Standard Mode Edition

Field Logic, Inc.

Version 1.0

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1. Introduction

About This Document (Tutorial)

HelioBase® is an application that predicts the generated output of the photovoltaic system (PV). This document describes how to calculate the predicted generated output where the designer of the photovoltaic system configures the PV arrays by verifying the shadow or reflected light. This tutorial describes the basic operations: the program starts where the designer defines the location of the system and sets the conditions of the meteorological data, defines the PV arrays, configures the building layout, configures the equipment, and then, performs the calculations and verifies the results.

You will learn basic operations of *HelioBase*® through these operations.

◇NOTE◇

Data file used:

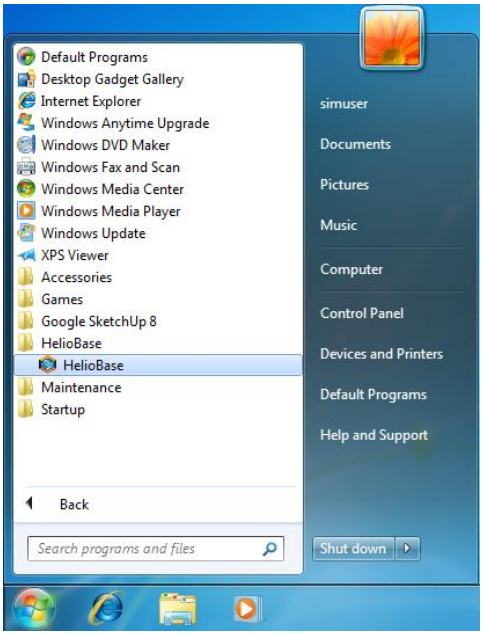
The following data file is used in this document.

① Tutorial-01.stl: STL data file for the building model

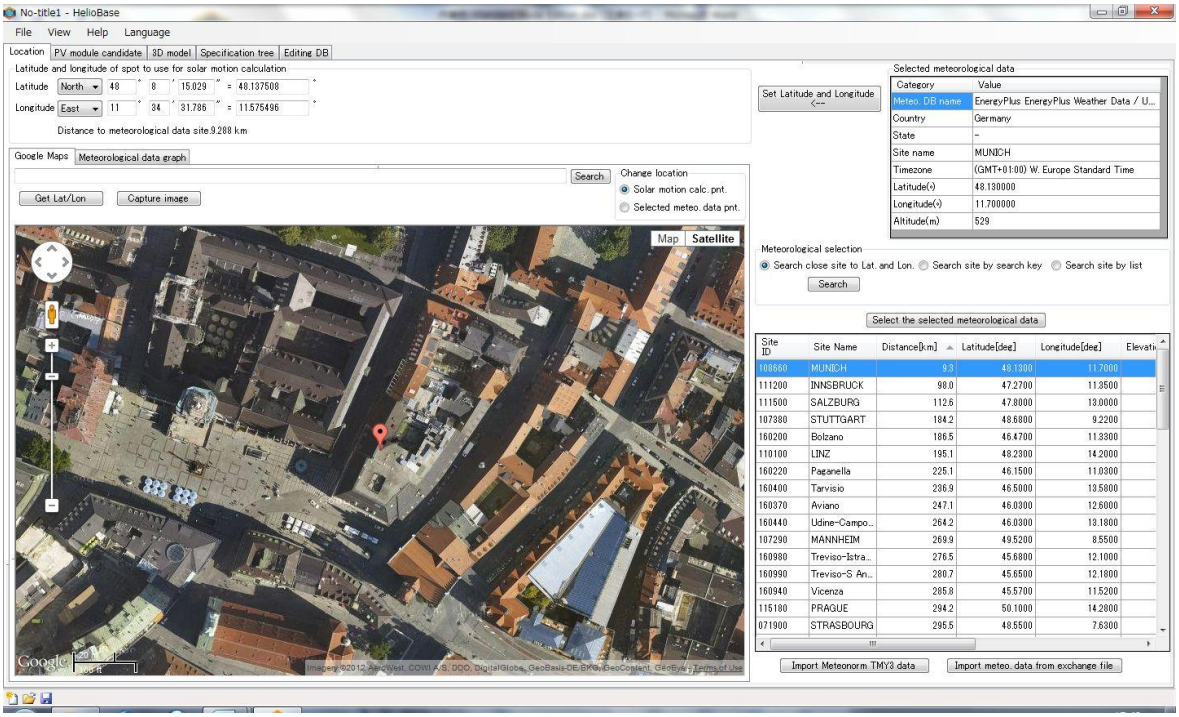
2. Starting *HelioBase®*

Operation: Start *HelioBase®.*

① Click the Windows [Start] button, click [All Programs], then click [HelioBase®]-[HelioBase®].



② *HelioBase®* starts.



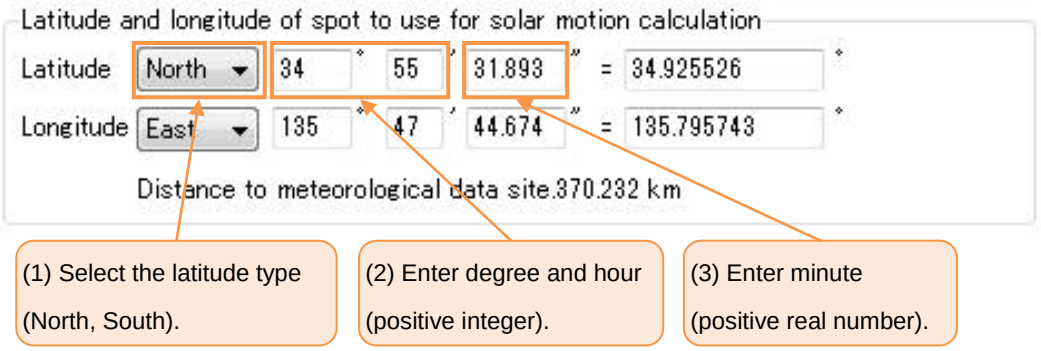
3. Set the Location

Define the location (latitude, longitude) and the meteorological data to simulate the power generation.

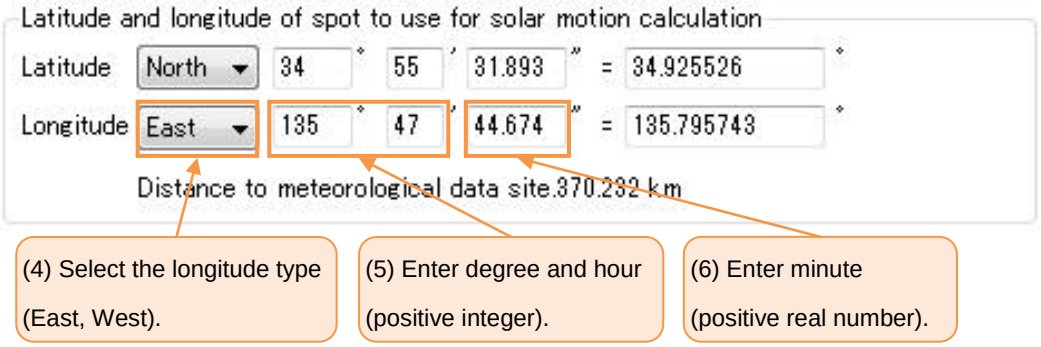
Set the latitude and longitude

Operation:　Set the latitude and longitude of the location to simulate.

① Enter the latitude (degree, arc-minute, arc-second) to simulate in the [latitude and longitude of spot to use for solar motion calculation] box.



② Similarly, enter the longitude (degree, arc-minute, arc-second).



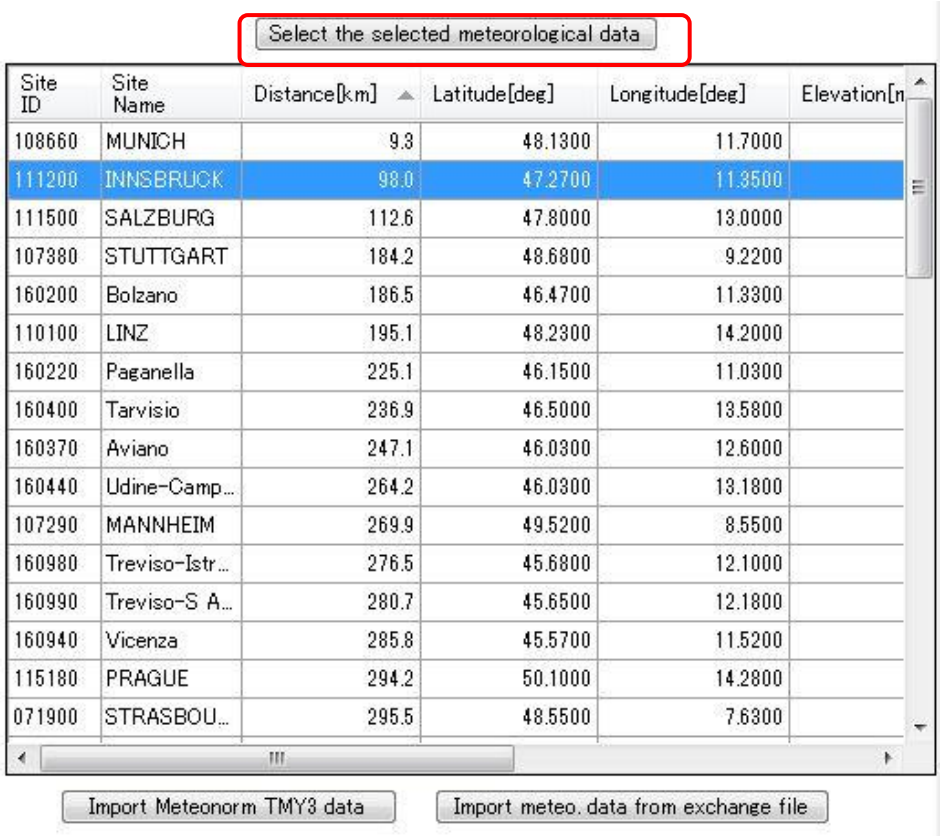
Select the meteorological data

Operation: Select the meteorological data for simulation.

① Click the [Search close site to Lat. and Lon.] radio button.

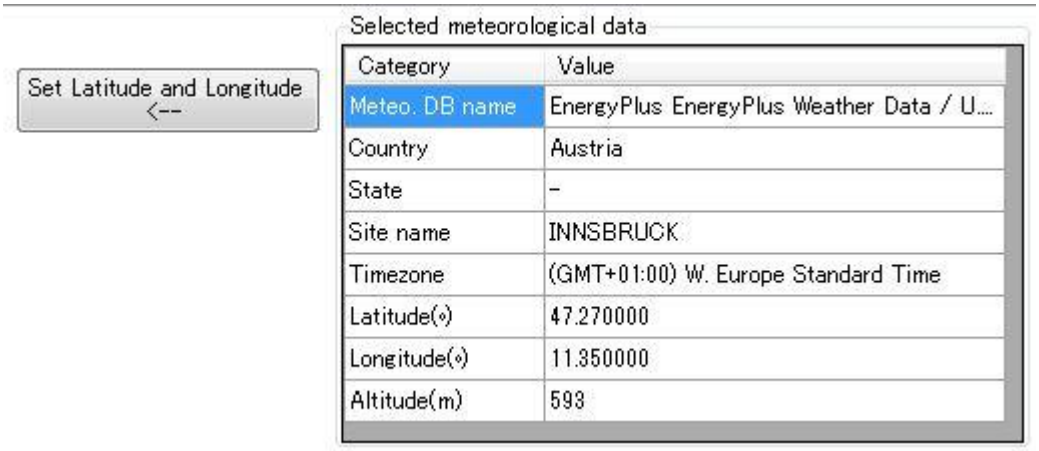
② The following [Meteorological selection] box shown. Click the [Search] button.

③ The [Meteorological data site list] is updated. Click the line of the site near the location. Click the [Select the selected meteorological data] button.



Site ID	Site Name	Distance[km]	Latitude[deg]	Longitude[deg]	Elevation[n
108660	MUNICH	9.3	48.1300	11.7000	
111200	INNSBRUCK	98.0	47.2700	11.3500	
111500	SALZBURG	112.6	47.8000	13.0000	
107380	STUTTGART	184.2	48.6800	9.2200	
160200	Bolzano	186.5	46.4700	11.3300	
110100	LINZ	195.1	48.2300	14.2000	
160220	Paganella	225.1	46.1500	11.0300	
160400	Tarvisio	236.9	46.5000	13.5800	
160370	Aviano	247.1	46.0300	12.6000	
160440	Udine-Camp...	264.2	46.0300	13.1800	
107290	MANNHEIM	269.9	49.5200	8.5500	
160980	Treviso-Istr...	276.5	45.6800	12.1000	
160990	Treviso-S A...	280.7	45.6500	12.1800	
160940	Vicenza	285.8	45.5700	11.5200	
115180	PRAGUE	294.2	50.1000	14.2800	
071900	STRASBOU...	295.5	48.5500	7.6300	

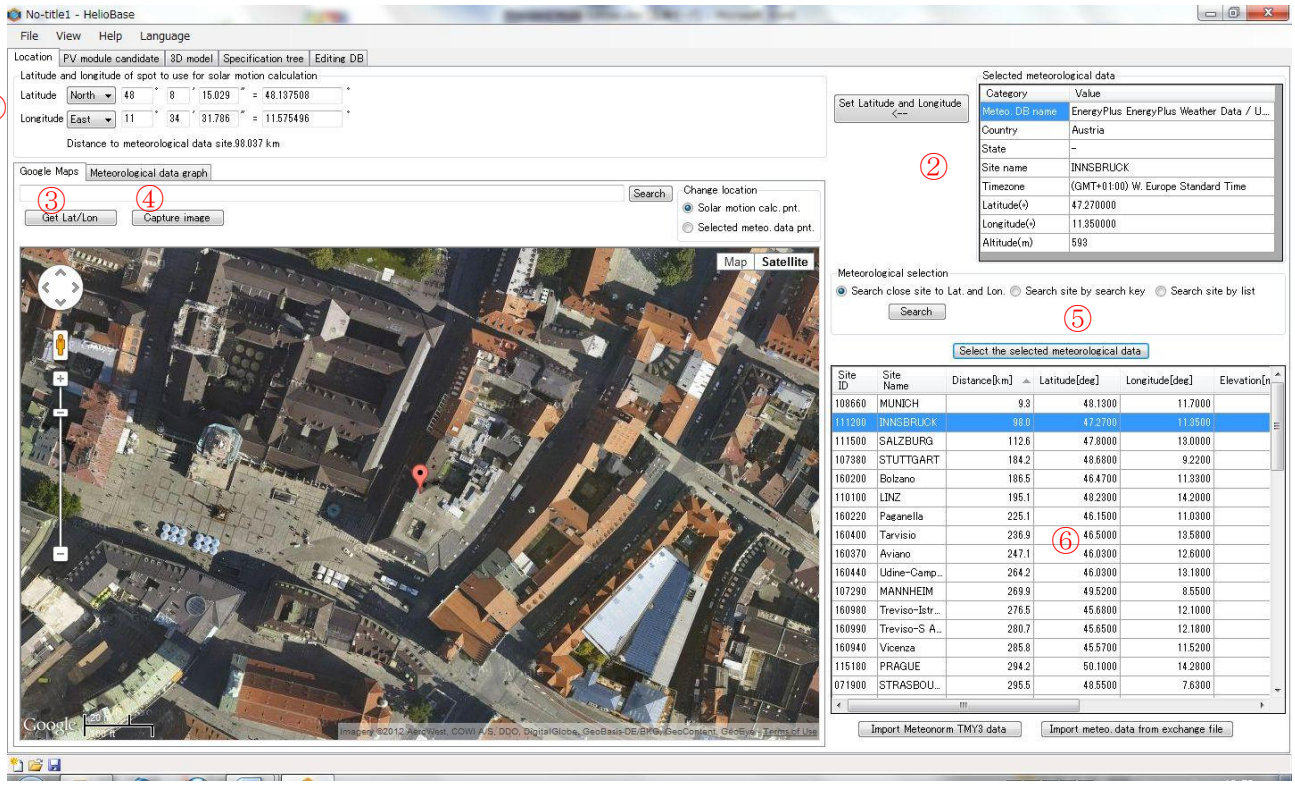
④ The [Selected meteorological data] box is updated to the data of the selected site.



◇NOTE◇

[Location] – Screen configuration

The following shows the screen configuration of the [Location] tab.



① [Latitude and longitude of spot to use for solar motion calculation]... Sets the latitude and longitude of the location for the actual simulation.

② [Selected meteorological data] ... Shows the meteorological data used for simulation.

③ In this tab, you can search location and get latitude and longitude, and check the selected meteorological data point.

④ …Shows the graph of the irradiance and temperature data of the selected meteorological point.

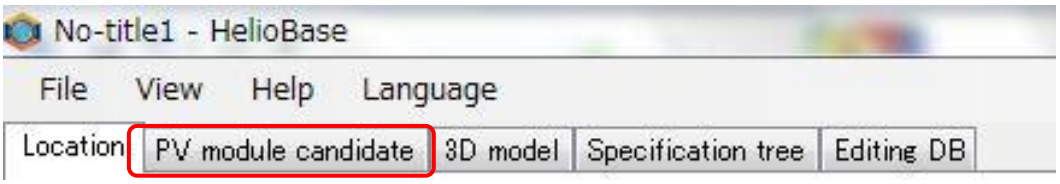
⑤ [Meteorological selection]... Selects the method to select the meteorological data.

⑥ …Displays the list of the meteorological points searched in ③.

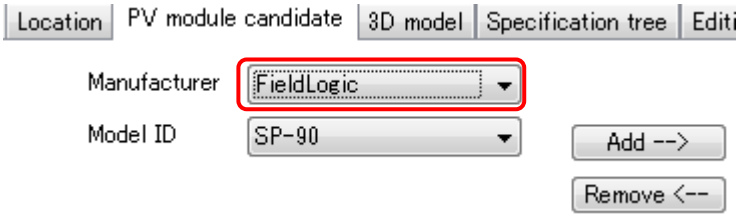
4. Select the PV Module to Use

Operation:　Select the PV module to use in the simulation.

① Click the [PV module candidate] tab to display the PV module candidates.

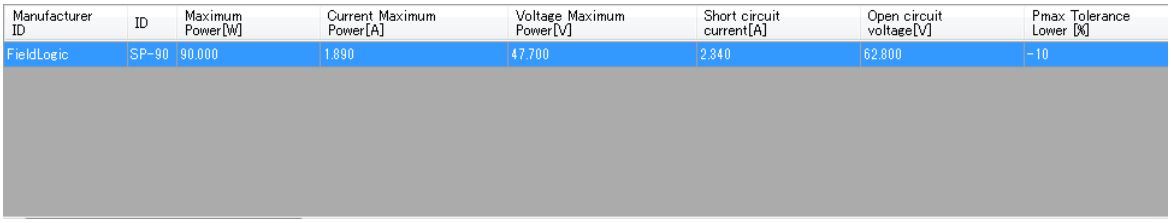


② Select [FieldLogic] in the [Manufacturer] list box.

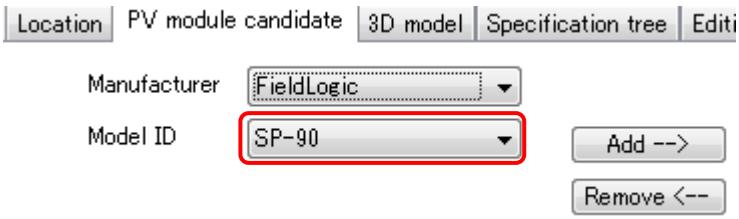


◇NOTE◇

Changing the value in the [Manufacturer] list box changes the [Module list] grid (screen center) to the module list of the selected manufacturer.

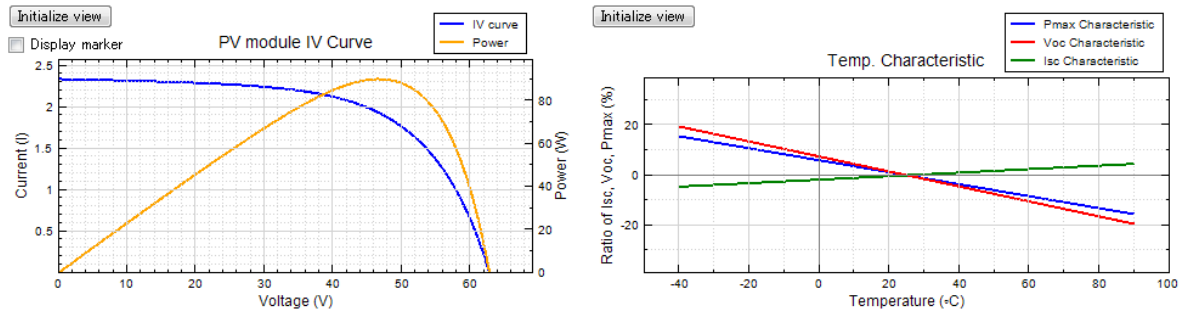


③ Select [SP-90] in the [Module ID] list box.

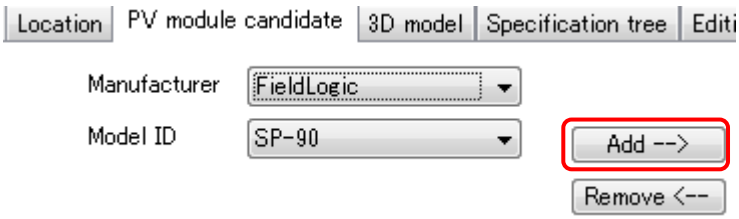


◇NOTE◇

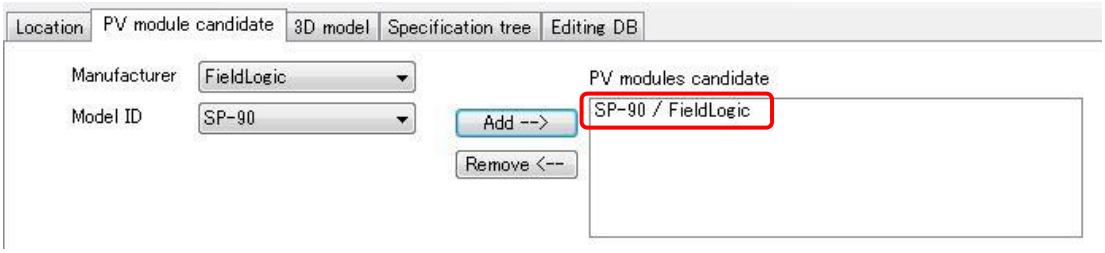
When the value in the [Module ID] list box is changed, the [PV module IV Curve] graph and [Temp. Characteristic] graph at the bottom of the screen are changed accordingly.



④ Click the [Add] button.



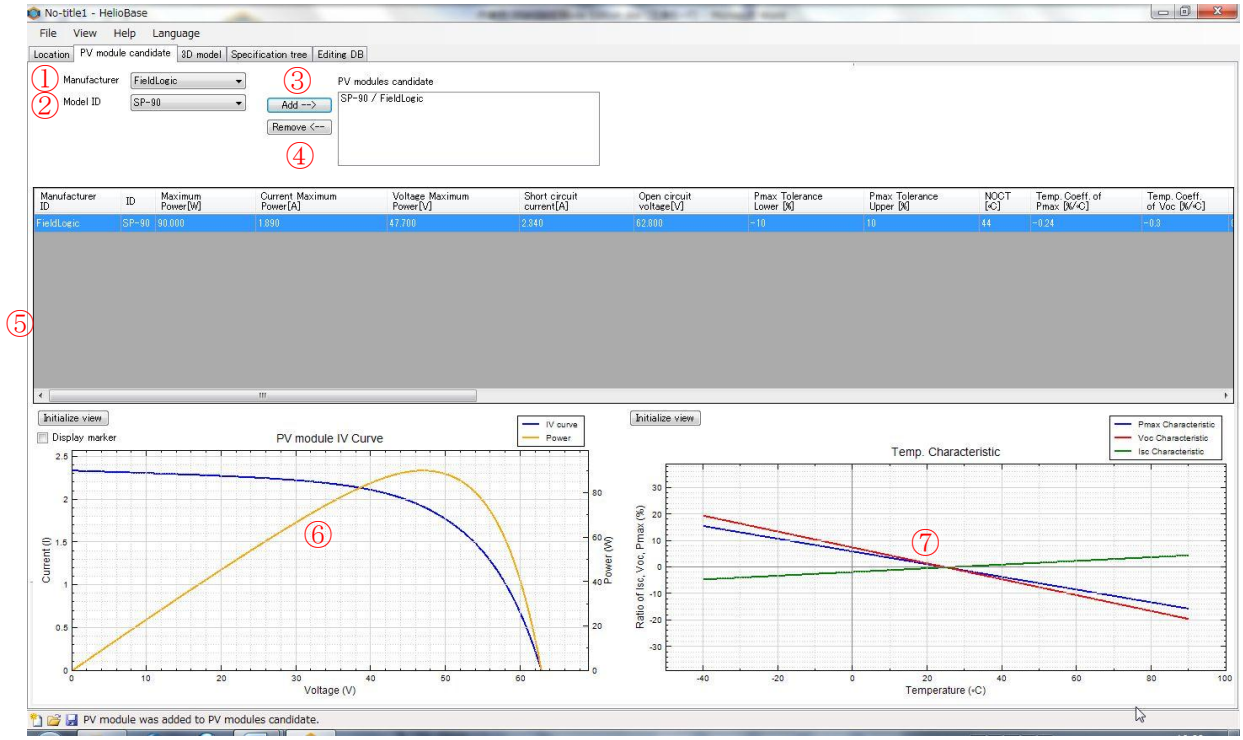
⑤ [SP-90] is selected in the [PV modules candidate] box.



◇NOTE◇

[PV module candidate] – Screen configuration

The following shows the screen configuration of the [PV module candidate] tab.



①…Selects the manufacturer of the PV module.

②…Selects the PV module.

③…Adds the selected PV module to the PV module used in the simulation.

④…Deletes the PV module selected in [PV module candidates] from the PV module used in the simulation.

⑤…Shows the PV module list of the selected manufacturer.

⑥…Shows the IV Curve (IV characteristics curve) of the selected PV module.

⑦…Shows the temperature characteristics curve of the selected PV module.

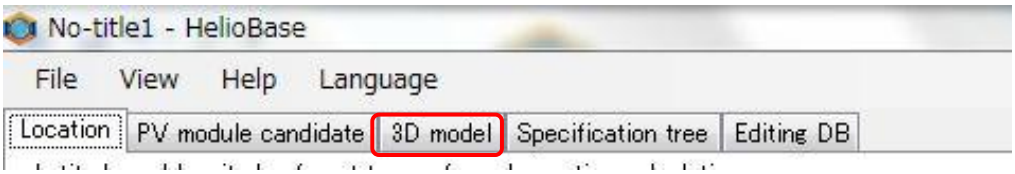
5. Set the Layout

You can set the PV arrays and buildings (that cast a shadow) in the 3D drawing.

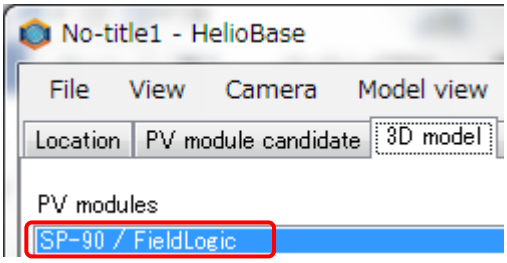
Set the PV arrays

Operation: Set the PV array configuration and place the PV arrays in the 3D drawing.

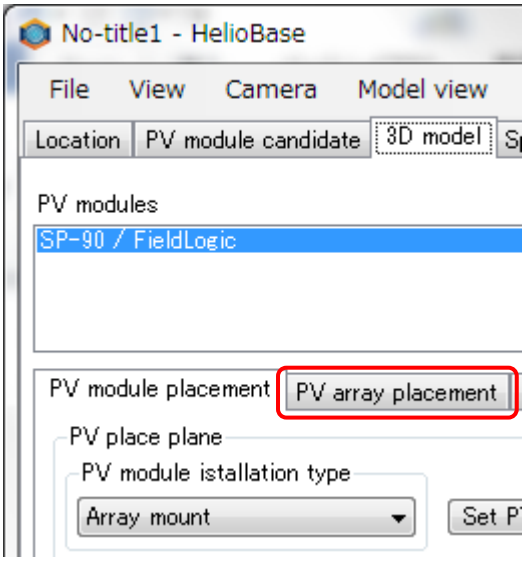
① Click the [3D model] tab. The 3D model appears.



② Verify that the PV module (selected in Chapter 4) is shown in the [PV modules] box (upper-left corner of the screen).



③ Click the [PV array placement] tab. The [PV array placement] tab appears.



④ Set the parameters to place the PV arrays.

[PV array parameters] box

[Columns]: 10

[Col.Gap]: 10

[Rows]: 3

[Row Gap]: 10

[Tilt Ang.]: 20

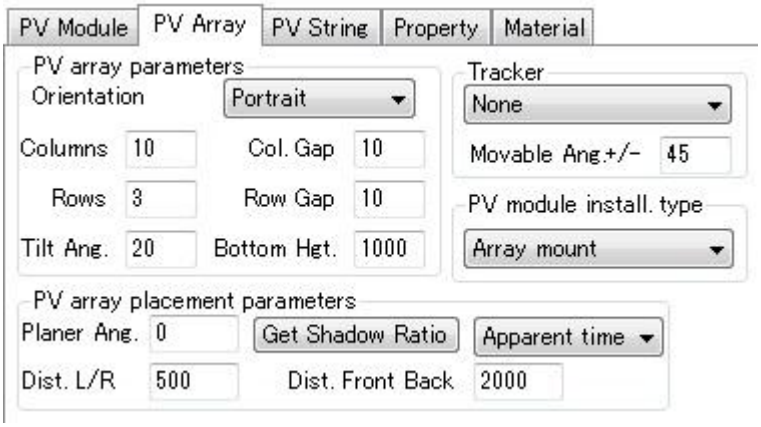
[Bottom Hgt.]: 1000

[PV array placement parameters] box

[Planer Ang. for South]: 0

[Dis. Left Right]: 500

[Dist. Front Back]: 2000



◇NOTE◇

Parameters in detail

[PV array parameters] box

[Columns]: No. of PV modules placed horizontally

[Col. Gap]: Distance between the PV modules in the horizontal direction (Unit: mm)

[Rows]: No. of PV modules placed vertically

[Row Gap] Distance between the PV modules in the vertical direction (Unit: mm)

[Tilt Ang.]: Inclination angle of the PV array against the horizontal plane (Unit: °)

[Bottom Hgt.] Distance from the horizontal plane to the bottom of the PV array (Unit: mm)

[Tracker] box

[Tracker]: Type of tracker's movable axis (Select [None], [1-axis horizontally] or [1-axis skew].)

[Movable Ang.]: Movable angle of tracker's movable axis (Unit: °)

[PV array placement parameters] box

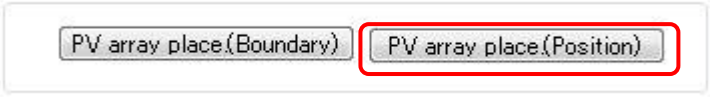
[Planer Ang. for South]: Angle counterclockwise of the PV array (front) if direct south is 0°.

[Dist. Left Right]: Distance between the PV arrays in the horizontal direction (Unit: mm)

[Dist. Front Back]: Distance between the PV arrays in the "front and back" direction.

[Get by Shadow Ratio] button: Calculates and enters the value in [Dist. Front Back] which is the distance by which the PV array in the back will not be "shadowed". The value is calculated based on the specified date and time (Default: 12/22 10:00-14:00).

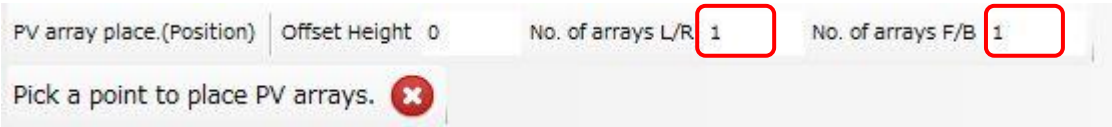
⑤ Click the [PV array place.(Position)]button and move the [PV array place.(Position)] mode.



⑥ Set the number of PV arrays. One PV array is set here. Set the following parameters:

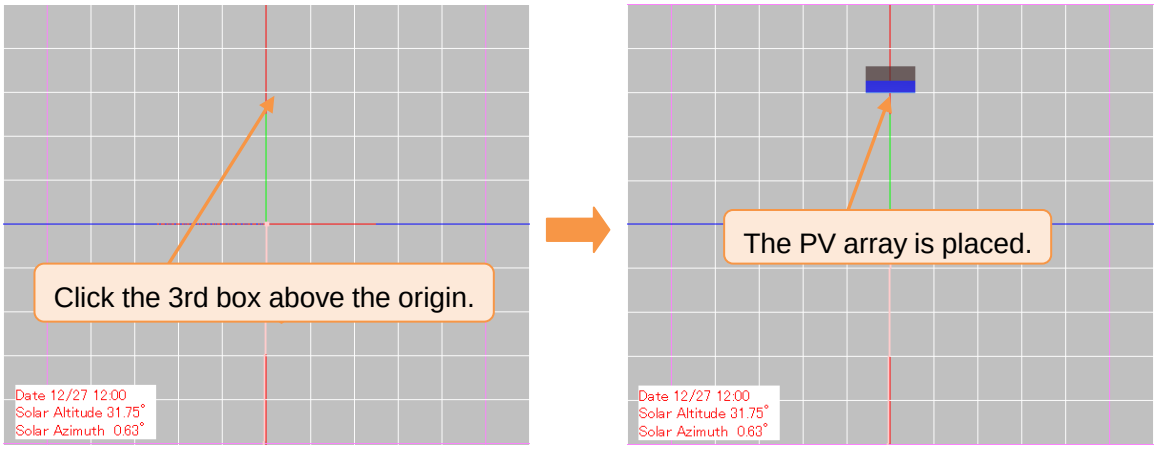
[No of arrays L/R] 1

[No of arrays F/B] 1



⑦ Click any point on the 3D drawing.

The PV array is placed where the clicked point is the center of the lower edge.



◇NOTE◇

Camera operation in the 3D drawing.

Camera mode types and switching

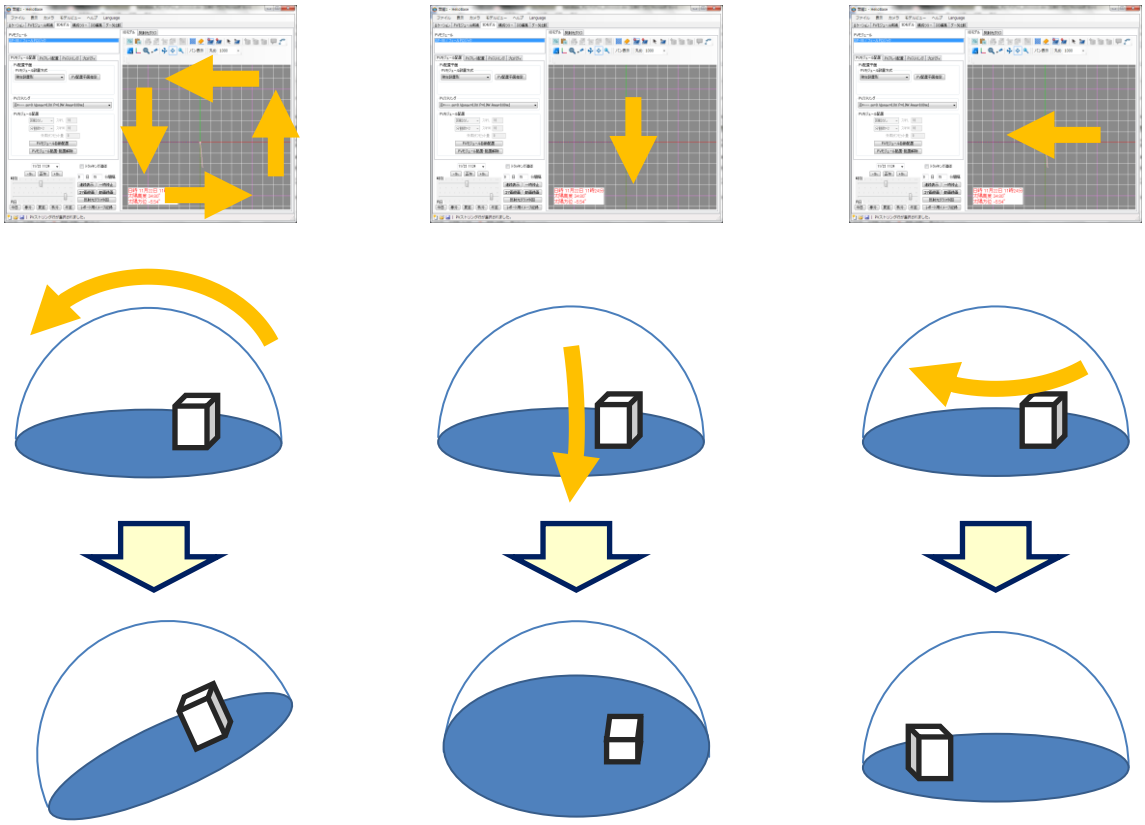
In the [3D Model], the camera on the 3D drawing can be moved by using one of three camera modes ([Pan Display], [Orbit], [Zoom]).

The camera mode can be changed by clicking one of the icons 

above the 3D drawing or by selecting a mode: ([Camera] – [Orbit], [Pan Display] or [Zoom]).


[Orbit] mode – Operation

Mouse drag: Moves the camera so that the clicked point rotates in the direction of the mouse drag.
[Shift] key + Mouse drag: Moves the camera so that the clicked point moves in the direction of the mouse drag.
[CTRL] key + Mouse drag:




[Pan Display] mode – Operation

Mouse drag: Moves the camera so that the clicked point moves in the direction of the mouse drag.
[Shift] key + Mouse drag: Moves the camera so that the clicked point rotates in the direction of the mouse drag.

 [Zoom] mode – Operation

Mouse drag: Dragging the mouse upward from the clicked point zooms in (enlarges) on the view. Dragging the mouse downward from the clicked point zooms out (shrinks) from the view.
[Shift] key + Mouse drag: Moves the camera so that the clicked point moves in the direction of the mouse drag.

Common operation in all modes
Mouse wheel: Rotating the wheel to the back zooms in (enlarges). Rotating the wheel to the front zooms out (shrinks).

[F8] key: Initializes the camera to the default position.

◇NOTE◇

To delete the placed PV array from the 3D drawing:

・To delete all PV arrays placed

1) Click the [Delete PV arrays (all)] icon .

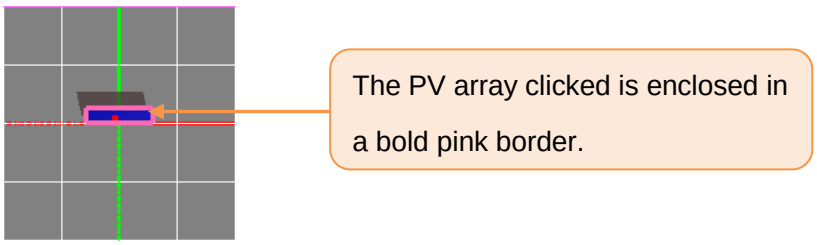
2) The message "Delete all PV arrays". Click the [OK] icon shown next to the message.

3) All PV arrays placed in the 3D drawing are deleted.

・To delete a specific PV array

1) Click [Select Object/PV array] icon (in the operation icons).

2) The [Select PV array model] mode is enabled. Place the mouse cursor on the PV array to delete in the 3D drawing, and click the mouse.



3) Click the [Delete Selected Object] icon (in the operation icons).

4) The message "Delete the selected object" appears. Click the [OK] icon shown next to the message.

5) The PV array selected is deleted from the 3D drawing.

Placing the building

Operation: Place the obstacle that casts a shadow on the PV array on the 3D drawing.

In order to place a building, there are the following methods.

① Importing an external file.

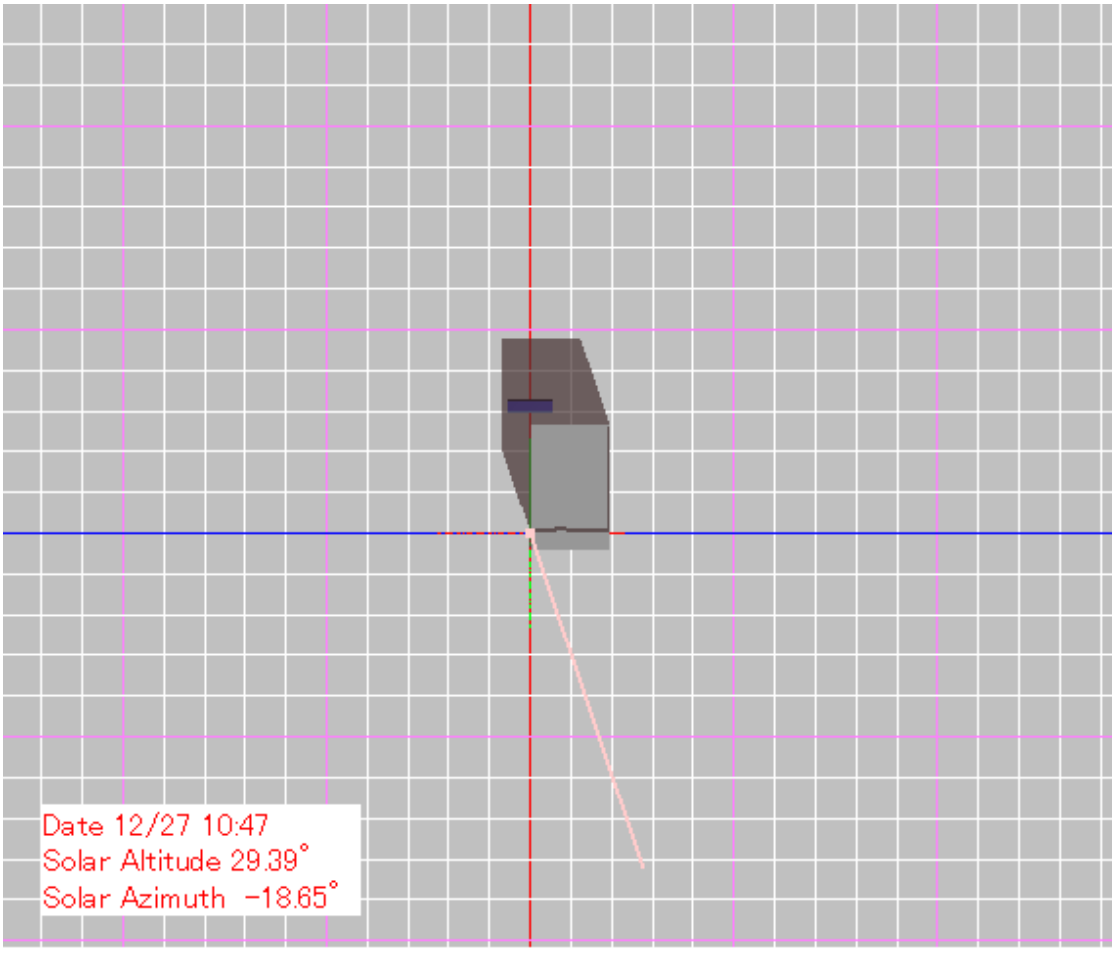
② Using the [solid gen. (Boundary line)] function.

① Importing an external file

1) Select [Model View] – [Read STL file] in the menu.

2) The [Open STL File] dialog box appears. In the dialog box, select [C:\temp\Tutorial-01.stl] and click the [Open] button.

3) The 3D model selected is displayed on the origin of the 3D drawing.

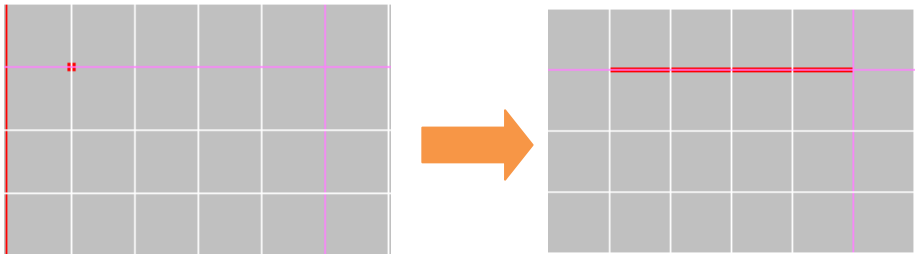


② Using the [Solid generation (Boundary line)] function

1) Click the [Boundary line definition (Pick)] icon on the 3D model toolbar.

2) Click the arbitrary places on 3D drawing.

3) Then, the 2nd point is clicked. As shown in the following figure, the 2nd point is connected with a red line to the 1st point.

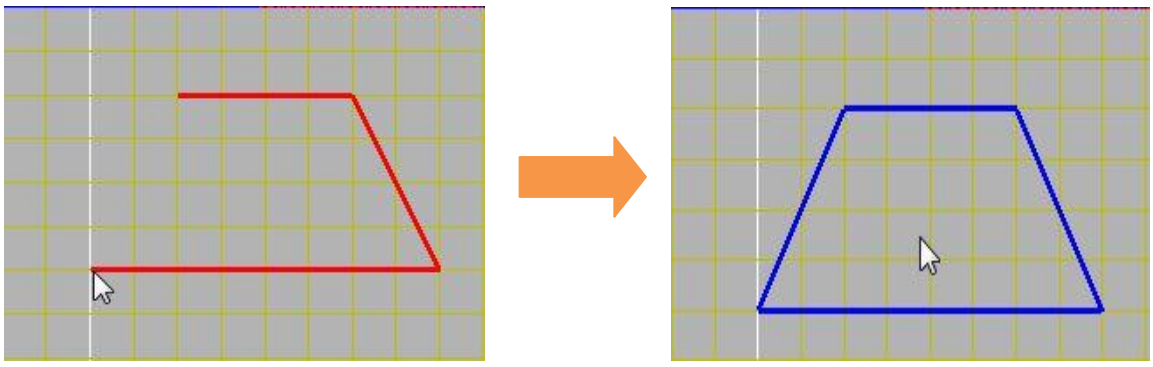


◇NOTE◇

If the backspace key is pressed, the point specified immediately before can be deleted.

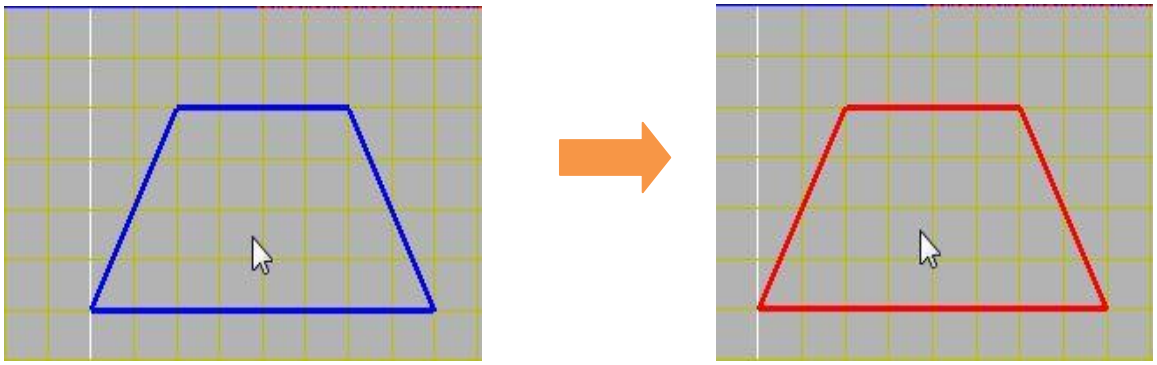
4) Then, addition of the point is repeated so that it may become a form of an object to create.

5) If the enter key is pressed or the [Execution] button is pushed, the starting point and a terminal point will be combined, a joint line changes to blue, and the [Boundary line definition(Pick)] mode is canceled.

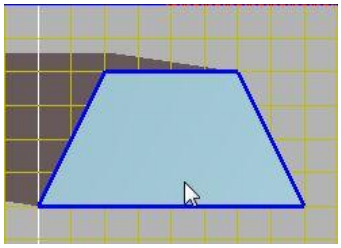


6) Click the [Solid generation (Boundary line)] icon on 3D model tool bar. Then, [Solid gen.(Boundary line)] command toolbar will be displayed.

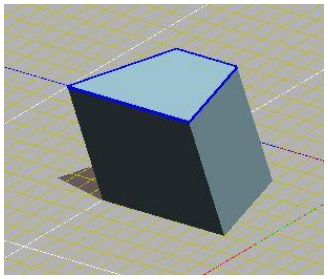
7) If it clicks the inside of the created boundary line, a boundary line will be changed into red and will become active.



8) If the [Execution] button is clicked or it presses the enter key, a 3D model whose height is specified by [Sweep height] will be generated.



※If camera mode is set as [Orbit] and the viewpoint is changed, it will be easy to check the 3D model.



◇NOTE◇

Another method of placing 3D models

・Reading the model by "Drag and Drop"

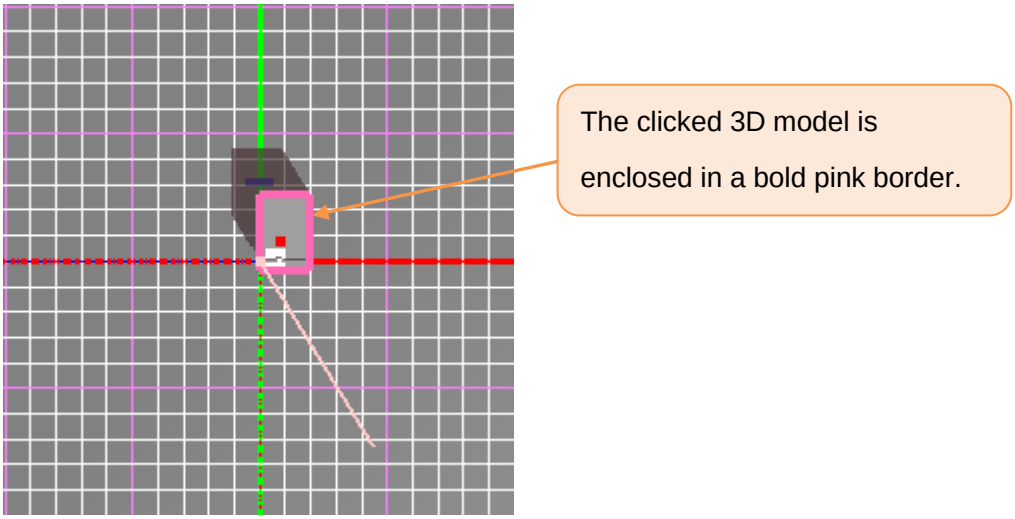
In Explorer, etc., select a 3D model file to read (file with the .stl file extension) and drag and drop the file. The 3D model is read into the origin in the 3D drawing.

◇NOTE◇

To delete the placed 3D model from the 3D drawing

1) Click the [Select Object/Model] icon  (in the operation icons).

2) The [Select Mode] mode is enabled. Place the mouse cursor on the 3D model to be deleted in the 3D drawing and click the mouse.



3) Click the [Delete Selected Object] icon  (in the operation icons).

4) The message "Delete the selected object" appears. Click the [OK] icon  shown next to the message.

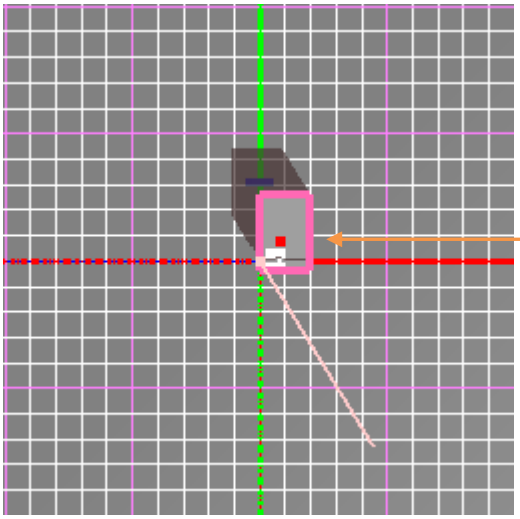
5) The 3D model selected is deleted from the 3D drawing.

◇NOTE◇

To move the placed 3D model to another position in the 3D drawing

1) Click the [Select Object/Model] icon (in the operation icon).

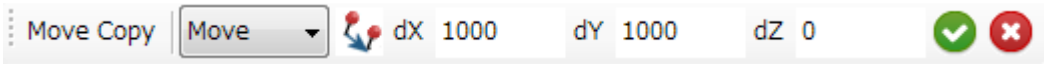
2) The [Select Model] mode is enabled. Place the mouse cursor on the 3D model to move in the 3D drawing and click the mouse.



3) Click [Move/Copy Selected Object (Relative)] icon (in the operation icons).

4) The parameter input box for [[Move/Copy Selected Object] appears. Select the operation ([Move] or [Copy]) and enter the distance (relative position from the current position) to move the object in the respective axis directions.

Relative position (Unit: mm): ΔX,ΔY,ΔZ



Red axis (East/West)	Green axis (South/North)	Blue-axis (Zenith/Earth)
East direction +	North direction: +	Zenith direction: +

5) After entering the data, click the [OK] icon shown next to the input box.

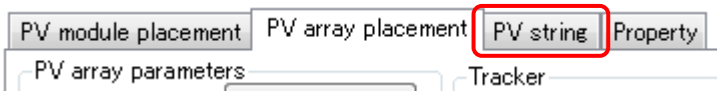
6) The selected 3D model is moved or copied to/in the entered target position.

Set the string

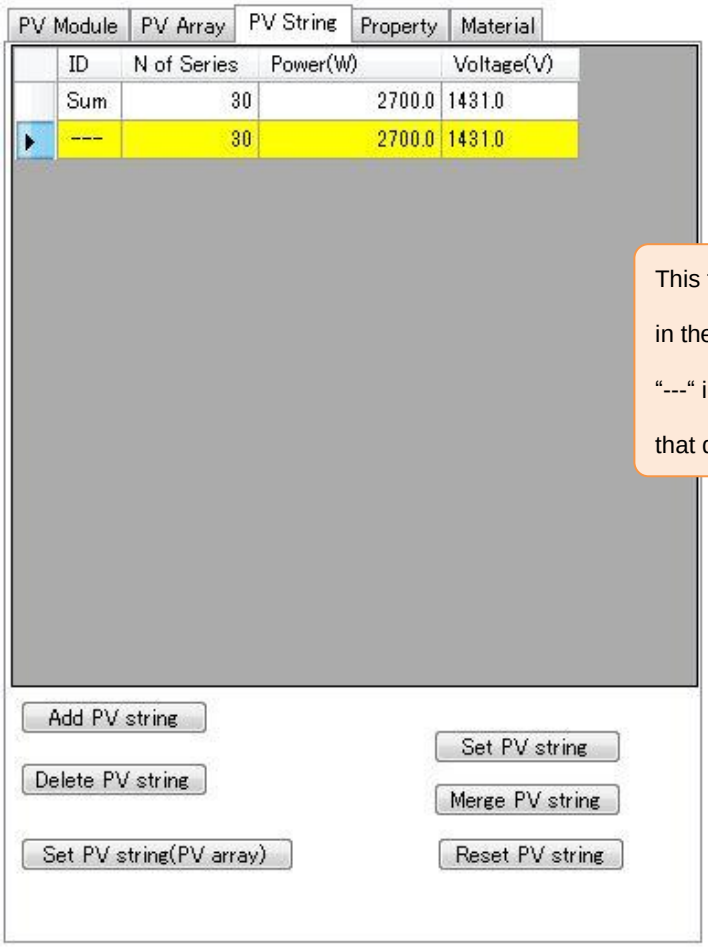
Operation: Set the PV strings for the placed PV array.

Here, set 3 PV strings to which 10 PV modules are connected horizontally.

① Click the [PV string] tab. The [PV string] tab opens.



② The following table is shown.



This table shows the number of PV modules included in the PV string, total power and voltage.

"---" in [ID] column shows the data for the PV module that does not belong to the PV string.

③ Click the [Add PV string] button.

ID	N of Series	Power(W)	Voltage(V)
Sum	30	2700.0	1431.0
---	30	2700.0	1431.0
1	0	.0	.0

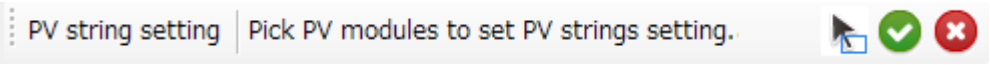
The line with "1" in the ID column is added.

④ Similarly, click the [Add PV string] button twice to add "2" and "3" lines in the ID column.

ID	N of Series	Power(W)	Voltage(V)
Sum	30	2700.0	1431.0
---	30	2700.0	1431.0
1	0	.0	.0
2	0	.0	.0
3	0	.0	.0

⑤ Click the [Set PV string] button.

Verify that the following message is displayed below the operation icons.

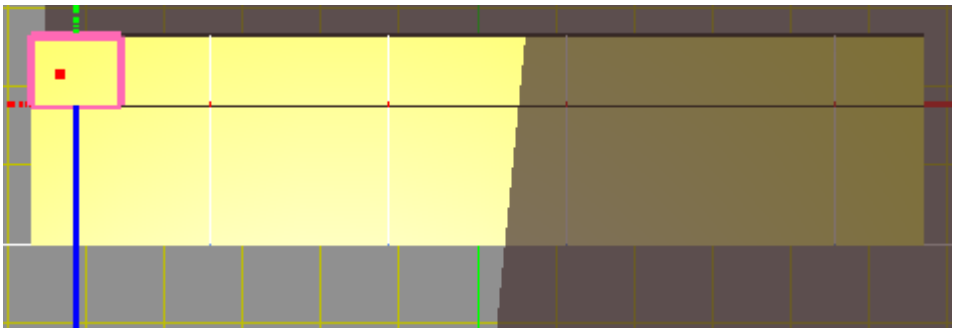


⑥ Click the line with "1" in the ID column.

	ID	N of Series	Power(W)	Voltage(V)
	Sum	30	2700.0	1431.0
	---	30	2700.0	1431.0
▶	1	0	.0	.0
	2	0	.0	.0
	3	0	.0	.0

Verify that the line selector (left edge of the table) points to "1" in the ID column.

⑦ Click the PV module on the PV array in the 3D drawing.



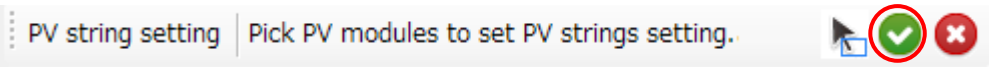
(The camera has already moved for the easy click operation.)

The clicked PV module is selected.

⑧ While pressing down the [SHIFT] key, click the PV modules in the PV array horizontally.

Ten PV modules in the horizontal direction have been selected.

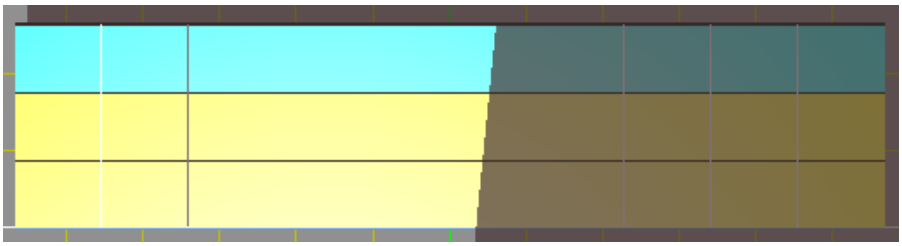
⑨ Click the [OK] icon.



The line with "1" in the ID column in the table is updated accordingly with the selected PV module data.

ID	N of Series	Power(W)	Voltage(V)
Sum	30	2700.0	1431.0
---	20	1800.0	954.0
1	10	900.0	477.0
2	0	.0	.0
3	0	.0	.0

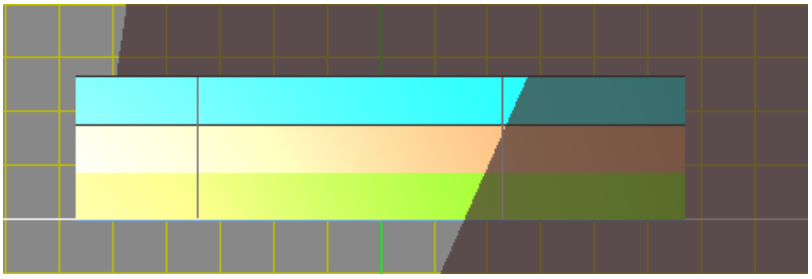
The surface of the selected PV modules in the 3D drawing is drawn with the color of the table.



⑩ Repeat steps ⑥～⑨ for the lines with "2" and "3" in the ID column.

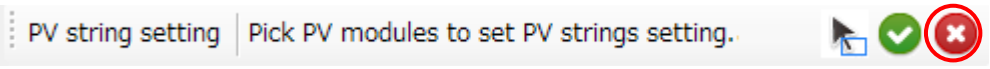
ID	N of Series	Power(W)	Voltage(V)
Sum	30	2700.0	1431.0
---	0	.0	.0
1	10	900.0	477.0
2	10	900.0	477.0
3	10	900.0	477.0

Table after setting ID2 and ID3.



PV arrays in the 3D drawing after setting ID2 and ID3.

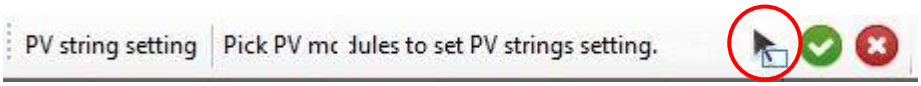
⑪ After setting the PV string, click the [Cancel] icon to cancel the [Set PV string] mode.



◇NOTE◇

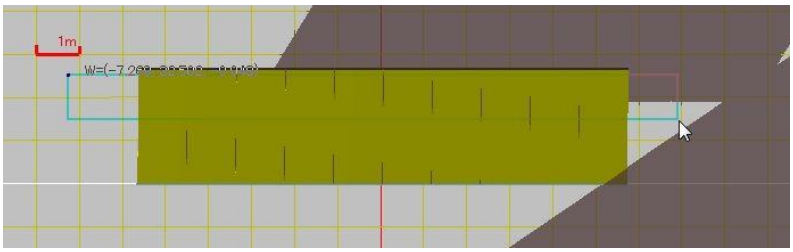
It is possible to select one or more PV modules by range selection.

To use the range selection, click the icon shown below.



Mode is changed into the range selection mode. Drag arbitrary area over the 3D models.

Selected area is shown as a square shown in the next figure during dragging.

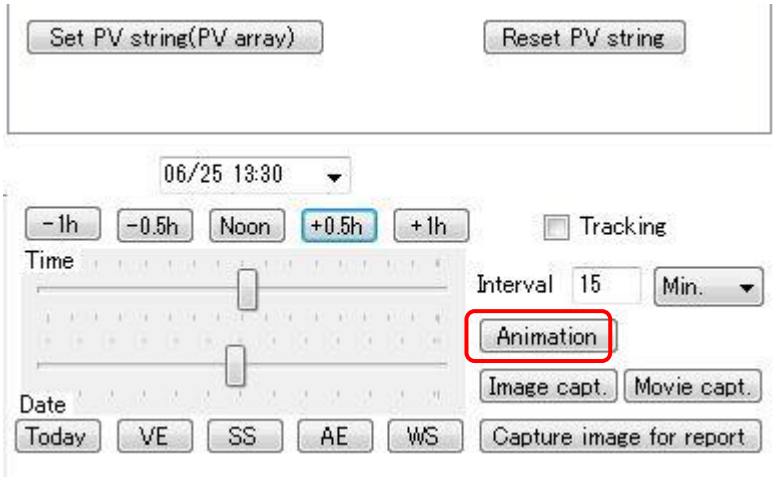


PV modules in the square is selected when the dragging is finished.

Verifying the shadow status and saving the picture image for the report

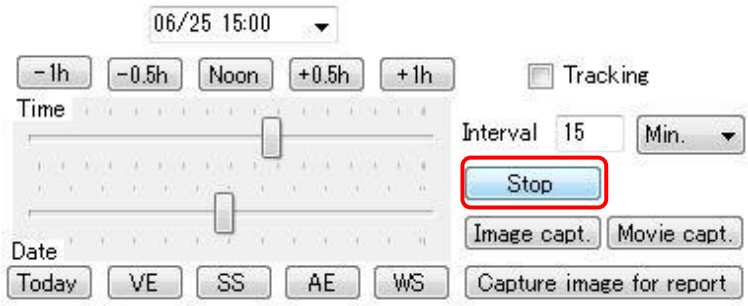
Operation: Change the display time of the 3D drawing and verify how the shadow is cast on the PV array. The picture image used for the result report after simulation is also saved.

① Click the [Animation] button (lower left corner of the [3D model] screen).

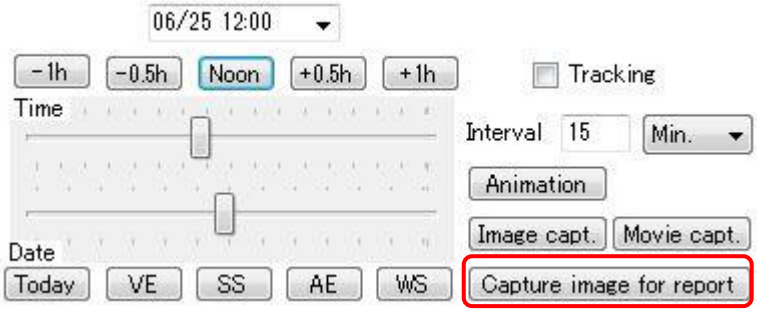


② The insolation status specified and shadow movement can be easily verified.

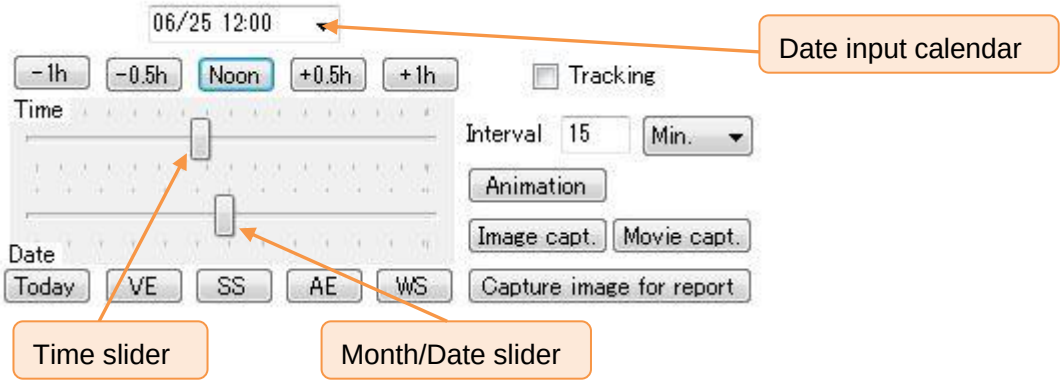
③ Click the [Stop] button to stop the animation.



④ Click the [Capture image for report] button. The image being displayed in the 3D drawing is saved. The image can be shown in the report after simulation.



⑤ To verify the shadow status of a particular date and time, select the date by using the [Month/Day] slider or [Date Input Calendar] and select the time by using the [Time] slider. The shadow status of the specified date and time can be verified.



◇NOTE◇

[Display] option in [3D model]

From [Display] in the menu, [Drawing] option for the 3D drawing can be set.

The following can be set:

[Axis]: Turn ON/OFF to draw the axis line extended vertically from the origin.

[Draw Ground]: Turn ON/OFF to draw the grid on the ground.

[Shadow]-[No Shadow]: The shadow is not drawn.

[Shadow]-[With Shadow] The shadow is drawn.

[Shadow]-[Shadow+Reflection]: When the shadow is drawn, the reflection (that the placed PV module caused on the other 3D model or the ground) is drawn.

[Draw Shadow Line]: The shadow line is drawn.

[Draw Reflection Line]: The reflection line is drawn.

[PV module - Reflection Surface], [Placed Plane – Reflection Surface]: The method to draw the reflection surface and reflection line can be selected.

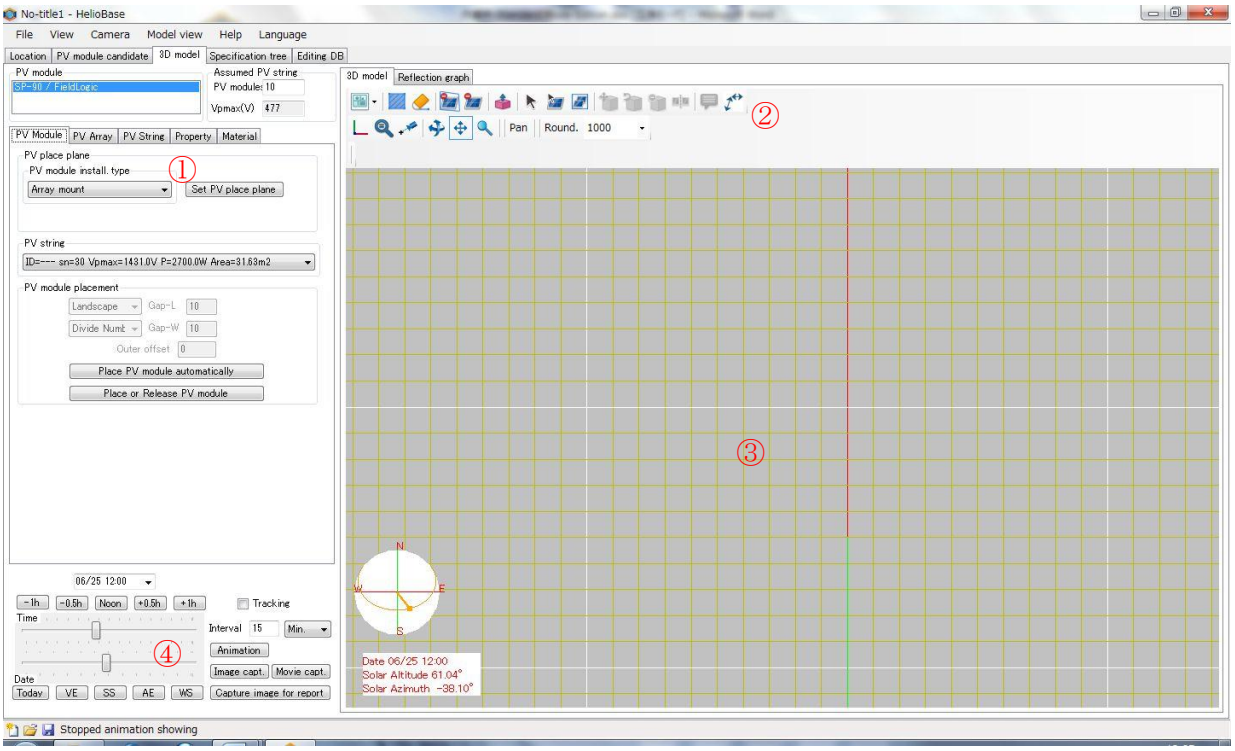
If [PV module – Reflection Surface] is selected, the reflection surface and reflection line are drawn for each PV module.

If [Placed Plane – Reflection Surface] is selected, the reflection surface and the reflection line are drawn for each placed plane (for each frame of the array if it is placed as a PV array).

◇NOTE◇

[3D model] – Screen configuration

The following shows the screen configuration of [3D model].



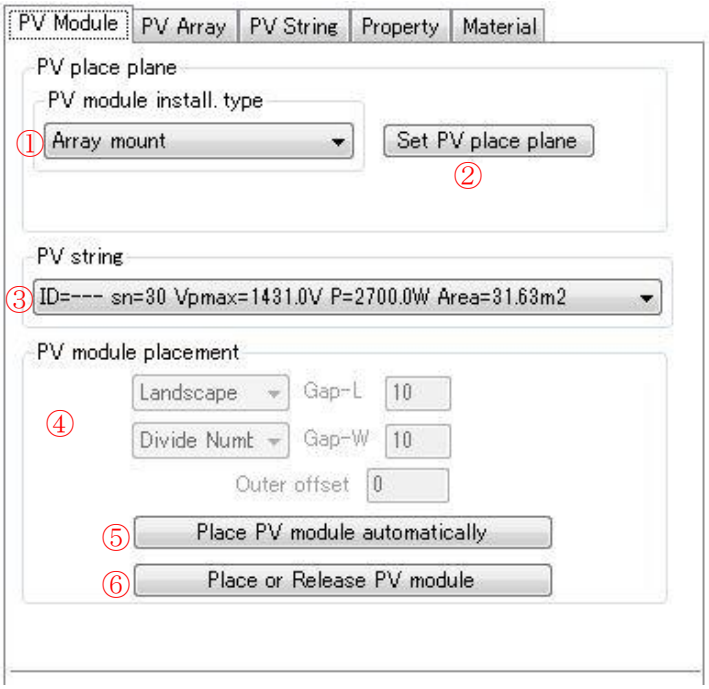
①… PV module selection, Array placement parameter setting

②… Operation icons

③…3D model display area

④… Year/Month/Date of display

[PV module placement] tab



①… [PV module installation type] list box: Selects the method to install the single PV module.

②… [Set PV place plane]: Selects the plane to place the PV module.

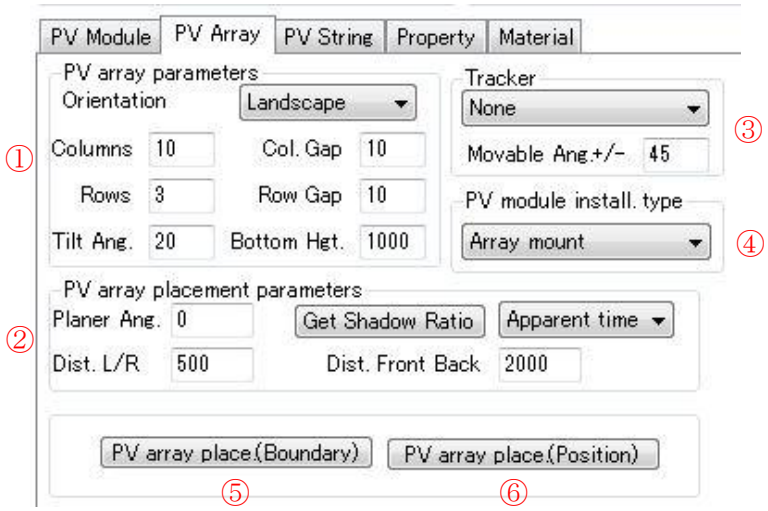
③…[PV string] list box: Selects the PV string that the placed PV module belongs to.

④… [PV module placement] box: Sets the parameter for the position to place the PV module.

⑤… [Place PV module automatically] button: Places the PV modules on the specified plane according to the set parameters.

⑥… [Place PV module or Release PV module]: Places one PV module on the specified placement plane. Selecting the placed PV module while pressing down [CTRL] deletes the selected PV module.

[PV array placement] tab



①… [PV array parameters] box: Sets the PV module configuration of the placed PV array.

②… [PV array placement parameters] box: Sets the position parameters to place the PV array.

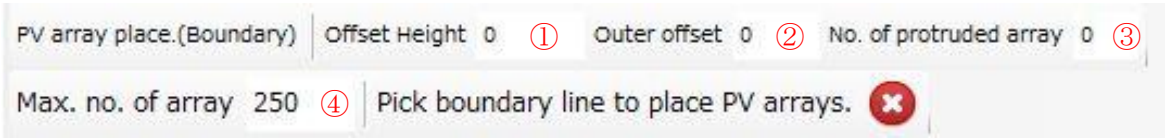
③… [Tracker] box: Specifies to use or not use the tracker for the placed PV array, the tracker type and movable angle.

④… [PVmodule install. type] box: Specifies to the installation of PV modules.

⑤…[PVarray place(Boundary)] button: Switch to the [PV array place.(Boundary)] mode.

⑥…[PVarray place(Position)] button: Switch to the [PV array place.(Position)] mode.

[PV array place.(Boundary)] mode



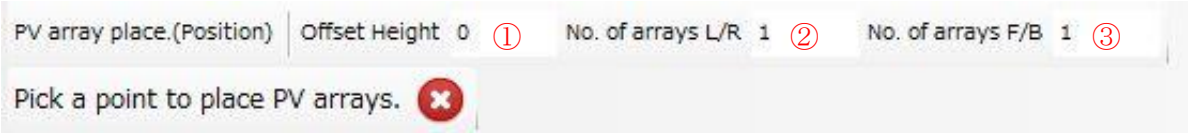
①…[Offset Height] box: Specifies to height[mm] which floats PV array from the surface enclosed by boundary line.

②…[Outer Offset] box: Lets the range of inner side “Outer offset”[mm] from the boundary line be a placement area.

③…[No. of protruded array] box: Specifies the number of arrays which protrudes out of the placement area.

④…[Max. no. of array] box: Specifies the number of maximum PV arrays to place.

[PV array plcace.(Position)] mode

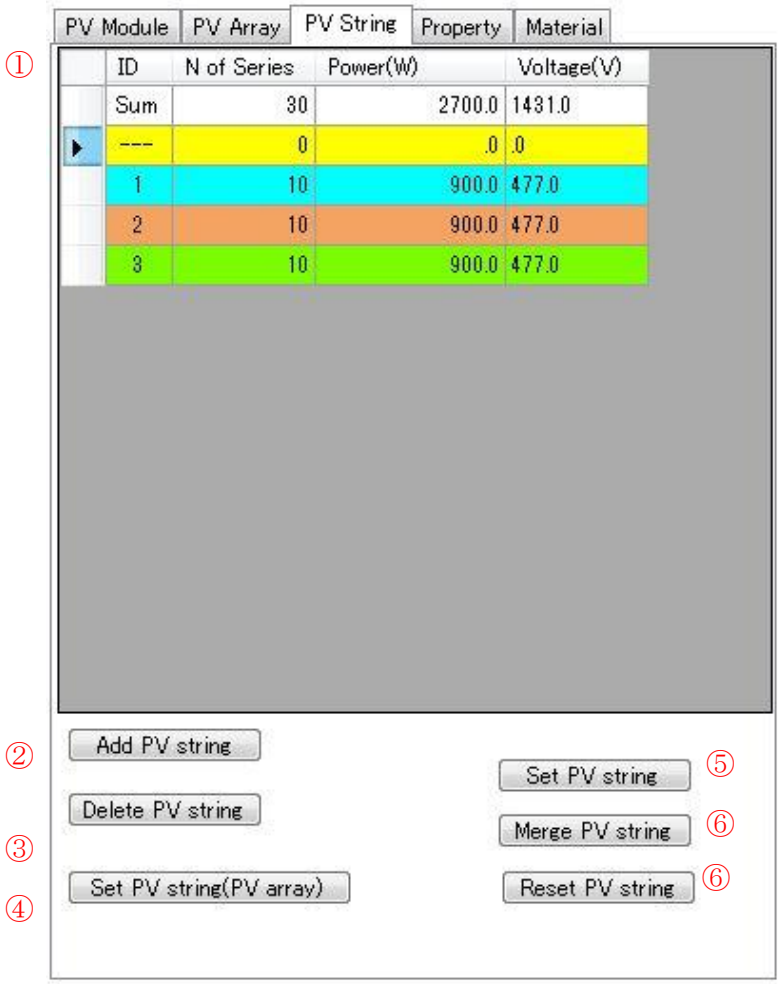


①…[Offset Height] box: Specifies to height[mm] which floats PV array from the surface of picked point.

②…[No.of arrays L/R] box: Specifies the number of arrays placed to a horizontal direction.

③…[No.of arrays F/B] box: Specifies the number of arrays placed to a vertical direction.

[PV string] tab



①… PV string display: Shows the list of the currently set PV strings. The line with "---" in the ID column shows the data for the PV module that does not belong to the string.

②…[Add PV string] button: Adds a PV string.

③… [Delete PV string] button: Deletes the specified PV string.

④… [Set PV string (PV array)] button: Sets the PV string automatically by using the number of PV modules set in Assumed PV string area.

⑤… [Set PV string] button: Adds/deletes the PV module to/from the PV string selected in the list (PV string display)

⑥… [Systhetic PV string] button: Systhetics two PV strings specified.

⑦… [Reset PV string] button: Deletes all PV modules from the specified PV string.

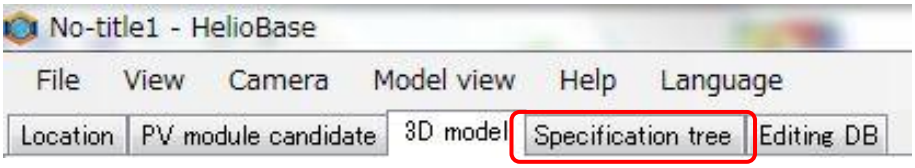
6. Setting the Device Configuration

The configuration of the devices used for simulation can be defined. For simplicity, this tutorial only sets the power conditioner and PV string.

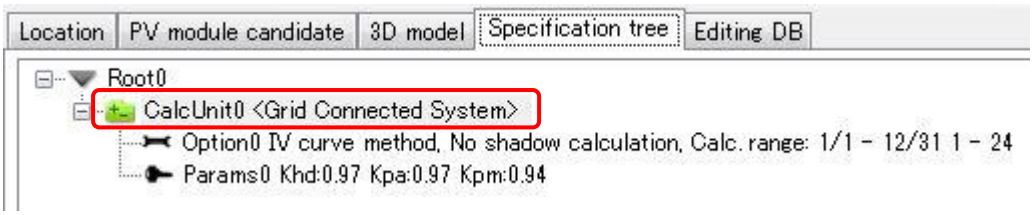
Adding the power conditioner

Operation: Add the power conditioner to the device configuration for simulation.

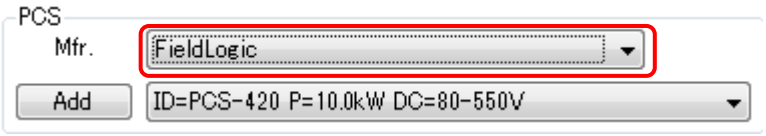
① Click the [Specification tree] tab. [Specification tree] opens.



② In the specification tree displayed in the upper left corner of the screen, [CalcUnit0] is highlighted in grey.

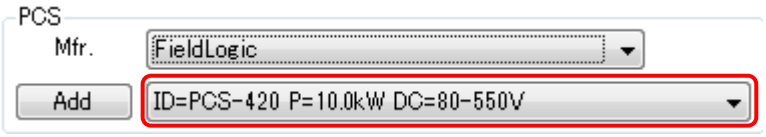


③ In the [PCS] box in the [Elements] tab (right side of the screen), select the PCS manufacturer in the [Mfr.] list box.



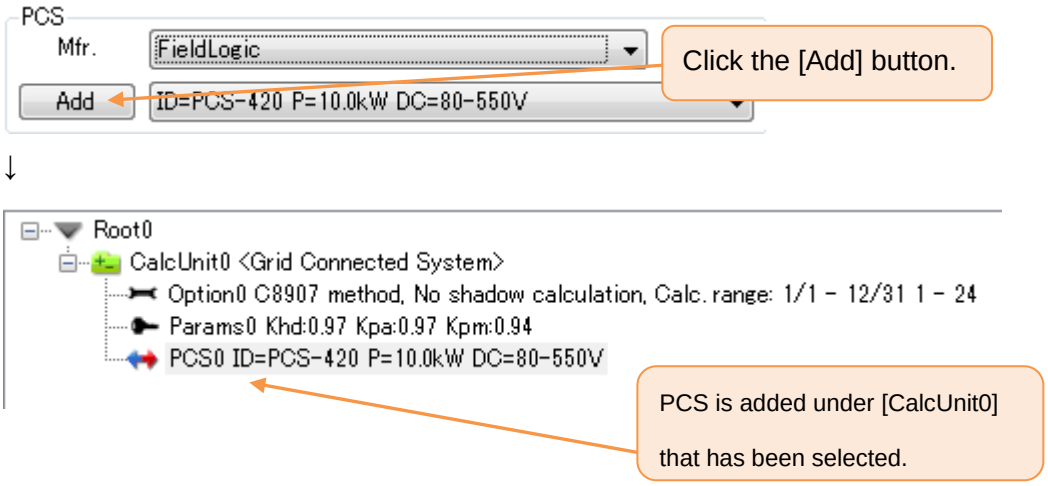
Here, select [FieldLogic].

④ In the list box directly below the [Mfr.] list box, select the PCS model to use.



Here, select [PCS-420].

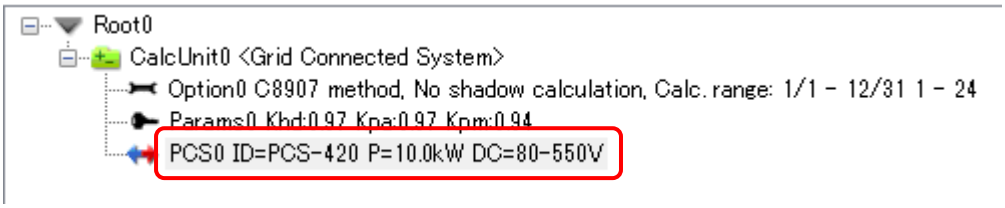
⑤ After selecting the PCS model, click the [Add] button to add the PCS in the [Specification tree].



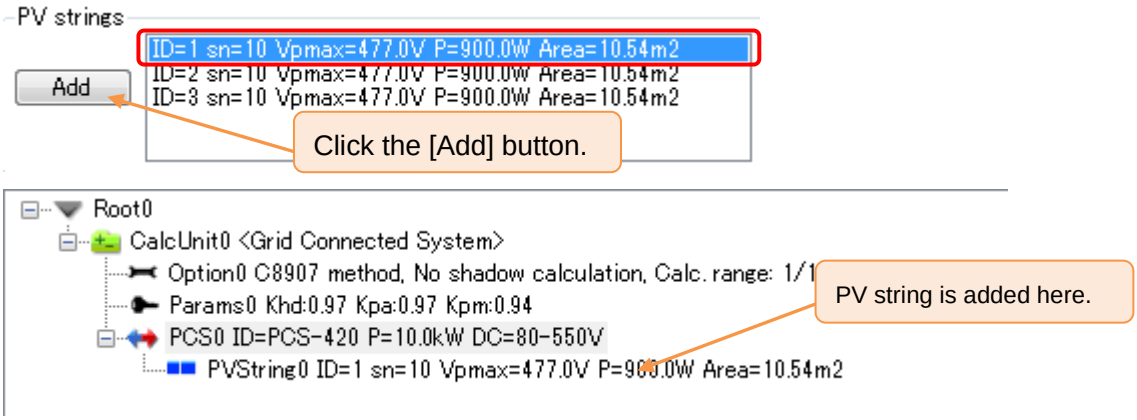
Adding a PV string

Operation: Add the placed PV string (in the 3D drawing) to the device configuration (for simulation).

① Verify that [PCS0] is highlighted in grey (being selected).

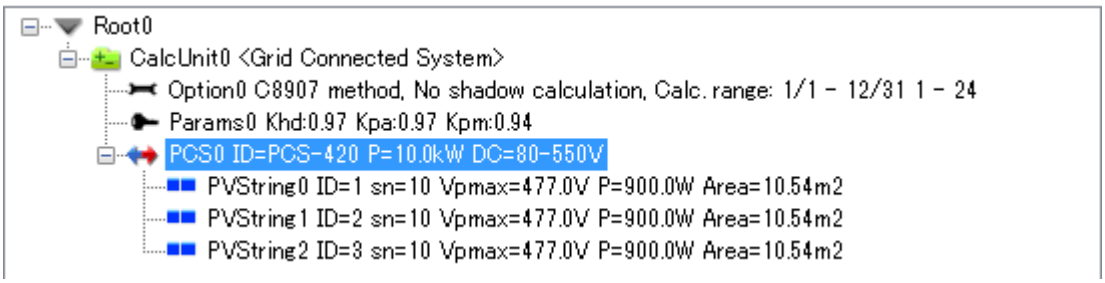


② Three pairs of set PV strings (set in [Set PV string]) are listed in [PV strings]. Select [ID=1] and click the [Add] button.



③ Repeat ①～② to add the PV strings (ID=2, ID=3) below [PCS0].

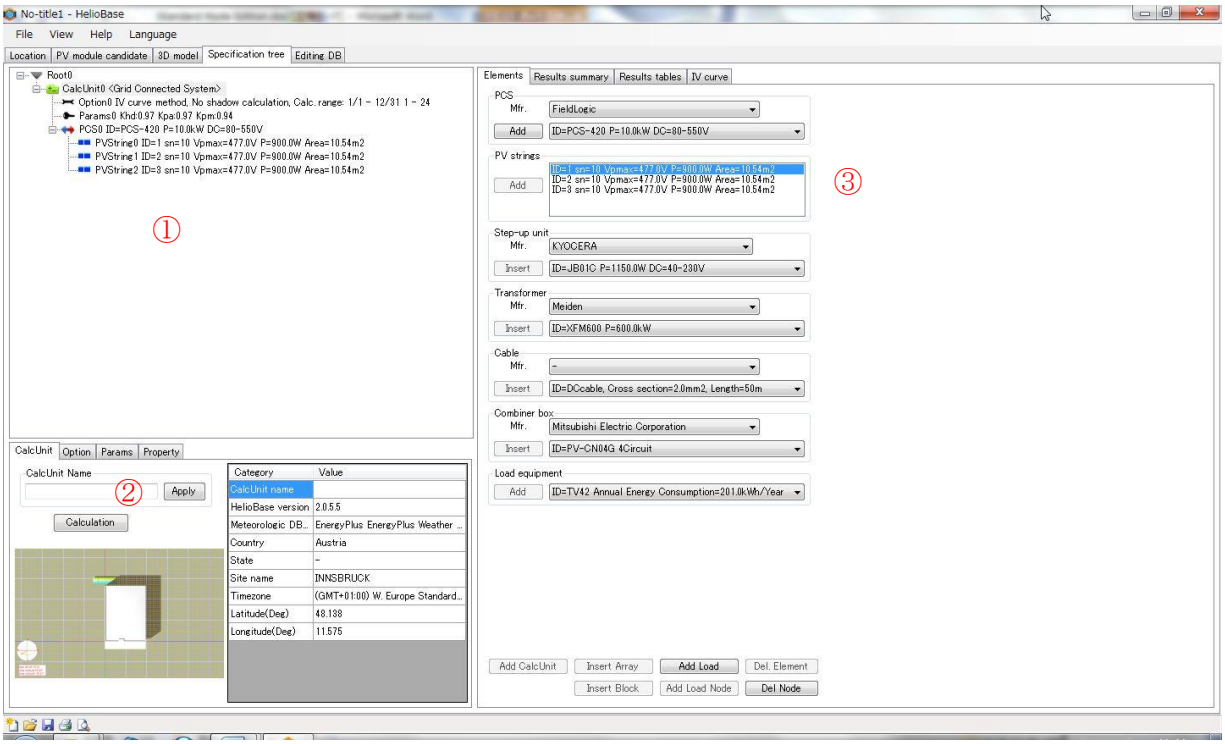
The following shows the [Specification tree] after the strings are added.



◇NOTE◇

[Specification tree] – Screen configuration

The following shows the screen configuration of [Specification tree].

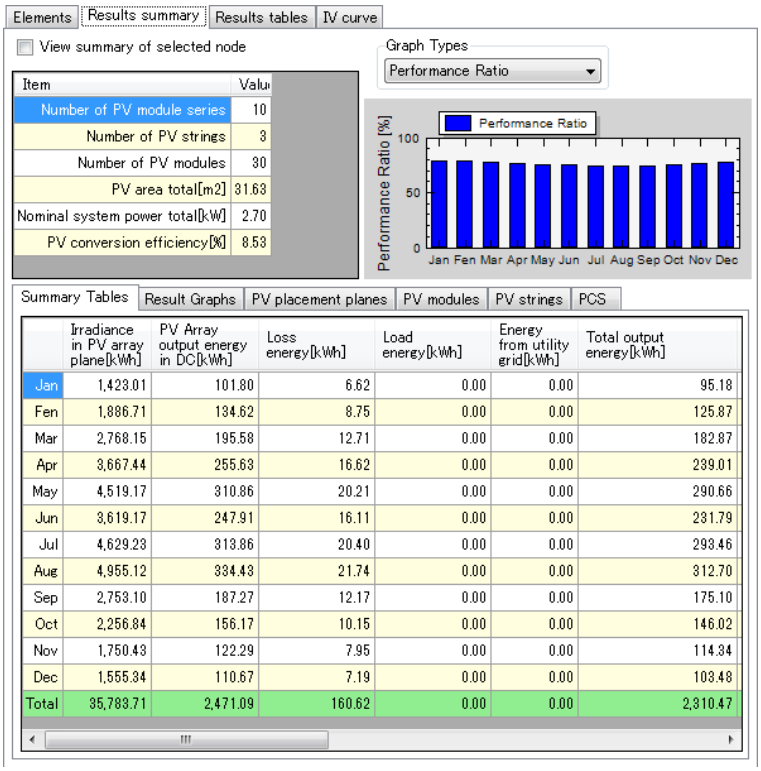


①…Specification tree (display): Shows the system configuration to be simulated. After the simulation, the configuration for the simulation result is also shown.

②…Simulation parameter setting: Shows and sets the calculation parameters for simulation.

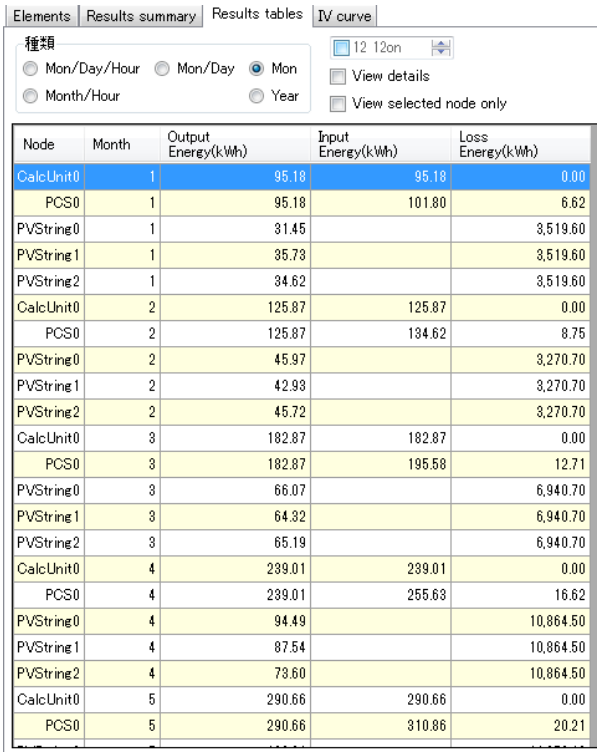
③…[Elements] tab: Selects a device to be inserted in the specification tree.

[Summary Tables] tab



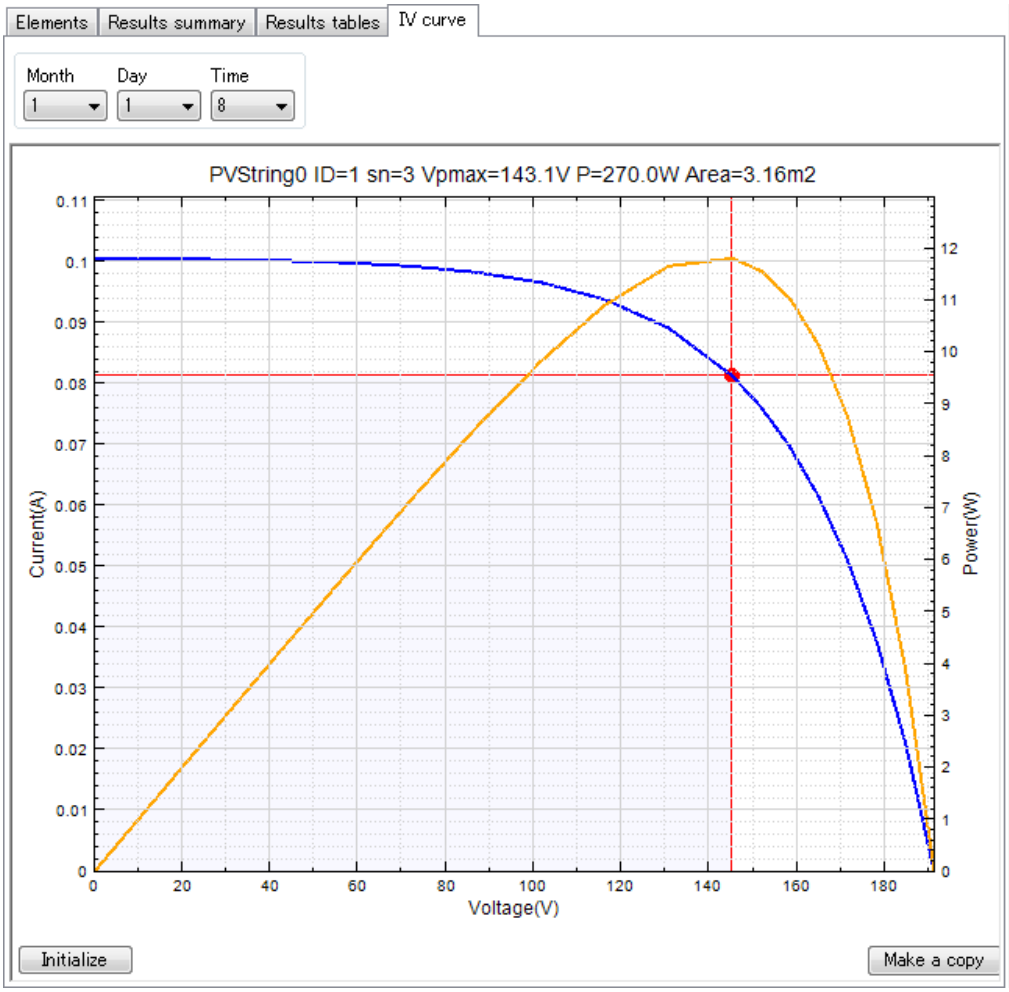
[Summary Tables] shows the simulation results.

[Results tables] tab



[Results tables] shows the simulation results. More details than the summary are shown.

[IV curve] tab



The IV curve for each PV string, module and cell string can be displayed:

- Specify [PV module – IV curve composition method] in [Calculation method for PV string output] in the simulation.

- Place a check mark in the [Save IV curve data] check box and select the PV string of the simulation results.

◇NOTE◇

Devices that can be added to [Specification tree]

The [Specification tree] can have the following in addition to PCS and the PV string:

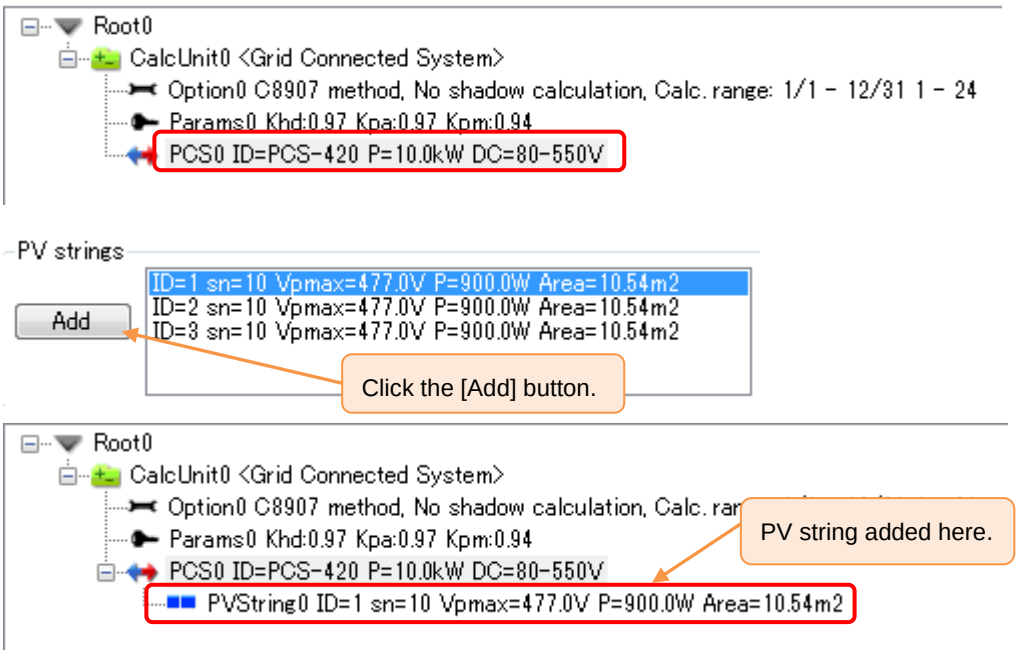
- Step-up unit
- Transformer
- Cable
- Junction box

Also, a loading apparatus to consume power according to a set schedule can be configured.

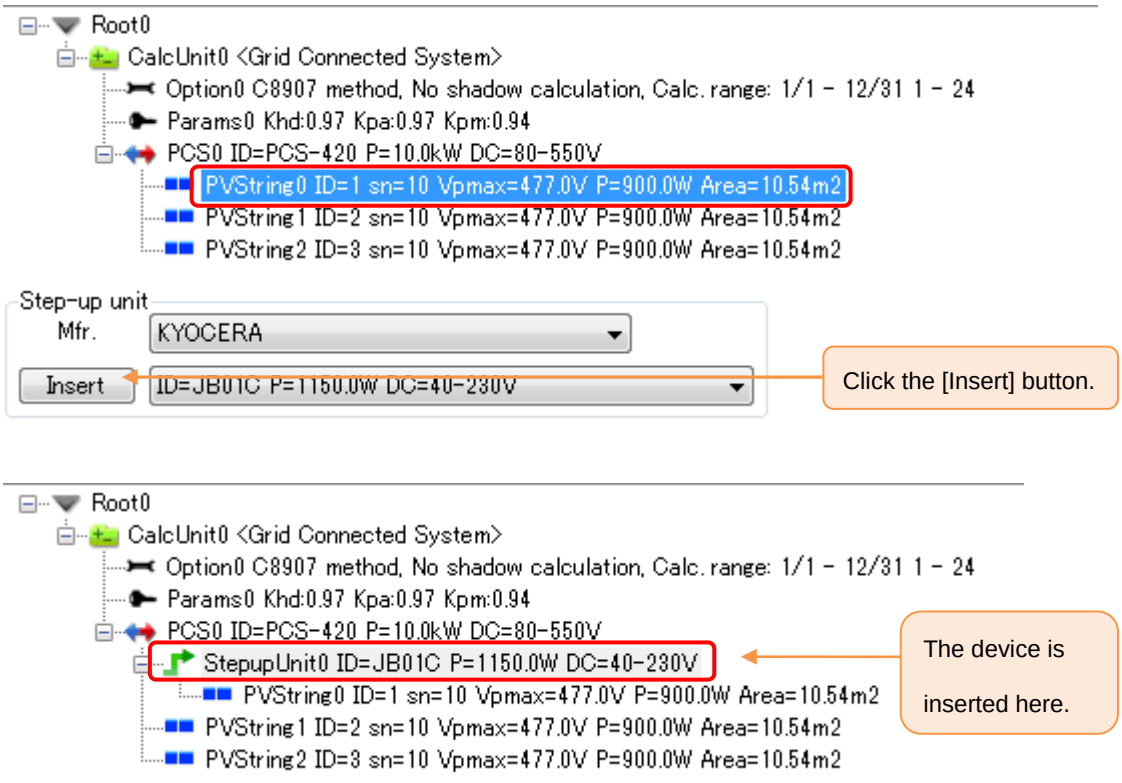
◇NOTE◇

[Add] and [Insert] buttons in [Elements] tab - Operations

[Add] button: Adds the specified device as a child element currently selected in the [Specification tree].



[Insert] button: Inserts the specified device (as the parent) to the currently selected element in [Specification tree].



7. Calculation and Result Verification

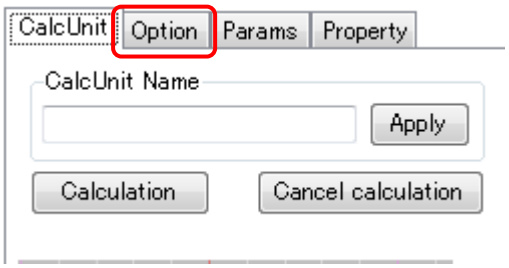
Perform the calculation using the device configuration (defined so far) and verify the simulation results.

Setting the calculation options

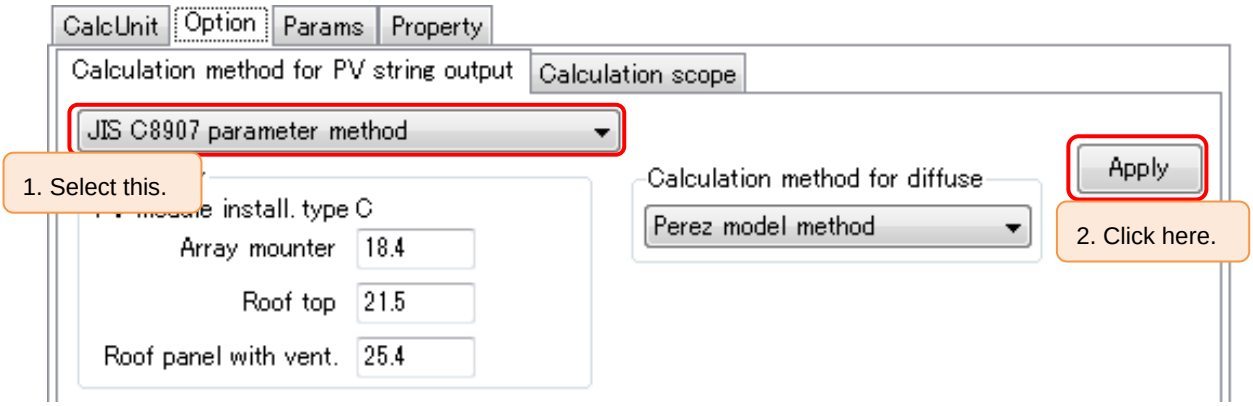
Operation:　Set the calculation options for simulation.

Here, set [Calculation method for PV string output] and [shading calculation method] of the parameters for the shade.

① Click the [Option] tab. The [Option] tab opens.



② Select the [JIS C8907 parameter method] in the [Calculation method for PV string output] and click the [Apply] button.



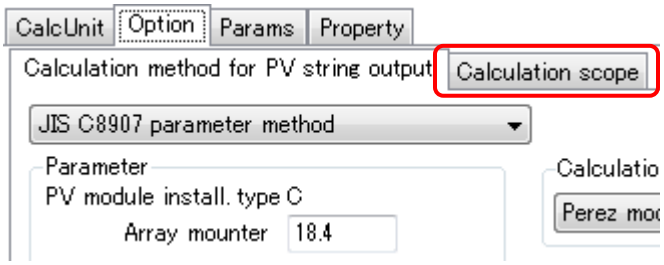
◇NOTE◇

Parameters for [Calculation method for PV string output]

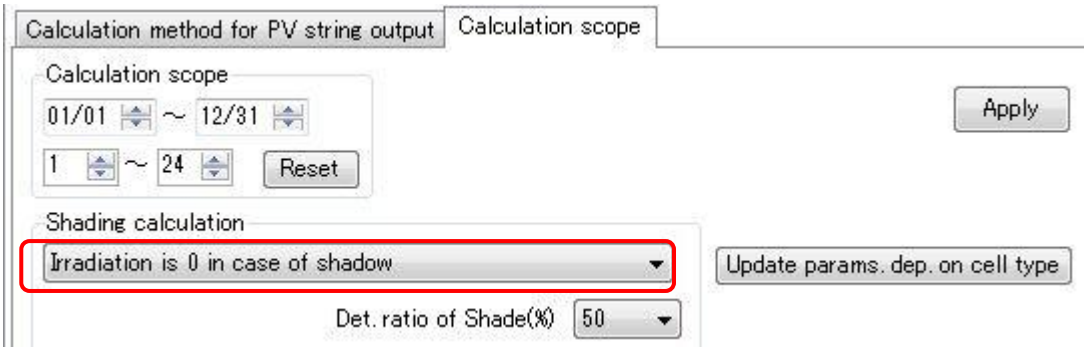
Three calculation methods can be selected including [JIS C8907 parameter method] set above:

- [JIS C8907 parameter method]
- [Temperature corrective coefficient method by month (JPEA method)]
- [PV module – IV curve composition method]

③ Click the [Calculation scope] tab. The [Calculation scope] tab opens.



④ In the [Shading calculation] list box, select [Irradiation is 0 in case shadow].



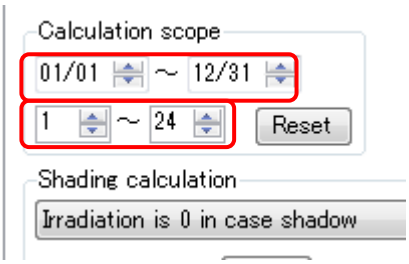
◇NOTE◇

[Shading calculation] parameters

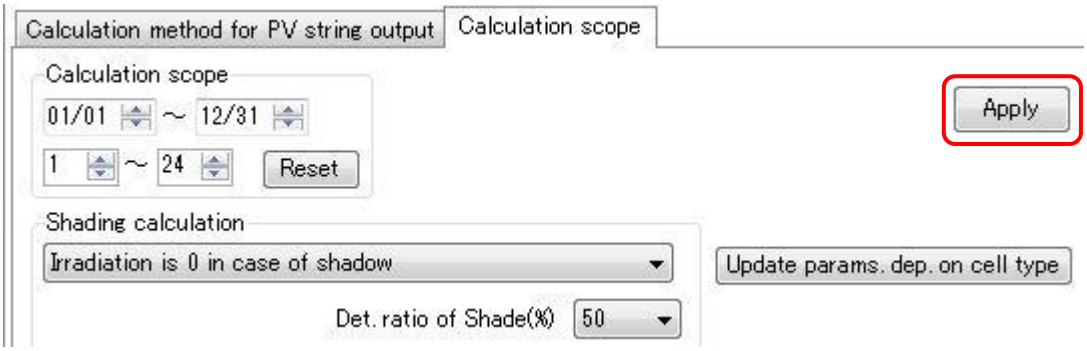
The shading calculation methods are as below:

[No shading calculation]	No shade is considered in the simulation.
[Apply diffuse solar radiation if shaded]	If the PV module is within the shadow area, and if the shade ratio is the same as the threshold ([Shadow determination ration]) or more, only diffuse solar radiation (amount) is applied for the irradiation for the PV module. (If it is in the sun, the irradiation should be "Direct solar radiation "+ "Diffuse solar radiation".)
[Irradiation is 0 if shaded]	If the shade is included in the PV module, and if the shade ratio is the same as the specified threshold ([Shade determination ratio]) or more, the irradiation of the PV module should be 0.
[Shade ratio: Apply a diffuse solar radiation amount]	If the shadow is cast on the PV module, the radiation of the area ratio of the shade should be only the diffuse solar radiation amount.
[Shade ratio: Irradiation is 0]	If the shadow is cast on the PV module, the radiation of the shade area ratio should be 0.

⑤ Verify that the value in the [Calculation scope] box is [01/01 ～ 12/31] and [1～24].



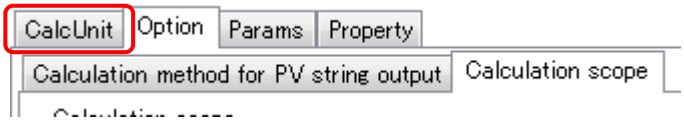
⑥ Click the [Apply] button to set the calculation options.



Calculation

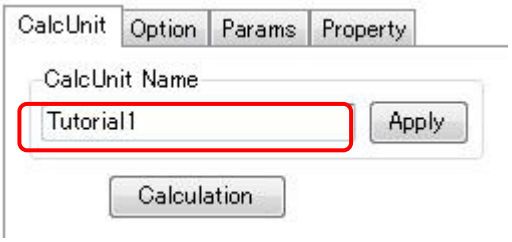
Operation: Starts the calculation.

① Click the [CalcUnit] tab. The [CalcUnit] tab opens.

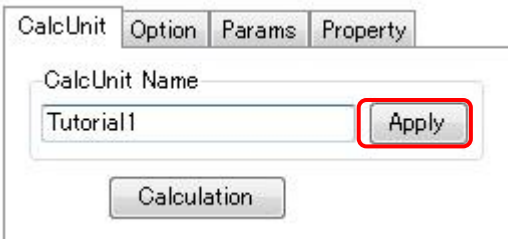


② Enter a name in the [CalcUnit Name] text box.

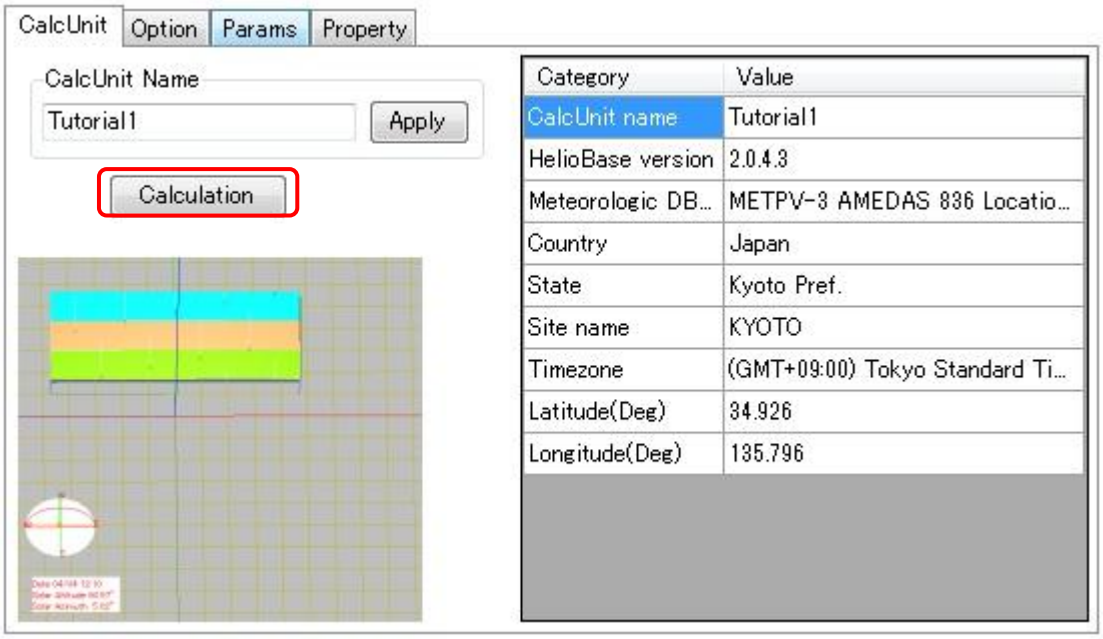
Here, enter "Tutorial1".



③ Click the [Apply] button to set the name.



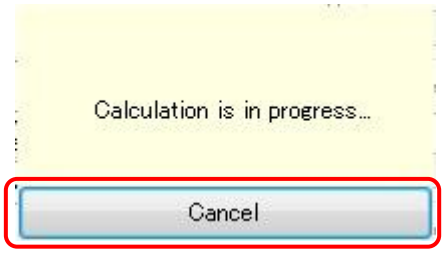
④ Click the [Calculation] button.



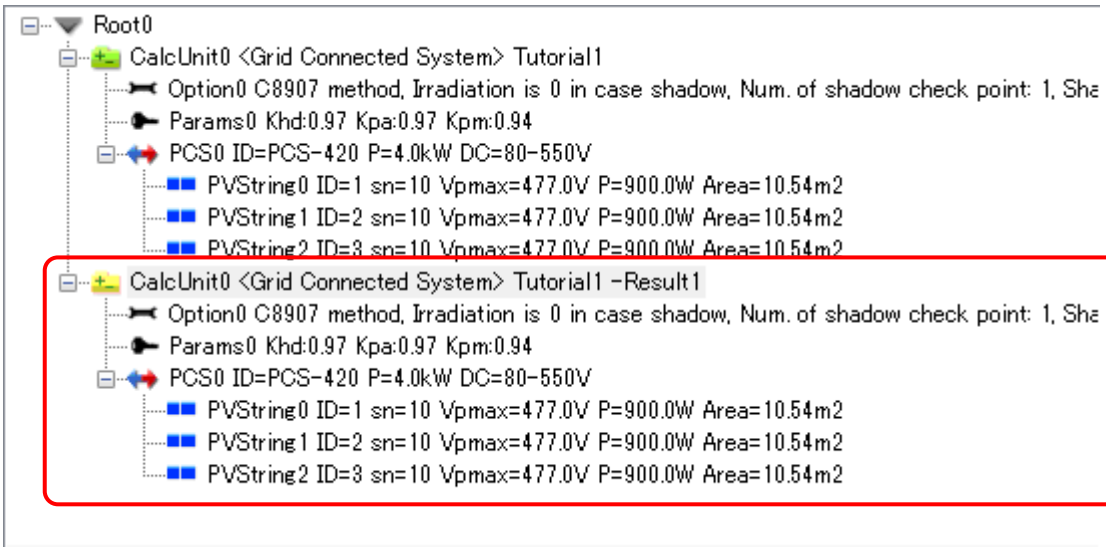
The calculation starts.

◇NOTE◇

To abort the calculation, click the [Cancel calculation] button in the [CalcUnit] tab.



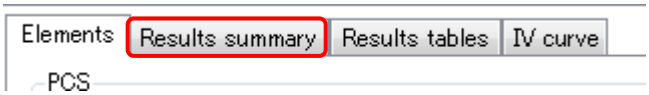
⑤ When the calculation completes, the calculation results are added under [Root0] in [Specification tree] as follows:



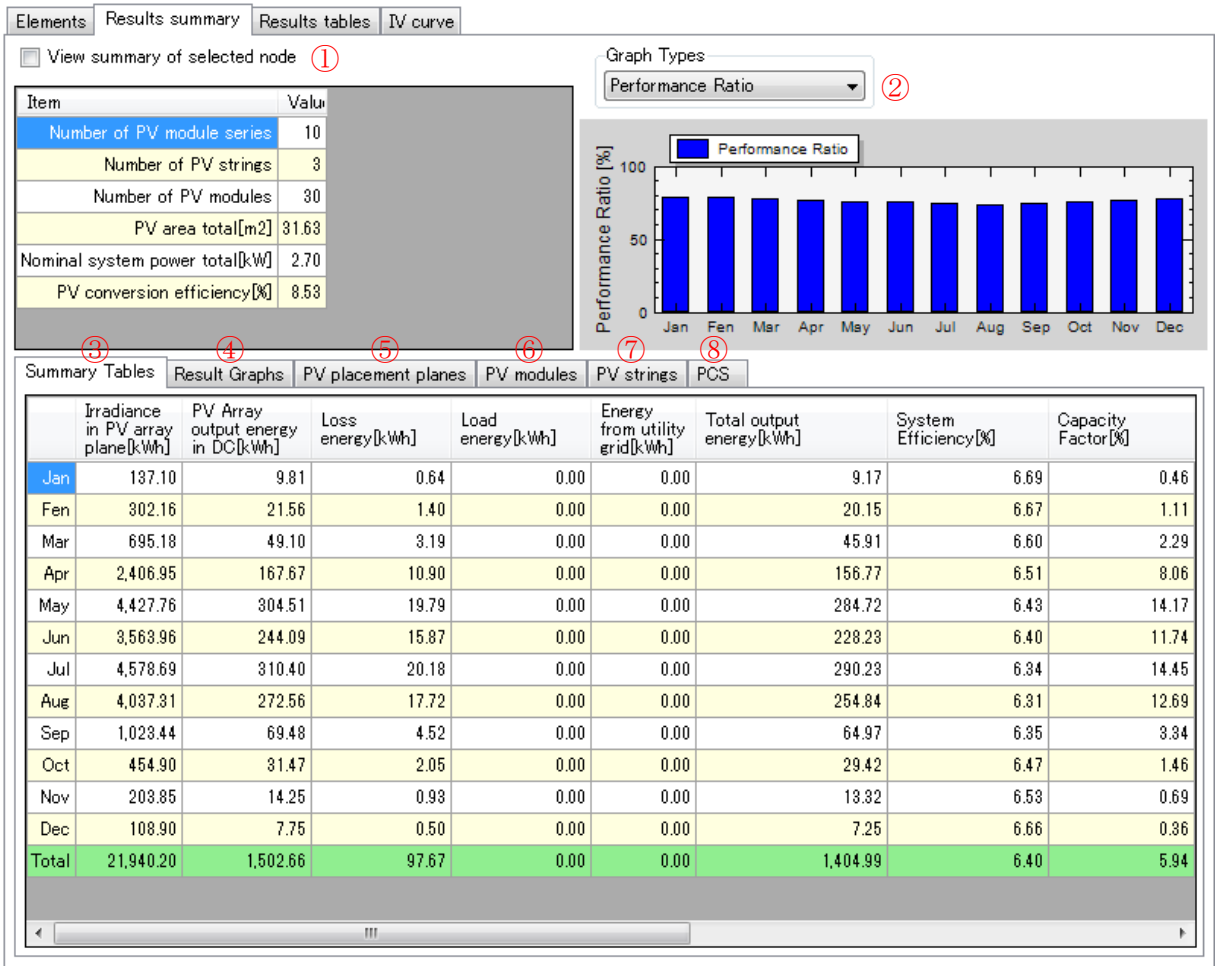
Verifying the calculation results

Operation: Verify the calculation results.

① Click the [Results summary] tab. The [Results summary] tab opens.



② The following table is shown.



	Irradiance in PV array plane[kWh]	PV Array output energy in DC[kWh]	Loss energy[kWh]	Load energy[kWh]	Energy from utility grid[kWh]	Total output energy[kWh]	System Efficiency[%]	Capacity Factor[%]
Jan	137.10	9.81	0.64	0.00	0.00	9.17	6.69	0.46
Fen	302.16	21.56	1.40	0.00	0.00	20.15	6.67	1.11
Mar	695.18	49.10	3.19	0.00	0.00	45.91	6.60	2.29
Apr	2,406.95	167.67	10.90	0.00	0.00	156.77	6.51	8.06
May	4,427.76	304.51	19.79	0.00	0.00	284.72	6.43	14.17
Jun	3,563.96	244.09	15.87	0.00	0.00	228.23	6.40	11.74
Jul	4,578.69	310.40	20.18	0.00	0.00	290.23	6.34	14.45
Aug	4,037.31	272.56	17.72	0.00	0.00	254.84	6.31	12.69
Sep	1,023.44	69.48	4.52	0.00	0.00	64.97	6.35	3.34
Oct	454.90	31.47	2.05	0.00	0.00	29.42	6.47	1.46
Nov	203.85	14.25	0.93	0.00	0.00	13.32	6.53	0.69
Dec	108.90	7.75	0.50	0.00	0.00	7.25	6.66	0.36
Total	21,940.20	1,502.66	97.67	0.00	0.00	1,404.99	6.40	5.94

The following data in the tabs and graphs are shown:

①… Total number of PV modules used in the simulation and other data are shown.

②… The calculation result graph is shown. The following data are shown in the graph. The values correspond to the values in the [Result summary table].

[Irradiance in PV array plane] [kWh]:

Total radiation (monthly) of the PV array plane (according to the calculation time)

[PV Array output energy in DC] [kWh]

Total PV array output (monthly) (according to the calculation time).

[Loss energy] [kWh]:

Total loss energy (monthly) (according to the calculation time).

[Load energy] [kWh]:

Total load energy (monthly) of the power (PCS's no-load loss, phantom load, operation power consumption, etc.) that the PV system itself consumes and the power that the loading apparatus consumes)

[Energy from utility grid] [kWh]:

Total energy (monthly) that had to be received from the grid as the result of the calculation of the generated power and load power.

[Total output energy] [kWh]:

Total power in a month: The power value (loss power and load power are subtracted from the PV output power (according to the calculation time) is accumulated.

If there is power from the utility grid, the calculation is done assuming that the total output power is 0.

[System Efficiency] [%]:

The value (%) where the total output power (monthly) is divided by the PV array plane radiation.

[Capacity factor] [%]:

The value (%) where the total output power (monthly) is divided by the total of the nominal maximum output of the PV array and the total time (month).

The nominal maximum output of the PV array is calculated as follows:

[Nominal maximum output of the PV module] x [Number of units]

[System Yield] [h/month]:

The value where the total output power (monthly) is divided by the nominal maximum output of the PV array.

This value shows how many hours are required for the system to generate the power equivalent for the power for one month if the PV array runs continuously in the nominal maximum output state.

[System Yield] [h/day]:

Equivalent system operation time for one day. The value calculated as the equivalent system operation time monthly is divided by the number of days in each month.

This value shows how many hours are required for the system to generate the power equivalent for the power for one day if the PV array runs continuously in the nominal maximum output state.

[Reference Yield] [h/month]:

This value shows the time required to supply the PV plane irradiation (month) with the irradiation intensity of the standard state (1.0kW/m^2).

This value is calculated as PV plane irradiation divided by the PV array area.

[Performance Ratio] [%]:

The value (%) is calculated as the equivalent system operation time divided by the equivalent solar irradiation time.

This value is used as an index to describe PV system performance.

[Irradiance in PV array place] [kWh/m^2]:

The value shows that the PV plane irradiation is divided by the PV array area.

③… [Summary Tables]

Shows a summary of the data for each month.

④… [Result Graphs]

The enlarged graph of graph ②. Two graphs can be shown for comparison.

⑤… [PV placement planes]

Shows the data for the PV module placement planes.

⑥… [PV modules]

Shows the data of the PV modules used in the simulation.

⑦…PV strings

Shows the data of the PV strings used in the simulation.

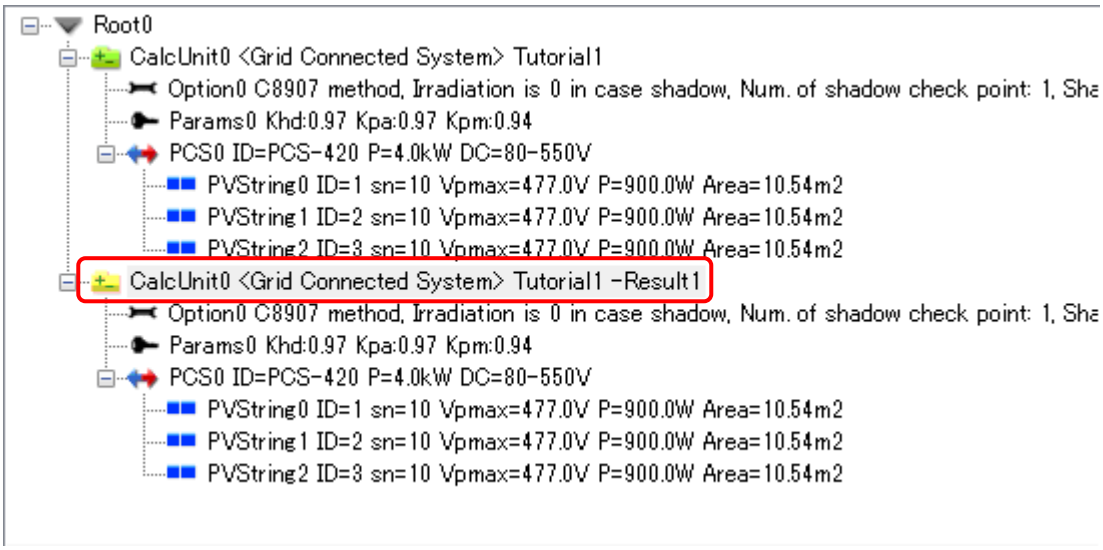
⑧… [PCS]

Shows the data of the PCS used in the simulation.

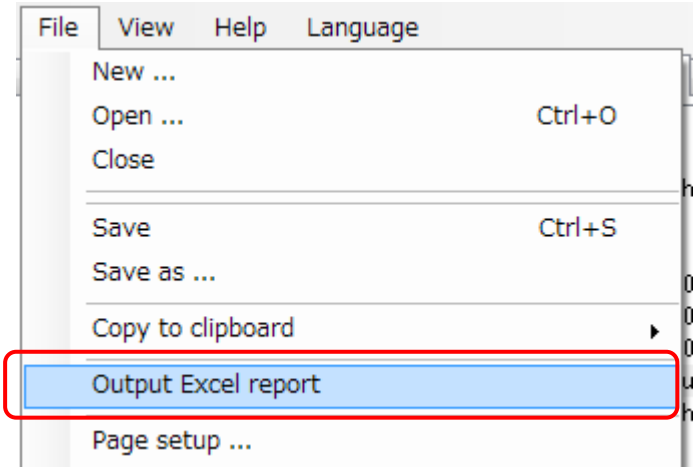
Output – Excel report

Operation: The simulation results can be output as a report in an Excel file.

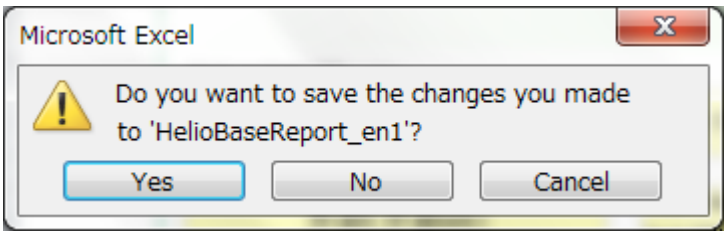
① Click and select the [Result node] in the [Specification tree].



② From the menu, click [File] – [Output Excel report].



③ In a few seconds, Excel is enabled and the following dialog box appears.



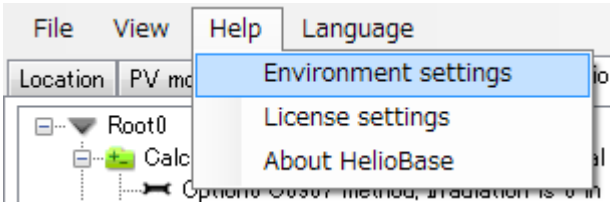
④ Click the [Save] button. The Excel report file can be saved in a folder.

◇NOTE◇

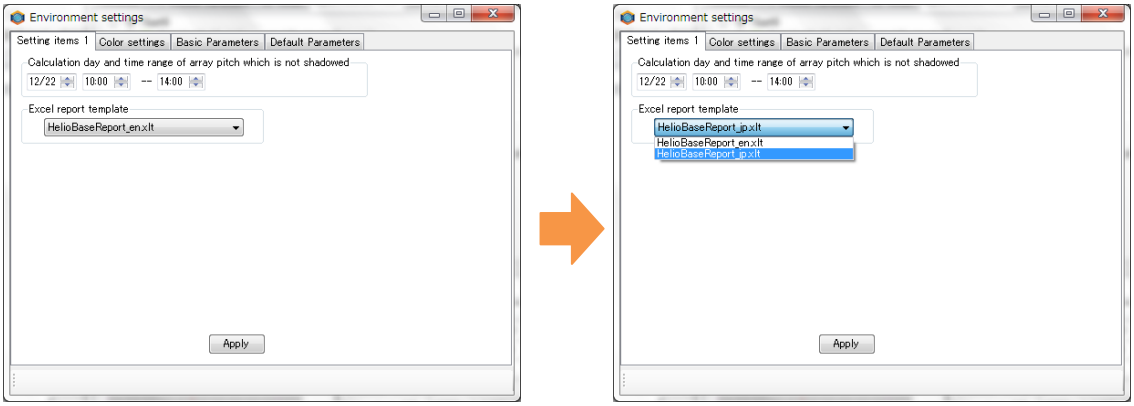
Excel report – Japanese / English

When HelioBase® is installed, the Excel report template file in English is selected as the default. To use the Japanese template, change the setting as follows:

① From the menu, select [Help] – [Environment settings].



② In the [Environment settings] window, select [HelioBase®Report_jp.xlt] in the [Excel report template] list box in the [Setting items 1] tab.



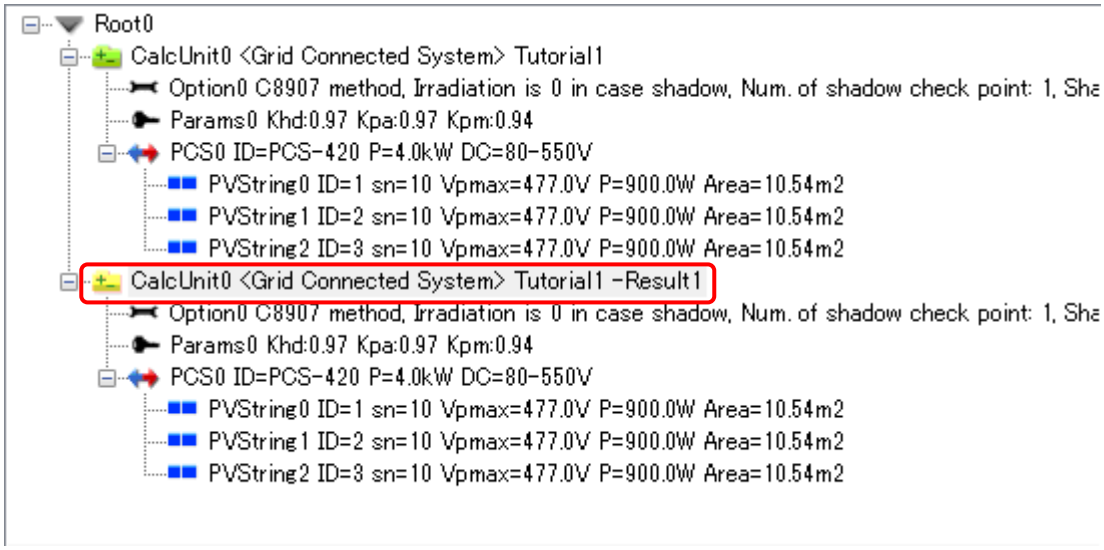
③ Click the [Apply] button.

④ Click the [Close] button. The [Environment settings] window closes.

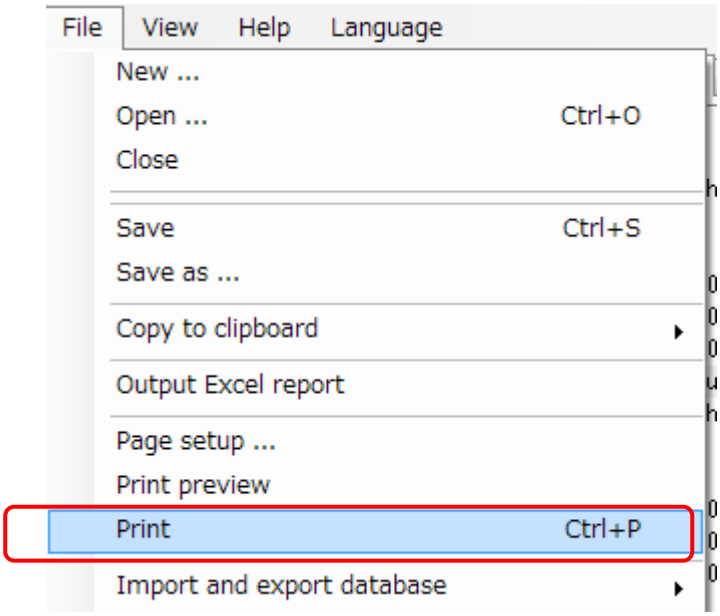
Printing the detail report

Operation: Print the detail report of the simulation results.

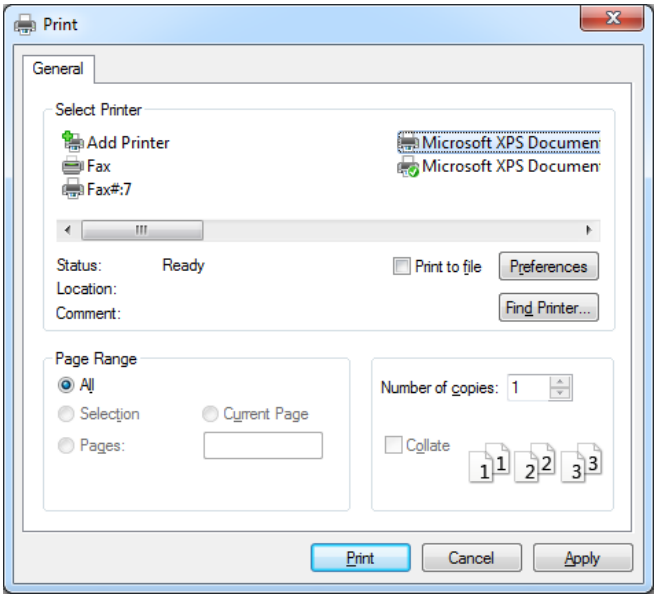
① Click and select the result node in [Specification tree].



③ In the menu, click [File] – [Print].



④ The [Print] dialog box appears. Sets the number of copies to print and click the [Print] button.



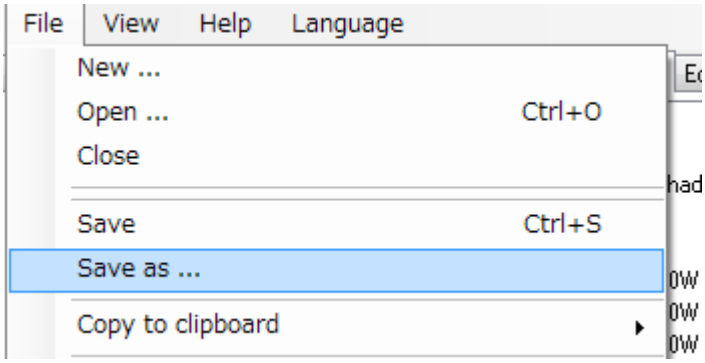
8. Saving the Simulation Contents and Terminating the Application

Save the simulation contents and terminate the application.

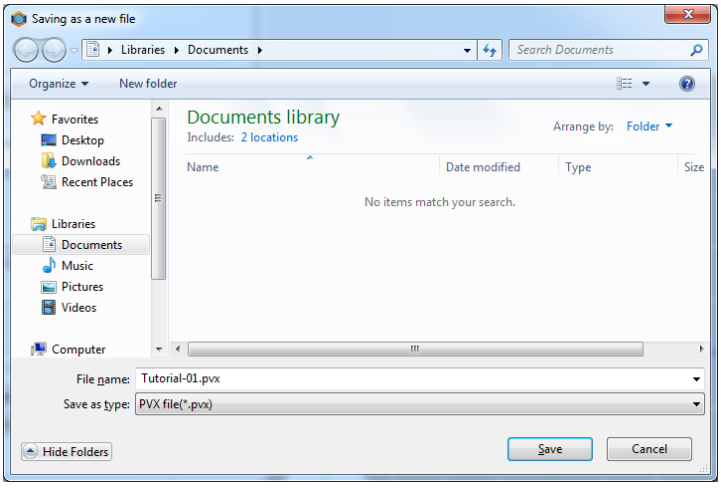
Saving the simulation contents

Operation:　Save the simulation contents (PV array, 3D model placement, etc.)

① In the menu, select [File] – [Save as...].



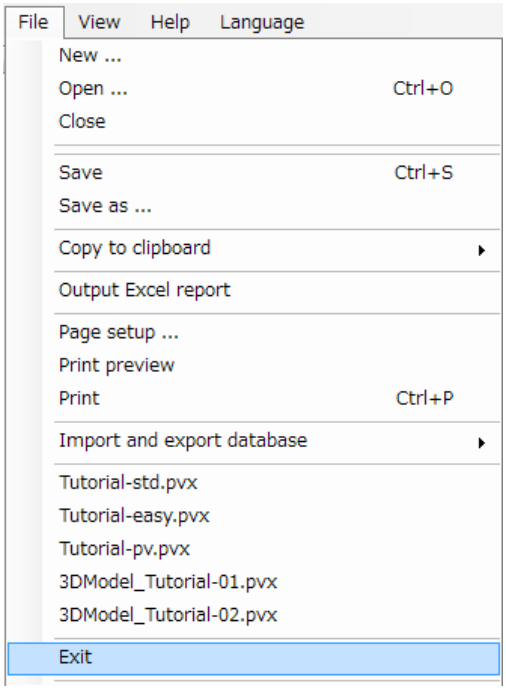
② The [Save as...] dialog box appears. Enter a name in [File name] box and click the [Save] button.



Terminating the application

Operation:　Terminate the application.

Method 1: In the menu, select [File] – [Exit].



Method 2: Click the [Close Window] button in the upper right corner of the screen.

If the work being done when the application is terminated is not saved, the [Confirmation of cancelation of changes] dialog box appears.

Click [No] to save the work. The application will not be terminated.

Click [Yes] to terminate the application without saving the work.