

Pvsyst tutorial



**ASSIGN
BUSTER**

PV-SYST Tutorials All the tutorials in this series will teach you how to use the basic functions of PV-SYST to design a PV system. This set of tutorials works through how to use the software in both preliminary and project design modes. The basis for this tutorial will be to design a PV system that fits on the area defined by the LDK roof of the model used in the Ecotect_Tutorial. A 30 day full functioning demo version of the program can be downloaded from the PV-SYST website.

Figure 1 presents the opening screen for PV-SYST upon starting the program. From this initial window you can choose whether to undertake an analysis via “ Preliminary design” or “ Project design” mode. Figure 1: Opening screen for PV-SYST

1. Start PV-SYST from Start>> All Programs>> PV-SYST. The icon for PV-SYST is presented to the right.
2. Select “ Preliminary Design” from the available options. This will bring up a new panel called “ System”.
3. Select “ Grid-Connected” in the System panel. Then select OK to continue.
4. A new pop-up window titled “ Grid system presizing project” will appear, as presented in Figure 2. Click on the “ Location” button to continue.
5. A 2nd pop-up window will appear called project’s location. In the Project name call the file “ PV-SYST tutorial location Melbourne”
6. Under the “ Location” heading change the “ Site” entry to “ Melbourne Meteonorm”.

7. Leave the other default parameters, and click OK to continue. Note: In this preliminary design we are going to assume that there is no near or far shading on our designed PV system.

8. In the “ Grid system presizing project” window select the “ System” button.

9. This opens another pop-up window titled “ System Specifications” Note: In preliminary design mode you have three options to design the system.

System size can be set by 1) Active area; 2) Nominal Power or 3) Annual yield.

Figure 2: Pop-up window Grid system presizing project 10. 11. 12. 13. Select Active area (m²) as the method to determine the system size. This will bring up a field titled “ Area” enter the area 54m². This is the area of the LDK roof. Enter 3° for tilt and 180 for Azimuth, i. e. indicating that the roof is sloping towards south. Click the “ Next” button to continue. Note: Within the “ System Specification” window you can quickly view how your system causes losses in comparison to a system with optimum tilt and orientation.

In this scenario the loss with respect to the optimum is 12. 2%. 14. In the next window of the “ System Specification” wizard select the module type and specifications. For this tutorial select: a. Module Type: Standard b. Technology: Polycrystalline c. Mounting disposition: Facade or tilt roof d. Ventilation property: Ventilation . Click OK to continue. This will take you back to the “ Grid system presizing project window” 15. Select “ Results” in the “ Grid system presizing project window”. A new pop-up window titled results will appear. 16. The default results page appears as presented in

Figure 3. From this window you can see the nominal power and annual yield from the system. 17. Click on the third graphical icon button (which looks like a table) located down the left hand side of the results page, as highlighted by the blue circle in Figure 3. This will bring up the results in table format. 18.

The results page should now display the results on a monthly basis, for the level of insolation falling on a horizontal plane and on the tilted plane that you designed your system on (i. e. 3° sloping facing south). 19. The results also present on a monthly basis the output of the PV system. Note: the results for a PV system designed on 54m² area at 3° sloping facing south achieves annual output of 6835 kWh. However an optimally designed system at 30 degrees tilt facing north can achieve an annual output of 7787 kWh for the same array area. Therefore our system has a loss of 12. % compared to optimal tilt and orientated system. Figure 3: Results page for “ Preliminary Design” mode Project Design 1. Upon opening PV-SYST select the “ Project Design” option under the “ Option” heading. Note: If you are continuing from the following tutorial, close all the open windows to return to the main PV-SYST window that was presented in Figure 1. 2. Select “ Grid-Connected” under the “ System” heading and click “ OK” to continue. This will bring up a new pop-up window pictured as presented in Figure 4. 3. If you wish to save a copy of your file, click on the “ Project” button and fill in the respective details.

For this tutorial we will not worry about saving any details. 4. Click on the Project Button then click on the “ Site and Meteo” button. This will bring up a pop-up window titled “ Project: Situation and Meteo”. Make the following

adjustments: a. Country: Australia b. Site: Melbourne Meteonorm c. Meteo File: Melbourne_syn. met: Melbourne, Synthetic Hourly data. d. Click “ Next” to continue. Then click “ Ok” in the new pop-up window that appears e. Finally click “ Back (Calculation)” to return to the main window. Figure 4: Project window for “ Project Design” mode. 5. Click on the “ Orientation” button 6.

Within the Orientation pop-up window change the following parameters a. Plane tilt: 3 degrees b. Azimuth: 180 degrees c. Field Type: Fixed Tilted Plane. d. Leave the other parameters at default settings and click OK to continue Note: The horizon tool is used to designate shading elements that appear off in the horizon that will block out access to the sun. For example a hill or mountain may block out all the afternoon sun. For this tutorial there is no Horizon shading. 7. Click on “ Near Shading”. This element defines elements that are close to the PV array which can cause shading on the system. 8.

In this tutorial we will construct a 3D scene to indicate the shading surrounding the PV system we want to put on the LDK roof of the Ecotect tutorial house. 9. Click on the “ Construction/Perspective” button. This will bring up a drawing window as presented in Figure 5. 10. First we will draw a rough version of the LDK zone to place the PV plane. Select Object>> New>> Elementary Shading Object from the main toolbar menu. 11. Under the Parameters heading change the following elements: e. Shape type: Select “ House, asymmetric roof” from the drop down box f. Width (DX): 8. 1m g. Length (DY): 7m h. Height at top: 2. 9m i.

Roof 1 tilt angle: 3 degrees j. Roof 2 tilt angle: 3 degrees k. Roof 1 ratio: 0 m
l. Click Ok to continue. This will put the building we just dimensioned in the modelling window. Figure 5: Construction/Perspective drawing window Note: You always need to check the orientation of any plane or building you draw. The building you just drew will have the slope pointing in the west direction. Click on the element you want to adjust, then select Object>> Position in scene from the main toolbar menu. This will make an object positioning toolbar active in the top right hand corner of the modelling window as presented in Figure 6.

Figure 6: Building object in modelling window with object positioning toolbar active. 12. Within the “ Object Positioning” toolbar change the Azimuth entry from zero to 90 degrees. 13. Next we will include the tree that causes shading. Select “ Object>> New>> Elementary shading object” from the main toolbar. 14. Under the Parameters heading change the following elements: m. Shape type: Tree n. Medium-point height: 2. 7m o. Medium height: 2. 7m p. Low part height: 2m q. Trunk height: 2m r. Medium diameter: 4m s. Trunk diameter: 0. 5m t. Click OK to continue u. Move the tree position 11. 5m in the north direction and 3. m in the east direction 15. Next we will include the Neighbouring buildings that may cause shading. Select “ Object>> New>> Elementary shading object” from the main toolbar. 16. Under the Parameters heading change the following elements: v. Shape type: Parallelepiped w. Width (DX): 11. 3m x. Length (DY): 11. 5m y. Height: 5m 17. 18. 19. 20. 21. z. Click OK to continue aa. Move the neighbouring building 12. 8 m east and 3. 4m south Repeat and create a

second neighbour building 3m high, 10.2m wide, 14.1m long and offset 26.77m west and 12.3m south. Next we will draw in the PV Surface plane.

Select “ Object>> New>> Rectangular PV Plane” Under the collector plane heading change the following elements: bb. Nb. Of rectangles: 1 cc. Plane Tilt: 3 degrees dd. Width: 8.1m ee. Length: 7 ff. Click OK to continue Adjust the Positioning of the PV plane to: gg. Tilt: 3 degrees hh. Azimuth: 180 degrees ii. West: 7m jj. Height: 2.5m Now you have detailed the plane the PV is located on and the elements that can possibly cause shading. Your drawing window should appear as presented in Figure 7. Figure 7: Shading scene for PV located on 3 degree sloping facing south 22. Select File>> Close.

This will return you to the near shading window Note: If you already have a built shading file you can load it directly into the “ Near Shading” window by clicking the “ Open” button under the model library heading, and selecting the near shading scene. Only files that are located in the file location C: Program DataPV systDataShadings can be opened. 23. Select the “ Table” button to generate the shading factors calculated from the model just built. Once generated close the window. 24. You can view the effects of the shading on an Iso-shading curve by selecting the “ Graph” button located under the “ Linear (rough) Shading Factor” heading.

Figure 8 presents the results. 25. In the Near shading pop-up window select Ok to continue. Figure 8: Iso shading diagram from PV-SYST for the shading model built 26. In the Project window now select the “ System” button. This will open up the “ Grid system definition window” 27. In the “ Grid system definition window” select “...or available area” as the method to define the

system size. Type in 54m². 28. In the “ Project Design” mode you have the ability to select the actual brand, type and size of module you want in your system. 29. For this tutorial select “ Sort Modules” by “ Power”.

The PV Modules are then ordered by Watt peak output and voltage. You can choose which ever module you would like to test for your system. For this tutorial, let’s select the SunPower 200Wp 34V Si-mono Modules. 30. The next step is to select the inverter. Sort the inverter list via Manufacturer and scroll down to the top of the available Sun Power inverters. Note: PV-SYST can automatically determine the number of modules in series and the number of strings per inverter, and the number of inverters required, based on your module and inverter selection.

It should be noted however, that the majority of combinations are not compatible. PV- SYST has a grey indicator box, as highlighted by the green square in Figure 9 that provides detail about your chosen combination. For example, if a message in red text is displayed, the combination chosen is not viable, i. e. The Sun Power models we chose in combination with 30kW 420-800V Sunways inverter achieve a message that reads “ The inverter power is strongly oversized”. If a message in orange text is displayed, the combination is potentially viable, but there are likely to be better combinations. . e. The SunPower models we chose in combination with the 3.3kW 195 550V SunPower inverter achieves a message that reads “ The inverter power is slightly oversized” or with the 5.2kW 240-450V Sun Power inverter achieves an orange message that reads “ The array V_{mpp} at 60°C is lower than the inverter minimum operating voltage”. The best combinations of PV modules and inverters occur when no message is received. For

example the combination of the Sun Power modules we chose with the 4kW 195-550V Sun Power inverter. 31.

Choose the Sun Power inverter that is rated at 4kW 195-550V SPR-4000x 32. This combination of PV modules and inverter results in a system that requires two inverters, with 7 modules in series and six strings. 33. Select OK to continue 34. In the Project window select the “ Simulation” button. This will open the Simulation pop-up window. 35. Accept the default parameters and click on the “ Simulation” button to begin the calculation process. 36. Click the OK button once the simulation calculation process is complete. This will bring up the Results window