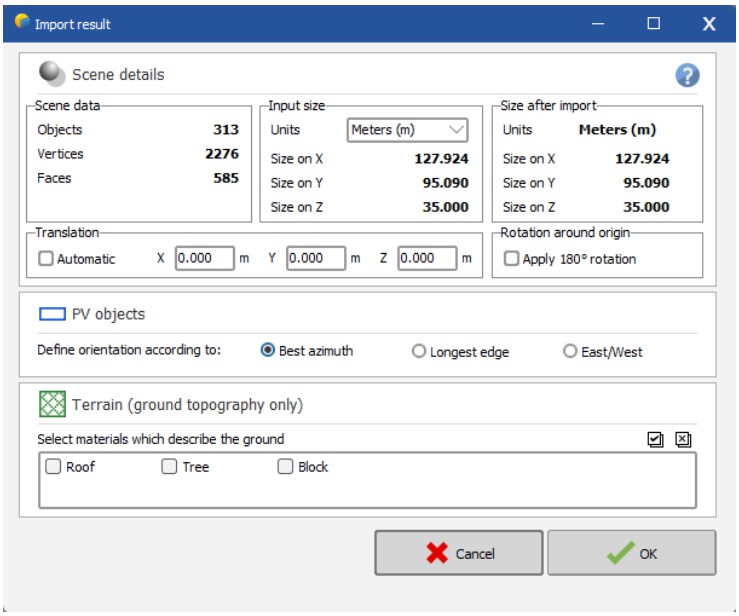


Figure 43 : Import Results

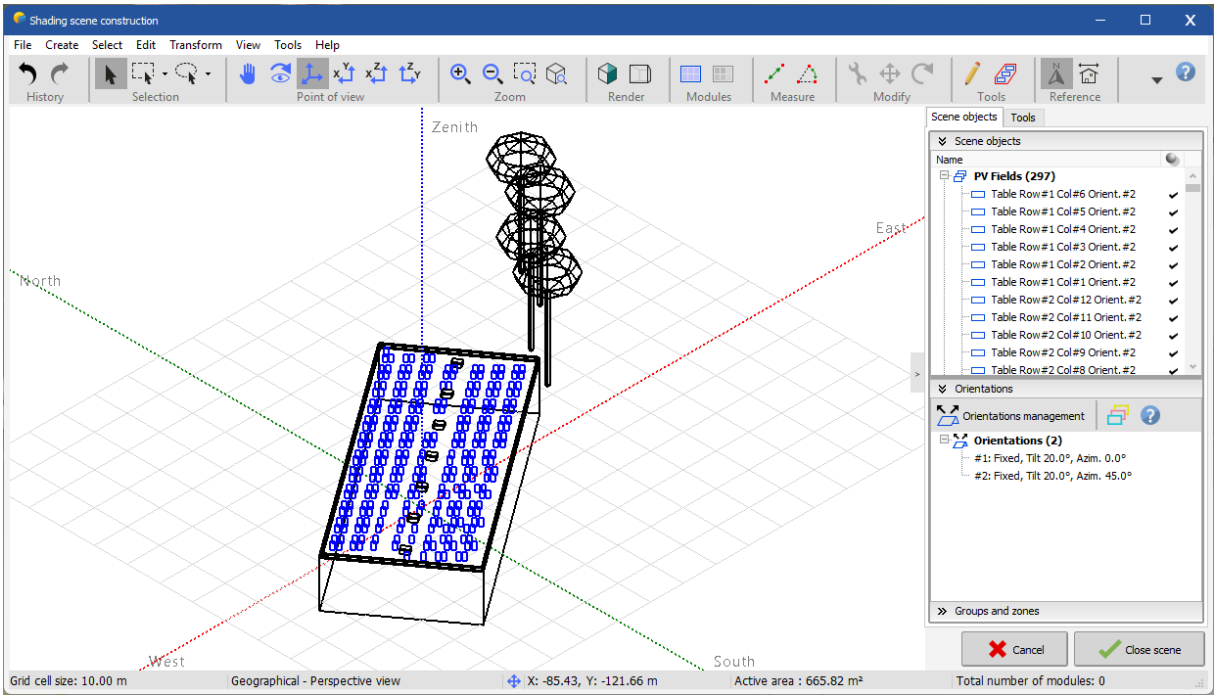


Figure 44 : 3D scene after import

The scene has been imported into PVsyst. You can see that all the elements defined in PVcase have been imported.

5 PVcase to PVsyst version 6.8 or earlier

It is possible to import a PVcase project into PVsyst version 6.8 or earlier. The procedure is explained below.

5.1 Defining a project

Let's go back to the previous project example, a PV system on a topography with objects that needs to be created.

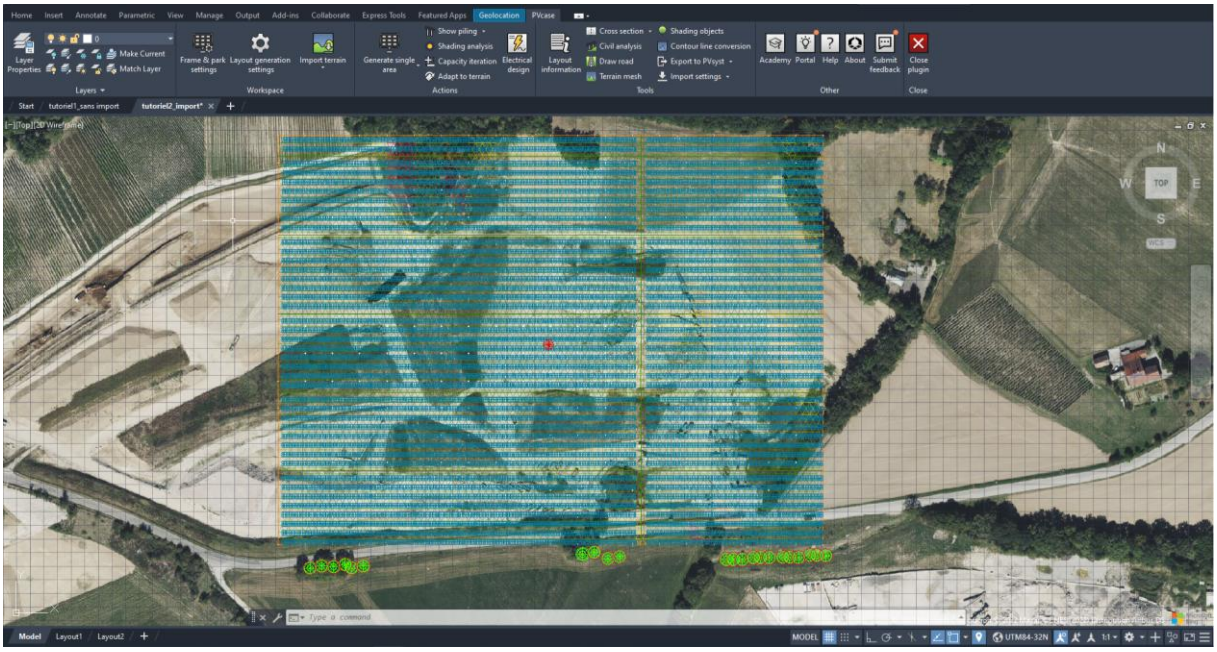


Figure 45 : PVcase project window on a topography imported from the Internet for PVsyst v. 6.8

5.2 Export procedure

To export, click on "*Export to PVsyst*", and select "*FRAMES*" to export PV tables and objects only.

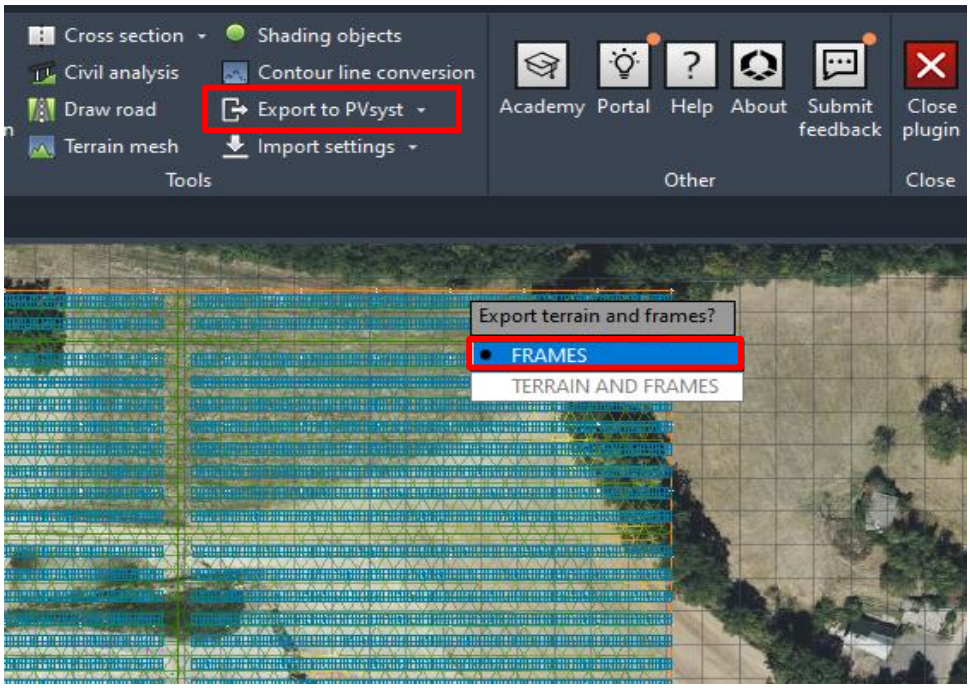


Figure 46 : Choice of export on PVcase Ground Mount for PVsyst v. 6.8 8

Choose the *DAE* format to export to PVsyst version 6.8 or earlier and click on "*Export*", then save the file in a dedicated folder.

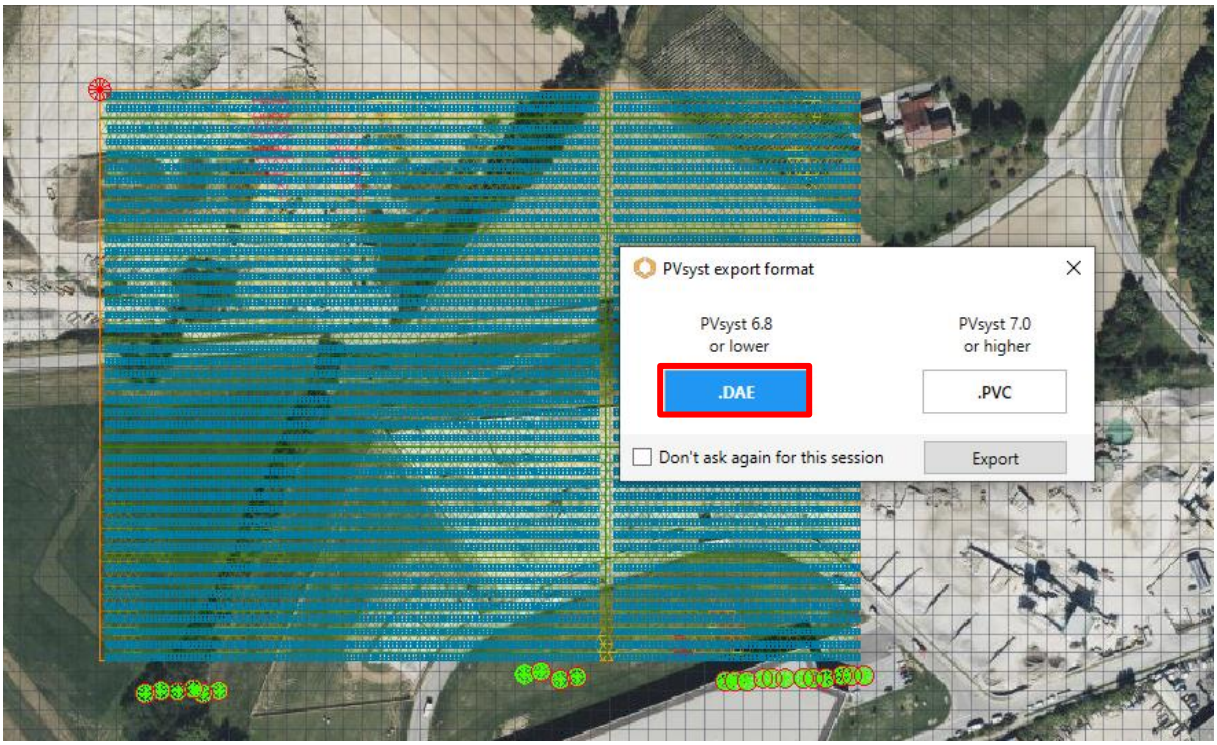


Figure 47 : Choice of DAE format for PVsyst v. 6.8

6 Virto CAD

With the Virto.CAD plug-in in AutoCAD, you can define a scene on a terrain or on a building and export it in PVC format, to then import it into PVsyst.

As a reminder, it is not necessary to export the topography to PVsyst, as this will have no influence on the shading calculation.

In this description, a simple scene with no topography and no shading objects will be used.

6.1 Defining a project

You must first define a project using the Virto.CAD plug-in. The project is a PV field without imported topography. The field measures 300 meters by 200 meters.

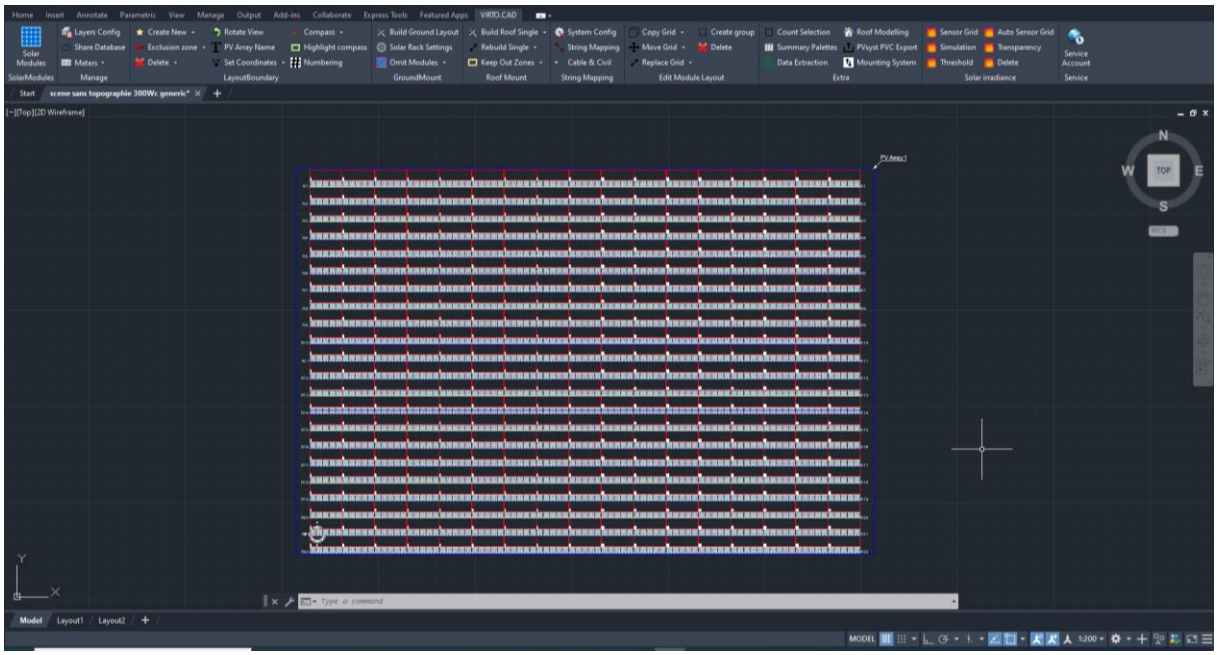


Figure 48 : Field scene PV Virto.CAD

6.2 Export procedure

To export a file to PVsyst, carry out the following steps:

In the Virto.CAD ribbon, go to "*AutoCAD*", then to the "*Extra*" section and finally to "*PVsyst PVC Export*".

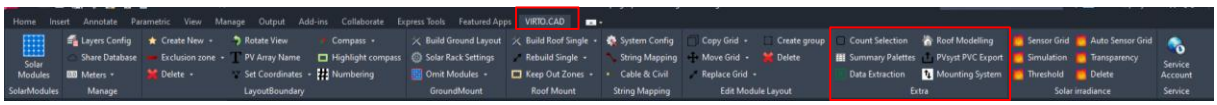


Figure 48 : Virto.CAD ribbon

A new window opens, in which you need to specify the exported file destination.

Click on 

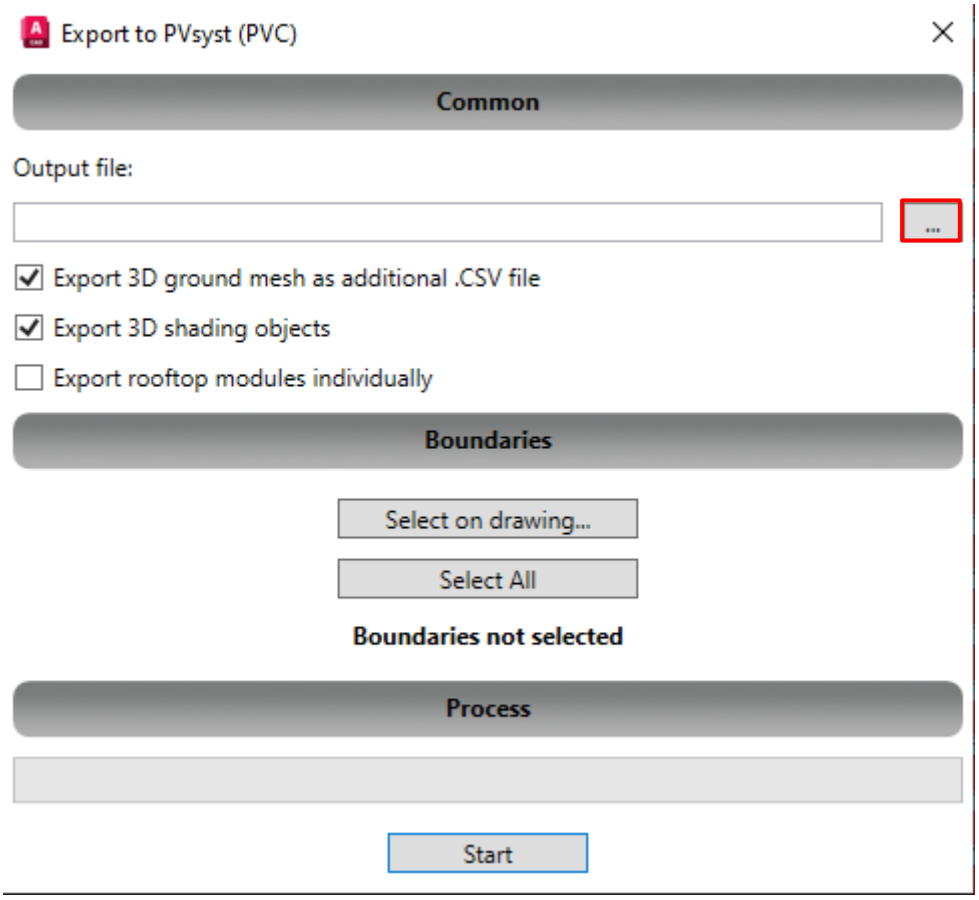


Figure 50 : Dialog to export to PVsyst

Choose a dedicated folder to export the *PVC* file.

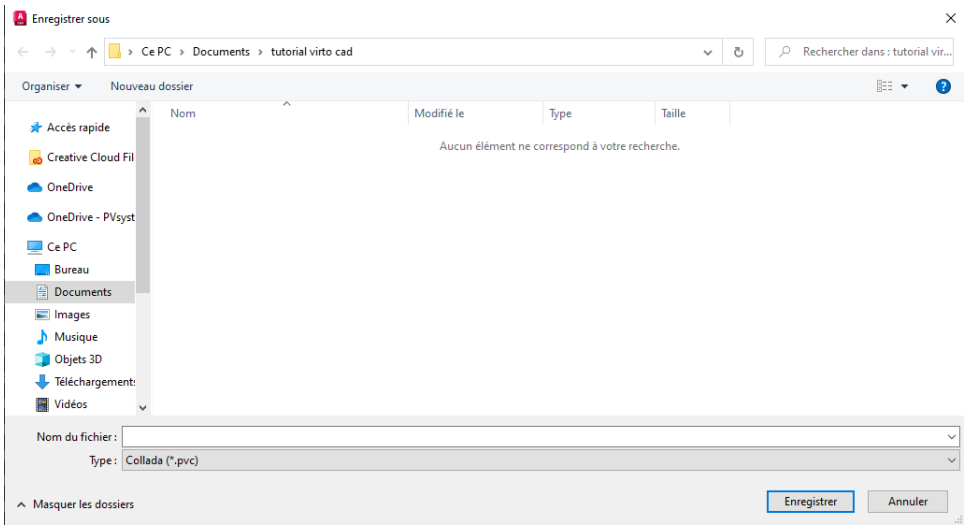


Figure 49 : Dialog to export to PVsyst

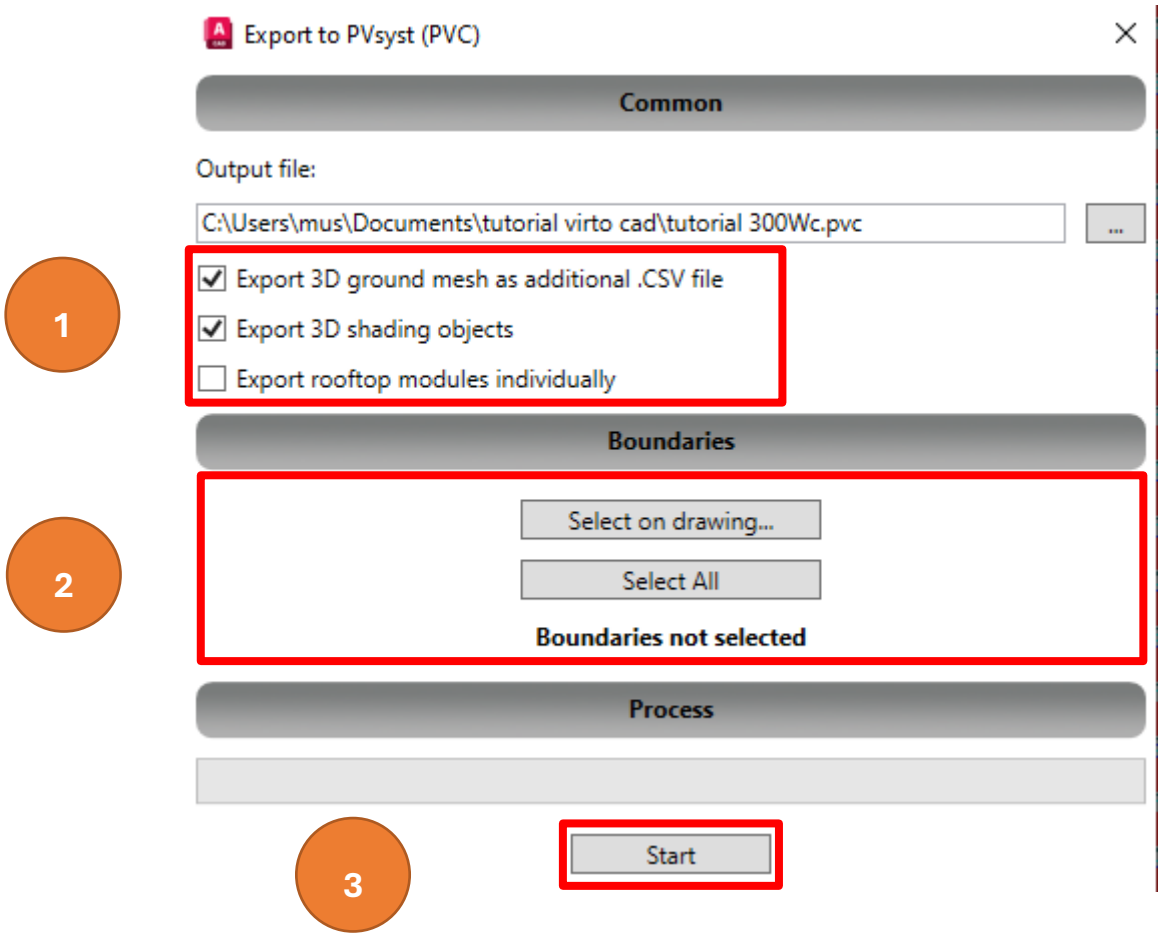


Figure 51 : Choice of export option to PVsyst

1 "*Common*": specify the options you wish to export.

- 3D ground meshes: for PV systems with topography
- 3D shading objects: for PV systems with ground and/or roof objects
- Rooftop modules individually: for rooftop systems only

2 "*Boundaries*": you can select part or the whole 3D scene.

Warning! You can only select boundaries within the same orientation. If you have different orientations, different exports must be made for each orientation.

3 "*Process*": click on "*Start*" to create the export file.

6.3 Importing a Virto.CAD PVC file into Pvsyst

In PVsyst, click directly on "*Near shadings*" without defining "*Orientation*" nor "*System*".

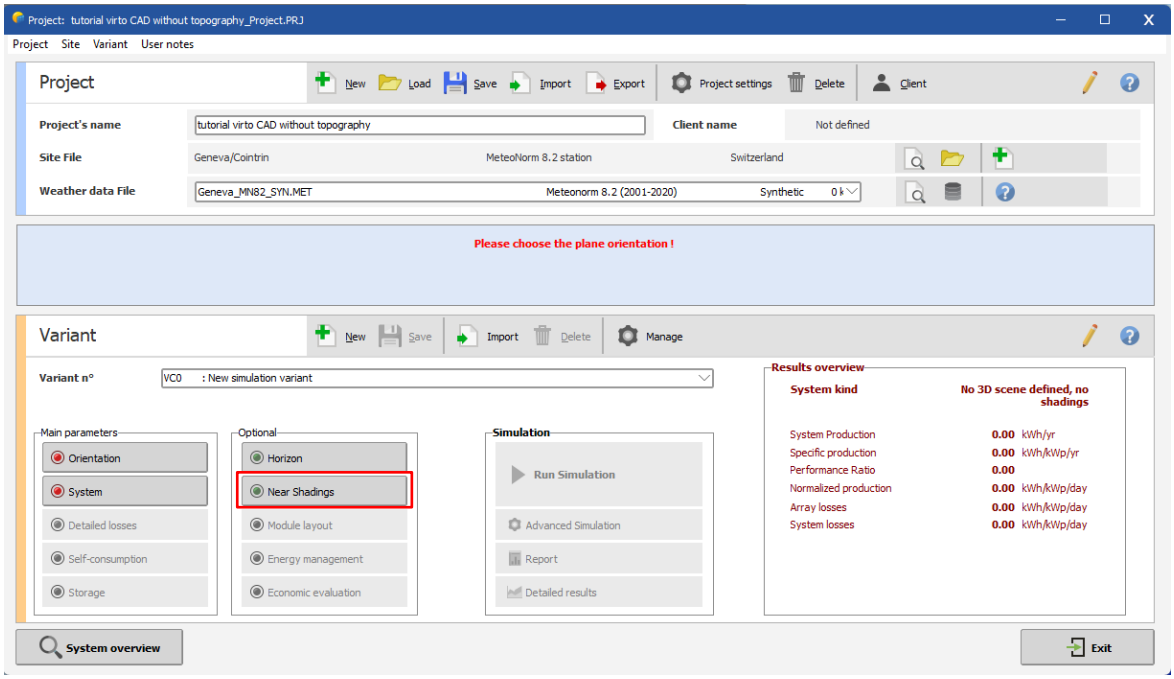


Figure 53 : PVsyst Virto.CAD project window

In this new window, click on "*Construction/Perspective*".

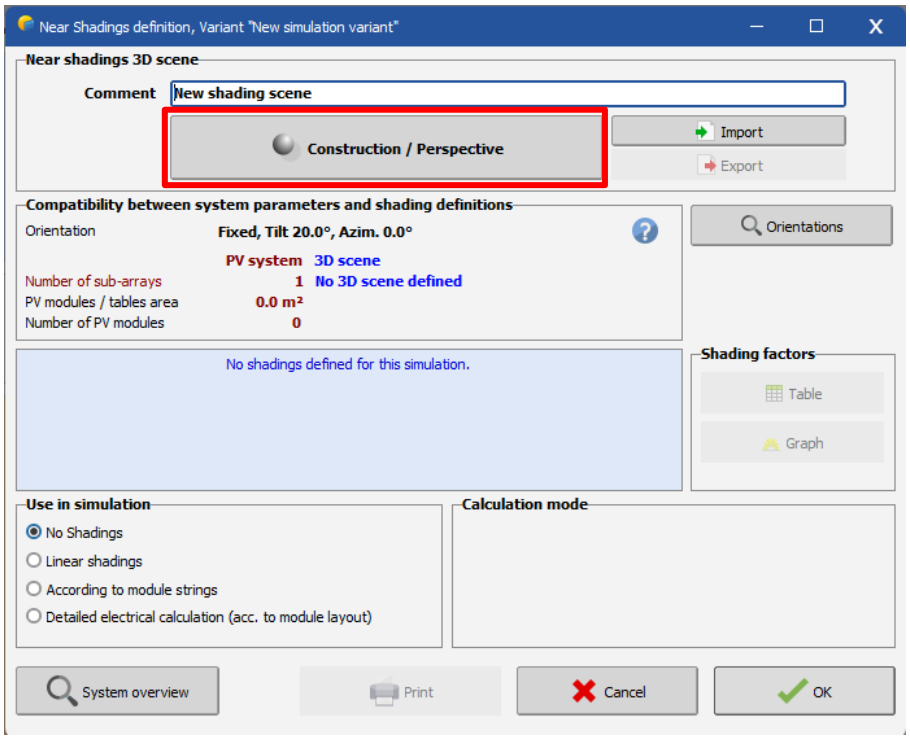


Figure 52 : PVsyst dialog to define shading

The new 3D scene window opens. Click on "*File*", then on "*Import*". Select "*Import a 3D scene (3DS, DAE, PVC)*".

Select the *PVC* file previously exported with Virto.CAD.

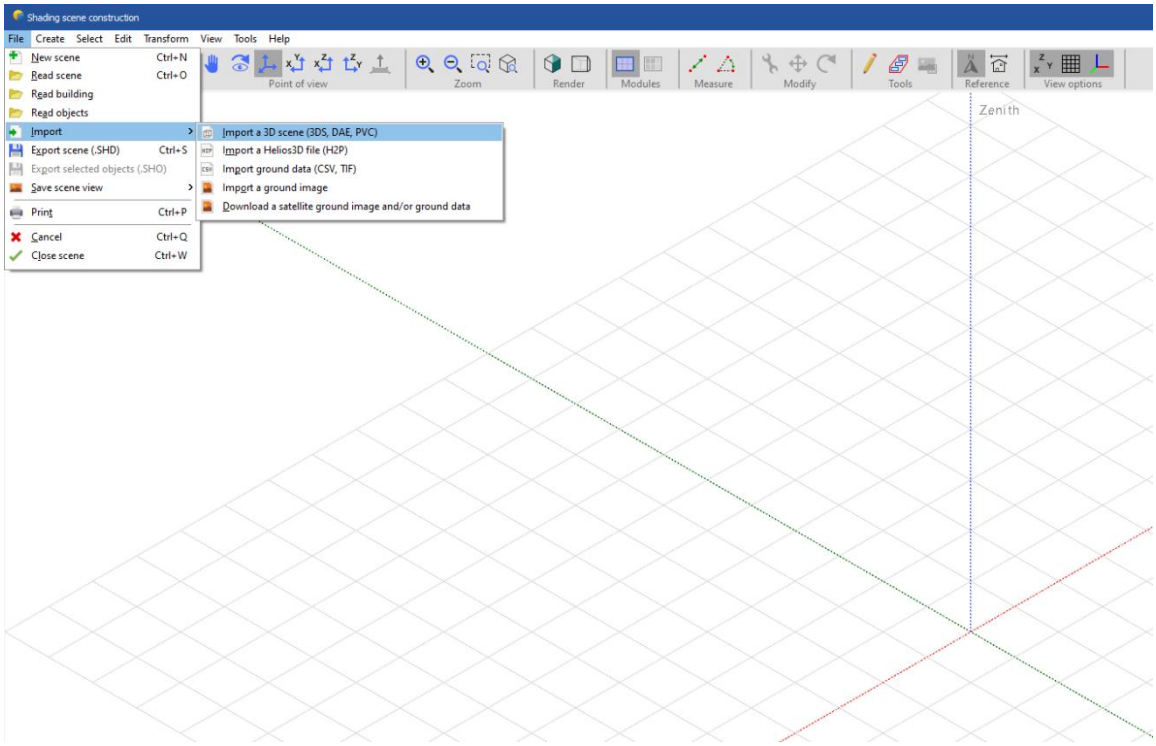


Figure 54 : Shading scene PVsyst-import PVC

The “Import Results window provides information about the PVC file. If the objects are already close to the origin, translation to it is not suggested. If the objects are at a distance greater than 5 km, translation is automatically calculated. If you want PVsyst to center the scene at the origin of the 3D view, click on 'Automatic': the translation values will then be recalculated. Click on "*OK*".

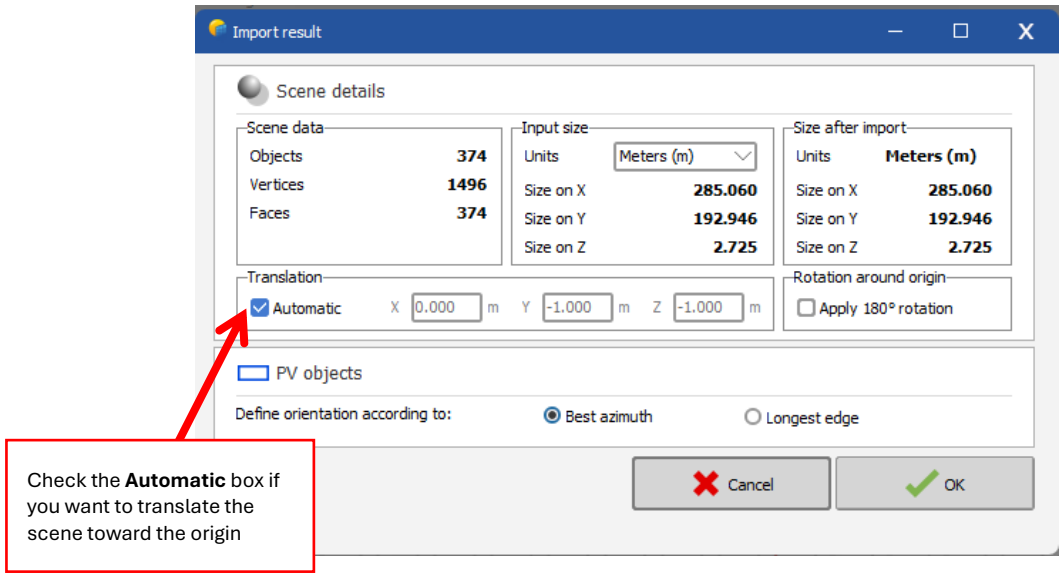


Figure 55 : Import results

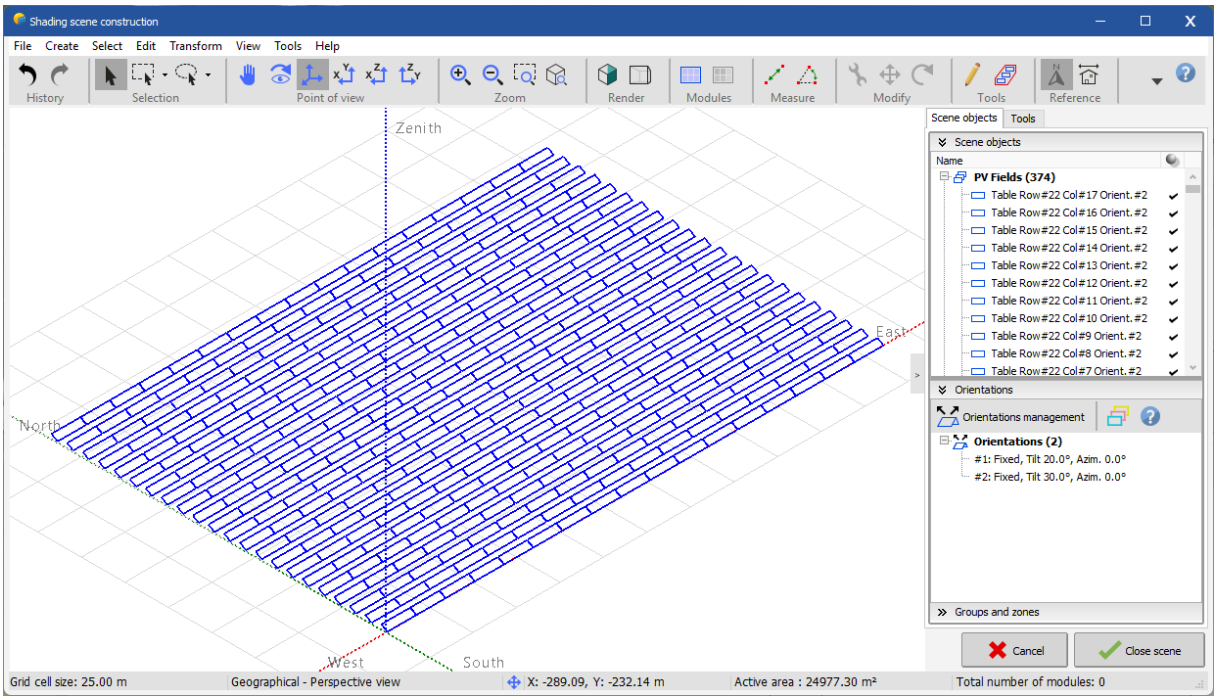


Figure 56 : PVC imported into the shading scene

The 3D scene is imported and centered.

7 Helios 3D

7.1 Defining a project

A project must be defined beforehand using the HELIOS3D plug-in in Civil3D. The project is a PV field on a topographic surface configured with the Civil 3D tools.

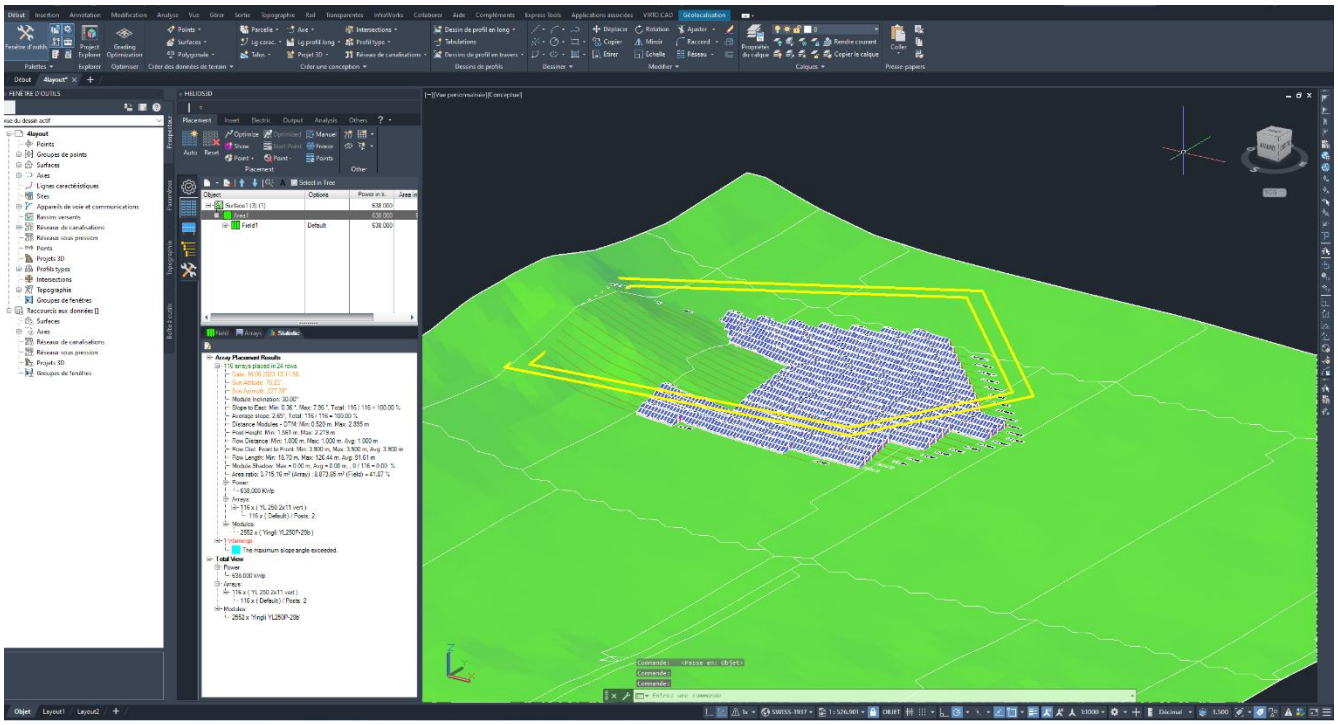


Figure 57: 3D scene in Civil3D

7.2 Export procedure

To export a file to PVsyst, follow the below procedure:

Under the HELIOS3D tab, click on "*Output*", then on the PVsyst button to export a file in *.h2p* format

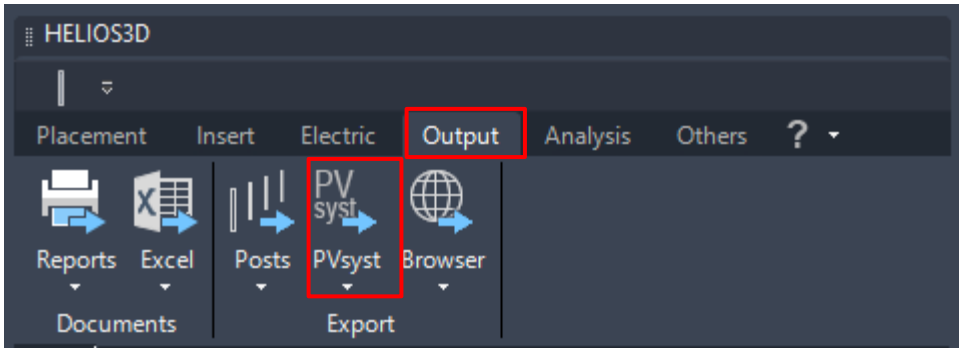


Figure 58: HELIOS3D tab

In the export window, save your file in *.h2p* format to the desired location by clicking on the "*Save*" button.

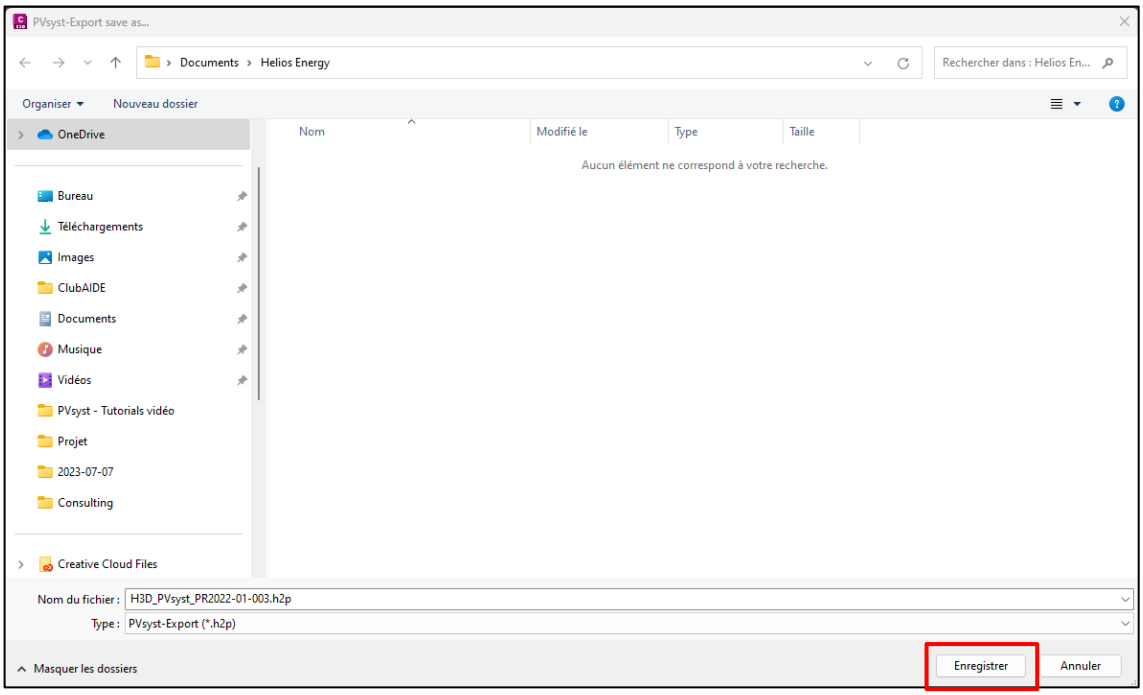


Figure 59: Export .h2p file

Your project is exported in.*h2p*. format.

7.3 Importing an .h2p file into PVsyst

In PVsyst, click directly on "*Near shadings*" without defining "*Orientation*" nor "*System*".

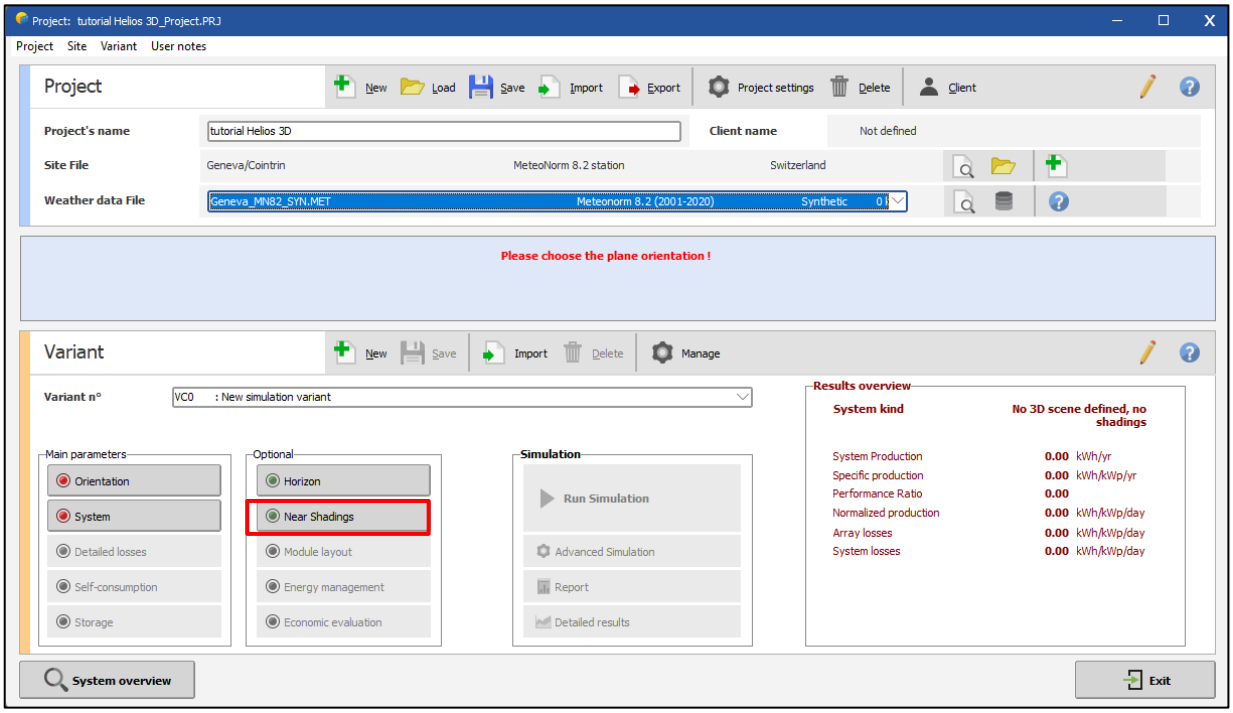


Figure 60: General PVsyst window

In this new window, click on "*Construction/Perspective*".

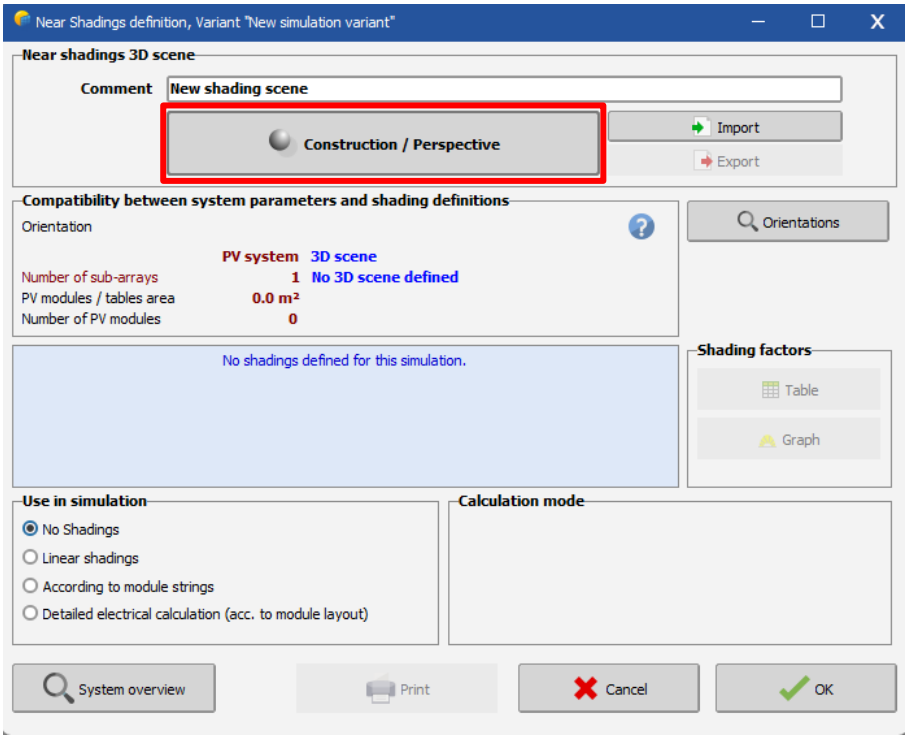


Figure 61: Near shading dialogue box

The new 3D scene window opens. Click on "*File*", then on "*Import*" and finally on "*Import a Helios3D (H2P) file*".

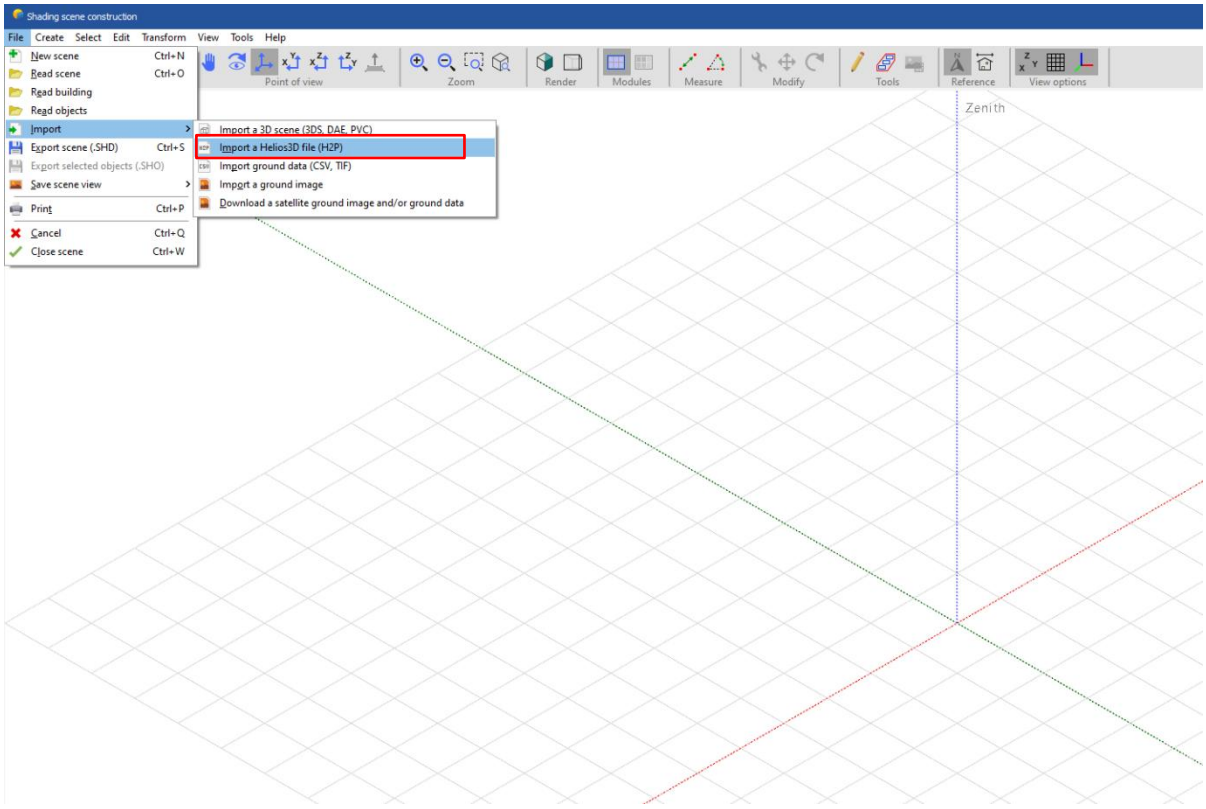


Figure 62: Import 3D scene file in PVsyst

Select the *h2p* file previously exported with Helios3D.

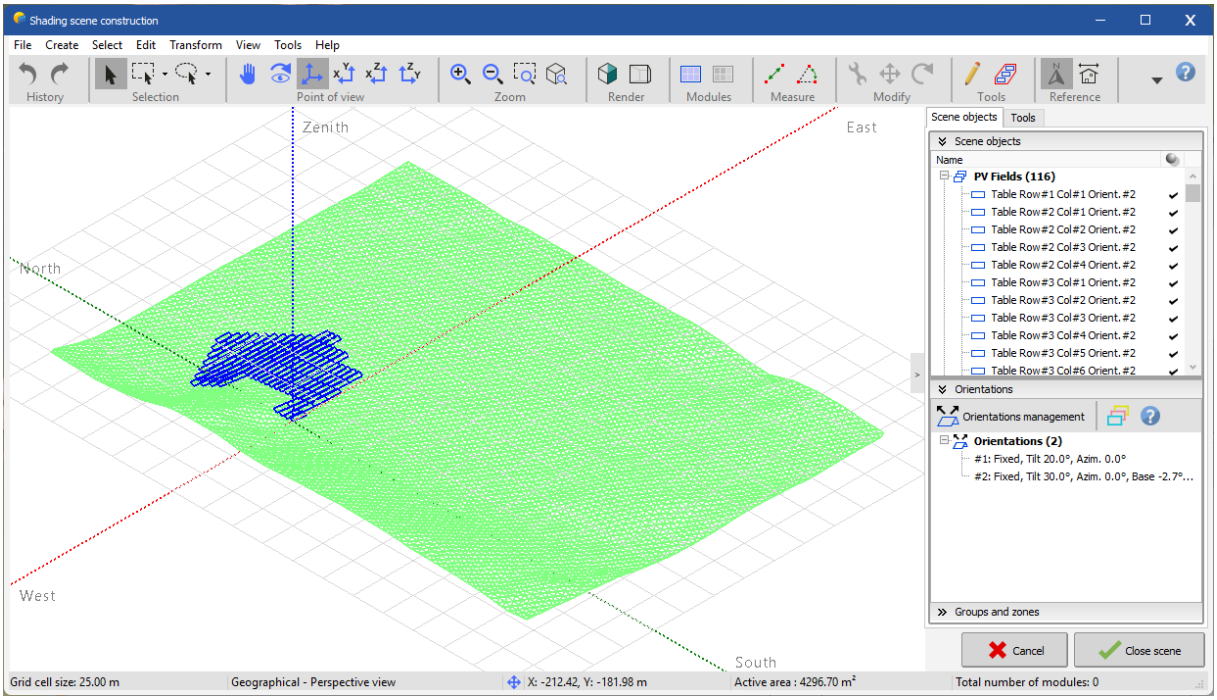


Figure 63: 3D scene in PVsyst with imported file

The *h2p* file is correctly imported into the PVsyst 3D scene.

8 Importing PVC file with multiple orientations and topography

We demonstrate how in PVsyst version 8, the importation of a PVC file with two orientations and topography reacts.

In Pvsyst window, click on “Near shadings”.

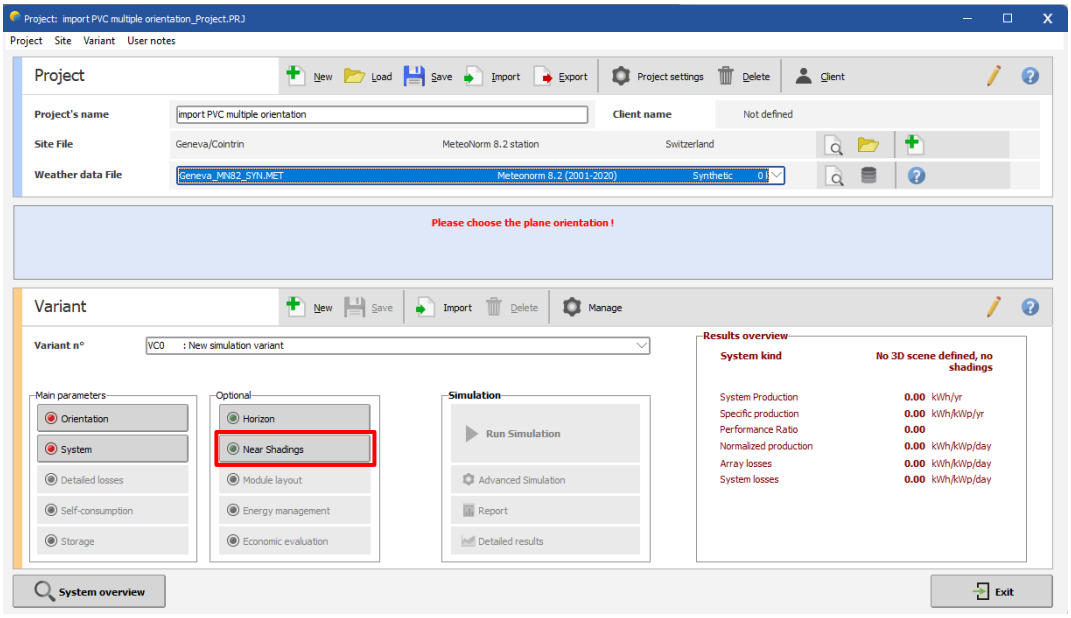


Figure 64: PVsyst window for multiple orientation import

The "Near shadings definition" window opens. Click on "Construction/Perspective".

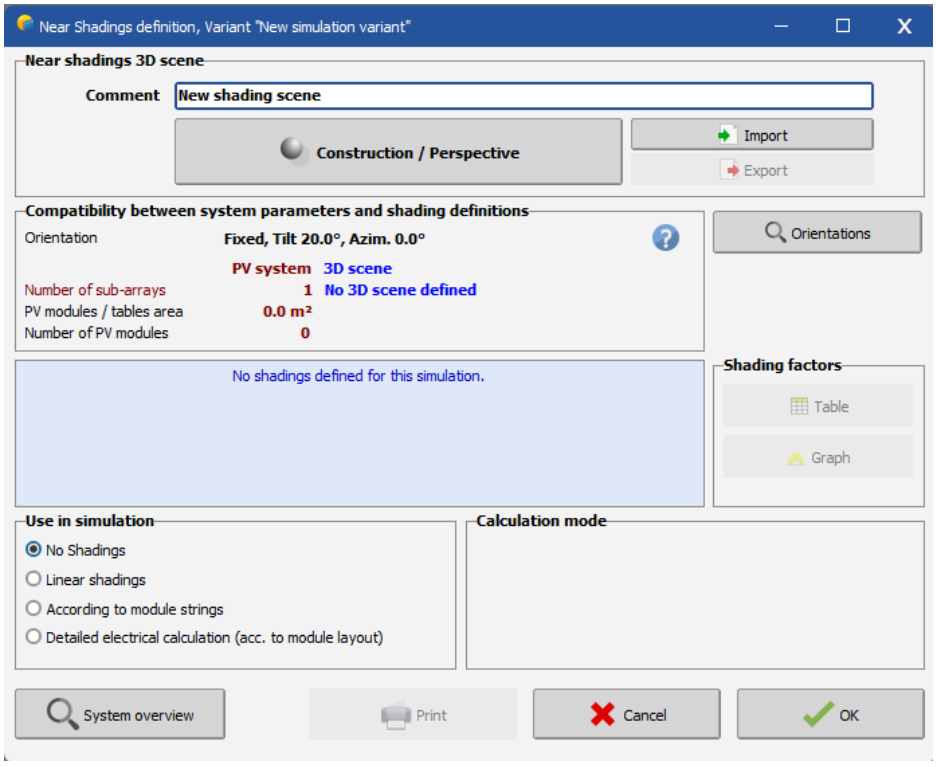


Figure 65: Near shading window

Click “File”, then click “Import” and then click on “Import a 3D scene (3DS, DAE, PVC)”

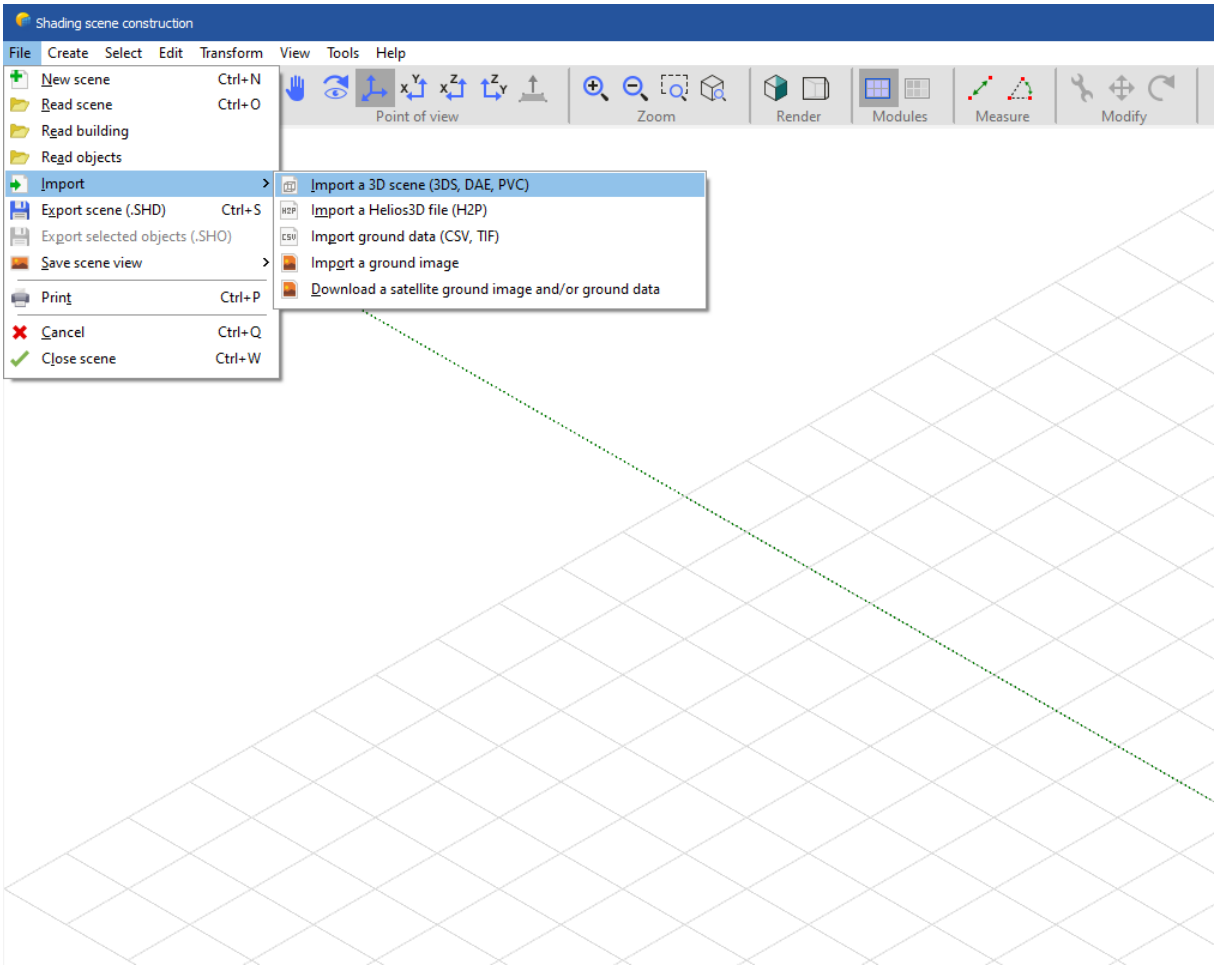


Figure 66: Import 3D scene file in PVsyst

Choose the project with the variant having two orientations and import it.

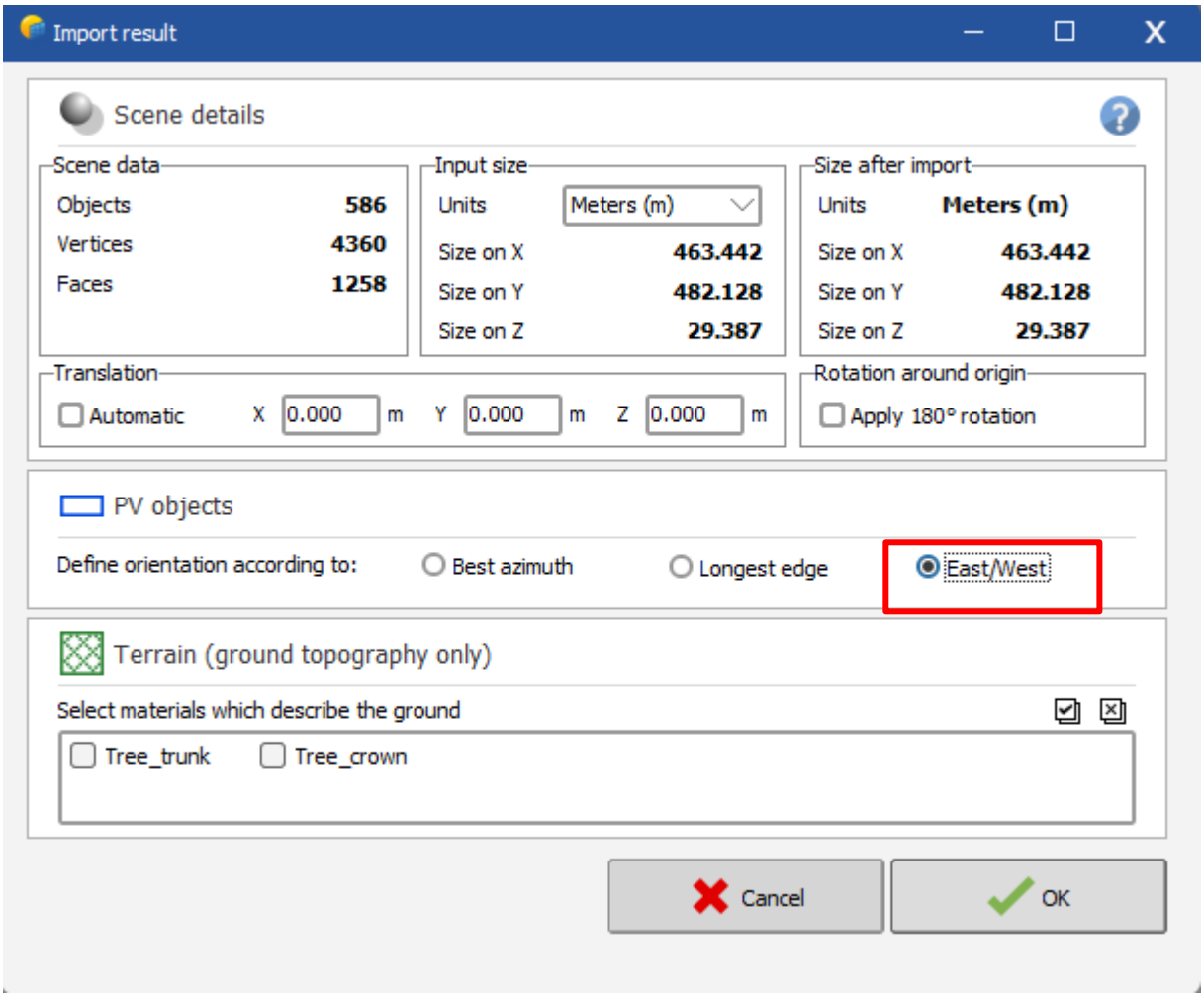


Figure 67: Import result window

In this particular example we are importing domes. So to help PVsyst generate the correct orientations you must select the orientation type of the PV objects as 'East/West'. Then click “Ok”.

Pvsyst has imported the scene:

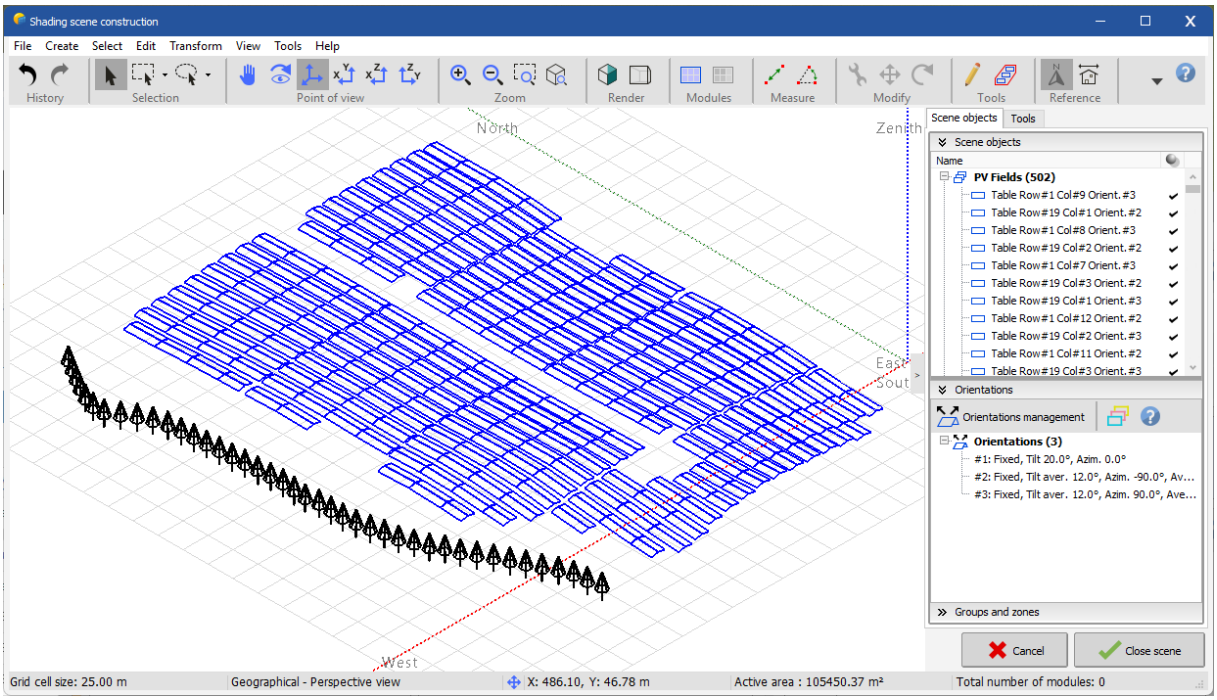


Figure 68: 3D scene with the PVC file imported

You can notice that PVsyst has created two new orientations, which automatically include the east and west PV modules it identified.

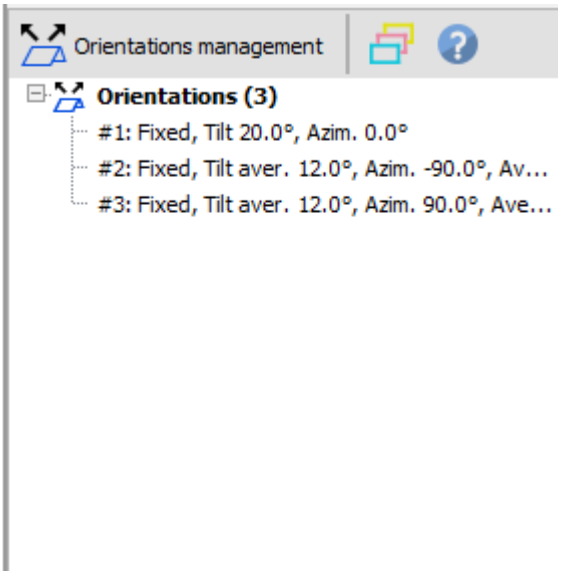


Figure 69: Orientations management location

If you click on orientation #3 PVsyst selects the tables that belong to this orientation:

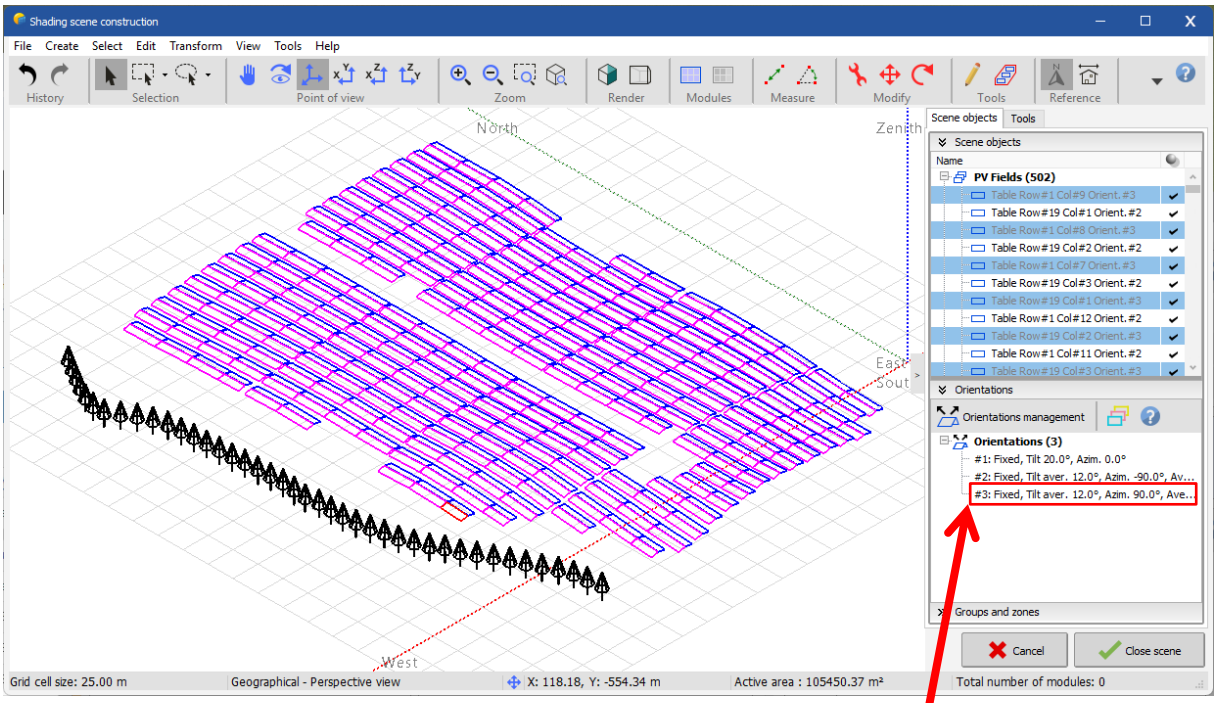


Figure 70: 3D scene with orientation selected

Click on an orientation to highlight the associated PV objects in the scene in pink.

Then, by clicking on this icon:

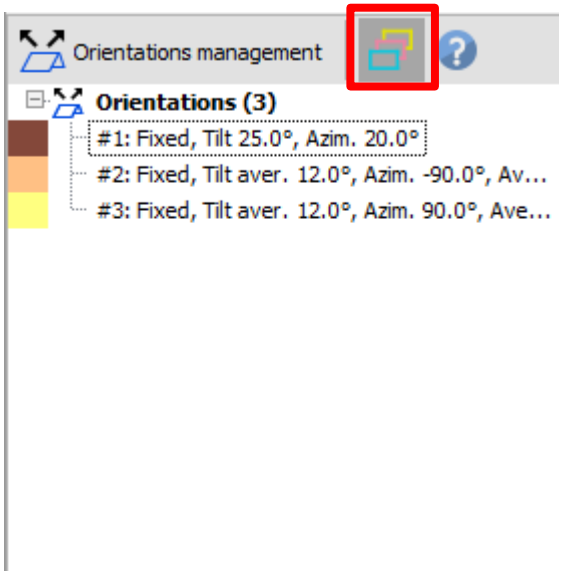


Figure 71: Orientation coloured

It shows the tables of your scene with a different colour for each orientation:

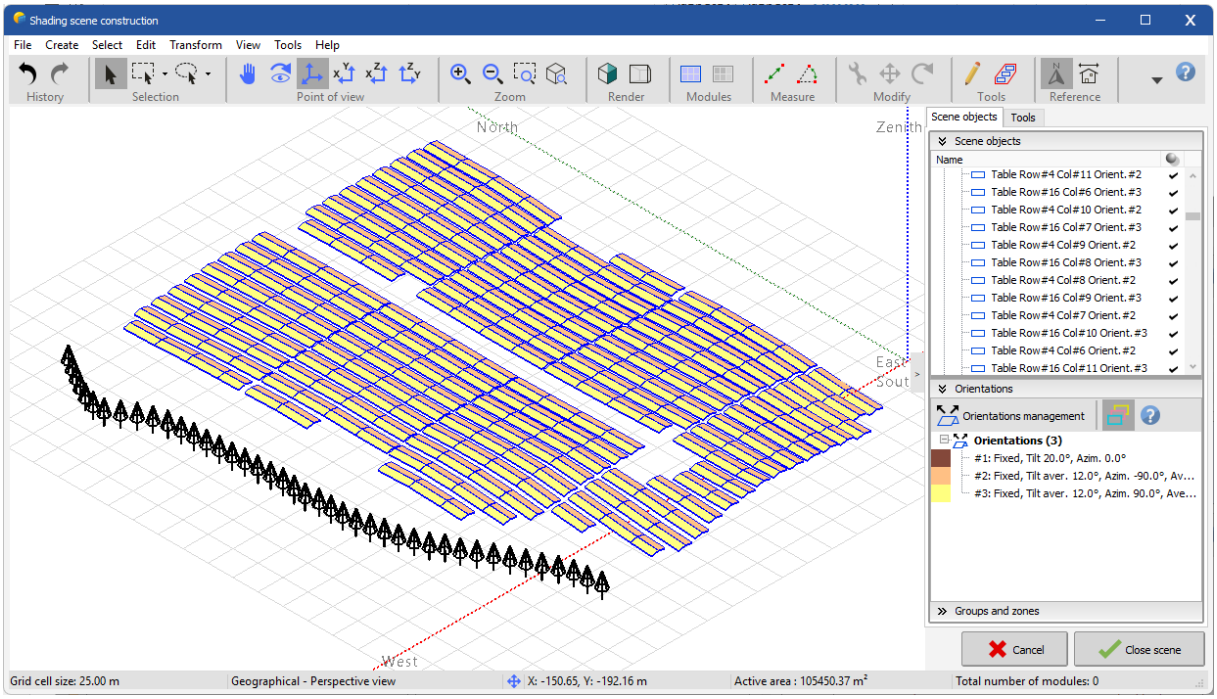


Figure 72: 3D scene with coloured orientations

Then, by clicking on “Orientation management”:

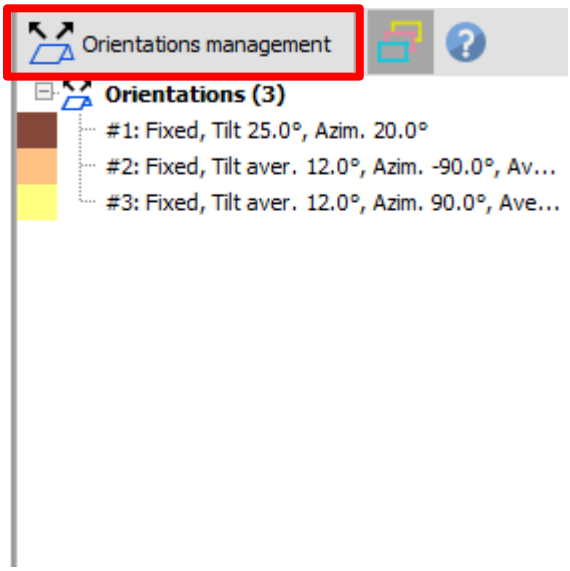


Figure 73:Orientationn button location

It allows you to open a new window where you can manage different PV orientations of your scene, see below:

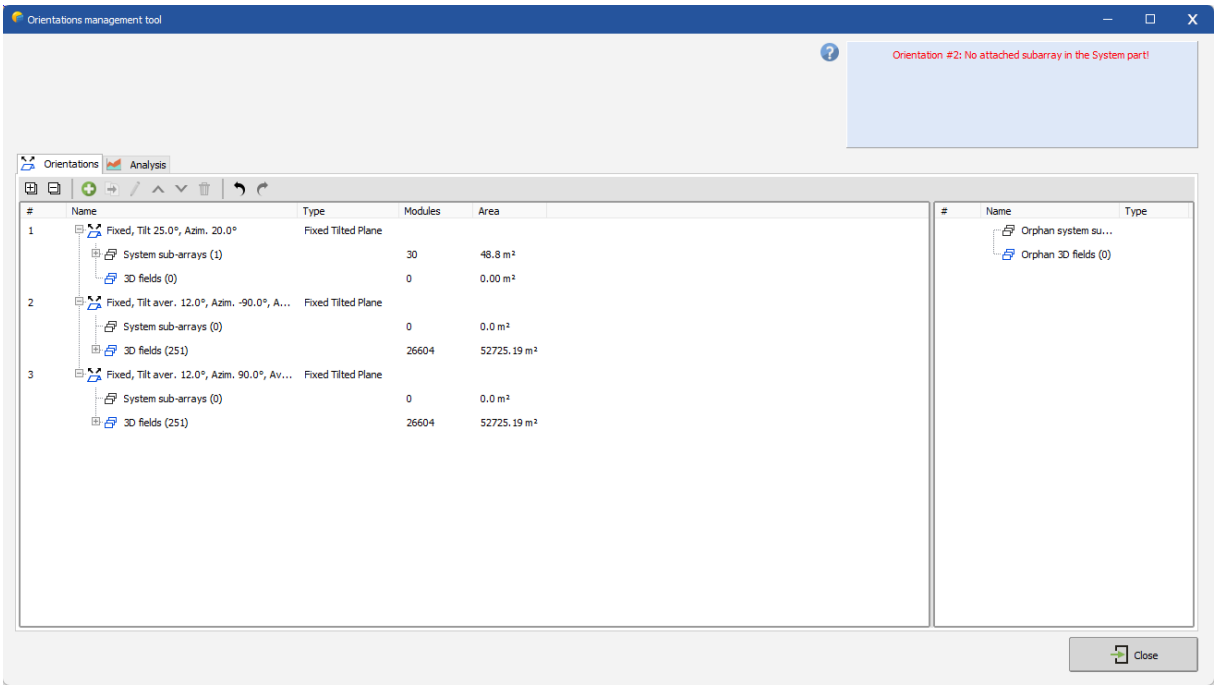


Figure 74: Orientation management windows