Specifications of Solar Pro

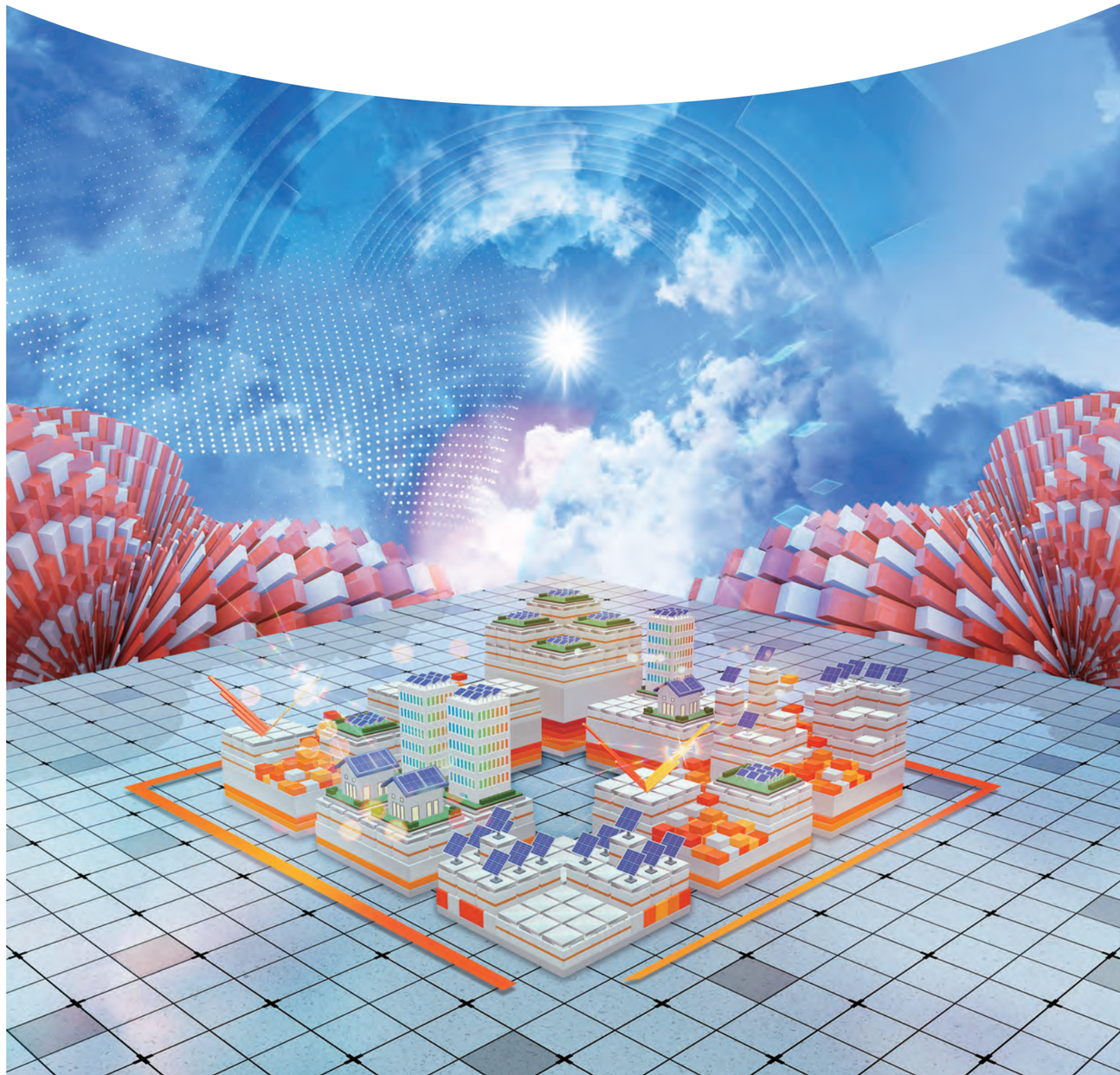
System Requirements	OS : Windows11　CPU : More than Clock 1GHz　Memory : More than 512MB Hard Disk : 3GB or more free space (1GB or more for versions prior to 4.8)　Screen Resolution : More than 1,366×768 USB Port : USB 1.1 or higher	
Meteorological Data	Built-in Data	1,360 locations overseas, METPV-20, etc.
	Importable Data	Actual data, meteonorm data (7.1 and earlier), SolarGIS (TMY data), NSRDB (SUNY 10-km grid data), TMY3 data, METPV-11, etc.
Solar cell and circuit configuration	Supported types	Full cell, half cell
		Single crystal, polycrystalline, amorphous, hybrid, HIT, CIS, CIGS
	Number of inverters	Up to 400 inverters
	Number of Modules	Up to 160,000 modules
	Max. Series-Parallel Module Number	Limitless within number of modules
Creatable Objects	PV Array (Up to 1,000 modules per array), House, Building, Slope, Array Area, Pyramid, Prism,Truncated Pyramid, Free Form, Tree, Polyhedron	

The information in this catalog is current as of February 2025. Specifications are subject to change without notice.

Laplace System

Photovoltaic System Simulation Software

Solar Pro®



High accuracy simulation software, acknowledge by the world.

Full-scale simulation software

Solar Pro was the world's first full-scale simulation software, released in 1997. It realizes highly accurate calculation of generated power by integrating instantaneous values that take into account the effects of solar radiation and shadows on each module.

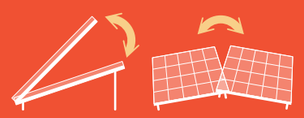
Cutting-edge technology recognized worldwide

In 2001, it was introduced as the most advanced simulation software by the German photovoltaic power generation magazine "PHOTON", and has been continuously improved since then. Since then, Solar Pro has been widely used around the world.

Contribution to the spread of solar power generation

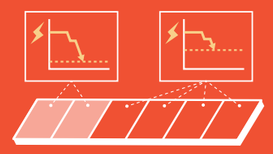
Solar Pro's high technology and contribution to the spread of solar power generation have been highly praised by many public institutions. In 2003, it won the Kyoto Small and Medium Enterprise Excellent Technology Award, and has also been selected as a Small and Medium Enterprise Creative Activity Promotion Act certified project and Oscar certified company.

Simple drawing functions for complex system designs



It supports a wide range of installation methods, such as flat placement or wall installation, as well as systems such as tracking and mega solar. Furthermore, the inclination of the solar cell array can be freely adjusted forward, backward, left and right, and it is also possible to simulate a case where it is facing in a direction different from the inclination of the roof or is placed in a complicated location.

Precise simulation considering the influence of shadows



If a module is partially shaded, the power generation capacity of the entire string will decrease, and the amount of power generated by the system will drop significantly. Solar Pro performs accurate simulations by taking into account the effects of shading on a module-by-module basis.

Reflected light simulation to prevent light pollution

The glare of reflected light from solar panels has become a social issue, and it has become essential to take reflected light into consideration when considering panel installation methods. Solar Pro allows you to specify the season and time of day to understand how reflected light affects the surrounding area.

3D simulation of bifacial module

Demonstration experiment scene

Reflected light can be reproduced in 3D, allowing accurate calculations including the effect of reflected light from reflective objects and the ground on power generation when using bifacial modules. In addition, multiple reflections of reflected light (specular reflection) can be reproduced, allowing simulation of up to two levels of reflected light from the ground, walls, etc.

Examples of Solar Pro usage

Flexible layout design of solar panels

Many simulation software programs have restrictions on designing solar panel orientations and angles.
With Solar Pro, you can perform simulations in any arrangement pattern, such as the entire wall of a building or a panel arrangement in a complicated slope.

For example, this complicated design...

1. Placing panels across the wall
2. Arranging 6 kinds of panels
3. Incrementally changing panel angles
4. Arrangement in which reflected light does not hit the surroundings

Solar Pro is capable of achieving these

1. Design the number of panels, the direction of installation, the pitch, etc., and fill the wall with countless panels
2. Considering the characteristics of each panel, design to maximize the amount of power generation.
3. We set the inclination angle finely for each panel and design so that each panel is hit by sunlight for a longer time.
4. Confirm the display and trajectory of reflected light on the 3D CAD drawing and pay attention to surrounding buildings and transportation facilities

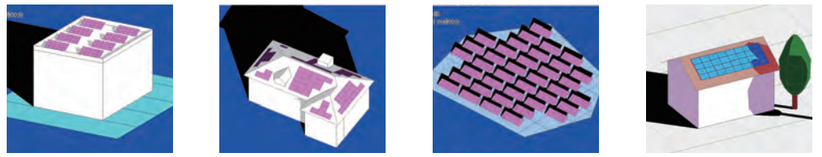
Promotion and Sales activities

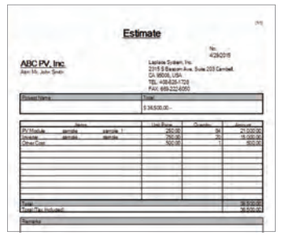
In addition to conducting simulations, Solar Pro can organize the cost of the designed equipment into an estimate, or you can create a customized report using the derived results.

Create a quote

By registering the unit price in the database, you can create a quote that reflects the total price of the equipment.
You can also save frequently used patterns, such as item settings, as templates.

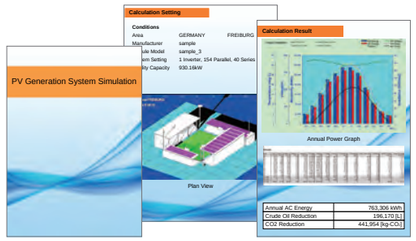
Reflect simulation contents

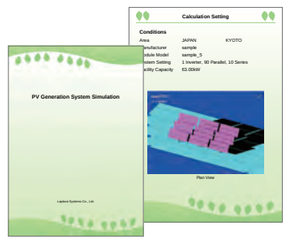


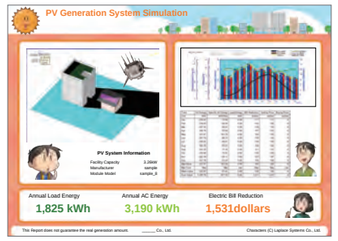


Create original reports

From detailed simulation results, you can freely arrange graphs and forms to create customized reports.

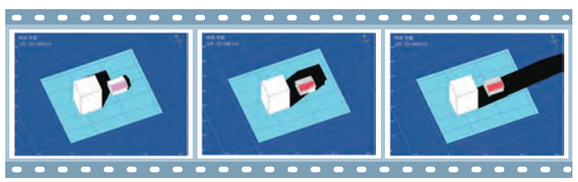




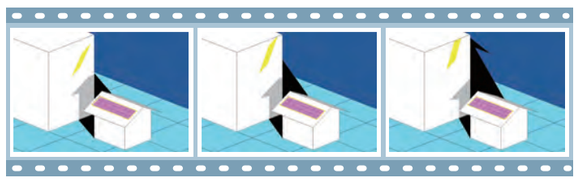


Education and Research

Solar Pro, which enables accurate simulation of various patterns, is also ideal for research and educational use of photovoltaic power generation. You can learn expert system designs easily by understanding motion of shadows and reflected light with animation.



Confirm animation of shadow movement



Confirm movement of reflected light with animation

Function Guide

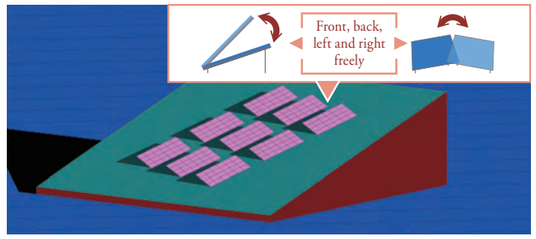
Extensive design support functions

Map loading function

Display a map of any location from an address, and press the "Import" button to display the map image on the 3D CAD screen. No map image file is required, making designing easy.

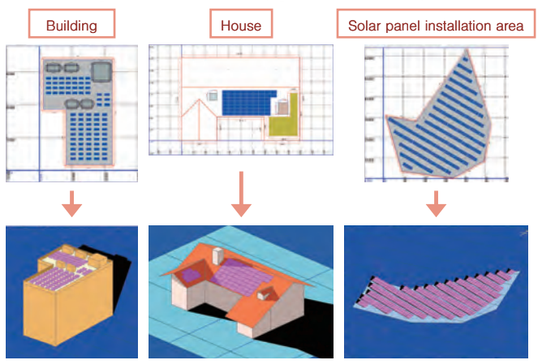
Tilt variation of solar array

The tilt of the solar array can be adjusted not only forward and backward, but also left and right. This allows you to point it in a direction different from the slope of the roof, or to simulate a complex location.



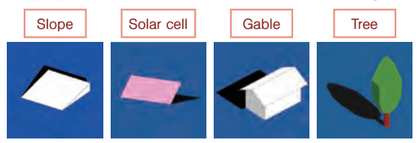
Input function for floor plan

You can efficiently create buildings and place modules, and easily set up even complex installation environments. Even for ground-mounted facilities such as mega solar power plants, you can easily create plots and automatically place solar cell arrays.



Selecting the input shape

You can select and place a shape that is close to the image of the actual building. You can move, duplicate, and delete buildings on the 3D CAD screen. You can use the inspector function to adjust the shape, position, and color of the selected building.



Other shapes
- Building
- Square
- Hip Roof
- Polyhedron

etc.

Creating building models from photos

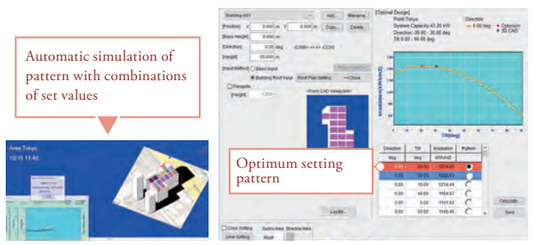
Based on a photo of the building to be simulated, a building model can be automatically created on 3D CAD.
[Pre-trial feature] *We are currently working on improving the accuracy.

Input Wizard

This function allows anyone to easily perform rough simulations, even if they have no knowledge of solar power generation or architecture. After inputting the data, it is also possible to change the object settings.

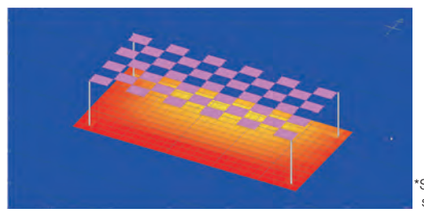
Optimal Design

We perform simulations by varying the azimuth angle of the array installation, the angle of the panels, and the distance between the arrays to design the system to maximize annual and daily power generation. We optimize each parameter, leading to a more efficient design.



Solar sharing compatible

The amount of solar radiation under the power generation facility is displayed in color on the 3D CAD, which can be used as a reference when selecting crops suitable for solar sharing. It can also calculate the shading rate required for applying for solar sharing.



*Scattered light is always set to 100%.

Various display functions

Shadow animation

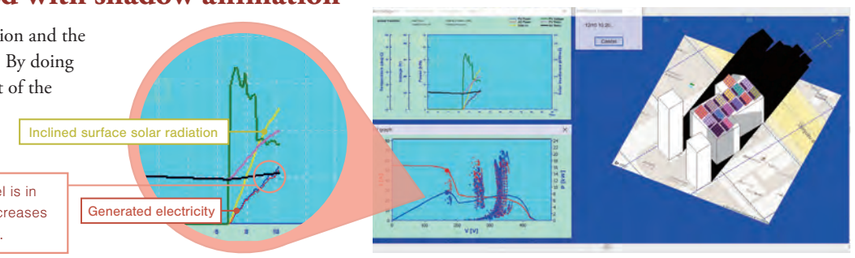
By inputting location information (latitude and longitude) and time information (date and time), you can display the shadow at that location and time. You can also display a continuous video of the shadow's movement throughout the day.

Shadow trajectory diagram

You can display the shadow trail by specifying any time interval. Even if the shadows of buildings overlap in complex ways, you can get a detailed view of the shadows at each hour of the day.

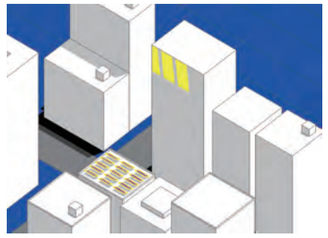
Graph display linked with shadow animation

You can display the shadow animation and the power generation graph in tandem. By doing so, you can see at a glance the effect of the shadow on the power generation.



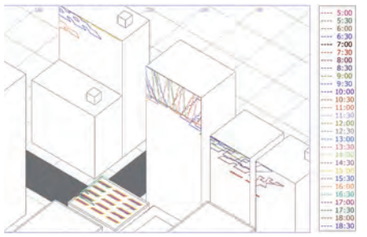
Reflection animation

By inputting location information (latitude and longitude) and time information (date and time), you can display the reflected light at that location and time. It is also possible to display the movement of reflected light over the course of a day.



Reflected light trajectory diagram

You can display the trajectory of reflected light by specifying any time interval. You can get a detailed understanding of the impact of reflected light on the surroundings at each time point.

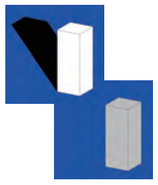


Image/video output

The simulation results of shadows and reflected light can be output as images and videos, and titles and comments can also be added to the videos. The simulation results can be viewed on a PC, smartphone, or tablet, making it ideal for presentations and PR.

Toggle display/Non display

By hiding shadows and reflected light, the load is reduced and display speed is improved. Even when shadows and reflected light are hidden, the simulation results will reflect the results taking shadows and reflected light into account.



Extensive database for improved accuracy

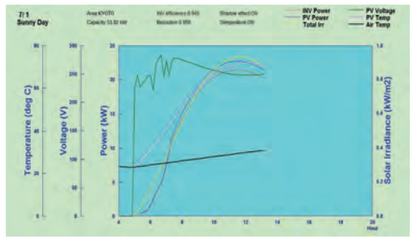
Weather database	Compatible with various domestic weather databases. Weather data from 837 locations in Japan and 1,360 locations overseas is used.
Solar cell database	The data collected by our company is built in. We handle data from over 100 manufacturers and over 1000 types of models.
Inverter database	It is compatible with almost all domestic PCS manufacturers and has built-in data such as PCS model names.

Function Guide

Predicts power generation with highly accurate calculations based on instantaneous values

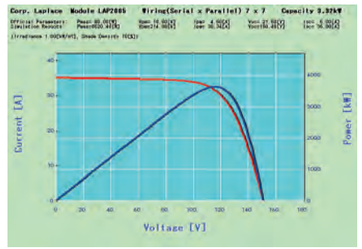
Integration of Instantaneous Calculations

Integrating instantaneous calculations of irradiance, instead of the simple calculation based on the annual irradiation amount, results in valid and precise calculation of generated energy. It supports arch type, tracking type and other special systems, too.



Calculation on I-V Characteristics Graph

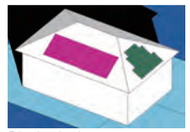
By calculating PV system as a circuit combing the current equation per module, it shows a precise I-V curve which takes account of circuit linkage of each module.Various changes of I-V curves resulted from the defference of the shadow influence can be compared, therefore evaluation on environment where a system performs effectively.

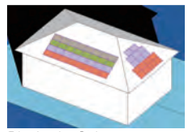


Module connection setting

The wiring patterns of modules in a solar array can be set arbitrarily, and can be displayed by PCS and string on the 3D CAD (wiring across multiple arrays is also possible). Multiple PCSs are also supported.

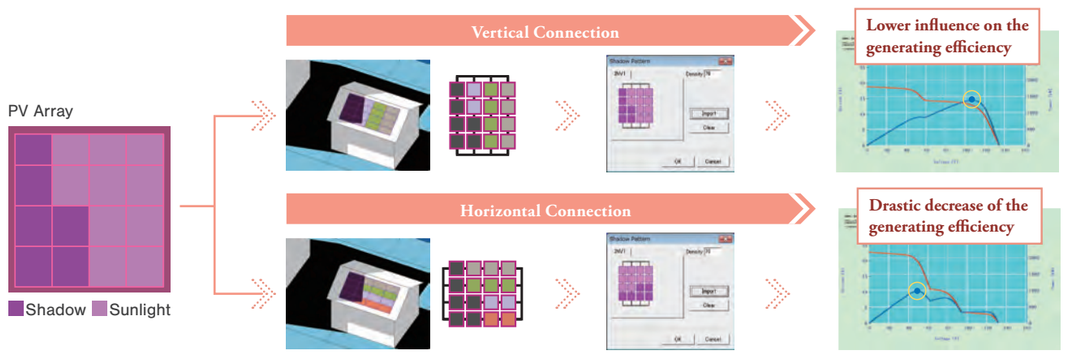

Setting Screen


Display by inverter


Display by String

Interlocking of Module Connections and Shadow Patterns

The optional setting of module wiring allows the design of wiring that is less susceptible to shadows. As shown in the figure below, power generation efficiency varies greatly depending on the module wiring method, even when shadows are cast in the same way.



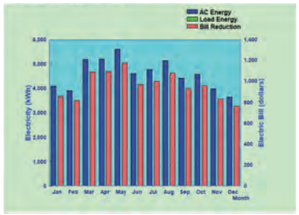
Multifaceted PR of economic efficiency from simulation results

Various settings

Cost	Enter the initial and operating costs of the system to calculate the payback period.
Electricity rate plan	You can choose from a variety of electricity rate plans, from household to industrial, offered by power companies across Japan.
Load Power	Enter the load power amount for each month and the approximate electricity bill for that month will be calculated based on the electricity rate plan and load power amount.

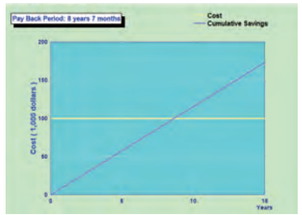
Generated power and load power

The monthly generated power and load power are displayed in a graph. You can also check the amount of electricity bill reduction as a result of introducing a solar power generation system.



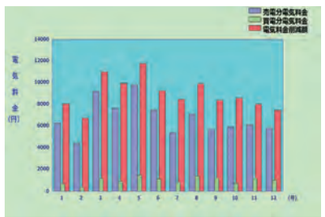
Changes in cost reimbursement over time

Displays the cumulative amount of electricity bill reduction and the trends in the initial and operating costs of the system. You can also check the number of years it will take to repay the costs.



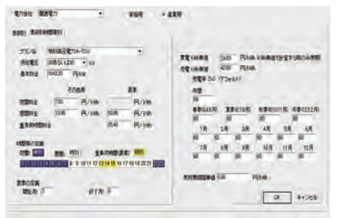
Comparison of electricity purchase and sale rates

The monthly electricity charges for selling and purchasing electricity, as well as the amount of electricity charge reduction, are displayed in a graph.



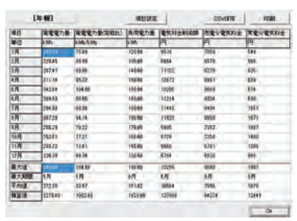
Economic calculations for the full and surplus purchase system

The system calculates the economic viability of the total and surplus purchase systems by reflecting preset electricity rate plans and electricity buying and selling prices.

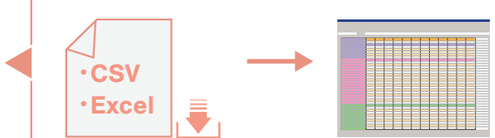


Report

Displays the amount of generated power, the amount of generated power (rated ratio), the amount of load power, the amount of electricity bill reduction, the amount of electricity sold, and the amount of electricity purchased. It can be calculated in 15, 30, or 60 minute increments and saved in CSV or Excel format.



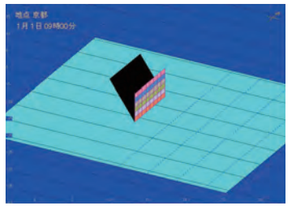
Save in CSV or Excel format and edit freely.

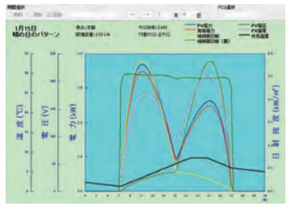


Function Guide

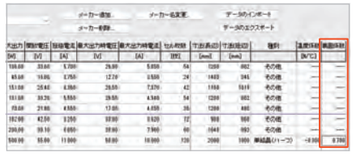
Supports bifacial modules

It is now possible to simulate the amount of power generated when using bifacial modules.
Accurate calculations can now be made, including the effect on power generation of reflective objects and light reflected from the ground.



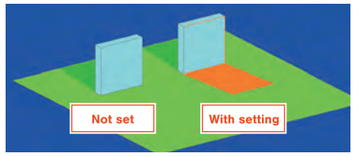


Back Coefficient



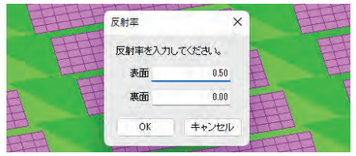
Back coefficient can be set arbitrarily,and different settings can be made for each module

Object reflection settings



Reflection can be set on the surface of an object

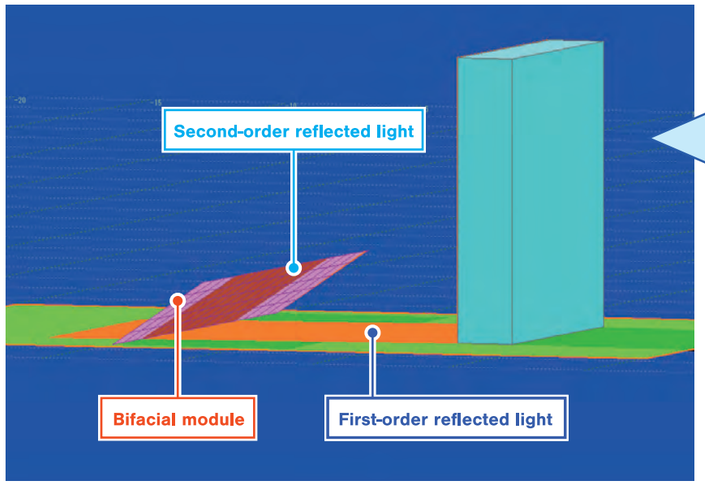
Reflectivity

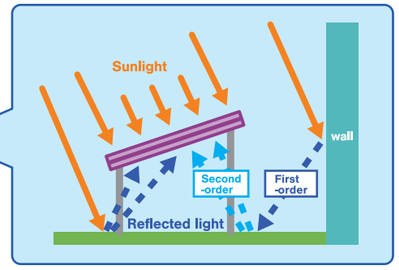


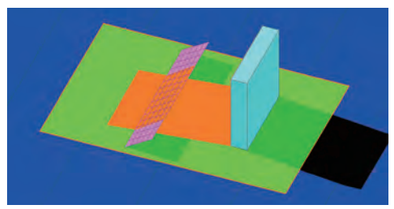
Different reflectances can be set for different objects, enabling more realistic calculations

Simulation with up to two levels of reflection

Reproduces multiple reflections of reflected light (specular reflection). Supports up to two levels of reflected light simulation from the ground, walls, etc.





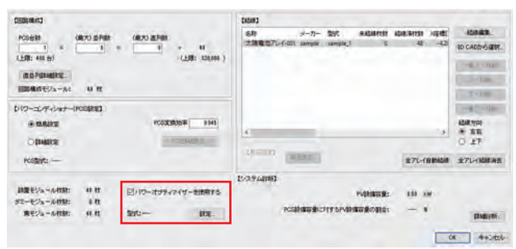


It is possible to simulate light reflecting off a wall, onto the ground (first-order reflected light), and then onto the back of a bifacial module (second-order reflected light).
Level 2 reflections are displayed in a darker color.

Reflected light from the wall

Optimizer Support

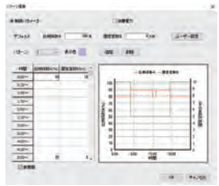
By connecting one unit to one or two modules, it is possible to perform power generation calculations using an "optimizer" that maximizes output efficiency.

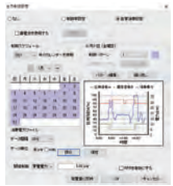


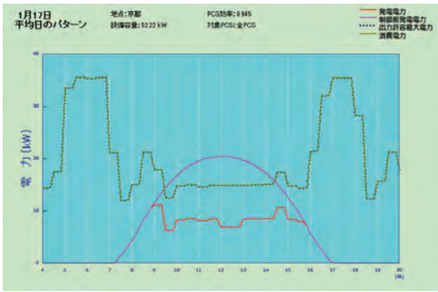
Simulation of self-consumption power generation control

Self-consumption power generation simulation

The control algorithm of Solar Legato, an automatic output control system for self-consumption solar power generation, can also be applied to Solar Pro's power generation calculations, allowing you to simulate the effects of installing Solar Legato.
In addition, calculations that take power consumption into account are compatible with data on power consumption (kWh), total power consumption for one month, and power consumption in 15-, 30-, and 60-minute increments. Power consumption data (CSV format) can also be input.

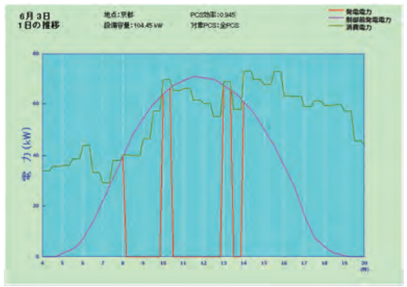






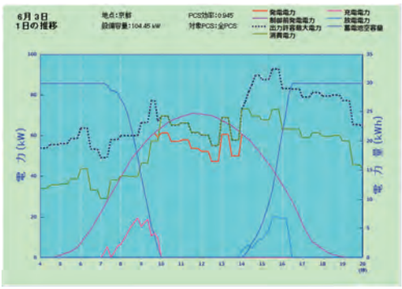
Reverse power flow occurrence simulation

When power generation exceeds power consumption, reverse power flow occurs and power generation facilities may stop. By reproducing the power generation stoppage caused by reverse power flow, a more detailed simulation can be performed.



Simulation of self-consumption control when introducing storage batteries

It also supports simulations when storage batteries are introduced into self-consumption control facilities. It is possible to simulate inverter control that matches the balance between generated power and consumed power, as well as storage battery charge and discharge control.

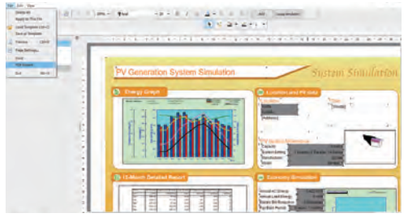


What is Solar Legato?

This power generation control system is equipped with patented technology that automatically controls the output of the inverter in accordance with fluctuations in power consumption. It solves the problems of reverse power flow and excessive control that are issues with self-consumption solar power generation, and maximizes the power generation.

Integrated Report

You can create a report that summarizes the calculation results, settings, and 3D CAD images. The report generated from the calculation results is displayed, and the displayed contents can be converted to PDF. You can also edit and use the contents on the integrated report editing screen.



Simulation principle of Solar Pro

Solar Pro integrates the instantaneous value of the generated electric power and leads to highly accurate results.

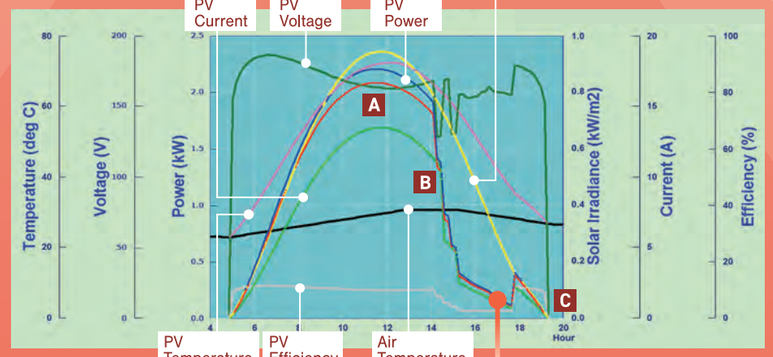
Enable highly accurate and scientifically grounded calculations by integrating instantaneous values instead of calculating from annual accumulated solar radiation.

3

1 year energy generation graph

There are detailed calculations and simple calculations for yearly calculations.
You can also select the calculation interval in units of 1 minute.

1 day energy generation graph



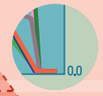
The solar radiation incident on the PV array is calculated using direct irradiance, scattered light, and ground reflected light. This allows you to determine the total amount of solar radiation (tilted surface solar radiation) received by the PV array, whatever orientation the PV array is installed in.

A Temperature Influences

Rise in PV temperature during daytime shows decrease in voltage.
It is one of the unique characteristics of Solar Pro to analyze the influence by temperature at the voltage base.

B Shadow Influences

This graph shows electric decreasing voltage, electric current, and electric power.It can reflect the calculation of shadow changing momentarily.



C Operating Conditions on Inverters

It reflects inverter settings, including operation, shutdown, and behavior when exceeding capacity.

Plot the maximum power point obtained from the IV curve as generated power.

2

Calculation on I-V Characteristics Graph

Draw an IV curve from a combination of electric current and voltage and find the maximum power point.

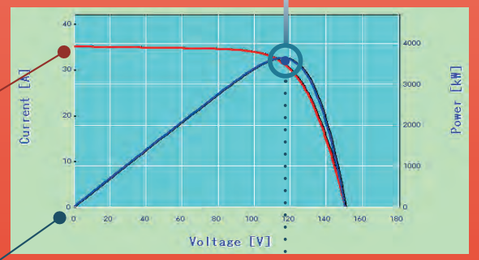
I-V curve

An I-V curve graph is a basic graph displaying performance of PV modules. In Solar Pro,a possible combination of electric current and voltage is calculated precisely by altering load resistance accordingly.

P-V curve

A P-V curve consists of electric power and electric voltage.

Generated Power



Maximum Power Point

It is the point where modules are able to deliver maximum power which determines operating voltage and current.

*Maximum Power Point per inverter, string, and module can be calculated.

Solve simultaneous equations for the number of modules and find the combination of electric current and voltage.

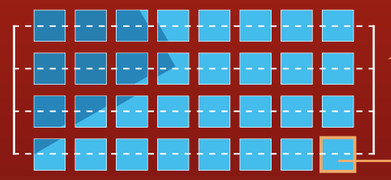
1

Calculation per Module

Calculate the current equation taking into consideration the state of sunshine and shadow for each module.

A combination of electric current and voltage is derived according to the situation such as the installation condition of each module and the type of module, and is represented as an IV curve. Therefore, it is possible to calculate accurately even in complicated situations such as different installation conditions and modules in different wiring configurations.

calculation : $I=I_{ph} - I_o[exp\{C(V+I R_s)\} - 1] - (V+I R_s) / R_p$



It reflects the state and connection of modules one by one.

Consider the effects of shading on all modules in a string, not just the one being shaded.

Simulation Agency Service

Support for panel installation planning with agency services

We will perform simulations on your behalf using Solar Pro. Once the simulation is complete, we will submit a report summarizing the results. Please feel free to request this service.

*We do not provide optimal designs, including module wiring.

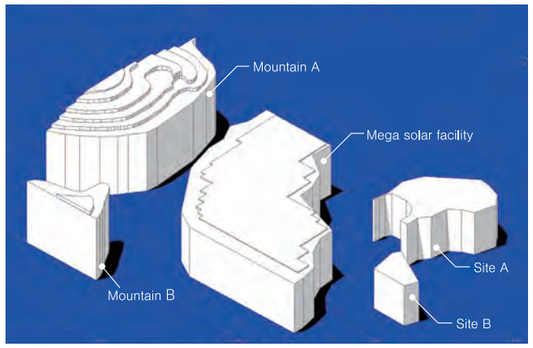
Recommended for those who:

- Want to try Solar Pro simulation
- Want to check the effect of Solar Legato
- Not accustomed to designing in complicated place
- Want to check the results with easy-to-understand reports

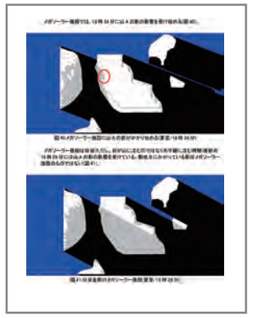
Simulation Agency Service cases

Shadow Simulation

We will verify how the shadow of the surrounding mountains will affect the mega-solar facility. We will also verify how the shadow of the mountains and the mega-solar facility will affect neighboring sites.

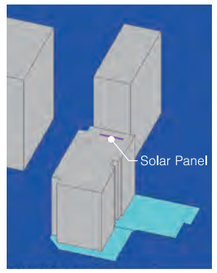


Report example (partial excerpt)

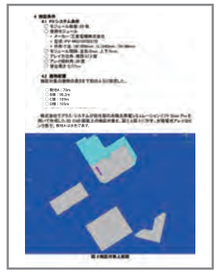


Reflected light simulation

The solar panel tilt angles are set to 10 degrees and 30 degrees, and a comparative study is conducted to see how the reflected light from the solar panel affects the surrounding buildings.



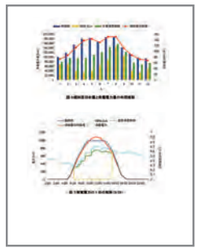
Report example (partial excerpt)



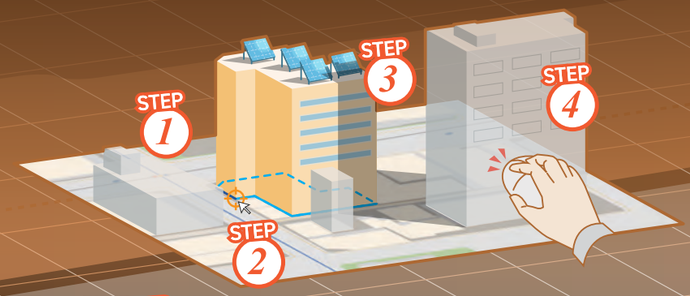
Self-consumption control simulation

Using the self-consumption power generation control simulation function, we will verify the effect of Solar Legato on the amount of electricity sold and purchased.

Report example (partial excerpt)



Let's try a simulation!



You can check the results from various perspectives, such as power generation graphs, reports, and economic graphs.

STEP 1 Load a map as a template

As a base for creating a building, load a map of the building you want to simulate using the "map loading function."

▶P.5 for details

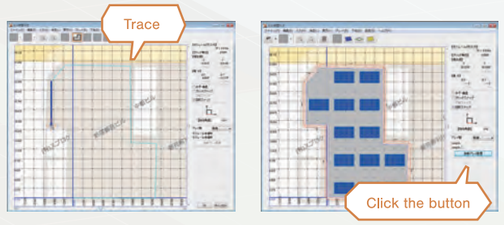
Tip

DXF files and images can also be read!

STEP 2 Create a building and place a solar array

Trace the outline of the building on the loaded map using the "Input function for floor plan." The "Automatic Array Placement Function" will place the solar array, making it easy to complete the building.

▶P.5 for details



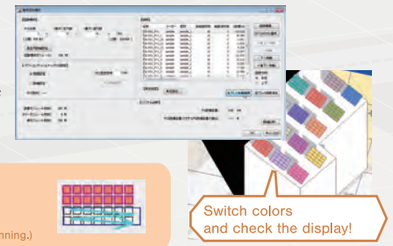
Tip

You can also install the building by selecting an input shape that is closest to the image of the actual building without using a floor plan.

STEP 3 Set the module wiring pattern

Wiring for each module of the solar cell array is done in the "Module Wiring Settings." The effect of shadows on power generation varies greatly depending on the wiring method.

▶P.7 for details



Tip

After the wiring pattern is automatically set, you can also adjust it manually!
(You can also set the wiring pattern manually from the beginning.)

Tip

After automatic placement, the array can also be adjusted manually!

STEP 4 Creating the surrounding buildings

Similar to the procedure in STEP 2, use the "Input function for floor plan" and "select input shape" to create the surrounding buildings.

▶P.5 for details

Tip

When simulating shadows, create surrounding buildings that are taller than the building created in STEP 2.

Checking the simulation results