# ENGENEXT SOLAR ENGINEER

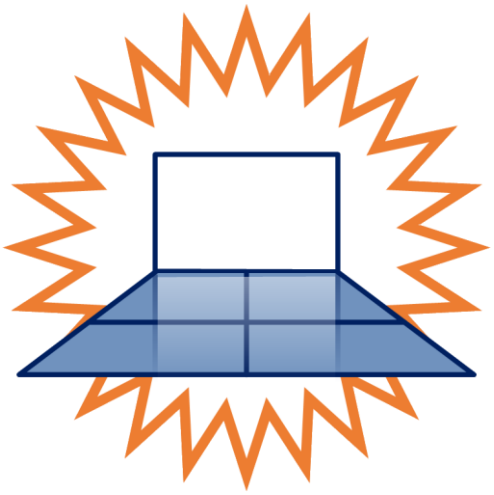
## Your tool for roof-top Solar Grid Design

*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 design and constructs buildings, or for a solar energy consultant who designs solar arrays for existing buildings, using Solar Engineer makes it easy to include solar grids into the design of a building without any efforts.

It 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.

ENGENEXT SOLAR ENGINEER 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(BOM) for solar panels, which is an important document for construction engineer.

It also provides facility for energy analysis which includes radiant solar energy, DC energy generated and AC energy generated based on location parameters, surface conditions and electrical

parameters. Energy analysis is important for solar grid design since it provides information about the economics of the system.

# 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 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, it 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<br>• 512 GB storage space |
| Operating System | Windows 10, 64 bit professional |
| CAD Platform | BricsCAD en_US V17 to V21 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.

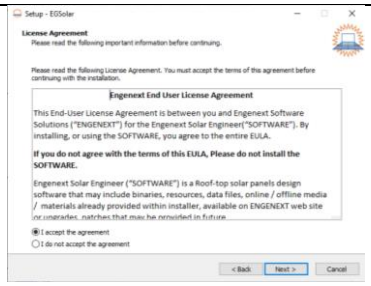
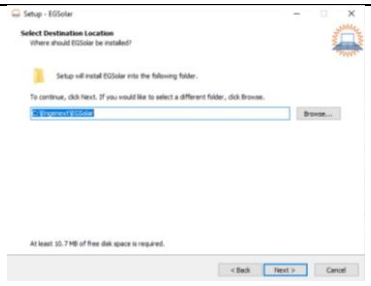
Any additional, user specific information is stored under C:\Users\<username>\AppData\Roaming i.e. (%AppData%) folder for the user.

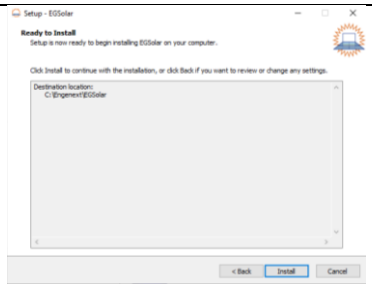
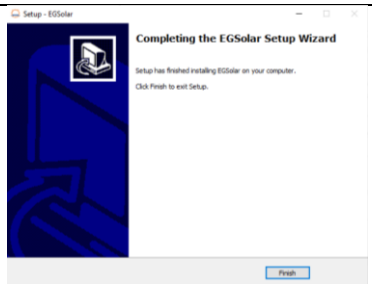
This also adds an entry to on_start.lsp file in 'Support' folder of BricsCAD installation in order to hook it into BricsCAD.

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. Additional 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.<br>ENGENEXT SOLAR ENGINEER can now be used through BricsCAD. Please refer subsequent sections to start using ENGENEXT SOLAR ENGINEER. |

After the completion of installation, when BricsCAD is opened for regular functioning of ENGENEXT SOLAR ENGINEER, license is required. The details regarding ENGENEXT SOLAR ENGINEER license are as explained in subsequent section.

# 5 EGSolar License

The latest version of ENGENEXT SOLAR ENGINEER requires license.

## 5.1 Obtaining license

The license needs to be purchased from Engenext Software Solutions. It will be sent as a license file to your registered email id.

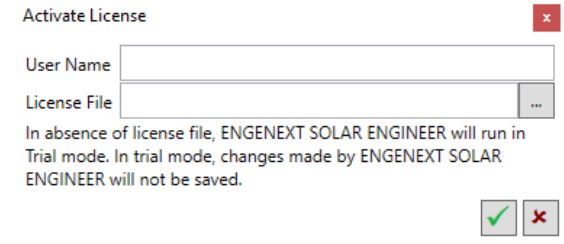
Currently a single license file is associated with single user. License activation and usage does not require internet access. The license activation and usage might be subject to further modifications.

For any other queries related to license activation and usage, contact us on contact@engenext.com.

## 5.2 Activation

After obtaining the license, the procedure for license activation is as follows:

When BricsCAD is opened after installation of ENGENEXT SOLAR ENGINEER, license activation popup appears. The fields in the license dialog are as explained below.




| Parameter | Description |
|---|---|
| User Name | Represents the email id of the user which is registered for getting the EGSolar license. |
| License file | Represents the location on the PC where the license file is temporarily stored before activation. |
| … Button | Allows user to browse and select the temporarily downloaded license file. |

| | | |
|---|---|---|
| | ✓ | Click this button to activate the license. |
| | ✗ | Click this button to cancel license activation. |

If the license activation dialog is closed without activating the license, ENGENEXT SOLAR ENGINEER runs in trial mode. Once the application gets into trial mode, for activation of license, BricsCAD needs to be restarted and after restarting, the above procedure needs to be followed.

## 5.3 Trial mode

ENGENEXT SOLAR ENGINEER allows users to run the application in trial mode in absence of license. The implications of trial mode are as follows:

1. The user is able to run all the commands, view all the options available in the user interface but not able to save any changes except for adding panels and adding array on window closing.
2. On closing the project, switching tab or on BricsCAD save command the changes made to the solar document or solar CAD will be reverted back to the original state.
3. Export commands will remain deactivated.
4. The background colour is different for all the popups and the popup titles appear with trial mode written in brackets. Also, 'Close' button appears instead of regular 'tick and cross' buttons.

### 5.3.1 New and Existing models in Trial mode

For projects created in EGSolar versions before the introduction of licensing, existing solar document entities and related CAD entities will be visible but user will not be able to add any new changes to solar specific CAD.

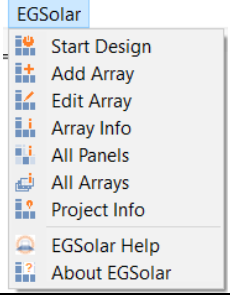
New panels and arrays added to the solar document will be reverted back to the original state on saving the document, BricsCAD tab switch or when closing the drawing.

# 6 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. For this section, it is assumed that EGSolar runs in fully activated mode.

## 6.1 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. |

## 6.2 Command: Start Design

### 6.2.1 Description

Solar design project can be started in an active DWG file with this command.

### 6.2.2 Prerequisites

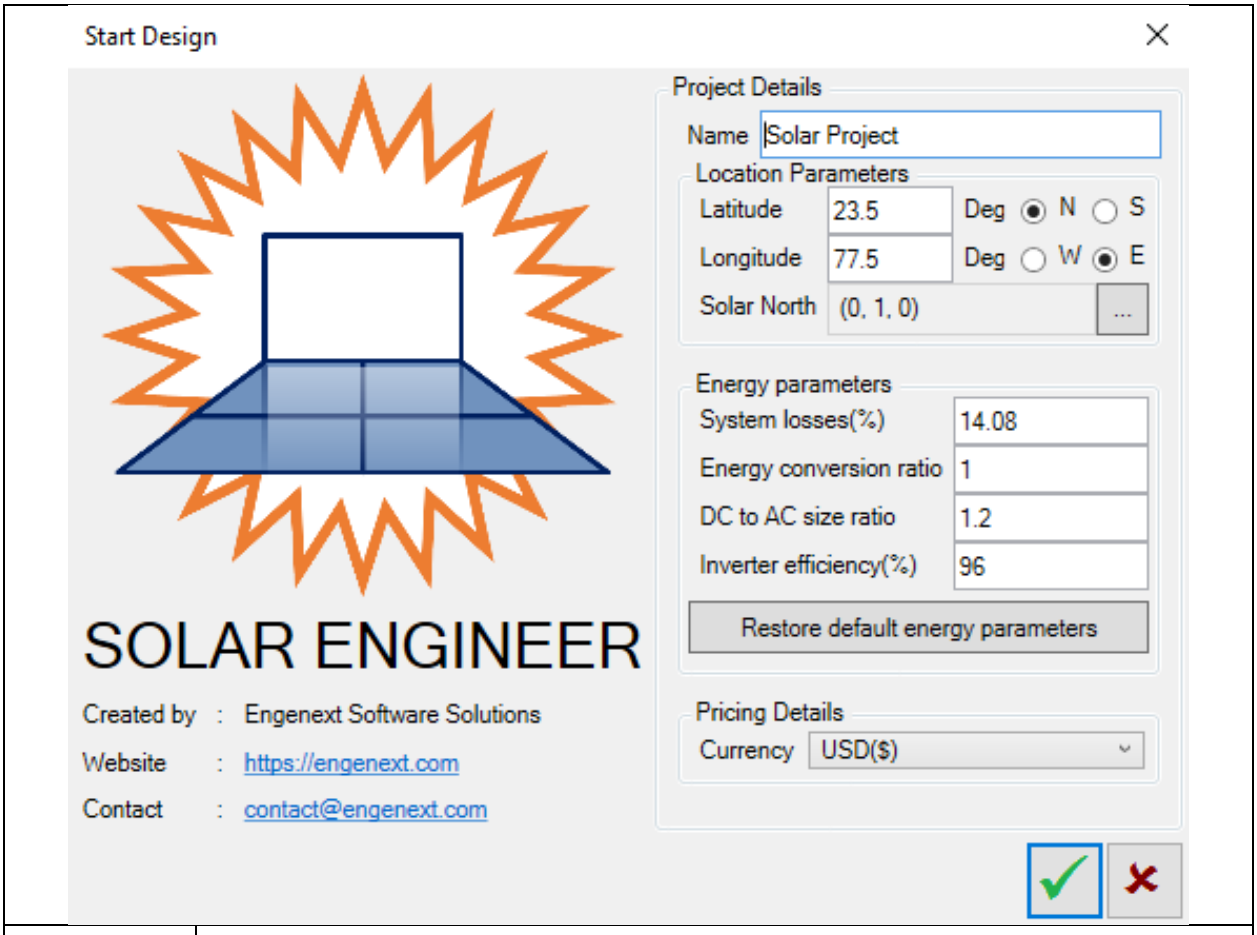
As the solar grid can be created on planar surfaces of a solid body, a solid model that contains a support surface should be available.

### 6.2.3 Usage:

Start the command by either:

1. Type EGSTARTDESIGN on the command line and hit Enter or
2. Click on EGSolar ->Start Design menu.

A window as shown below pops up. The fields in the popup window are as explained below.




| Parameter | Description |
|---|---|
| Name | Represents the name of the solar project. It can be any alphanumeric text. |
| Latitude | Latitude is a measurement on a globe or map of location north or south of the |

| | |
|---|---|
| | Equator. It ranges from 0 to 90 degrees either towards north or towards south. Non-editable if an array is placed. |
| Longitude | Longitude is a measurement of location east or west of the prime meridian at Greenwich, London, England. It ranges from 0 to 180 degrees either towards east or towards west. Non-editable if an array is placed. |
| 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.<br>In UCS set up, this direction will be different from UCS Y direction. Non-editable if an array is placed. |
| … Button | Allows user to select the direction from a straight edge in the model. Non-editable if an array is placed. |
| System losses (%) | Account for performance losses which occur due to various reasons like soiling, connection losses, losses in wires, losses due to external shadows, etc. System losses are set to a default value of 14.08 considering all the average conditions. |
| Energy conversion ratio | Represents the ratio of incident energy and energy generated. Its default value is 1. It can be set to any value as per requirements. |
| DC to AC size ratio | It is the DC to AC size ratio of the array's DC rated size to the inverter's AC rated size. Its default value is 1.2. |
| Inverter efficiency (%) | The inverter's nominal rated DC-to-AC conversion efficiency, defined as the inverter's rated AC power output divided by its rated DC power output. Its default value is 96. |
| Restore default settings | Restores all the energy parameters to their default values. The default values are selected based on typical conditions. |
| 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 |

When an array is inserted in drawing file, location parameters inserted in start design are used for the array orientation. Hence, once an array is added location parameters become non editable.

## 6.3 Command: Add Array

### 6.3.1 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.

### 6.3.2 Prerequisites

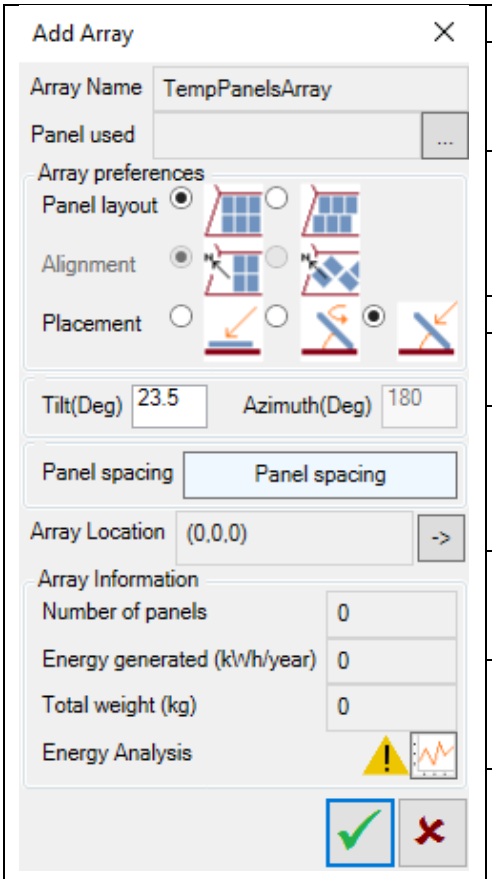
1. Solar Project should be created in the DWG file to be able to add an array.
2. Planar surface of a solid body should be available to place an array.
3. A surface should not already be having an array placed on it.

### 6.3.3 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. The name gets changed on insertion of array in cad model. |
| 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 inline or staggered. |
| Alignment | Choose to align panels with roof longitudinal or solar north. |
| Placement | Choose to place flat on roof, perpendicular to solar direction aligned with the face or perpendicular to solar direction with given tilt and azimuth. |
| Tilt (Deg) | Represents the required angle between solar panels and the surface on which the array is inserted. It varies from 0 to 90. |
| Azimuth (Deg) | Represents the angle between the solar north and array north. It varies from 0 to 359.99. |
| Panel spacing | When user clicks on panel spacing button, application popups up a window in which user can add spaces between adjacent panels or between adjacent panel rows. |
| Array Location | When user clicks on the arrow mark in front of the array location, the window closes and in CAD user can select the required surface on which panels are to be placed. |
| Number of panels | This value gets generated automatically depending on the area of the surface selected. |
| Energy generated(kWh/year) | 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. |
| | Energy Analysis | When user clicks on the energy analysis button, a popup dialog appears which shows the energy analysis for the array. The contents of the dialog will be discussed in subsequent sections. |
| | ✓ | Click this button to save created array. |
| | × | Click this button to cancel the array. |

After insertion of array in CAD model, information such as panel specifications, array preferences, tilt, azimuth and panel spacing, are displayed for user convenience and become read only. It can be edited only using 'Edit Array' command.

## 6.4 Functionality: Solar Panel Specification

### 6.4.1 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.

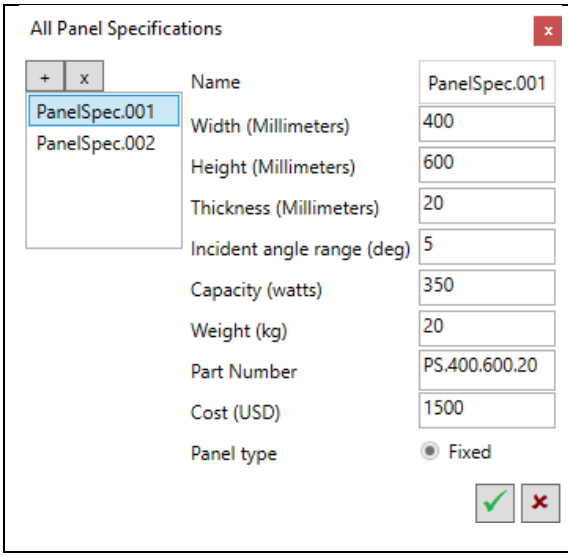
### 6.4.2 Prerequisites

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.

### 6.4.3 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 (dwg unit) | Width of a panel in east-west direction<br>Default value: 40 |
| Height (dwg unit) | Height of a panel in north-south direction |

| | | |
|---|---|---|
| | | Default value: 60 |
| | Thickness (dwg unit) | Panel overall thickness<br>Default value: 10 |
| | Capacity (watts) | Energy generation capacity<br>Default value: 0 |
| | Incident angle range (deg) | Incident angle range within which a panel will be generate energy effectively.<br>Default value: 0 |
| | Weight (kg) | Total weight of a panel. Does not consider weight of supports/fasteners<br>Default value: 0 |
| | Part Number | It is the display name of the panel specification in the BOM.<br>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.<br>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. |

## 6.5 Functionality: Energy Analysis for array

### 6.5.1 Introduction

This interaction is not provided as an independent command, it is given as a part of array interaction commands like Add Array, Edit Array, Array Info, etc. It is available after the array is placed, since the energy analysis depends on factors like the panel specifications, number of panels, direction of solar energy and the panels and location parameters.

Energy analysis is possible only if internet connection is available. In absence of internet connection warning symbol ⚠ is shown indicating that energy analysis is not done. After internet connection is restored, it is possible to perform energy analysis for all the arrays created in absence of internet connection.

The energy analysis data for ENGENEXT SOLAR ENGINEER is obtained from PVWatts https://pvwatts.nrel.gov/pvwatts.php. PVWatts is an internet site powered by NREL (National Renewable Energy Laboratory). It calculates solar radiation based on latest NSRDB (National solar

radiation database) and calculated DC and AC energy generated based on electrical parameters provided by the user.

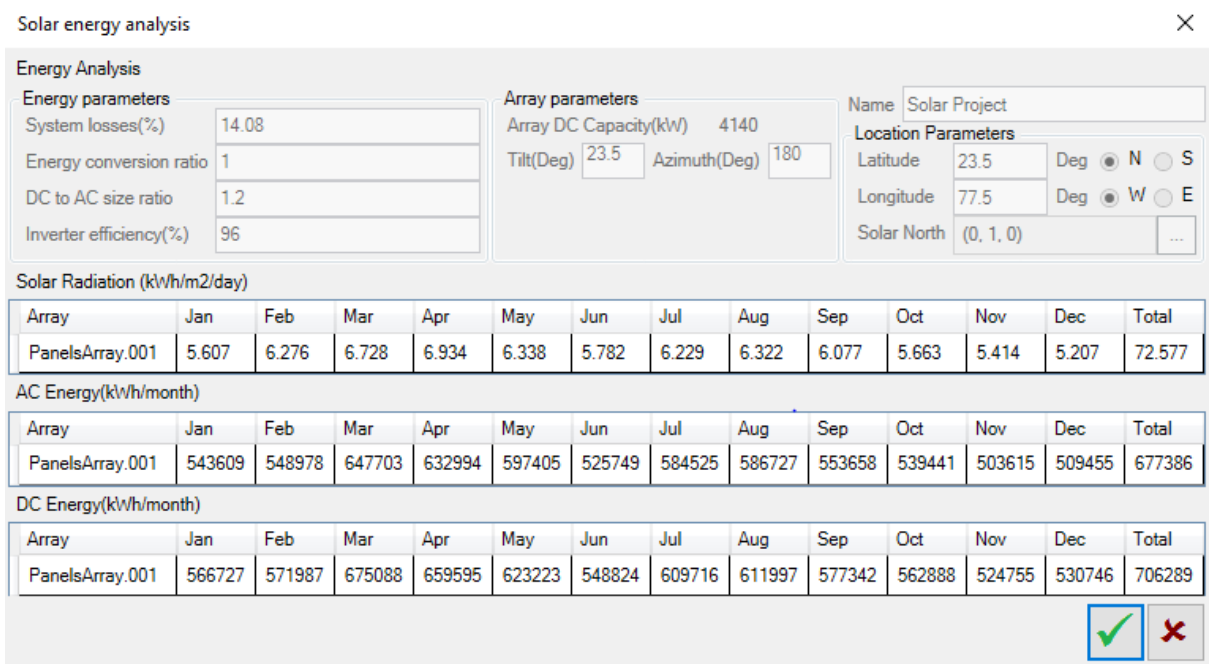
### 6.5.2 Prerequisites

1. Solar project should be created in the DWG file.
2. Live internet access should be available.
3. ENGENEXT SOLAR ENGINEER should be a licensed copy.
4. As this interaction is started through Array design commands, all prerequisites required for Array design are applicable.
5. Array should be placed, since energy analysis depends on array parameters like panels specifications, number of panels, etc.

### 6.5.3 Usage

The window pops up when user click on energy analysis button in Add array/Edit array/Array info dialogue.

The popup window is as shown below




| Parameter | Description |
|---|---|
| Energy parameters | Represents the energy parameters considered for energy calculations. The parameters in this box are for reference only, they are same as the ones entered in start design dialog. |
| Array parameters | Represents the array parameters required for energy calculations. The parameters in this box are for reference only, they are same as the ones entered in add array dialog. |
| Name | Represents the name of the project. |
| Location parameters | Represents the location parameters considered for energy calculations. The parameters in this box are for reference only, they are same as the ones entered in start design dialog. |
| Solar Radiation | The values in this table represent the incident solar radiation in kWh/$m^2$/day |

| | |
|---|---|
| (kWh/m$^2$/day) | for each month. |
| AC Energy (kWh/month) | The values in this table represent the AC energy generated in kWh for each month. |
| DC Energy (kWh/month) | The values in this table represent the DC energy generated in kWh for each month. |

## 6.6 Functionality: Panel spacing

### 6.6.1 Introduction

This interaction is not provided as an independent command. It stores information regarding the spacings between adjacent panels both along the rows and columns. Since spacings are array specific, they form a part of the array design commands.

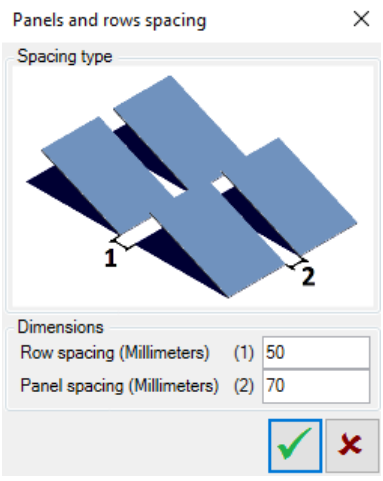
### 6.6.2 Prerequisites

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

### 6.6.3 Usage

The window pops up when user click on panel spacing button in Add/Edit array dialogue.

The popup window is as shown below




| Parameter | Description |
|---|---|
| Row Spacing (1) | It represents the distance measured on the ground which is not covered by the shadows cast by solar panels.<br>(Even in case of inclined surfaces, row spacing represents the width of the area not covered by the shadow)<br>Represented by dimension 1 in image. |
| Panel Spacing (2) | It represents the space between adjacent panels<br>Represented by dimension 2 in image. |

## 6.7 Command: Edit Array

### 6.7.1 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.

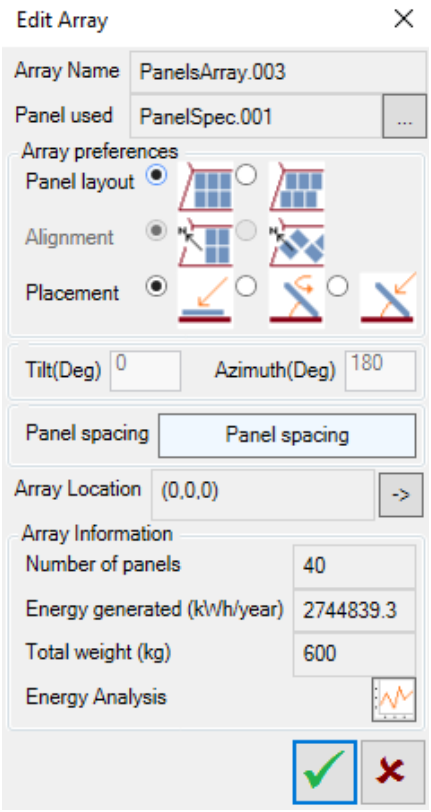
### 6.7.2 Prerequisites

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

### 6.7.3 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.

## 6.8 Command: Array Info

### 6.8.1 Introduction

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

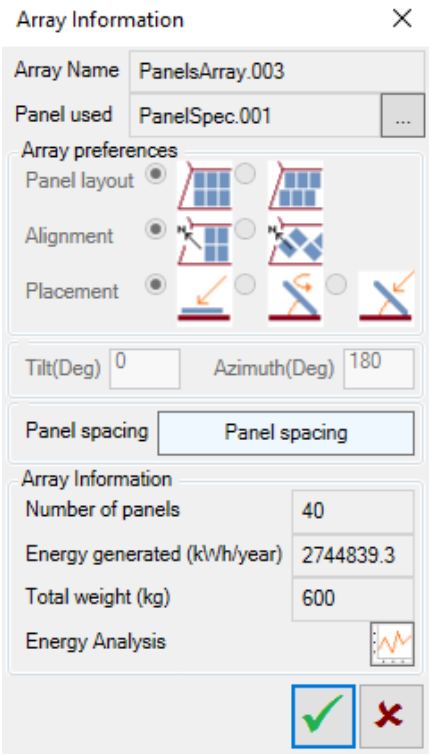
### 6.8.2 Prerequisites

A Solar array should be present in the DWG file.

### 6.8.3 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.

## 6.9 Command: All Panels

### 6.9.1 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.

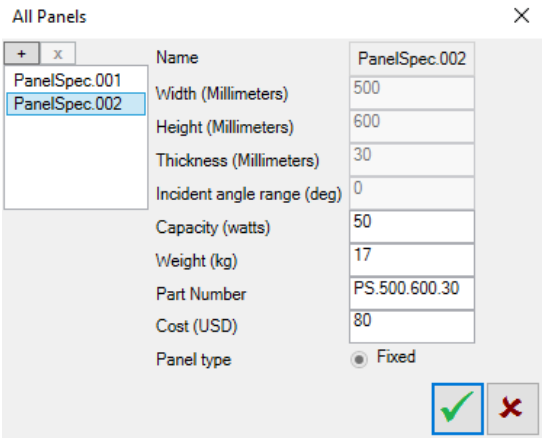
### 6.9.2 Prerequisites

Solar project should be present in the DWG file.

### 6.9.3 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.

## 6.10 Command: All Arrays

### 6.10.1 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.

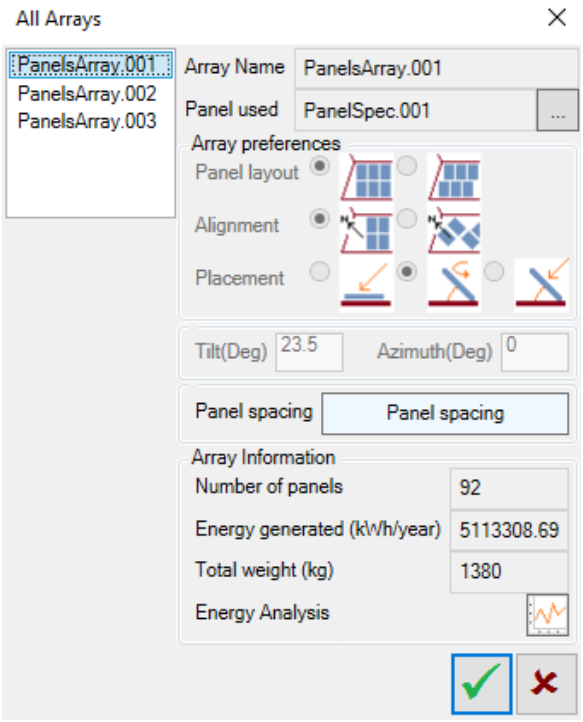
### 6.10.2 Prerequisites

Solar project should be present in the DWG file.

### 6.10.3 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.

## 6.11 Command: Project Info

### 6.11.1 Introduction

This command provides a complete overview of the project. It contains information regarding the panels and arrays, bill of materials and energy calculations. All this information is for the entire project.

In info tab it gives information regarding location parameters, all the arrays inserted, all the panels used and their quantities and overall project summary.

In BOM tab it gives information regarding all the part items and their quantities and the discount parameters.

In Energy Analysis tab it gives information regarding the entire project energy calculations. The display format is similar to the one displayed for individual arrays.

### 6.11.2 Prerequisites

Solar project should be present in the DWG file.

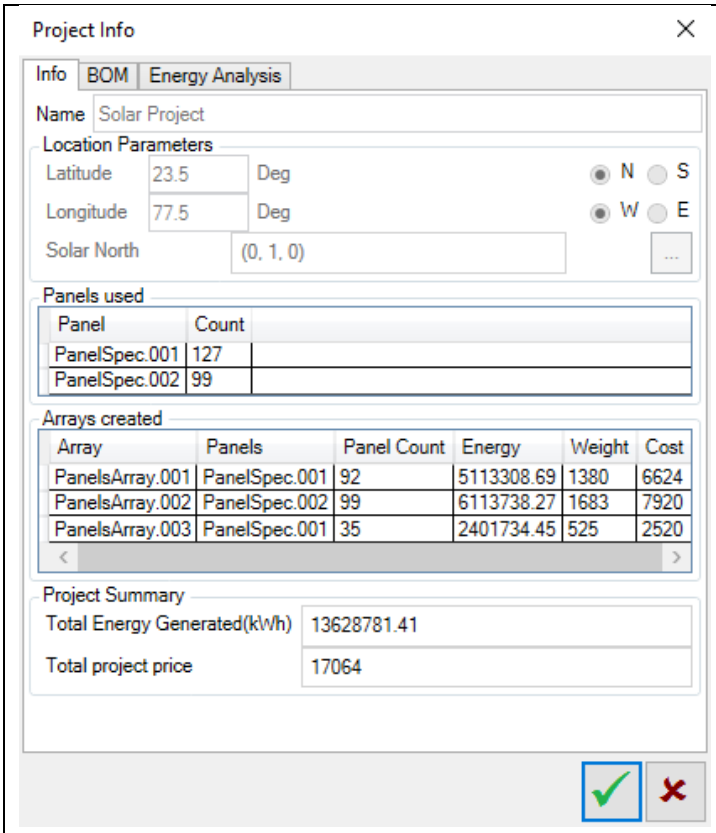
### 6.11.3 Usage

Start the command by either

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

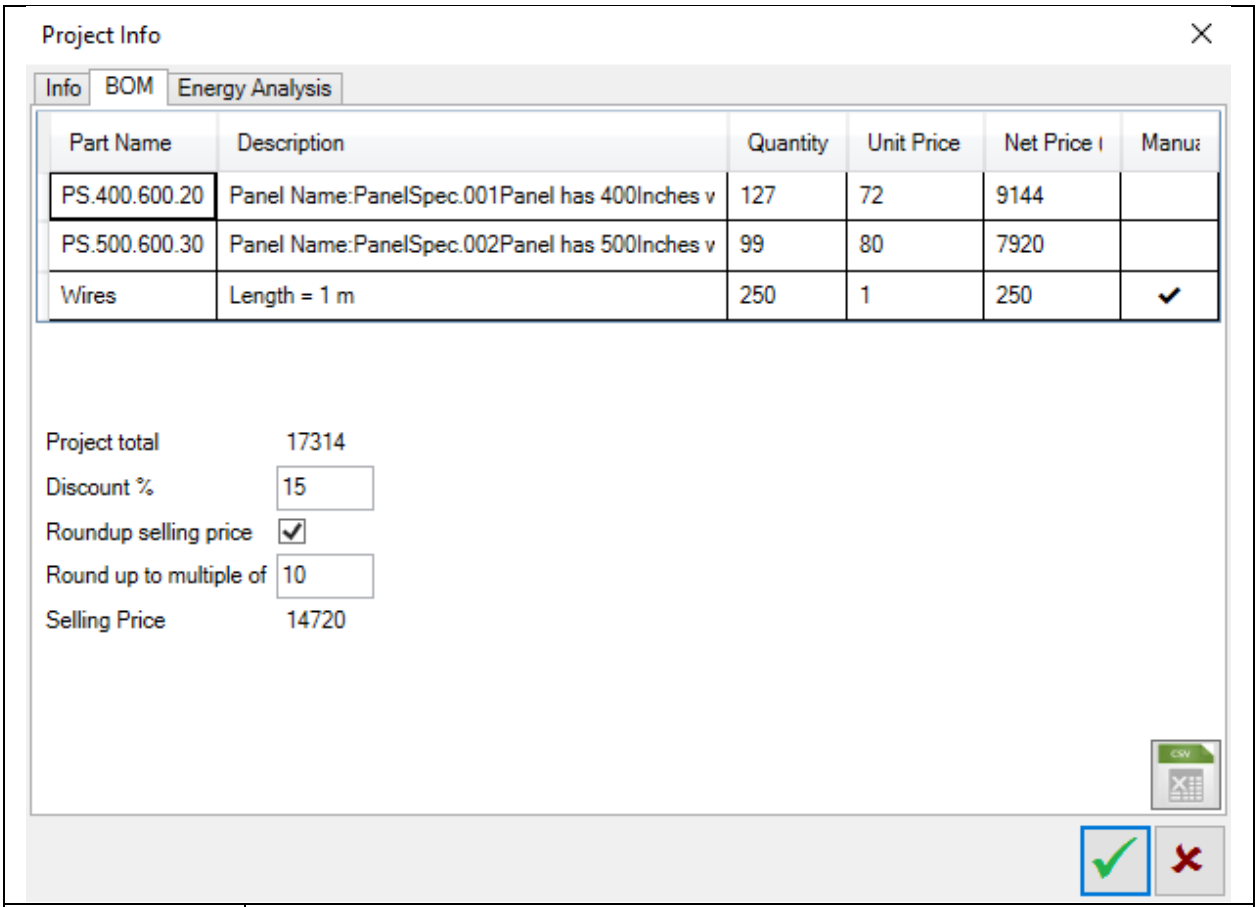
3. A window as shown below in individual tab sections pops up.
4. Each tab item is as explained below.

### 6.11.3.1 Info tab




| Parameter | Description |
|---|---|
| Name | Name of the project as entered while starting the project |
| Location parameters | Same as entered while starting the project |
| Panels used | Lists all panels defined in the project |
| Panel | Name of the panel |
| Count | Total count of panels in the whole project |
| Arrays 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( kWh) | Total energy generated by all arrays |
| Total project price | Total price of project |

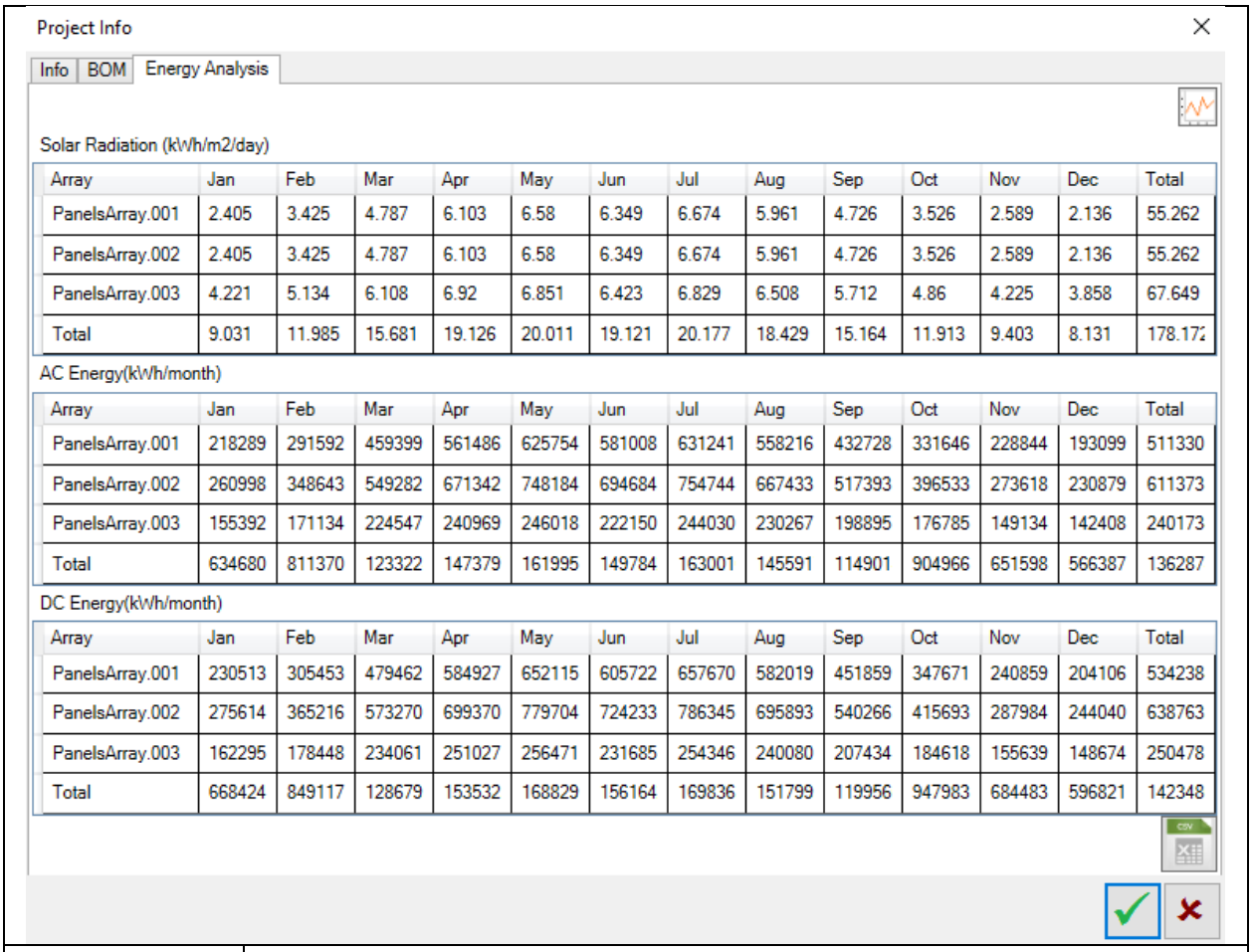
### 6.11.3.2 BOM tab




| 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. |
| Project total | It is the total price of the project before applying discount. |
| Discount % | Represents the percentage discount. |
| Roundup | Represents whether the selling price value has to be rounded up after applying the discount. |
| Rounding up factor | Represents the factor by which the value is to be round up. |
| Selling price | Represents the actual selling price after applying discount and rounding up. |
| Export to csv | Exports the information from the window to a csv file. |
| Close | Closes the popup window. |

Additional BOM line items can also be added using insert key or by right clicking on the BOM and clicking on add part. User can also delete BOM manually added BOM line items. Project total includes the price of the automatically generated parts as well as manually added parts.

#### 6.11.3.3 Energy Analysis tab




| Parameter | Description |
|---|---|
|  | Recalculate energy analysis- If energy analysis is not calculated for a particular array due to absence of internet connection, by clicking on this button, energy analysis gets calculated (if internet connection is available) for applicable arrays and gets displayed. |
| Solar Radiation | This table displays the solar radiation for all the arrays present in the project and their total month wise, array wise and grand total. |
| AC Energy | Similar to the explanation in solar radiation, this table displays information regarding the AC energy generated. |
| DC Energy | Similar to the explanation in solar radiation, this table displays information regarding the DC energy generated. |
| Export to csv | Exports the information from the window to a csv file. |

# 7 Command: EGSolar Help

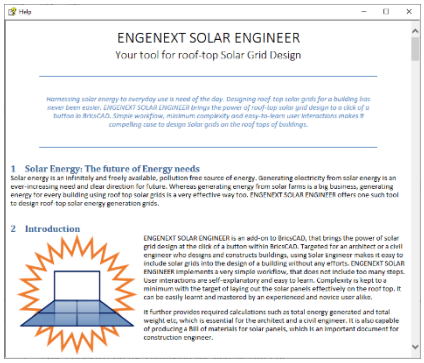
## 7.1.1 Introduction

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

## 7.1.2 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.



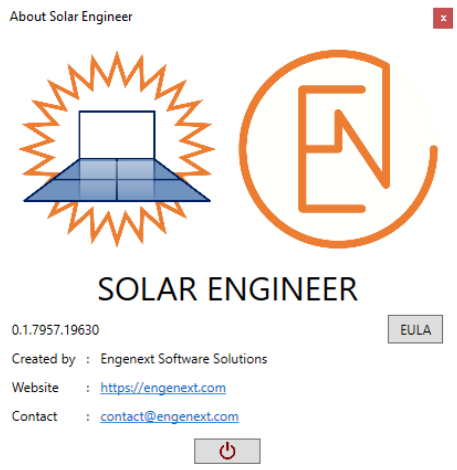

# 8 Command: About EGSolar

## 8.1.1 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).

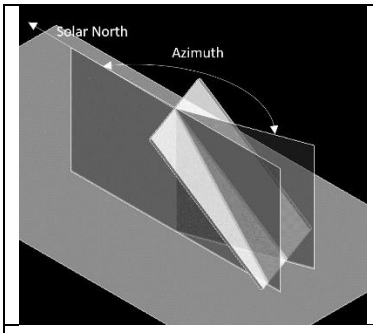
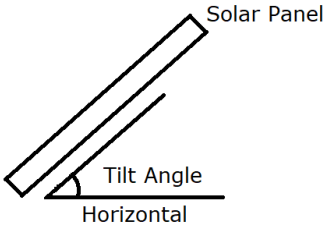
## 8.1.2 Usage

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.



# 9 Appendix

## 9.1 Solar concepts and terminology

| | |
|---|---|
|  | Azimuth- Please refer to https://www.pveducation.org/pvcdrom/properties-of-sunlight/azimuth-angle |
|  | Tilt- It represents the angle between solar panel and horizontal plane. |

For more information related to geometrical and electrical parameters required for energy calculations refer https://pvwatts.nrel.gov/

# 10 List of Releases

| Release Date | Release number |
|---|---|
| August 2020 | 0.1.7532 |
| November 2020 | 0.1.7636 |
| January 2021 | 0.1.7698 |
| October 2021 | 1.0.7962 |