ENGENEXT SOLAR ENGINEER

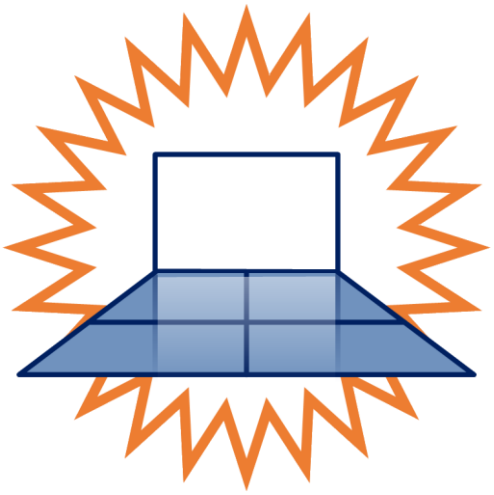
Your tool for roof-top Solar Grid Design

Harnessing solar energy to everyday use is need of the day. Designing roof-top solar grids for a building has never been easier. ENGENEXT SOLAR ENGINEER brings the power of roof-top solar grid design to a click of a button in BricsCAD. Simple workflow, minimum complexity and easy-to-learn user interactions makes it compelling case to design Solar grids on the roof tops of buildings.

1 Solar Energy: The future of Energy needs

Solar energy is an infinitely and freely available, pollution free source of energy. Generating electricity from solar energy is an ever-increasing need and clear direction for future. Whereas generating energy from solar farms is a big business, generating energy for every building using roof top solar grids is a very effective way too. ENGENEXT SOLAR ENGINEER offers one such tool to design roof-top solar energy generation grids.

2 Introduction



ENGENEXT SOLAR ENGINEER is an add-on to BricsCAD, that brings the power of solar grid design at the click of a button within BricsCAD. Targeted for an architect or a civil engineer who designs and constructs buildings, using Solar Engineer makes it easy to include solar grids into the design of a building without any efforts. ENGENEXT SOLAR ENGINEER implements a very simple workflow, that does not include too many steps. User interactions are self-explanatory and easy to learn. Complexity is kept to a minimum with the target of laying out the solar panels effectively on the roof top. It can be easily learnt and mastered by an experienced and novice user alike.

It further provides required calculations such as total energy generated and total weight etc, which is essential for the architect and a civil engineer. It is also capable of producing a Bill of materials for solar panels, which is an important document for construction engineer.

3 Engenext Solar Engineer

ENGENEXT SOLAR ENGINEER is a program to quickly design a solar grid on top of a roof. It can be used both for houses as well as residential and commercial buildings. The power of Solar Engineer lies in **automatically maximizing the coverage** while addressing the key challenges of placing the panels such as:

1. Optimal orientation of a panel with solar direction
2. Maximum coverage of roof area
3. Avoiding self-shadowing of panels
4. Avoiding overspill i.e. a panel protruding out of the roof boundary

3.1 Terminology

Solar Panel	A collection of photo-voltaic cells that forms a fundamental unit of Solar energy generation.
Solar Array	An arrangement of panels on a support surface. This arrangement is treated as single unit of calculating placement of panels
Solar Grid	A collection of Solar Arrays present in one CAD document.
Solar Design	A process of creating a Solar Grid by placing solar arrays on an existing structure.
Solar Project	A CAD document containing a solar grid and additional information about pricing, BOM and other layout drawings

3.2 Salient features

1. Does not disturb existing design
2. Fully compliant with existing data storage strategies. Model can be shipped to other systems that do not have Solar Engineer installed. Other systems can open the dwg files containing Solar Grid design, but cannot modify or post process Grid design in absence of Solar Engineer.
3. No enforced naming convention for Solar design files. Solar grid designs can be stored in any dwg files. Solar Engineer will automatically detect if the file has solar grid design in it. If yes, it will allow to work with them. Else it will ask to start a solar design project in the dwg file.
4. Multi-session, Multi-document support: Can work with multiple BricsCAD sessions as well as multiple solar documents in a single BricsCAD session. However does not detect if single DWG file is opened in multiple BricsCAD sessions.

3.3 What it does not support

1. Electrical wiring layout, Grid control panel placement
2. Tracking and management

4 Installation of ENGENEXT SOLAR ENGINEER

4.1 Prerequisites

Hardware	• Desktop with standard Keyboard, mouse/Monitor Or workstation laptop • Pentium i5 or i7 16GB RAM • 512 GB storage space
Operating System	Windows 10 64 bit professional
CAD Platform	BricsCAD en_US V17 to V20 64 bit Platinum
Office software	Microsoft Office 2010 Professional Edition

4.2 Installation privileges and location

This software is intended to be used and upgraded by any user with or without Administrator privileges. However, first time installation requires Administrative privileges.

By default, the software gets installed at C:\Engenext\EGSolar. With administrator privileges, you can change the installation location. The software also creates a folder under C:\ProgramData\EGSolar\Resources to store icons for CUI menu.

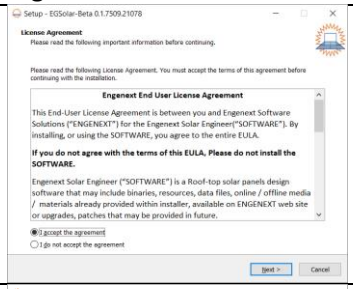
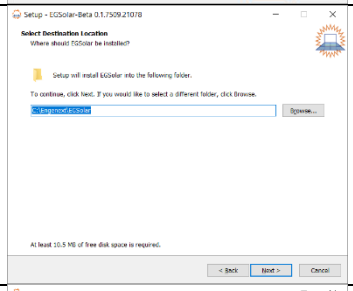
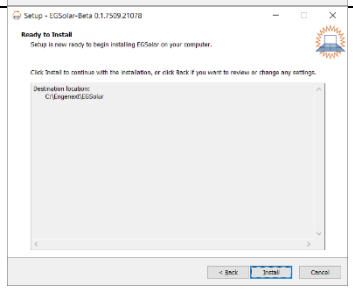
Any additional, user specific information is stored under C:\Users\<username>\AppData\Roaming i.e. (%AppData%) folder for the user.

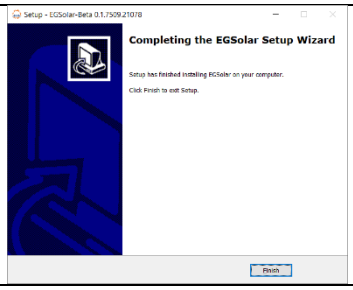
This also adds an entry to on_start.lsp file in 'Support' folder of BricsCAD installation in order to hook it into BricsCAD.

This software does not require any predefined location to store DWG files. It automatically identifies if the opened DWG file has Solar Engineer information in it, and works accordingly.

4.3 Installing Solar Engineer

After you have downloaded the installer, please follow these steps to install the same. The steps are pretty much standard. Additions explanation is given wherever required.

1	Right click on the EGSolar installer and click on Run as administrator.	
2		Go through the terms and conditions and click on I accept the agreement. 'Next' button is enabled. If you do not accept the terms and conditions, Solar Engineer will not be installed on your machine. Click on Next button to proceed.
3		Solar Engineer will be installed in C:\Engenext\EGSolar by default. If you want to change the installation location, click on browse and choose the appropriate location and then click on next. Any updates here onwards, will be installed in the location shown in the text box.
4		This dialog shows the summary of installation for review, before finally installing the software. Click on Install button to install the software. You can use 'Back' button to change any settings done before. Till this stage, user can cancel the installation any time by clicking 'Cancel' button. System will reconfirm the cancellation before actually cancelling the installation. After clicking the 'Install' button, cancellation of installation is not possible.

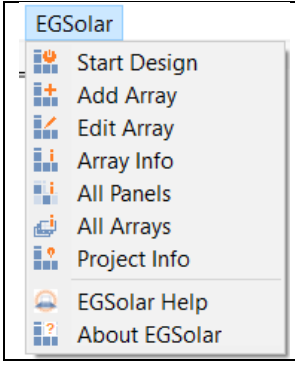
5		After the installation is successful, System will show appropriate message and a 'Finish' button. Click on Finish button to complete the installation. Installer dialog will close. ENGENEXT SOLAR ENGINEER can now be used through BricsCAD. Please refer subsequent sections to start using ENGENEXT SOLAR ENGINEER.

5 Using ENGENEXT SOLAR ENGINEER

ENGENEXT SOLAR ENGINEER is very easy to use tool with limited number of simple commands. It can work with any DWG file.

5.1 Command overview

ENGENEXT SOLAR ENGINEER runs with minimal set of commands as shown here. A quick introduction to command is as follows:



Start Project	Starts new Solar project if not already present
Add Array	Adds a solar array to a project
Edit Array	Edits an existing solar array
Array Info	Provides detailed info on selected array
All Panels	Provides detailed info on all panel specs in the project
All Arrays	Provides detailed info on all arrays in the project
Project Info	Provides detailed info on complete project
EGSolar Help	Opens a Help documentation for Solar Engineer
About EGSolar	Product & Support information, version etc.

5.2 Start Design

5.2.1 Description

Solar design project can be started in an active DWG file with this command. If a DWG file already contains a solar project, the command informs accordingly.

5.2.2 Prerequisites

As the solar grid can be created on planar surfaces of a solid body, a solid model that contains a support surface should be available.

5.2.3 Usage:

Start the command by either:

1. Type EGSTARTDESIGN on the command line and hit Enter or
2. Click on EGSolar ->Start Design menu.
3. A window as shown below pops up.

Parameter	Description
Name	Represents the name of the solar project. It can be any alphanumeric text.

	Latitude and N/S	Stores the latitude of the location of the site. The latitude value should be between 0 and 90 degrees and N and S indicate whether the site is in northern hemisphere or southern hemisphere.
	Solar North	This is the direction representing an imaginary axis around which the sun appears to revolve. This direction need not be same as geomagnetic north. In UCS set up, this direction will be different from UCS Y direction
	… Button	Allows user to select the direction from a straight edge in the model
	Currency	It represents the currency in which BOM is to be generated
	✓	Click this button to start the project
	×	Click this button to cancel the project creation. Once created, a solar project cannot be removed from DWG file

5.3 Add Array

5.3.1 Description

Add Array command adds a solar panel array to the project. Solar array is created on a planar surface of a solid body by selecting the surface and clicking a point on surface. ENGENEXT SOLAR ENGINEER automatically calculates best fitment of instances of a selected solar panel on a given surface within given boundary. Panels are placed within an array with following constraints

Mandatory constraints:

1. A solar panel should not shadow other panel in a solar direction.
2. A solar panel should never go outside the outer boundary of the selected planar surface while viewing from the solar direction.

Other constraints are more of user choices about panel layout (arrayed/ staggered), alignment with solar north/ roof longitudinal direction or panel placement flat on roof/ perpendicular to solar direction. An array uses only one panel specification to lay them on a surface. This ensures uniformity in design. Another array with another panel specification and settings can be designed.

5.3.2 Prerequisites

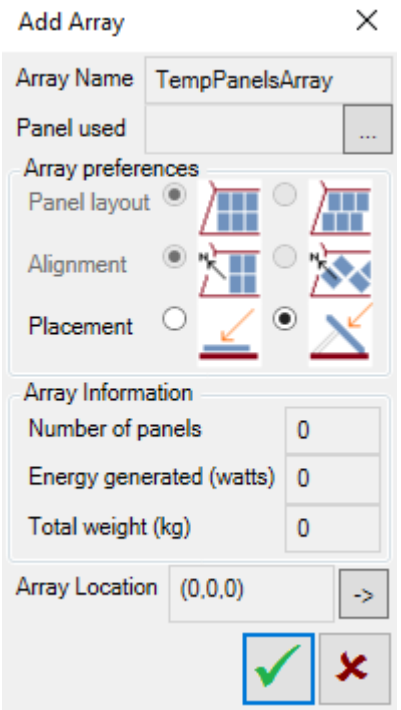
1. Solar Project should be created in the DWG file to be able to add an array.
2. Planar surface of a solid body should be available to place an array.
3. A surface should not already be having an array placed on it.

5.3.3 Usage

Start the command by either

1. Type EGADDARRAY on the command line and hit Enter or
2. Click on EGSolar ->Add Array menu.

A window as shown below pops up.



Parameter	Description
Array Name	The array name is TempPanelsArray by default and is not editable.
Panel Used	Name of the selected panel to be placed in an array. Button … will pop up a separate dialog to enable selection of a panel. Details of the dialog in subsequent section.
Panel Layout	Choose either arrayed or staggered.
Alignment	Choose to align panels with roof longitudinal or solar north.
Placement	Choose to place flat on roof or perpendicular to solar direction.
Number of panels	This value gets generated automatically depending on the area of the surface selected.
Energy generated(watts)	This value gets generated automatically depending on the area of the surface selected and the location of the site.
Total weight(kg)	This value gets generated automatically depending on the area of the surface selected.
Array Location	When we click on the arrow mark in front of the array location, the window closes and in then in the CAD we can select the required surface on which we want to place the panels.
✓	Click this button to save created array.
✗	Click this button to cancel the array.

5.4 Solar Panel Specification

5.4.1 Introduction

This interaction is not provided as an independent command. It can be accessed as a separate interaction while creating a solar array. This interaction enables defining various panel specifications to be used in a solar project. In addition to physical dimensions, it also stores information about energy generation capacity and weight of a panel. Currently, only a 'fixed' type of panel is supported.

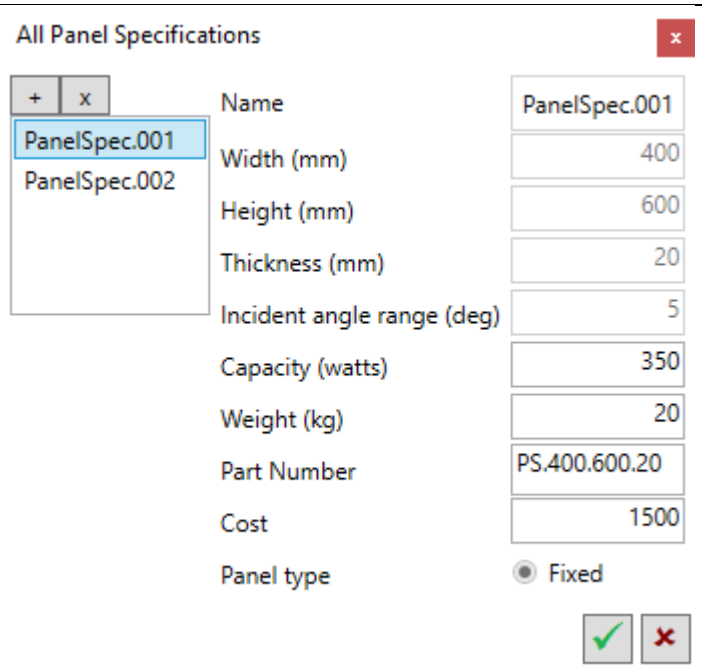
5.4.2 Prerequisites

1. Solar project should be created in the DWG file.
2. However, as this interaction is started through Array design commands, all prerequisites required for Array design are applicable.

5.4.3 Usage

Start the command by clicking … button in Add/Edit Array dialog.

A window as shown below pops up.



Parameter	Description
+	Adds a new panel with default values
X	Removes a selected panel if not in use
Panel list	Lists all the available panels, used or unused.
Name	The name of the panel is system defined and is not editable. It is PanelSpec.001, PanelSpec.002 and so on.
Width (mm)	Width of a panel in east-west direction Default value: 40
Height (mm)	Height of a panel in north-south direction Default value: 60
Thickness (mm)	Panel overall thickness Default value: 10
Capacity (watts)	Energy generation capacity Default value: 0
Incident angle range (deg)	Incident angle range within which a panel will be generate energy effectively. Default value: 0
Weight (kg)	Total weight of a panel. Does not consider weight of supports/fasteners Default value: 0
Part Number	It is the display name of the panel specification in the BOM. Its default value is the same as the name of the panel, the only difference being that it is editable.
Cost	Represents cost of a single panel. Default value: 0.
Panel type	The panels are fixed by default and it is not editable. Panels can come in advanced capabilities such as ability to change orientation in east-west or north-south

		directions. These panels are externally controlled and impact the calculations for placement and energy generation.
	✓	Click this button to save created panels
	×	Click this button to cancel the panel editing interaction.

5.5 Edit Array

5.5.1 Introduction

An array can be edited to change either panels used or any of the panel placement selections. User can even change the support surface. Array is calculated again and project information gets updated automatically.

5.5.2 Prerequisites

A solar array should be present in the model. All other prerequisites of having an array in first place, also apply.

5.5.3 Usage

Start the command by either

1. Type EGEDITARRAY on the command line and hit Enter or
2. Click on EGSolar ->Edit Array menu.

System asks user to select an existing array. Upon selecting an array, a window pops up. This window is exactly same as that of an 'Add Array' command except that it starts with a selected array. Pl refer to Add Array command to understand various UI controls and their behaviour.

Upon clicking ✓ button, Existing array is edited instead of creating a new one.

5.6 Array Info

5.6.1 Introduction

Array Info command provide information about a selected array. None of the details are editable.

5.6.2 Prerequisites

A Solar array should be present in the DWG file.

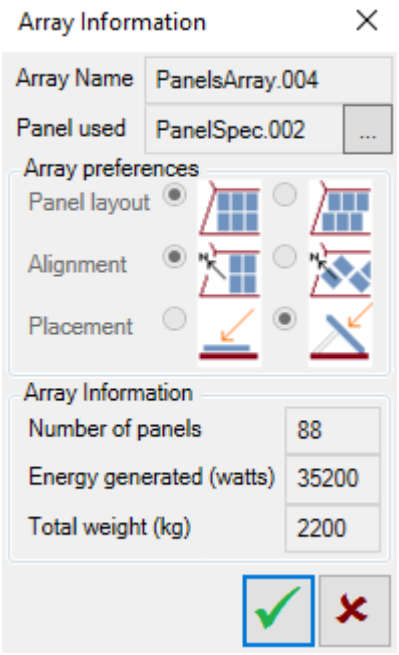
5.6.3 Usage

Start the command by either

1. Type EGARRAYINFO on the command line and hit Enter or
2. Click on EGSolar ->Array Info menu.

System asks use to select an existing array. Upon selecting an array, a window pops up. This window is exactly same as that of an 'Add Array' command except that it starts with a selected array and all

fields are read-only. None of the values can be changed. Pl refer to Add Array command to understand various UI controls and their behaviour



Upon clicking ✓ button, Information window is closed.

5.7 All Panels

5.7.1 Introduction

This command provides information about all panel specifications created in the solar project. User can select a panel from the list to view its information. User can also create new panel specification from this command.

5.7.2 Prerequisites

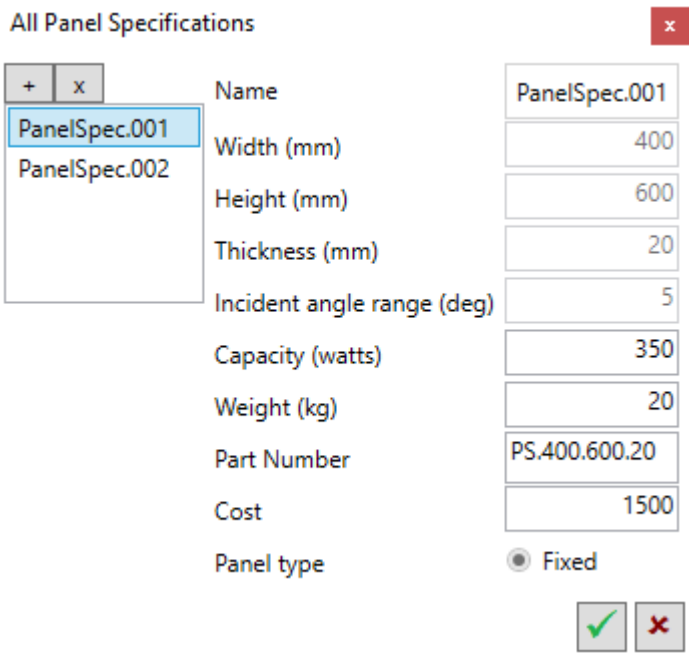
Solar project should be present in the DWG file.

5.7.3 Usage

Start the command by either

1. Type EGALLPANELS on the command line and hit Enter or
2. Click on EGSolar ->All Panels menu.

This window is exactly same as that of an ‘Solar Panel Specification’ interaction, except that all fields are read-only. None of the values can be changed. Pl refer to ‘Solar Panel Specification’ interaction to understand various UI controls and their behaviour.



Upon clicking ✓ button, Information window is closed.

5.8 All Arrays

5.8.1 Introduction

This command provides information about all arrays present in the Solar project. User can select an array from the list to view its information. User cannot create new array from this command.

5.8.2 Prerequisites

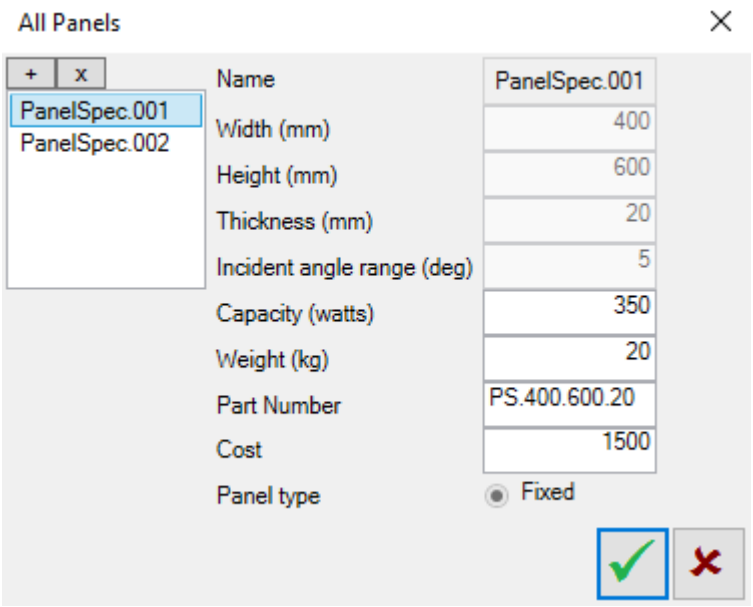
Solar project should be present in the DWG file.

5.8.3 Usage

Start the command by either

1. Type EGALLARRAYS on the command line and hit Enter or
2. Click on EGSolar ->All Arrays menu.

The window that pops up is similar to ‘Add Array’ command except that all fields are read-only. List on the left lists all arrays present in the project. User can click one array at a time to see its information.



Upon clicking ✓ button, Information window is closed.

5.9 Project Info

5.9.1 Introduction

This command provides a complete overview of all arrays created, and all panels defined in the Solar project. It also gives total energy generation capacity and total project price[$].

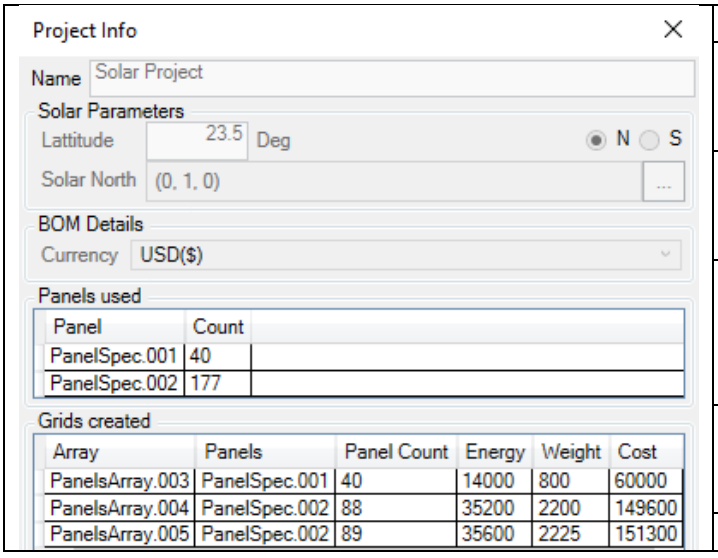
5.9.2 Prerequisites

Solar project should be present in the DWG file.

5.9.3 Usage

Start the command by either

1. Type EGPROJECTINFO on the command line and hit Enter or
2. Click on EGSolar ->Project Info menu.
3. A window as shown below pops up.

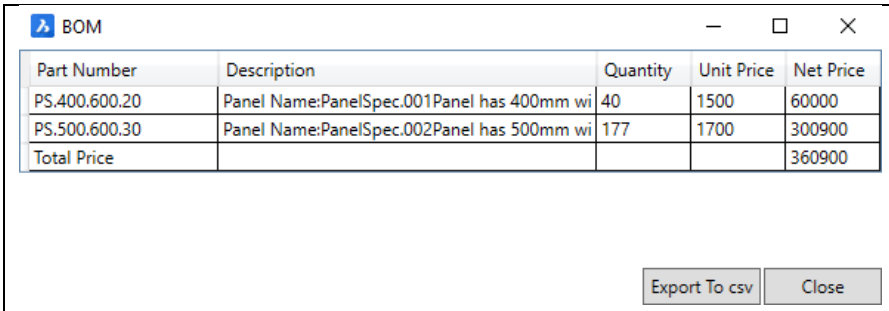


Parameter	Description
Name	Name of the project as entered while starting the project
Solar parameters	Same as entered while starting the project
BOM Details	Represents the currency in terms of which BOM is to be calculated.
Panels used	Lists all panels defined in the project
Panel	Name of the panel

	Count	Total count of panels in the whole project
	Grids created	Lists all arrays created in the project
	Array	Name of an array
	Panels	Number of panels used
	Panel Count	Represents the number of panels in given array
	Energy	Energy (Watts) generated by an array
	Weight	Total weight of an array
	Cost	Total cost of an array
	Project Summary	Shows a quick summary of project
	Total Energy Generated	Total energy generated by all arrays
	Total project price	Total price of project
	BOM	The BOM window pops up when we click on the BOM button.

The price does not include price of other support structure, electrification, control systems, installation, any other material handling, labour etc.

5.9.4 BOM



Parameter	Description
Part Number	Represents the part number of the panel used.
Description	Represents the dimensions of the panel representing the given part number.
Quantity	Represents the quantity of the given part number.

	Unit Price	Represents the unit price for the given part number.
	Net Price	Represents the total price for the given part number.
	Total Price	Represents the total price of the project.
	Export to csv	Exports the information from the window to a csv file.
	Close	Closes the popup window.

6 EGSolar Help

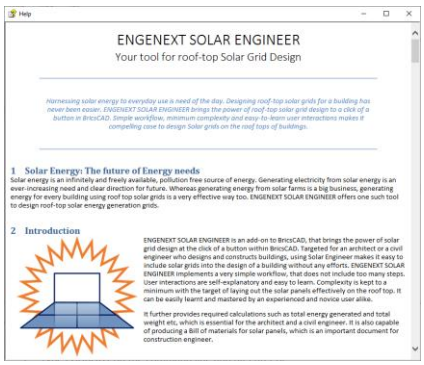
6.1.1 Introduction

This command provides help about Engenext Solar Designer. Opens current .chm file.

6.1.2 Usage

Start the command by either

1. Type EGSHELP on the command line and hit Enter or
2. Click on EGSolar ->EGSolar Help menu.
3. Help file is opened in a separate process.



7 About EGSolar

7.1.1 Introduction

This command provides version information, creator company and contact information about Engenext Solar Designer. It also has a provision to view EULA(End user license agreement).

7.1.2 Usage

1. Type EGABOUT on the command line and hit Enter or
2. Click on EGSolar ->About EGSolar menu.
3. A window as shown below pops up.