FusionSolar SmartDesign 2.0

User Manual

Issue 17

Date 2026-03-30



HUAWEI

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About This Document

Purpose

This document describes the basic functions and operation instructions of the SmartDesign for designing photovoltaic (PV) systems and energy storage systems (ESSs).

Statement

In this document, LUNA only refers to a specific model of Huawei Smart String ESS.

Intended Audience

This document is intended for PV plant O&M personnel and qualified electricians.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

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Symbol	Description
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

17 (2026-03-30)

- Updated **4.2 Quick Design**.
- Updated **5.3 Capacity Design**.
- Updated **8.1 Residential Solution Overview**.

16 (2026-02-15)

- Updated **4.1.2 Electricity Price and Consumption Settings**.
- Updated **5.1.2 Electricity Price & Consumption Settings**.
- Updated **5.3 Capacity Design**.
- Updated **5.3.1.2 Electricity Price & Consumption**.

15 (2025-12-25)

Updated **2 Registration and Login**.

14 (2025-09-30)

- Updated **5.1.2 Electricity Price & Consumption Settings**.
- Added **5.3.1 Capacity Design (New Version)**.
- Updated **8.1 Residential Solution Overview**.

13 (2025-06-30)

- Updated **5.3.2.3 Plan Settings**.

- Updated **6.1 Custom PV Modules**.
- Updated **8.2 Report Parameters**.

12 (2025-03-30)

- Updated **4.1.1 Entering Basic Information**.
- Updated **4.1.3 Performing 3D Modeling**.
- Updated **4.1.5 Electrical Design**.
- Updated **4.1.7 Generating a Report**.
- Updated **5.1.1 Entering Basic Information**.
- Updated **5.1.3 Performing 3D Modeling**.
- Updated **5.1.5 Electrical Design**.
- Updated **5.1.6 ESS Design**.
- Updated **5.2.3 Generating a Report**.
- Updated **7.2 How Do I Generate an Energy Consumption Model by Importing Data?**
- Added **7.5 How Do I Import Meteorological Data?**

11 (2024-12-30)

- Updated **3 Project Management**.
- Updated **4.1.4 PV Module Layout**.
- Updated **4.1.7 Generating a Report**.
- Updated **5.1.4 PV Module Layout**.
- Updated **5.1.5 Electrical Design**.
- Updated **6.1 Custom PV Modules**.
- Added **6.2 Setting Frequently Used PV Modules**.

10 (2024-09-30)

- Updated **4.1.2 Electricity Price and Consumption Settings**.
- Updated **5.3.2.3 Plan Settings**.

09 (2024-08-30)

- Updated **5.1.8 Generating a Report**.
- Added **7.4 How Do I Log In to the SmartDesign Remotely?**.
- Added **8.3 Acronyms and Abbreviations**.

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08 (2024-06-30)

- Updated **3 Project Management**.
- Updated **5.3 Capacity Design**.
- Added **6.3 Genset Configuration**.
- Updated **8.1 Residential Solution Overview**.
- Added **8.2 Report Parameters**.

07 (2024-05-25)

- Added **6.5 Report Cover Settings**.
- Updated **7.2 How Do I Generate an Energy Consumption Model by Importing Data?**

06 (2024-03-30)

- Updated **3 Project Management**.
- Updated **4.1.5 Electrical Design**.
- Updated **4.2.2 Plant Design**.
- Updated **5.1.7 Economic Analysis**.
- Updated **5.1.8 Generating a Report**.
- Updated **5.3.2.3 Plan Settings**.
- Added **8.1 Residential Solution Overview**.

05 (2024-02-20)

- Updated **5.1.2 Electricity Price & Consumption Settings**.
- Added **5.1.6 ESS Design**.
- Updated **5.1.7 Economic Analysis**.
- Updated **5.1.8 Generating a Report**.
- Added **5.3 Capacity Design**.

04 (2023-12-18)

- Updated **2 Registration and Login**.
- Updated **3 Project Management**.
- Added **4.2 Quick Design**.
- Added **5 Commercial and Industrial Project**.

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03 (2023-09-05)

- Updated **4.1.2 Electricity Price and Consumption Settings**.
- Updated **4.1.3 Performing 3D Modeling**.
- Updated **4.1.4 PV Module Layout**.
- Updated **4.1.5 Electrical Design**.
- Updated **4.1.6 Economic Analysis**.
- Updated **4.1.7 Generating a Report**.

02 (2022-12-30)

Added **4.1.2 Electricity Price and Consumption Settings**.

01 (2022-07-30)

This issue is the first official release.

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1 System Overview

This system is used to assist in designing PV systems, ESSs, and PV+ESS systems. It provides information such as the PV or ESS installation effect drawing, devices, price list, total quotation, and revenue for the PV owner, and intuitively displays the advantages and benefits of a PV design scheme.

Client Configuration

Use a PC that meets the following requirements to access the system with better experience:

Capacity	Resolution	Browser	CPU	Memory	Graphics Card
< 10 MW	Optimal resolution: 1920 x 1080 pixels	Chrome 79, Firefox ESR 68, or later is recommended.	/	/	/
10 MW			i7 3.2+ GHz	8+ GB	4+ GB GPU memory (or integrated graphics card)

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2 Registration and Login

Registering an Account

NOTE

If you already have a SmartPVMSManagement System installer account, you can use this account to access the SmartDesign without repeated registration. An owner account cannot be used to access the SmartDesign. You need to register a system account.

1. In the address bar of a browser, enter a domain name in the following table, and press **Enter**.
   - China: **https://cn.smartdesign.huawei.com**
   - Latin America: **https://la.smartdesign.huawei.com**
   - Japan: **https://jp.smartdesign.huawei.com**
   - Asia Pacific: **https://sg.smartdesign.huawei.com**
2. Click **Log In** to access the login page.
3. Click **Installer Registration** and complete the registration as prompted.

System Login

1. In the address bar of a browser, enter a domain name in the following table, and press **Enter** to access the login page.
   - China: **https://cn.smartdesign.huawei.com**
   - Latin America: **https://la.smartdesign.huawei.com**
   - Japan: **https://jp.smartdesign.huawei.com**
   - Asia Pacific: **https://sg.smartdesign.huawei.com**
2. Click **Log In** to access the login page.
3. Specify the username and password, and tap **Login**.

NOTE

For details about how to log in to the SmartDesign remotely, see **7.4 How Do I Log In to the SmartDesign Remotely?**.

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System Logout

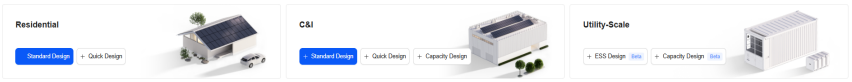
In the upper right corner of the system page, click  and select **Log Out**.

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3 Project Management

Creating a Project

You need to create a project to design a plant in the residential and C&I scenarios.



Scenario	Project Type	Description
Residential	Standard Design	Applies to small-scale residential scenarios. 3D modeling is used to simulate the real environment and assist in PV plant system design. ESSs are supported. The maximum installed capacity is 100 kW. For details, see **4.1 Standard Design**.
	Quick Design	Applies to small-scale residential scenarios. Reports can be quickly generated after plant information is configured. ESSs are supported. The maximum installed capacity is 100 kW. For details, see **4.2 Quick Design**.
C&I	Standard Design	Applies to large-scale C&I scenarios. 3D modeling is used to simulate the real environment and assist in PV plant system design. ESSs are supported. The maximum installed capacity is 10 MW. For details, see **5.1 Standard Design**.
	Quick Design	Applies to large-scale C&I scenarios. Reports can be quickly generated after plant information is configured. ESSs are not supported. The maximum installed capacity is 1.5 MW. For details, see **5.2 Quick Design**.

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Scenario	Project Type	Description
	Capacity Design	Applies to large-scale C&I ESS scenarios to calculate the ESS capacity and analyze benefits. For details, see **5.3 Capacity Design**.

Managing a Project

- Copying a project

  In the project list, click in the **Operation** column.

  NOTE

  When a project is copied, all schemes of the project are copied.

- Sharing a project

  Select a project from the project list and click in the **Operation** column. In the dialog box that is displayed, enter a username and click **Add** to share the project with the corresponding user.

  - The project owner can set the permission of a member who shares the project to **Read-Only** or **Edit**.
  - To remove a member, move the cursor to the member and click .
  - If a project report has been generated and the sharing permission is valid, the report can be shared by the static report link.

    NOTE

    - If the message **This report has expired** is displayed, the sharing permission of the project report has expired. If you want to share a report, you need to reset the validity period on the **Report** page.
    - If the message **This report has been closed** is displayed, the sharing permission of the project report is disabled. If you want to share a report, enable **Share** on the **Report** page.

- Locking a project

  Project locking is supported in standard design. Open a project and click in the upper right corner to lock the project. When the project is locked, you can only view the project but cannot edit it. When the project is unlocked, you can edit it. A locked project cannot be edited. Subsequent changes in design specifications do not apply to the project until it is unlocked.

- Deleting a project

  Select a project from the project list, click , and click **Delete** to delete the project.

- Create a plant on the SmartPVMS or FusionSolar app.

  For a project where PV modules have been arranged, click in the upper right corner of the project, enter related information, and create a plant on the FusionSolar SmartPVMS or the app. The following information will be synchronized to the SmartPVMS or the app.

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NOTE

- Plant creation is supported only in standard design projects.
- Plant creation is not supported in Japan.
- The plant creation button is not displayed on the first three steps.
- Plant creation is not supported in the project with a created plant.

Managing a Scheme

NOTE

You can add, compare, rename, delete, and set a scheme as the primary scheme only for a **Standard Design** project.

- Adding a scheme

  Method 1:

  a. Select a project from the project list, click ⋮ in the **Operation** column, and click **New Scheme**.

  b. Enter the scheme name, click **OK**, and perform steps 4 to 6/7 based on the site requirements.

     After a scheme is added, the settings in steps 1 to 3 are shared with other schemes. If you modify the settings, the existing schemes will be affected. If you select **Reuse Existing Scheme**, the settings in all steps of the selected scheme are copied.

  Method 2:

  Select a project. In steps 4 to 7/8, click ∨ in the upper left corner, move the cursor to the corresponding scheme, and choose **Copy**. After a scheme is copied, the settings in steps 1 to 3 are shared with other schemes. You can modify the settings as required. If you modify the settings, the existing schemes will be affected.

  NOTE

  A project supports a maximum of five schemes.

- Renaming a scheme

  Method 1: In the project list, click ∨ in the **Project Image** column and click ✎ in the **Operation** column.

  Method 2: Select a project. In steps 4 to 7/8, click ∨ in the upper left corner, move the cursor to the corresponding scheme, and choose **Rename**.

- Deleting a scheme

  Method 1: In the project list, click ∨ in the **Project Image** column and click 🗑 in the **Operation** column.

  Method 2: Select a project. In steps 4 to 7/8, click ∨ in the upper left corner, move the cursor to the corresponding scheme, and choose **Delete**.

- Setting the current scheme as the main scheme

  Select a project. In steps 4 to 7/8, click ∨ in the upper left corner, move the cursor to the corresponding scheme, and choose **Set as Primary Scheme**. The

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scheme is set as the primary scheme. After you enter the project again, the scheme is displayed by default.

NOTE

- If no primary scheme is set, the first scheme is the primary scheme by default.
- If a plant has been created for the project on the SmartPVMS or the FusionSolar app, the plant creation scheme is set as the primary scheme.

- Comparing schemes

  You can compare and analyze different schemes of the same project to display the optimal design scheme for the owner. The schemes can be compared and analyzed only after a report is generated.

  a. In the project list, select the schemes to be compared, click ⋮ in the **Operation** column, and choose **Compare and Analyze**.
  b. On the **Compare and Analyze** page, you can view the scheme comparison in terms of basic information, energy yield, devices, and economic analysis.

     NOTE

     A maximum of three different schemes can be compared at the same time.

Getting More Help

In the upper right corner of the system page, click ⓘ to open the help panel and obtain more operation guides.

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4 Residential Project

4.1 Standard Design

After logging in to system, click **Standard Design** in the **Residential** scenario, and then design the project and fill in the project information as prompted. Then, the project is created and a report is generated.



The process of creating a standard design project and generating a report is as follows.



4.1.1 Entering Basic Information

The basic information includes the PV plant location, weather station, and grid parameters.

1. Enter the project name, and set basic information such as the location of the PV plant, weather station, and power grid parameters based on the site requirements.

   NOTE

   If no weather stations provided by the system meet the requirements, click to upload the meteorological data. For details about the upload requirements, see **7.5 How Do I Import Meteorological Data?**

2. Frame the location where the PV plant is to be installed.

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  - Method 1: Hold down  on the map, move the cursor to the location where the PV plant is to be installed, and adjust the frame size to ensure that the location is completely framed.
  - Method 2: Hold down any place on the map, move the cursor to the location where the PV plant is to be installed, and adjust the frame size to ensure that the location is completely framed.
3. Click **Next** to save the settings.

4.1.2 Electricity Price and Consumption Settings

After the electricity prices and loads are set, the system recommends an appropriate ESS capacity based on the maximum self-consumption rate.

Electricity Price Settings

To ensure accurate benefit calculation, set related parameters in **Electricity Price Settings** as required.

1. Click **Set** and select a currency unit as required.
2. Set **Feed-in Tariff**.
3. Set **Purchase Price**.
4. Set **Electricity Price Growth Rate**.

NOTE

If a price template has been configured in the SmartPVMS, you can select **User-Defined Input** or **Template Input** as required.

If no price templates have been configured in the SmartPVMS, you can set **Purchase Price** based on the actual situation.

Consumption Settings

- Creating an energy consumption model through model generation
  a. Set **Type** to **Generate Model**.
  b. Set **Annual Energy Consumption** and **Monthly Energy Consumption** as required.
  c. Set **Workday Model** and **Weekend Model** as required. The system displays the daily load curve based on **Workday Model** and **Weekend Model**.
  d. **Optional:** If the preconfigured models cannot meet your requirements, set **Workday Model** or **Weekend Model** to **Custom** and click  to edit the model.
  e. Click **Next** to save the current scheme.
- Creating an energy consumption model by uploading data
  - Creating an energy consumption model by importing the load point table
    i. Select **Data Import** from the **Type** drop-down list.
    ii. Click **Add File** and choose **Import Load Point Table**.
  - Creating an energy consumption model by importing data

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i. Select **Data Import** from the **Type** drop-down list.

ii. Click **Download Template**, enter the load data in the template as required, and save the template. For details, see **7.2 How Do I Generate an Energy Consumption Model by Importing Data?**

iii. Click **Add File** and select **Import Standard Template**.

NOTE

- The **Import Load Point Table** function is available only in China. Obtain the load point table data from the SGCC or CSG official website.
- If the uploaded data is incorrect or missing, you can click **Edit Data** to change the data.

NOTE

If no load is connected, set **Annual Energy Consumption** to **0**.

4.1.3 Performing 3D Modeling

After you specify the location, the system automatically generates a rectangle area. In this area, you can draw buildings or import building models to draw rooftops to facilitate PV module arrangement and electrical design. If you encounter any difficulties during the operation, click **User Guide** in the lower left corner to view the solution.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

4.1.3.1 Drawing the 3D Model

Drawing Buildings

The system provides both 2D and 3D views. The 2D view displays the map in a top view and is used to draw the roof outline and obstacles. The 3D view is used to edit information, such as a building's height.

1. By default, the map is displayed in a top view. Click a map area, click , and draw the roof outline based on site requirements. All points form a closed geometric image. Alternatively, you can quickly draw the ridge based on the ridge type (for details, see **Drawing Ridges**).

   NOTE

   If there are obstacles such as windows, skylights, and tree branches that affect PV module installation and PV power generation efficiency on or around the roof, draw the obstacles based on site requirements. For details, see **Drawing Obstacles**.

2. Click 

to switch to the 3D view. Then, select the outline to be adjusted and specify information such as the building height.
3. Click **Next** to save the settings.

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Drawing Obstacles

There may be obstacles such as windows, skylights, and tree branches that affect PV module installation and PV power generation efficiency on or around a building's roof. You can draw obstacles based on site requirements.

- Drawing rectangular obstacles
  a. Click , choose **Rectangle**, and then click and hold the left mouse button to draw a rectangle in the actual position of the obstacle.
  b. Click 3D to switch to the 3D view. Select the obstacles to be adjusted and specify information, such as the obstacle height.
  c. After the drawing is complete, click **Next** to save the settings.
- Drawing polygonal obstacles
  a. Click , select **Polygon**, click the vertices of a polygon obstacle in sequence to draw the outline. Double-click the last vertex to complete the drawing.
  b. Click 3D to switch to the 3D view. Select the obstacles to be adjusted and specify information, such as the obstacle height.
  c. After the drawing is complete, click **Next** to save the settings.
- Drawing trees
  a. Click , choose **Pyramidal** or **Round**, and then click and hold the left mouse button to draw a tree and adjust the tree dimensions.
  b. **Optional:** Click and hold a tree to adjust its position.
  c. Click 3D to switch to the 3D view. Click a tree to display the top of the tree. Drag the top of the tree to adjust the height.
  d. After the drawing is complete, click **Next** to save the settings.

NOTE

You can manually adjust the dimensions of obstacles and trees in the **Settings** area.

Drawing Carports

The system allows users to draw carports for scenarios where PV modules are placed on carports. You can draw carports and adjust their length and width in both 2D and 3D views, and adjust the height in the 3D view.

1. Click and select the desired carport type.
2. Click and hold the left mouse button to draw a carport in the target area and release the button when the carport dimensions meet your requirements.

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NOTE

Select the carport, then drag the edges to adjust the dimensions, or manually enter them in the **Settings** area.

Drawing Ridges

After drawing the top view of a building, you can quickly draw the ridges.

1. Click and choose **Identify Ridge Line**. Double-click the roof you want to draw ridges on, and the system automatically places them. Adjust the ridges as required.
2. Click 3D to switch to the 3D view. Select a ridge and set the ridge height.
3. After the drawing is complete, click **Next** to save the settings.

Calibrating Dimensions

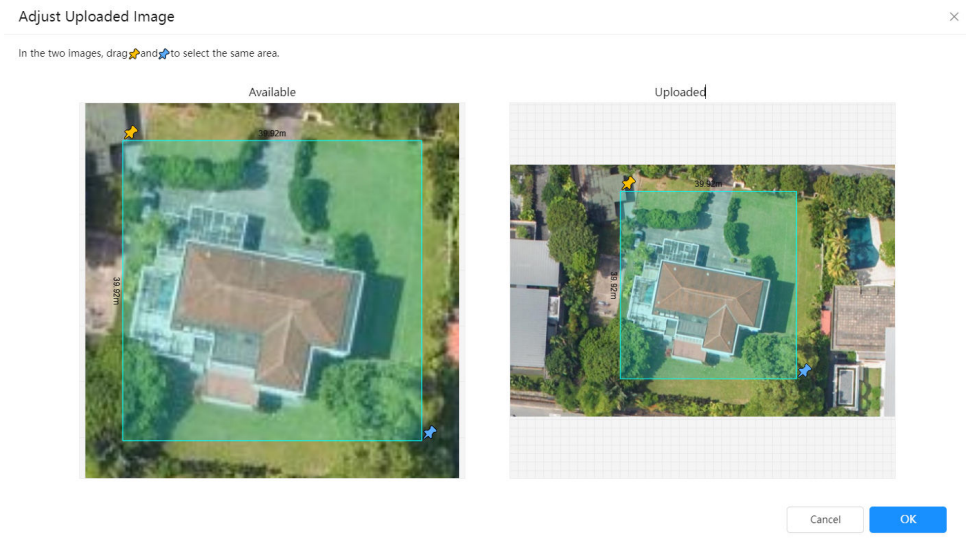
This function can be used to calibrate building outline dimensions.

1. Click , choose **Calibrate**, and double-click the line to be calibrated in the building outline.
2. Enter the calibrated dimensions in the data bars and press **Enter**.
3. After the calibration is complete, click **Next** to save the settings.

Replacing Images

If there is a clearer rooftop photo, for example, a photo taken by drones, you can use the **Replace Image** function to replace the photo for 3D modeling design.

1. Click and choose **Image**.
2. Click **Replace Image** on the right of the page.
3. Browse to the target folder and select the target image.
4. Adjust the replacement range in the **Available** and **Uploaded** image boxes, and click **OK**.



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5. Adjust the scaling factor, rotation degree, and transparency as required.
6. Click **Save**.

Shortcut Key Operations

Operation	Shortcut Key
Copying a target	Press **Ctrl** + **C** (uppercase or lowercase).
Undoing an operation	Press **Ctrl** + **Z** (uppercase or lowercase).
Selecting multiple targets	Hold down **Ctrl** and select the targets.
Moving a single target	Move the target in a drag-and-drop mode.
Moving multiple targets	Hold down **Ctrl** and select the targets. Then, move the selected targets in a drag-and-drop mode.
Deleting a target	Press **Delete**.
Drawing vertical or parallel lines	Hold down **Shift** and draw lines.
Stopping drawing lines	Press **Esc**.

4.1.3.2 Importing the Model

If you have a building model in OBJ format, click  to upload the building model and draw a rooftop and obstacles on the building model.

Basic Operations

Moving a model: Select a model and hold down the square to move the model.

Rotating a model: Select a model and hold down the arc to rotate the model.

Zooming in or out a model: Select a model and drag the arrow of the model to zoom it in or out.

Editing parameters: Select a model and edit the building name and azimuth on the **Settings** panel.

Exiting the **Model** page: Select a model and press **Delete**. The model is deleted and you exit the **Model** page.

Rooftop

You can draw a rooftop on the model as required to facilitate the arrangement of PV modules and electrical design in the rooftop area.

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- Drawing a rooftop

  a. Draw a rooftop: Click . Then in the rooftop area of the building model, click the left mouse button to determine the first vertex for the rooftop of the building model. Move the cursor and click other vertices along the rooftop outline in sequence to draw a rooftop.

  b. Exit drawing: Double-click the left mouse button or click the first vertex.

- Editing a rooftop
  - Edit a vertex: In the drawing area, click a vertex of the rooftop and edit its position by clicking the arrow of the vertex. You can also edit it in the **Settings** panel.
  - Edit a line: In the drawing area, click a line of the rooftop and edit its position by dragging the line. You can also edit it in the **Settings** panel.
  - Edit a plane: In the drawing area, double-click a vertex or line of the rooftop plane and select the arrow of the rooftop plane to edit its position. You can also edit it in the **Settings** panel.
  - Delete a rooftop: Double-click a vertex or line of the rooftop and click or press **Delete**.

Obstacle

- Drawing an obstacle

  a. Draw an obstacle: Click in the rooftop area. Click the left mouse button to determine the first vertex for the obstacle. Move the cursor and click other vertices along the obstacle outline in sequence to draw an obstacle.

  b. Exit drawing: Double-click the left mouse button or click the first vertex.

- Edit an obstacle: In the drawing area, click a vertex of the obstacle and edit the shape and size of the obstacle by dragging the vertex.

NOTE

Obstacles must be drawn in the rooftop area.

Carport

The system allows users to draw carports for scenarios where PV modules are placed on carports.

1. Click and select the desired carport type.
2. Click the desire position to place the carport.
3. (Optional) In the **Settings** panel, adjust **Length** and **Width** of the carport.

Ruler

- Drawing a ruler

  a. Draw a ruler: Click on the toolbar. In the drawing area, click any point to generate a ruler as required.

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b. Exit drawing: Double-click the left mouse button or press **Esc**.

- Edit a ruler: Modify the ruler size by modifying the ruler number. The model size is also modified proportionally.

NOTE

If either end of the ruler is placed on the ground, the ruler size cannot be modified.

4.1.4 PV Module Layout

After building 3D modeling is complete, you can arrange PV modules on the rooftop as required and specify the PV module model and direction. The system supports automatic and manual layout of PV modules. If you encounter any difficulties during the operation, click **User Guide** in the lower left corner to view the solution.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Automatically Arranging PV Modules

1. Select the area where PV modules are to be arranged, and select the PV module manufacturer, model, and color on the right.

   NOTE

   - Click  to add a customized PV module model.
   - Click **Frequently Used PV Module** to set the frequently used PV module models. For details, see **6.2 Setting Frequently Used PV Modules**.
2. Click **Auto** and then the system automatically arranges PV modules.
3. Click the PV module area, and set the area name, support type, direction, azimuth, tilt angle, and other information of PV modules.

   NOTE

   - **O&M Channel**: If you select this option, you can add row and column spacing in an array for maintenance access. By default, five rows and five columns of O&M channels are available. You can change the number as required.
   - Click  in the lower left corner to generate a radiation analysis chart.
4. **Optional:** To delete a PV module, select it and press **Delete**.
5. Click **Next** to save the current scheme.

Manually Arranging PV Modules

1. Select the area where PV modules are to be arranged, and select the PV module manufacturer, model, and color on the right.

   NOTE

   - Click  to add a customized PV module model.
   - Click **Frequently Used PV Module** to set the frequently used PV module models. For details, see **6.2 Setting Frequently Used PV Modules**.

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2. Click **Manual** and draw the area where PV modules are to be arranged on the rooftop. The system automatically arranges PV modules in the selected area.
3. Click the PV module area, and set the area name, support type, direction, azimuth, tilt angle, and other information of PV modules.

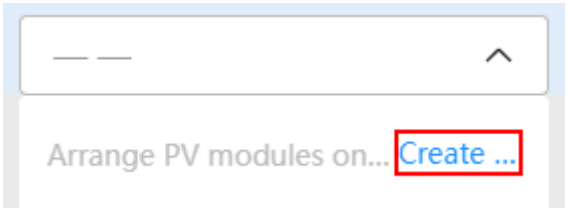
   NOTE

   - **O&M Channel**: If you select this option, you can add row and column spacing in an array for maintenance access. By default, five rows and five columns of O&M channels are available. You can change the number as required.
   - Click  in the lower left corner to generate a radiation analysis chart.
4. Click **Next** to save the current scheme.

Laying out PV Modules in a Vacant Space

PV modules can be arranged in a vacant space.

1. Click and choose **Create Vacant Space**.



2. Click any position on the edge of the space where the PV module is arranged to draw the first outline vertex. Move the pointer to generate a blue path line. Then, click the mouse along the edge of the space to draw the outline path.
3. Click the drawn area and select the PV module manufacturer, model, and color on the right.
4. Arrange the PV modules in the vacant space automatically or manually.

Shortcut Key Operations

- Click  to rotate a PV module.
- Hold down the left mouse button to rotate the view.
- Hold down the right mouse button to drag the view.
- Click a PV module to select it.
- Hold down **Ctrl** and click PV modules to select them.
- After clicking PV modules, press **Ctrl** and **A** to select all PV modules.
- Click a PV module, hold down **Shift**, and click other PV modules to select them.
- Select a PV module by cursor and move the PV module inside or outside the building.
- Select a PV module and press **Delete** to delete the PV module.
- Select a PV module and click  in the upper left corner or press **Ctrl+C** to copy the PV module.

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4.1.5 Electrical Design

After PV modules are arranged, the system automatically generates inverters, optimizers, and corresponding connections based on the number of PV modules and the target capacity ratio to quickly complete electrical design. If you encounter any difficulties during the operation, click **User Guide** in the lower left corner to view the solution.

NOTE

In Japan, a maximum of 10 inverters can be connected. In other countries or regions, a maximum of three inverters can be connected.

Automatic Design

1. Determine whether to configure optimizers, ESSs, communications devices, and meters based on site requirements.
2. You can set **Target Capacity Ratio** and decide whether to enable **Three-Phase Imbalanced Output** as required.
3. Click **Auto**. The system automatically adds inverters, optimizers, and ESSs, and connects cables based on the positions and quantity of PV modules.
4. The system automatically recommends communication devices and meters. You can also modify them based on the site requirements.
5. Click **Next** to save the current scheme.

Manual Design

1. Determine whether to configure optimizers, ESSs, communications devices, and meters based on site requirements.
2. You can set **Target Capacity Ratio** and decide whether to enable **Three-Phase Imbalanced Output** as required.
3. Click **Manual**. Then, the system automatically adds inverters, optimizers, and ESSs based on the quantity of PV modules. If the actual requirements are not met, you can click **Add Device** to add groups of devices.
4. Click **OK**. Then, the system automatically adds inverters, optimizers, and ESSs, and connects cables based on the positions and quantity of PV modules.
5. The system automatically recommends communication devices and meters. You can also modify them based on site requirements.
6. Click **Next** to save the current scheme.

NOTE

- If you need to configure the ESS, set loads first.
- You can enable **Three-Phase Imbalanced Output** only when you select a three-phase grid in **Grid Parameters** on the **Basic Info** page.
- If **Three-Phase Imbalanced Output** is selected, only inverters that support the function can be selected.
- You can set **Total ESS Capacity** and select **Support Power Backup** only after the ESS is selected.
- For details about the device networking, see **8.1 Residential Solution Overview**.

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Other Operations

- Click on the right of **PV Module Connection Status** to perform the connection again.
- Click on the right of **PV Module Connection Status** to clear the current connection.
- To delete an unconnected PV module, click on the right of **PV Module Connection Status** and select **Delete Unconnected PV Module**.
- Click to filter for the buildings or regions connected to PV strings.
- Click on the right of a device to delete its cable connections.
- Click to modify the device model.
- Click next to the MPPT to disconnect a string from the current inverter. The disconnected string is displayed in red.
- Click to view related technical parameters or alarm handling suggestions.
- Click to view the distribution of all inverters.

  NOTE

  - If the inverters can be configured with some models of optimizers at the MPPT level, click to add or delete an optimizer.

4.1.6 Economic Analysis

After the design of inverters and PV modules is determined, you can perform economic analysis on the PV system by specifying parameters such as **Cost Settings** and **Government Subsidy**.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Cost Settings

1. Click **Set** to set the discount rate and national tax rate as required.
2. In **Initial Installation Cost**, select **Initial Installation Cost Type** and enter the price as required.

   NOTE

   - If **Initial Installation Cost Type** is set to **Total Device Cost**, to set the unit price of each device, click in the **Operation** column in **Devices**.
   - **Total Initial Installation Cost** displays the sum of the purchase fees of all devices in the first year.
3. Enter the O&M cost in **O&M Cost** as required.

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NOTE

Total O&M Cost displays the sum of the O&M costs of PV devices and ESS devices each year.

4. In the **Devices** list, confirm the devices and click . In the dialog box that is displayed, enter the description and click **OK**.

   If other devices or auxiliary materials need to be added, click **Add Device**. In the dialog box that is displayed, enter basic information as prompted and click **OK**.



Government Subsidy Settings

If local government subsidies are available, set government subsidies for better economic analysis.

1. Click **Add Government Subsidy**.
2. Select a subsidy type and set the subsidy amount and other parameters as required.
3. Click **Next** to generate a report.

4.1.7 Generating a Report

After a report is generated, the system provides information such as energy yield and revenue based on the design scheme. You can customize report contents or export the report.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Report Details

The report contains multiple parts, such as **Basic Info**, **Project Overview**, **Electricity Bills Analysis**, and **Economic Benefits**. Click **Custom** and select the parts to be displayed in the report. For details about the parameters in the report, see **8.2 Report Parameters**.

Basic Info: displays the project name and address in the design scheme.

Project Overview: displays the 3D effect, system capacity, and device list in the design scheme.

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NOTE

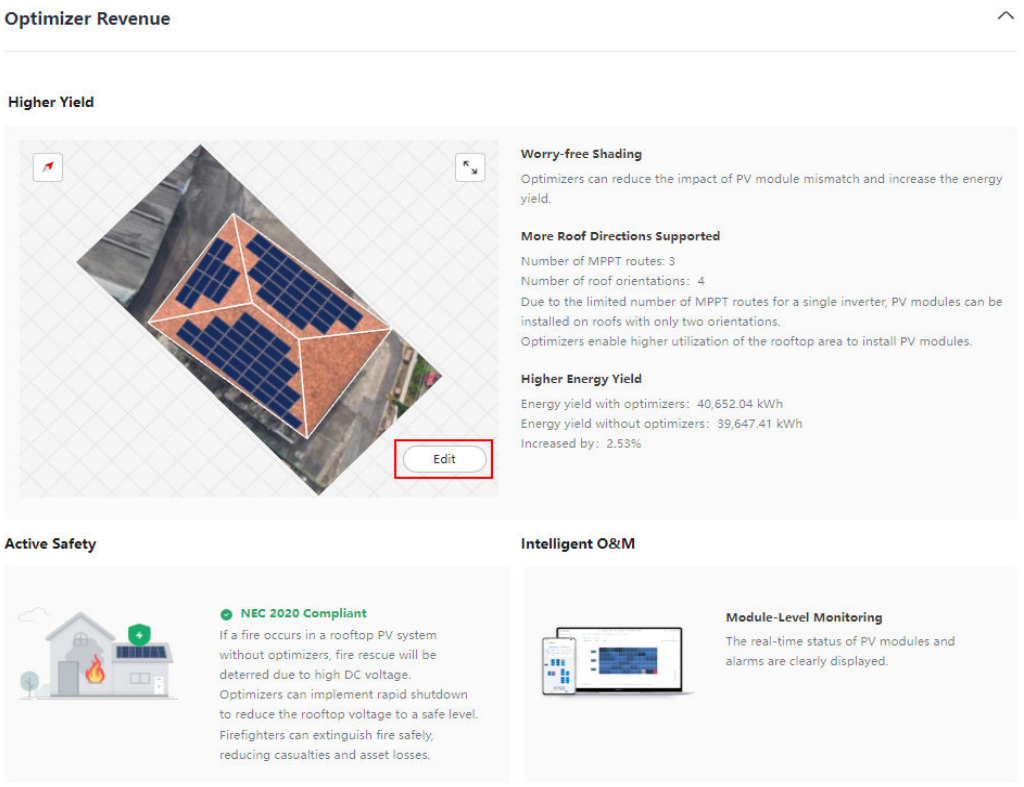
Click **Edit** in the lower right corner of the view to zoom in, zoom out, and return to the center position.



Optimizer Revenue: displays the increased energy yield with optimizers, active safety function, and module-level monitoring function when optimizers are deployed in the PV system.

NOTE

- The **More Roof Directions Supported** parameter is displayed only when the number of roof orientations is greater than the total number of selected MPPTs.
- Click **Edit** in the lower right corner of the view to zoom in, zoom out, and return to the center position.



Electricity Bills Analysis: displays the electricity bills comparison before and after PV or PV+ESS installation.

Economic Benefits: displays the expected economic benefits and investment return of the design scheme in the future.

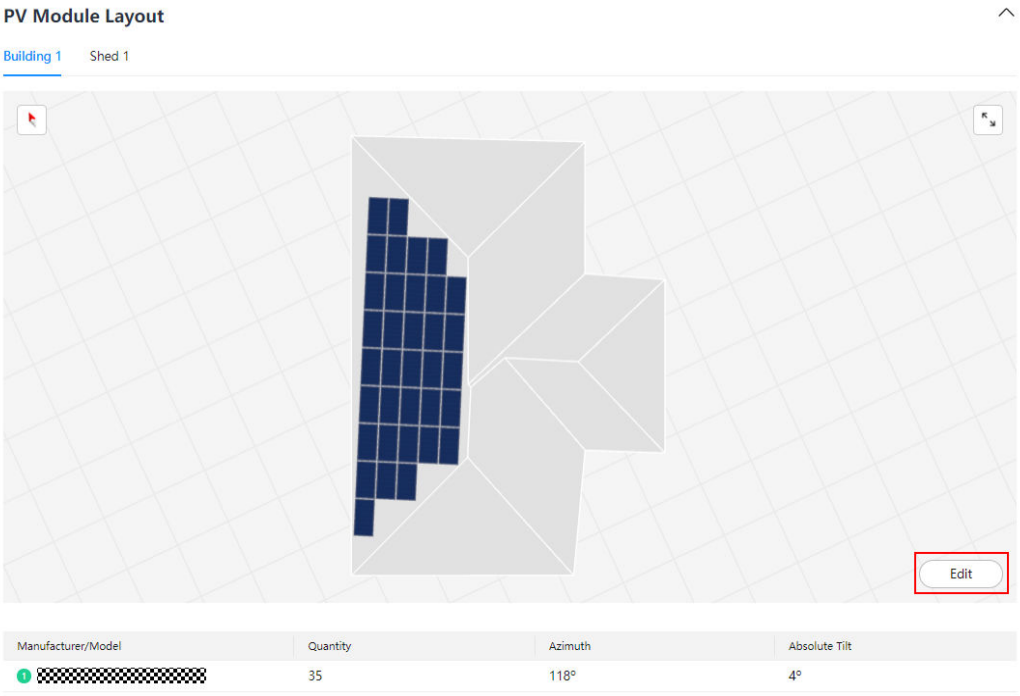
Energy Management: displays the detailed energy distribution in the scheme. When optimizers are deployed in the PV system, the energy yield increase with optimizers, and comparison between scenarios with and without optimizers will also be displayed.

Power Curve: displays the comparison of the grid power before and after PV+ESS or PV installation in each month of a year.

PV Module Layout: displays the PV module layout effect diagram and PV module array list.

NOTE

Click **Edit** in the lower right corner of the view to zoom in, zoom out, and return to the center position.



Electrical Connection: displays detailed electrical connections of inverters, MPPT circuits, and PV strings.

System Loss Diagram: displays the loss caused by various factors, such as shading, incidence angle, and optimizer efficiency. The loss diagram intuitively presents each loss phase of the PV system. This helps evaluate the overall efficiency of the system and determine the performance bottleneck, providing input for subsequent optimization. For the loss details, see the actual user interfaces.

First-Year Environmental Benefits: displays the statistics of the scheme's contributions to energy saving and emission reduction.

Simulation Parameters: is used to calculate the simulated energy yield.

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NOTE

If the values of economic parameters such as the payback period are 0 in the report, you are advised to check whether the PV+ESS system price and O&M cost are properly set based on the actual situation.

Advanced Settings

If the value of **PV Yield** in the **Monthly Energy Consumption in the First Year** chart in the **Energy Management** section of the report differs significantly from the actual PV yield, you can set the energy yield coefficient to adjust the value of **Theoretical Monthly Energy Yield in First Year** to narrow the gap. The procedure is as follows:

1. On the report page, click **Advanced Settings** and enter **Energy Yield Coefficient**.
2. Click **OK** to save the settings.



NOTE

- If the DC power of PV modules in a project does not exceed 10 MW, set **Consider Shading in Simulation Calculation**.
- **PV Yield** in the **Monthly Energy Consumption in the First Year** chart: energy yield of the PV system in each month of the first year with losses deducted
- **Theoretical Monthly Energy Yield in First Year**: theoretical energy yield of the PV system in each month of the first year without losses deducted
- **Energy Yield Coefficient**: monthly energy yield coefficient, which is used to adjust the theoretical monthly energy yield in the first year

Exporting a Report

On the **Report** page, click **Export Report**.

Sharing a Report

On the **Report** page, click **Share Report**. In the **Share Report** dialog box, copy the static report link and share the generated report.

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By default, the report sharing link is open and valid for six months. To set the sharing link, perform the following operations:

1. In the **Share Report** dialog box, click **Set Permissions**.
2. Set the validity period of the sharing link and whether to allow sharing. When **Share** is disabled, the static report content cannot be viewed.

Exporting Electrical Design

On the **Report** page, click **Export Electrical Design** to export the electrical design diagram in PDF or DXF format.

4.2 Quick Design

After logging in to the system, click **Quick Design** in the **Residential** scenario, and then design the project and fill in the project information as prompted. Then, the project is created and a report is generated.



The process of creating a quick design project and generating a report is as follows:



4.2.1 Entering Basic Information

The basic information includes the PV plant location, weather station, and grid parameters.

1. Enter the project name, select the PV plant location, weather station, annual power consumption, and power grid parameters based on the site requirements.

   NOTE

   - The default value of **Annual Energy Consumption** is 0. You can configure ESSs in plant design only after this value is reset.
   - **Grid Parameters** can be edited only after the address is entered. The default value is the first value in the drop-down list box. You can select the value based on the site requirements.
   - **Feed-in** is selected by default. If you do not select this parameter, you cannot configure **Feed-in Power Upper Limit**.
   - If there is no feed-in power upper limit, you do not need to configure **Feed-in Power Upper Limit**.
   - If no weather stations provided by the system meet the requirements, click to upload the meteorological data. For details about the upload requirements, see **7.5 How Do I Import Meteorological Data?**

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2. Click **Next** to save the settings.

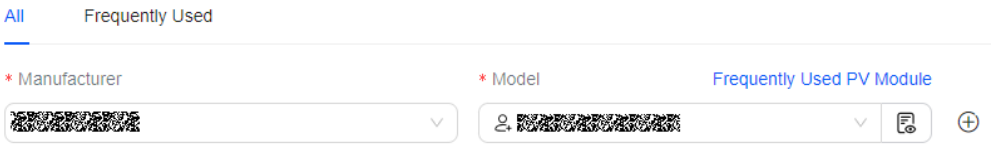
4.2.2 Plant Design

After the basic information about the plant is entered, the system automatically configures the inverter list based on the number of PV modules and the target capacity ratio to quickly complete the plant design.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

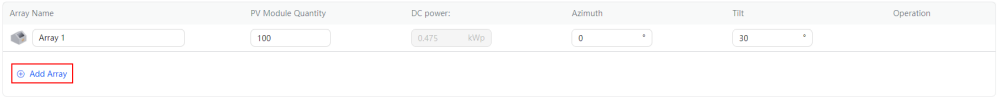
1. Set PV module information, such as the manufacturer and model.



NOTE

- Click  to add a customized PV module model.
- Click **Frequently Used PV Module** to set the frequently used PV module models. For details, see **6.2 Setting Frequently Used PV Modules**.

2. Set the PV array name and quantity of PV modules.



NOTE

- When you enter the **Plant Design** page for the first time, only one PV array is displayed by default. You can add, edit, and delete PV arrays in the PV array list. A maximum of five PV arrays can be configured.
- The default value of **PV Module Quantity** is 100. Enter an integer from 2 to 100000.

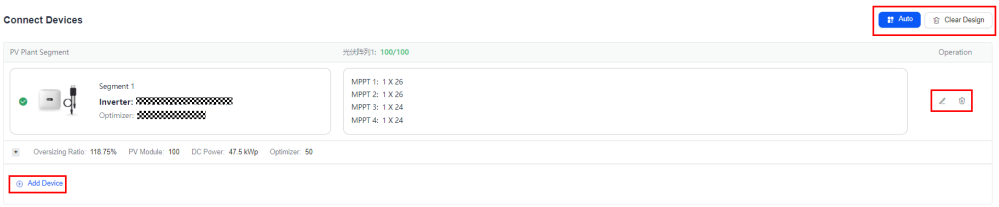
3. Determine whether to configure optimizers, ESSs, communications devices, and meters based on site requirements.
4. Set **Target Capacity Ratio** and decide whether to enable **Three-Phase Imbalanced Output** as required.

NOTE

- If you need to configure the ESS, set loads first.
- You can enable **Three-Phase Imbalanced Output** only when uicontrol is set to a three-phase grid on the **Basic Info** page.
- If **Three-Phase Imbalanced Output** is selected, only inverters that support the function can be selected.
- You can set **Total ESS Capacity** and select **Support Power Backup** only after the ESS is selected.
- For details about the device networking, see **8.1 Residential Solution Overview**.

5. Click **Auto**. The system automatically configures devices.

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NOTE

- To clear the existing inverter list, click **Clear Design**.
- You can modify and delete segments generated by auto design.
- If the existing segments do not meet the actual requirements, click **Add Device** to add a segment.
- In Japan, a maximum of 10 inverters can be connected. In other countries or regions, a maximum of three inverters can be connected.

6. The system automatically recommends communications devices and meters. You can also modify them based on the site requirements.
7. Click **Next** to save the current scheme.

4.2.3 Generating a Report

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Report Details

A report contains multiple parts, such as **Basic Info** and **Project Overview**. For details about the parameters in the report, see **8.2 Report Parameters**.

Basic Info: displays the project name and address in the design scheme.

Project Overview: displays the system capacity and device list in the design scheme.

Energy Management: displays the detailed energy distribution in the scheme.

Power Curve: displays the comparison of the grid power before and after PV+ESS or PV installation in each month of a year.

Module Layout: displays the manufacturer, model, and number of PV modules in the array.

Electrical Connection: displays detailed electrical connections and relationships between devices (such as the inverter and PV string) in the scheme.

System Loss Diagram: displays the loss caused by various factors, such as shading, incidence angle, and optimizer efficiency. The loss diagram intuitively presents each loss phase of the PV system. This helps evaluate the overall efficiency of the system and determine the performance bottleneck, providing input for subsequent optimization. For the loss details, see the actual user interfaces.

First-Year Environmental Benefits: displays the statistics of the scheme's contributions to energy saving and emission reduction.

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Simulation Parameters: is used to calculate the simulated energy yield.

Advanced Settings

If the value of **PV Yield** in the **Monthly Energy Consumption in the First Year** chart in the **Energy Management** section of the report differs significantly from the actual PV yield, you can set the energy yield coefficient to adjust the value of **Theoretical Monthly Energy Yield in First Year** to narrow the gap. The procedure is as follows:

1. On the report page, click **Advanced Settings** and enter **Energy Yield Coefficient**.
2. Click **OK** to save the settings.



NOTE

- **PV Yield** in the **Monthly Energy Consumption in the First Year** chart: energy yield of the PV system in each month of the first year with losses deducted.
- **Theoretical Monthly Energy Yield in First Year**: theoretical energy yield of the PV system in each month of the first year without losses deducted.
- **Energy Yield Coefficient**: monthly energy yield coefficient, which is used to adjust the theoretical monthly energy yield in the first year.

Exporting a Report

On the **Report** page, click **Export Report**.

Sharing a Report

On the **Report** page, click **Share Report**. In the **Share Report** dialog box, copy the static report link and share the generated report.

By default, the report sharing link is open and valid for six months. To set the sharing link, perform the following operations:

1. In the **Share Report** dialog box, click **Set Permissions**.

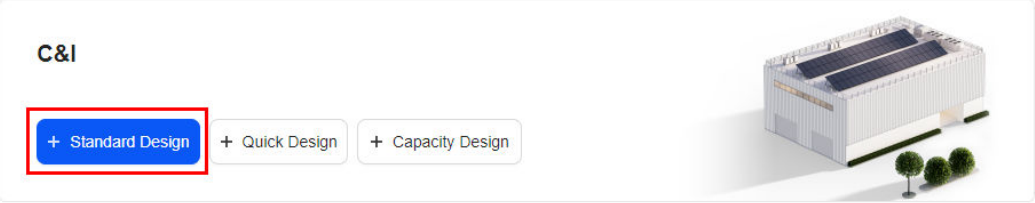
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2. Set the validity period of the sharing link and whether to allow sharing. When **Share** is disabled, the static report content cannot be viewed.

5 Commercial and Industrial Project

5.1 Standard Design

After logging in to the system, click **Standard Design** in the **C&I** scenario, and then design the project and fill in the project information as prompted. Then, the project is created and a report is generated.



The process of creating a standard design project and generating a report is as follows.



5.1.1 Entering Basic Information

The basic information includes the PV plant location, weather station, and grid parameters.

1. Enter the project name, and set basic information such as the location of the PV plant, weather station, and power grid parameters based on the site requirements.

   NOTE

   If no weather stations provided by the system meet the requirements, click to upload the meteorological data. For details about the upload requirements, see **7.5 How Do I Import Meteorological Data?**

2. Frame the location where the PV plant is to be installed.

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- Method 1: Hold down  on the map, move the cursor to the location where the PV plant is to be installed, and adjust the frame size to ensure that the location is completely framed.
- Method 2: Hold down any place on the map, move the cursor to the location where the PV plant is to be installed, and adjust the frame size to ensure that the location is completely framed.

3. Click **Next** to save the settings.

5.1.2 Electricity Price & Consumption Settings

After the electricity price and energy consumption load are set, the system calculates the revenue and self-consumption of a PV plant system based on the energy consumption.

Electricity Price Settings

To configure ESSs and ensure the accuracy of benefit calculation, set the effective electricity price and related parameters in **Electricity Price Settings** as required.

1. Click **Set** and select a currency unit as required.
2. Set **Feed-in Tariff**.
3. Set **Purchase Price**.
   - Select **User-Defined Input** in **Type**.
     i. Set **Volumetric Charge Type** and the electricity price as required.

     NOTE

     1. If you want to set a time-of-use electricity price, set **Volumetric Charge Type** to **Time-of-Use**. For details, see **7.1 How Do I Set the Time-of-Use Electricity Prices?**

     ii. Set the demand charge rate as required.
     - If you set the demand charge rate to **By Actual Demand**, you need to set parameters such as **Maximum Demand Mode** and **Monthly Demand Charge**.
     - If you set the demand charge rate to **Transformer Capacity**, you need to set parameters such as **Transformer Capacity** and **Price**.

Parameter	Description
Maximum Demand Mode	Set the settlement period of the maximum demand charge. The statistics can be collected by year, month, or time period.
Monthly Demand Charge	The basic demand charges are calculated based on the maximum demand statistical period and are converted into monthly electricity bills.
Volumetric Charge Type	The volumetric charge type can be set to **Fixed** or **Time-of-Use**.

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- Select **Template Input** in **Type**.
  i. Click **Select Template**.
  ii. Select the required template and click **OK**.

  NOTE

  - If a price template has been configured in the SmartPVMS, the **Template Input** option is provided for the electricity purchase price type. You can select the option as required.
  - If the price template does not meet the requirements, you can configure a template in the SmartPVMS.
- Set **Type** to **Data Import**.
  i. Click **Download Template**, enter the load data in the template as required, and save the template.
  ii. Click **Add File**, and select and upload the saved template.

4. Select the electricity price growth rate and set related parameters based on site requirements.

Consumption Settings

- Creating an energy consumption model through model generation
  a. Set **Type** to **Generate Model**.
  b. Set **Annual Energy Consumption** and **Monthly Energy Consumption** as required.
  c. Set **Workday Model** and **Weekend Model** as required. The system displays the daily load curve based on **Workday Model** and **Weekend Model**.
  d. **Optional:** If the preconfigured models do not meet your requirements, set **Workday Model** or **Weekend Model** to **Custom** and click  to edit the model.
  e. Select a type of consumption growth rate and set related parameters based on site requirements.
- Creating an energy consumption model by uploading data
  - Creating an energy consumption model by importing the load point table
    i. Select **Data Import** from the **Type** drop-down list.
    ii. Click **Add File** and choose **Import Load Point Table**.
    iii. Select a type of consumption growth rate and set related parameters based on site requirements.
  - Creating an energy consumption model by importing data
    i. Select **Data Import** from the **Type** drop-down list.
    ii. Click **Download Template**, enter the load data in the template as required, and save the template. For details, see **7.2 How Do I Generate an Energy Consumption Model by Importing Data?**
    iii. Click **Add File** and select **Import Standard Template**.
    iv. Select a type of consumption growth rate and set related parameters based on site requirements.

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NOTE

- The **Import Load Point Table** function is available only in China. Obtain the load point table data from the SGCC or CSG official website.
- If the uploaded data is incorrect or missing, you can click **Edit Data** to change the data.

NOTE

- If no load is connected, set **Annual Energy Consumption** to **0**.
- If you need to configure ESSs, set valid electricity prices and loads first.

5.1.3 Performing 3D Modeling

After you specify the location, the system automatically generates a rectangle area. In this area, you can draw buildings or import building models to draw rooftops to facilitate PV module arrangement and electrical design. If you encounter any difficulties during the operation, click **User Guide** in the lower left corner to view the solutions.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

5.1.3.1 Drawing the 3D Model

Drawing Buildings

The system provides both 2D and 3D views. The 2D view displays the map in a top view and is used to draw the roof outline and obstacles. The 3D view is used to edit information, such as a building's height.

1. By default, the map is displayed in a top view. Click a map area, click , and draw the roof outline based on site requirements. All points form a closed geometric image. Alternatively, you can quickly draw the ridge based on the ridge type (for details, see **Drawing Ridges**).

   NOTE

   If there are obstacles such as windows, skylights, and tree branches that affect PV module installation and PV power generation efficiency on or around the roof, draw the obstacles based on site requirements. For details, see **Drawing Obstacles**.

2. Click 

to switch to the 3D view. Then, select the outline to be adjusted and specify information such as the building height.
3. Click **Next** to save the settings.

Drawing Obstacles

There may be obstacles such as windows, skylights, and tree branches that affect PV module installation and PV power generation efficiency on or around a building's roof. You can draw obstacles based on site requirements.

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- Drawing rectangular obstacles
  a. Click , choose **Rectangle**, and then click and hold the left mouse button to draw a rectangle in the actual position of the obstacle.
  b. Click 3D to switch to the 3D view. Select the obstacles to be adjusted and specify information, such as the obstacle height.
  c. After the drawing is complete, click **Next** to save the settings.
- Drawing polygonal obstacles
  a. Click , select **Polygon**, click the vertices of a polygon obstacle in sequence to draw the outline. Double-click the last vertex to complete the drawing.
  b. Click 3D to switch to the 3D view. Select the obstacles to be adjusted and specify information, such as the obstacle height.
  c. After the drawing is complete, click **Next** to save the settings.
- Drawing trees
  a. Click , choose **Pyramidal** or **Round**, and then click and hold the left mouse button to draw a tree and adjust the tree dimensions.
  b. **Optional:** Click and hold a tree to adjust its position.
  c. Click 3D to switch to the 3D view. Click a tree to display the top of the tree. Drag the top of the tree to adjust the height.
  d. After the drawing is complete, click **Next** to save the settings.

NOTE

You can manually adjust the dimensions of obstacles and trees in the **Settings** area.

Drawing Carports

The system allows users to draw carports for scenarios where PV modules are placed on carports. You can draw carports and adjust their length and width in both 2D and 3D views, and adjust the height in the 3D view.

1. Click and select the desired carport type.
2. Click and hold the left mouse button to draw a carport in the target area and release the button when the carport dimensions meet your requirements.

NOTE

Select the carport, then drag the edges to adjust the dimensions, or manually enter them in the **Settings** area.

Drawing Ridges

After drawing the top view of a building, you can quickly draw the ridges.

1. Click and choose **Identify Ridge Line**. Double-click the roof you want to draw ridges on, and the system automatically places them. Adjust the ridges as required.
2. Click 3D to switch to the 3D view. Select a ridge and set the ridge height.
3. After the drawing is complete, click **Next** to save the settings.

Calibrating Dimensions

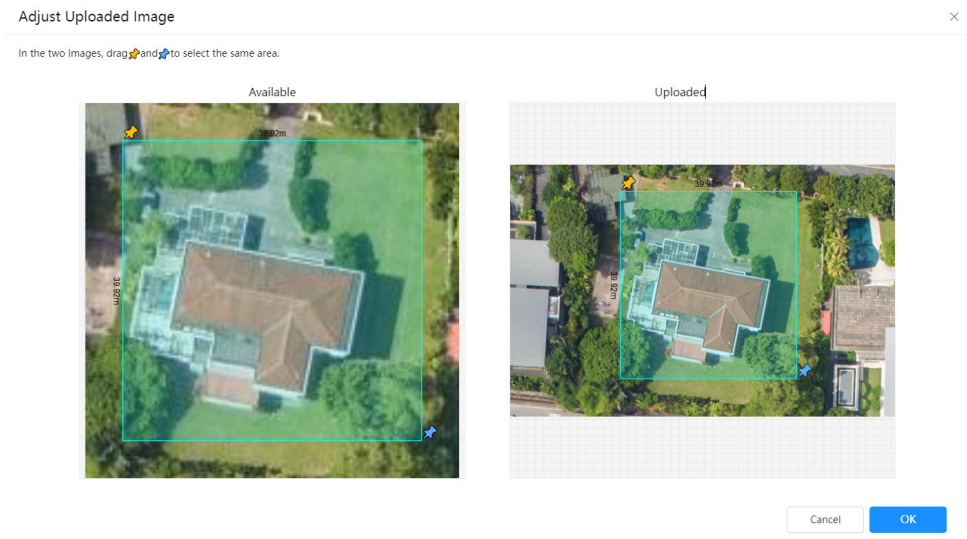
This function can be used to calibrate building outline dimensions.

1. Click , choose **Calibrate**, and double-click the line to be calibrated in the building outline.
2. Enter the calibrated dimensions in the data bars and press **Enter**.
3. After the calibration is complete, click **Next** to save the settings.

Replacing Images

If there is a clearer rooftop photo, for example, a photo taken by drones, you can use the **Replace Image** function to replace the photo for 3D modeling design.

1. Click and choose **Image**.
2. Click **Replace Image** on the right of the page.
3. Browse to the target folder and select the target image.
4. Adjust the replacement range in the **Available** and **Uploaded** image boxes, and click **OK**.



5. Adjust the scaling factor, rotation degree, and transparency as required.
6. Click **Save**.

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Shortcut Key Operations

Operation	Shortcut Key
Copying a target	Press **Ctrl** + **C** (uppercase or lowercase).
Undoing an operation	Press **Ctrl** + **Z** (uppercase or lowercase).
Selecting multiple targets	Hold down **Ctrl** and select the targets.
Moving a single target	Move the target in a drag-and-drop mode.
Moving multiple targets	Hold down **Ctrl** and select the targets. Then, move the selected targets in a drag-and-drop mode.
Deleting a target	Press **Delete**.
Drawing vertical or parallel lines	Hold down **Shift** and draw lines.
Stopping drawing lines	Press **Esc**.

5.1.3.2 Importing the Model

If you have a building model in OBJ format, click  to upload the building model and draw a rooftop and obstacles on the building model.

Basic Operations

Moving a model: Select a model and hold down the square to move the model.

Rotating a model: Select a model and hold down the arc to rotate the model.

Zooming in or out a model: Select a model and drag the arrow of the model to zoom it in or out.

Editing parameters: Select a model and edit the building name and azimuth on the **Settings** panel.

Exiting the **Model** page: Select a model and press **Delete**. The model is deleted and you exit the **Model** page.

Rooftop

You can draw a rooftop on the model as required to facilitate the arrangement of PV modules and electrical design in the rooftop area.

- Drawing a rooftop
  a. Draw a rooftop: Click . Then in the rooftop area of the building model, click the left mouse button to determine the first vertex for the rooftop of

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the building model. Move the cursor and click other vertices along the rooftop outline in sequence to draw a rooftop.

b. Exit drawing: Double-click the left mouse button or click the first vertex.

- Editing a rooftop
  - Edit a vertex: In the drawing area, click a vertex of the rooftop and edit its position by clicking the arrow of the vertex. You can also edit it in the **Settings** panel.
  - Edit a line: In the drawing area, click a line of the rooftop and edit its position by dragging the line. You can also edit it in the **Settings** panel.
  - Edit a plane: In the drawing area, double-click a vertex or line of the rooftop plane and select the arrow of the rooftop plane to edit its position. You can also edit it in the **Settings** panel.
  - Delete a rooftop: Double-click a vertex or line of the rooftop and click or press **Delete**.

Obstacle

- Drawing an obstacle

  a. Draw an obstacle: Click in the rooftop area. Click the left mouse button to determine the first vertex for the obstacle. Move the cursor and click other vertices along the obstacle outline in sequence to draw an obstacle.

  b. Exit drawing: Double-click the left mouse button or click the first vertex.
- Edit an obstacle: In the drawing area, click a vertex of the obstacle and edit the shape and size of the obstacle by dragging the vertex.

NOTE

Obstacles must be drawn in the rooftop area.

Carport

The system allows users to draw carports for scenarios where PV modules are placed on carports.

1. Click and select the desired carport type.
2. Click the desire position to place the carport.
3. (Optional) In the **Settings** panel, adjust **Length** and **Width** of the carport.

Ruler

- Drawing a ruler

  a. Draw a ruler: Click on the toolbar. In the drawing area, click any point to generate a ruler as required.

  b. Exit drawing: Double-click the left mouse button or press **Esc**.
- Edit a ruler: Modify the ruler size by modifying the ruler number. The model size is also modified proportionally.

NOTE

If either end of the ruler is placed on the ground, the ruler size cannot be modified.

5.1.4 PV Module Layout

After building 3D modeling is complete, you can arrange PV modules on the rooftop as required and specify the PV module model and direction. The system supports automatic and manual layout of PV modules. If you encounter any difficulties during the operation, click **User Guide** in the lower left corner to view the solution.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Automatically Arranging PV Modules

1. Select the area where PV modules are to be arranged, and select the PV module manufacturer, model, and color on the right.

   NOTE

   - Click  to add a customized PV module model.
   - Click **Frequently Used PV Module** to set the frequently used PV module models. For details, see **6.2 Setting Frequently Used PV Modules**.

2. Click **Auto** and then the system automatically arranges PV modules. For a large roof, after you click **Auto**, the system automatically divides it into multiple areas. Each area allows a maximum of 3000 PV modules.
3. Click the PV module area, and set the area name, support type, direction, azimuth, tilt angle, and other information of PV modules.

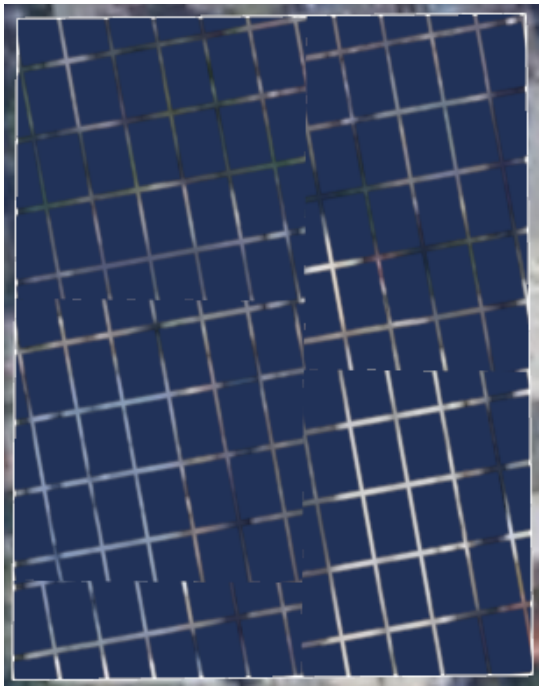
   NOTE

   - **O&M Channel**: If you select this option, you can add row and column spacing in an array for maintenance access. By default, five rows and five columns of O&M channels are available. You can change the number as required.
   - Click  in the lower left corner to generate a radiation analysis chart. When the DC power of PV modules exceeds 5000 kWp, you need to select buildings before generating the radiation analysis chart. The radiation analysis charts of a maximum of five buildings can be displayed at a time.

4. For a project where PV modules have been arranged, if the DC power of PV modules exceeds 5000 kWp, the PV module placeholder diagram is displayed by default on the **Module Layout** page when you access the project again. If you click this area, the placeholder diagram is switched to the PV module layout. To delete a PV module, select it and press **Delete**.

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Figure 5-1 PV module layout



5. Click **Next** to save the current scheme.

Manually Arranging PV Modules

1. Select the area where PV modules are to be arranged, and select the PV module manufacturer, model, and color on the right.

   NOTE

   - Click  to add a customized PV module model.
   - Click **Frequently Used PV Module** to set the frequently used PV module models. For details, see **6.2 Setting Frequently Used PV Modules**.

2. Click **Manual** and draw the area where PV modules are to be arranged on the rooftop. The system automatically arranges PV modules in the selected area.
3. Click the PV module area, and set the area name, support type, direction, azimuth, tilt angle, and other information of PV modules.

   NOTE

   - **O&M Channel**: If you select this option, you can add row and column spacing in an array for maintenance access. By default, five rows and five columns of O&M channels are available. You can change the number as required.
   - Click  in the lower left corner to generate a radiation analysis chart. When the DC power of PV modules exceeds 5000 kWp, you need to select buildings before generating the radiation analysis chart. The radiation analysis charts of a maximum of five buildings can be displayed at a time.

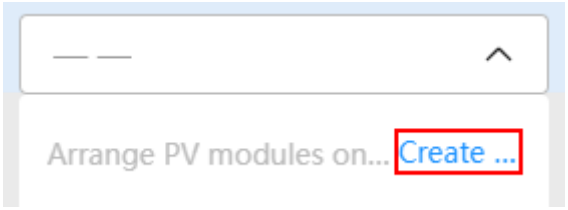
4. Click **Next** to save the current scheme.

Laying out PV Modules in a Vacant Space

PV modules can be arranged in a vacant space.

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1. Click and choose **Create Vacant Space**.



2. Click any position on the edge of the space where the PV module is arranged to draw the first outline vertex. Move the pointer to generate a blue path line. Then, click the mouse along the edge of the space to draw the outline path.
3. Click the drawn area and select the PV module manufacturer, model, and color on the right.
4. Arrange the PV modules in the vacant space automatically or manually.

Shortcut Key Operations

- Click to rotate a PV module.
- Hold down the left mouse button to rotate the view.
- Hold down the right mouse button to drag the view.
- Click a PV module to select it.
- Hold down **Ctrl** and click PV modules to select them.
- After clicking PV modules, press **Ctrl** and **A** to select all PV modules.
- Click a PV module, hold down **Shift**, and click other PV modules to select them.
- Select a PV module by cursor and move the PV module inside or outside the building.
- Select a PV module and press **Delete** to delete the PV module.
- Select a PV module and click in the upper left corner or press **Ctrl+C** to copy the PV module.

5.1.5 Electrical Design

After PV modules are arranged, the system automatically generates inverters, optimizers, and corresponding connections based on the number of PV modules and the target capacity ratio to quickly complete electrical design. If you encounter any difficulties during the operation, click **User Guide** in the lower left corner to view the solution.

Automatic Design

1. Select devices such as **Optimizer**, **ESS**, **Communications Device**, and **Meter** as required.
2. You can set **Target Capacity Ratio** as required.
3. Click **Auto**. The system automatically adds devices such as inverters, optimizers, and ESSs, and connects cables based on the positions and quantity of PV modules.

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4. The system automatically recommends communications devices and meters. You can modify them as required.
5. Click **Next** to save the current scheme.

Manual Design

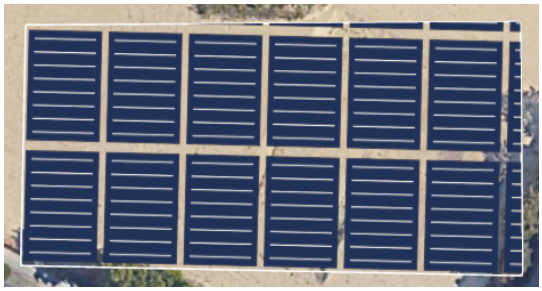
1. Select devices such as **Optimizer**, **ESS**, **Communications Device**, and **Meter** as required.
2. You can set **Target Capacity Ratio** as required.
3. Click **Manual**. The system automatically adds devices such as inverters and optimizers based on the positions and quantity of PV modules. If the actual requirements are not met, you can click **Add Device** to add groups of devices.
4. Click Confirm. The system automatically connects PV modules, inverters, and optimizers based on the positions and quantity of PV modules.
5. If **Communications Device** and **Meter** are selected in the **Select Device** area, the system automatically recommends these devices for you. You can also modify them as required.
6. Click **Next** to save the current scheme.

Other Operations

- Click on the right of **PV Module Connection Status** to perform the connection again.
- Click on the right of **PV Module Connection Status** to clear the current connection.
- To delete an unconnected PV module, click on the right of **PV Module Connection Status** and select **Delete Unconnected PV Module**.
- Click to filter for the buildings or regions connected to PV strings.
- Click on the right of a device to delete its cable connections.
- Click to modify the device model.
- Click next to the MPPT to disconnect a string from the current inverter. The disconnected string is displayed in red.
- Click to view related technical parameters or alarm handling suggestions.
- Click to view the distribution of all inverters.
- If the DC power of PV modules exceeds 5000 kWp, the electrical design placeholder diagram is displayed by default on the **Electrical Design** page when you access the project again. If you click this area, the placeholder diagram is switched to the electrical design diagram.

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Figure 5-2 Electrical design placeholder diagram



5.1.6 ESS Design

ESS Design is supported only after **ESS** is selected in the **Select Device** area on the **Electrical Design** page.

Auto Design

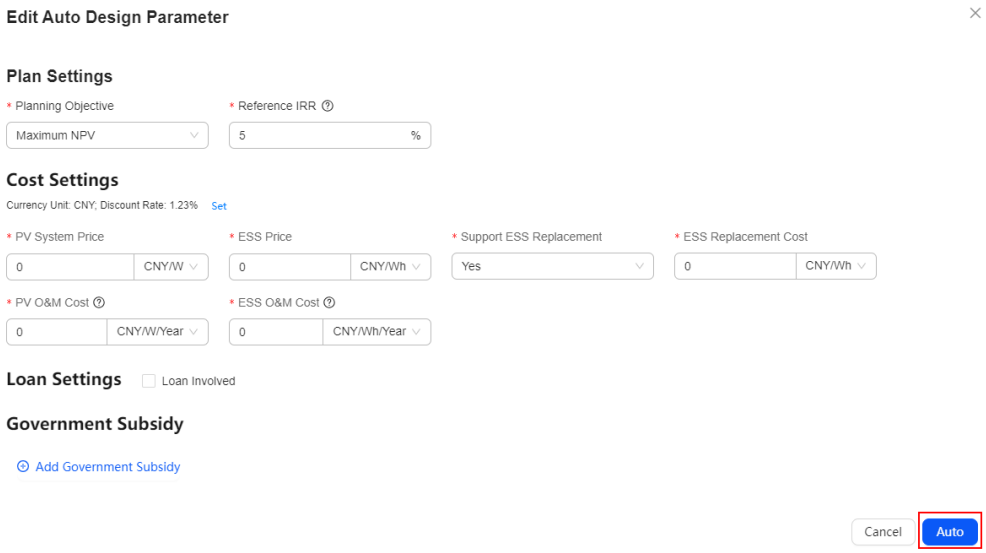
1. Configure **ESS Type** and **PV+ESS Operating Mode** as required.

PV+ESS Operating Mode	Description
Maximum Self-Consumption	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. If the ESS is fully charged or is being charged at full power, the surplus PV energy is fed to the grid. When PV energy is insufficient or cannot be generated at night, the ESS discharges energy to loads. This improves the self-consumption rate and energy self-sufficiency rate, and reduces electricity costs.
Maximum Self-Consumption+TOU	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy based on the TOU policy. That is, the ESS is charged based on the maximum charge power calculated by the algorithm during the charge period. In the **No Charge or Discharge** period, the surplus PV energy is used to charge the ESS.
Maximum Self-Consumption+Peak Shaving	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. In the ESS charge period, the power obtained from the grid is controlled based on the demand calculated by the algorithm. In the **No Charge or Discharge** period, the surplus PV energy is used to charge the ESS.

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PV+ESS Operating Mode	Description
Maximum Self-Consumption+TOU+Peak Shaving	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy based on the TOU policy. That is, in the ESS charge period, the charge power is controlled based on the demand calculated by the algorithm. In the **No Charge or Discharge** period, if the sum of the power from the grid plus the PV power does not meet the consumption requirements according to the peak shaving rule, the ESS discharges if it has energy so that the grid can obtain power from the ESS.

2. Click **Auto**.
3. In the **Edit Auto Design Parameter** dialog box, set **Plan Settings**, **Cost Settings**, **O&M Cost**, **Loan Settings**, and **Government Subsidy** as required.
4. Click **Auto**. The system automatically configures the ESSs.



NOTE

- To clear the existing ESS list, click **Clear Design**.
- If you want to modify some parameters after the automatic design is complete, click **Auto**. After the parameters are modified, perform the automatic design.

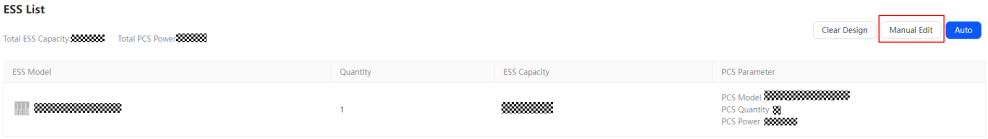
5. Click **Next** to save the current scheme.

Manual Design

After the ESSs are automatically designed, you can perform manual design if the current design does not meet actual requirements.

1. Click **Manual Edit**.

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NOTE

- After you click **Manual Edit**, the ESS capacity benefit comparison chart becomes invalid.
- After you click **Manual Edit**, the ESS list retains the auto design result.

2. Set parameters based on the actual situation.

NOTE

- If the existing ESS model does not meet the requirements, click **Add Device** to add an ESS model.
- A maximum of four ESS models can be added.
- To clear the existing ESS list, click **Clear Design**.

3. Click **Next** to save the current scheme.

5.1.7 Economic Analysis

After determining the design of inverters, PV modules, and ESSs, you can analyze the PV benefits.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Cost Settings

1. Click **Set** to set the discount rate as required.
2. In the **Initial Installation Cost** area, select **Initial Installation Cost Type** and enter the price based on site requirements.

NOTE

- If **Initial Installation Cost Type** is set to **Total Device Price**, to set the unit price of each device, click in the **Operation** column in **Devices**.
- **Total Initial Installation Cost** displays the sum of the purchase fees of all devices in the first year.

3. In **O&M Cost**, enter the O&M cost as required.

NOTE

Total O&M Cost displays the sum of the O&M costs of PV devices and ESS devices each year.

4. In the **Devices** list, confirm the devices and click . In the dialog box that is displayed, enter the description and click **OK**.

   If other devices or auxiliary materials need to be added, click **Add Device**. In the dialog box that is displayed, enter basic information as prompted and click **OK**.

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NOTE

After the ESS is automatically designed, the parameters related to the **Cost Settings** are consistent with those for the ESS automatic design and cannot be modified. If you want to modify these parameters, you need to perform ESS automatic design again.

Loan Settings

If you have a loan, select **Loan Involved** and set **Loan Ratio**, **Max Loan Amount**, and other parameters.

NOTE

After the ESS is automatically designed, the parameters related to the **Loan Settings** are consistent with those for the ESS automatic design and cannot be modified. If you want to modify these parameters, you need to perform ESS automatic design again.

Investment Settings

If you want to share the revenue with investors, select **Share Revenue with Investor** and set investment parameters.

Government Subsidy Settings

If local government subsidies are available, set government subsidies for better economic analysis.

1. Click **Add Government Subsidy**.
2. Select a subsidy type and set the subsidy amount and other parameters as required.
3. Click **Next** to generate a report.

NOTE

After the ESS is automatically designed, the parameters related to the **Government Subsidy** are consistent with those for the ESS automatic design and cannot be modified. If you want to modify these parameters, you need to perform ESS automatic design again.

5.1.8 Generating a Report

After a report is generated, the system provides information such as energy yield and revenue based on the design scheme. You can customize report contents or export the report.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Report Details

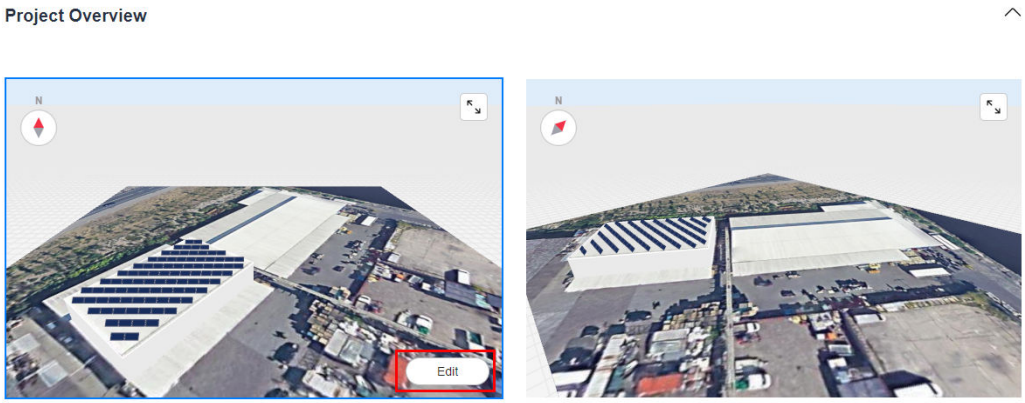
The report contains multiple parts, such as **Basic Info**, **Project Overview**, **Electricity Bills Analysis**, and **Economic Benefits**. Click **Custom** and select the parts to be displayed in the report. For details about the parameters in the report, see **8.2 Report Parameters**.

Basic Info: displays the project name and address in the design scheme.

Project Overview: displays the 3D effect, system capacity, and device list in the design scheme.

NOTE

Click **Edit** in the lower right corner of the view to zoom in, zoom out, and return to the center position.



Economic Benefits: displays the expected economic revenue, investment returns, and costs in the design scheme.

Owner's Revenue: displays the accumulated revenue, electricity fee saved, and comparison of different types of electricity purchase fees and accumulated revenue sharing of the owner.

Electricity Bills Analysis: displays the electricity bill comparison and the maximum grid power changes before and after PV or PV+ESS installation.

Energy Management: displays the detailed energy distribution in the scheme.

Networking Diagram: displays the networking diagram of devices.

ESS Configuration Policy: displays the operating mode, charge and discharge configuration policy, round-trip efficiency (RTE), and battery degradation curve of the ESSs.

Power Curve: displays the comparison of the grid power before and after PV+ESS or PV installation in each month of a year, the charge and discharge power in a day, and the electricity price curve.

NOTE

- You can select a day to view the charge and discharge power curve on that day. The exported report shows the statistics on the day you select.
- When the PV+ESS operating mode is maximum self-consumption, the charge and discharge configuration policies are not displayed in the **ESS Configuration Policy** area.

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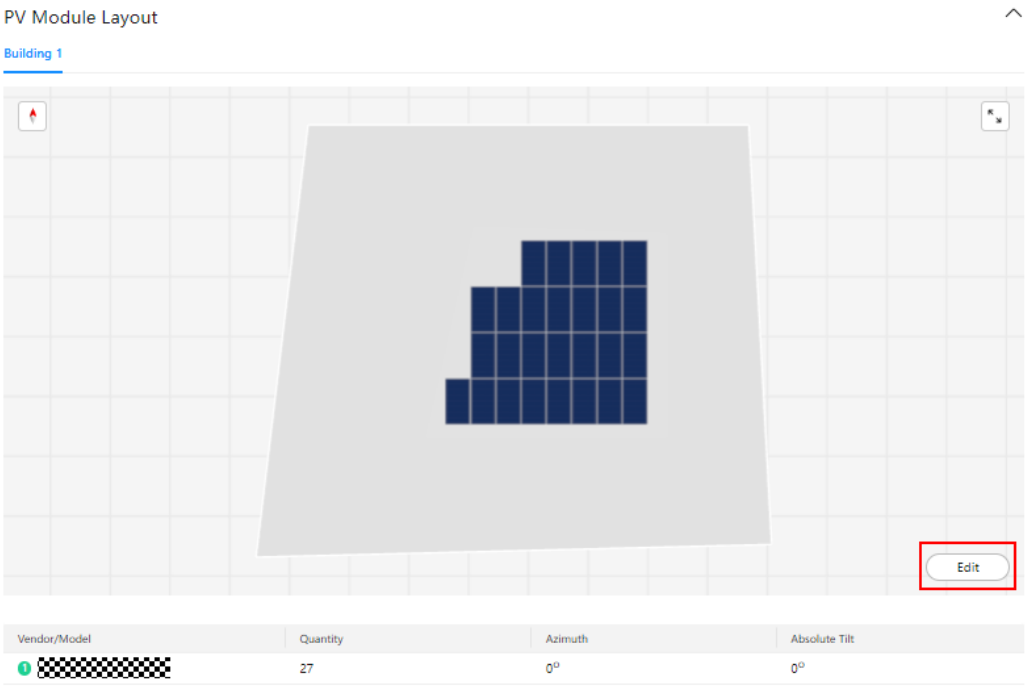
Optimizer Revenue: displays the benefits of a PV system when it contains Huawei's optimizers. The benefits include energy yield improvement, active safety, and intelligent O&M.

ESS Benefits: displays the benefits when the ESS type is liquid-cooled ESS. The benefits of Huawei's ESSs include C2C dual-link safety, lower levelized cost of storage (LCOS), and flexible application in all scenarios.

PV Module Layout: displays the PV module layout effect diagram and PV module array list.

NOTE

Click **Edit** in the lower right corner of the view to zoom in, zoom out, and return to the center position.



Electrical Connection: displays detailed electrical connections of inverters, MPPT circuits, and PV strings.

System Loss Diagram: displays the loss caused by various factors, such as shading, incidence angle, and optimizer efficiency. The loss diagram intuitively presents each loss phase of the PV system. This helps evaluate the overall efficiency of the system and determine the performance bottleneck, providing input for subsequent optimization. For the loss details, see the actual user interfaces.

First-Year Environmental Benefits: displays the statistics of the scheme's contributions to energy saving and emission reduction.

Simulation Parameters: is used to calculate the simulated energy yield.

NOTE

If the values of economic parameters such as the payback period are 0 in the report, you are advised to check whether the PV+ESS system price and O&M cost are properly set based on the actual situation.

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Advanced Settings

If the value of **PV Yield** in the **Monthly Energy Consumption in the First Year** chart in the **Energy Management** section of the report differs significantly from the actual PV yield, you can set the energy yield coefficient to adjust the value of **Theoretical Monthly Energy Yield in First Year** to narrow the gap. The procedure is as follows:

1. On the report page, click **Advanced Settings** and enter **Energy Yield Coefficient**.
2. Click **OK** to save the settings.



NOTE

- If the DC power of PV modules in a project does not exceed 10 MW, set **Consider Shading in Simulation Calculation**.
- **PV Yield** in the **Monthly Energy Consumption in the First Year** chart: energy yield of the PV system in each month of the first year with losses deducted
- **Theoretical Monthly Energy Yield in First Year**: theoretical energy yield of the PV system in each month of the first year without losses deducted
- **Energy Yield Coefficient**: monthly energy yield coefficient, which is used to adjust the theoretical monthly energy yield in the first year

Exporting a Report

On the **Report** page, click **Export Report**.

Sharing a Report

On the **Report** page, click **Share Report**. In the **Share Report** dialog box, copy the static report link and share the generated report.

By default, the report sharing link is open and valid for six months. To set the sharing link, perform the following operations:

1. In the **Share Report** dialog box, click **Set Permissions**.

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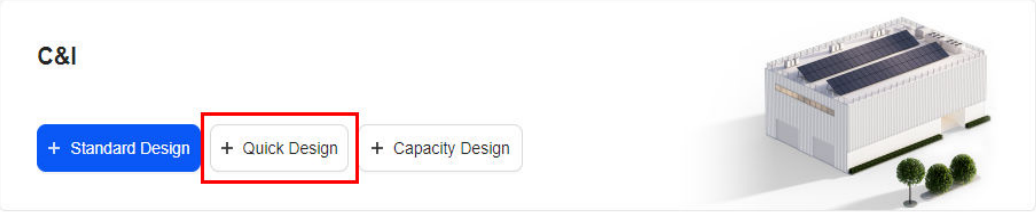
2. Set the validity period of the sharing link and whether to allow sharing. When **Share** is disabled, the static report content cannot be viewed.

Exporting Electrical Design

On the **Report** page, click **Export Electrical Design** to export the electrical design diagram in PDF or DXF format.

5.2 Quick Design

After logging in to the system, click **Quick Design** in the **C&I** scenario, and then design the project and fill in the project information as prompted. Then, the project is created and a report is generated.



The process of creating a quick design project and generating a report is as follows:



5.2.1 Entering Basic Information

The basic information includes the PV plant location, weather station, and grid parameters.

1. Enter the project name, select the PV plant location, weather station, annual power consumption, and power grid parameters based on the site requirements.

   NOTE

   - The default value of **Annual Energy Consumption** is 0. You can configure ESSs in plant design only after this value is reset.
   - **Grid Parameters** can be edited only after the address is entered. The default value is the first value in the drop-down list box. You can select the value based on the site requirements.
   - **Feed-in** is selected by default. If you do not select this parameter, you cannot configure **Feed-in Power Upper Limit**.
   - If there is no feed-in power upper limit, you do not need to configure **Feed-in Power Upper Limit**.
   - If no weather stations provided by the system meet the requirements, click to upload the meteorological data. For details about the upload requirements, see **7.5 How Do I Import Meteorological Data?**

2. Click **Next** to save the settings.

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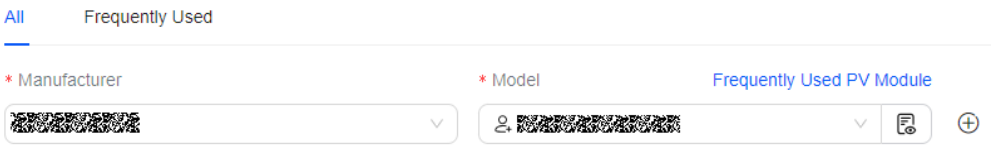
5.2.2 Plant Design

After the basic information about the plant is entered, the system automatically configures the inverter list based on the number of PV modules and the target capacity ratio to quickly complete the plant design.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

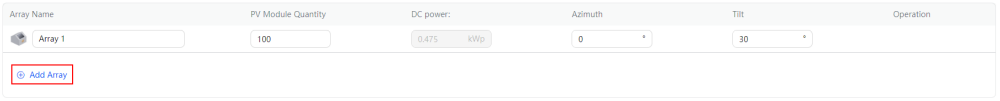
1. Set PV module information, such as the manufacturer and model.



NOTE

- Click ⊕ to add a customized PV module model.
- Click **Frequently Used PV Module** to set the frequently used PV module models. For details, see **6.2 Setting Frequently Used PV Modules**.

2. Set the PV array name and quantity of PV modules.



NOTE

- When you enter the **Plant Design** page for the first time, only one PV array is displayed by default. You can add, edit, and delete PV arrays in the PV array list. A maximum of five PV arrays can be configured.
- The default value of **PV Module Quantity** is 100. Enter an integer from 2 to 100000.

3. Configure parameters of optimizers, communications devices, and meters, and set **Target Capacity Ratio** as required.
4. Click **Auto**. The system automatically configures devices.



NOTE

- To clear the existing inverter list, click **Clear Design**.
- You can modify and delete segments generated by auto design.
- If the existing segments do not meet the actual requirements, click **Add Device** to add a segment.

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5. If devices such as **Communication Device** and **Meter** are selected, the system recommends the device types for you. You can also modify the device types as required.
6. Click **Next** to save the current scheme.

5.2.3 Generating a Report

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Report Details

A report contains multiple parts, such as **Basic Info** and **Project Overview**. For details about the parameters in the report, see **8.2 Report Parameters**.

Basic Info: displays the project name and address in the design scheme.

Project Overview: displays the system capacity and device list in the design scheme.

Energy Management: displays the detailed energy distribution in the scheme.

Networking Diagram: displays the networking diagram of devices.

Power Curve: displays the comparison of purchased power before and after PV installation in each month of a year.

Module Layout: displays the manufacturer, model, and number of PV modules in the array.

Electrical Connection: displays detailed electrical connections and relationships between devices (such as the inverter and PV string) in the scheme.

System Loss Diagram: displays the loss caused by various factors, such as shading, incidence angle, and optimizer efficiency. The loss diagram intuitively presents each loss phase of the PV system. This helps evaluate the overall efficiency of the system and determine the performance bottleneck, providing input for subsequent optimization. For the loss details, see the actual user interfaces.

First-Year Environmental Benefits: displays the statistics of the scheme's contributions to energy saving and emission reduction.

Simulation Parameters: is used to calculate the simulated energy yield.

Advanced Settings

If the value of **PV Yield** in the **Monthly Energy Consumption in the First Year** chart in the **Energy Management** section of the report differs significantly from the actual PV yield, you can set the energy yield coefficient to adjust the value of **Theoretical Monthly Energy Yield in First Year** to narrow the gap. The procedure is as follows:

1. On the report page, click **Advanced Settings** and enter **Energy Yield Coefficient**.

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2. Click **OK** to save the settings.



NOTE

- **PV Yield** in the **Monthly Energy Consumption in the First Year** chart: energy yield of the PV system in each month of the first year with losses deducted
- **Theoretical Monthly Energy Yield in First Year**: theoretical energy yield of the PV system in each month of the first year without losses deducted
- **Energy Yield Coefficient**: monthly energy yield coefficient, which is used to adjust the theoretical monthly energy yield in the first year

Exporting a Report

On the **Report** page, click **Export Report**.

Sharing a Report

On the **Report** page, click **Share Report**. In the **Share Report** dialog box, copy the static report link and share the generated report.

By default, the report sharing link is open and valid for six months. To set the sharing link, perform the following operations:

1. In the **Share Report** dialog box, click **Set Permissions**.
2. Set the validity period of the sharing link and whether to allow sharing. When **Share** is disabled, the static report content cannot be viewed.

5.3 Capacity Design

After logging in to the system, click **Capacity Design** in the **C&I** scenario, and then design the project and fill in the project information as prompted. Then, the project is created and a report is generated.

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5.3.1 Capacity Design (New Version)

On the basic info page, the new process for creating a capacity design project is as follows.



5.3.1.1 Basic Information

The basic information includes the PV plant location and weather station.

Step 1 Set the basic information.

1. Enter the project name, and set basic information such as the address of the PV plant, weather station, and project lifecycle based on site requirements.

   NOTE

   - **Project Lifecycle** indicates the period from the start to the end of a project. The period ranges from 5 to 30 years.
   - If no weather stations provided by the system meet the requirements, click to upload the meteorological data. For details about the upload requirements, see 7.5 How Do I Import Meteorological Data?

2. Select the project type and scenario as required.
3. Press and hold in the map area and move the pointer to the location where you want to install the PV plant.

Step 2 Set the grid information.

- Select the grid connection settings and set parameters.

  NOTE

  By default, PV modules are configured in off-grid mode.

Step 3 Click **Next** to save the settings.

----End

NOTE

- To return to the old version, click **Old Version** in the upper left corner before clicking **Next**.

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5.3.1.2 Electricity Price & Consumption

After the electricity price and load parameters are set, the system calculates the revenue after the ESS installation based on the electricity consumption.

Electricity Price Settings

NOTE

To set the currency unit and electricity price growth rate, click **Advanced Settings**.

1. Set **Feed-in Tariff**.
2. Set **Purchase Price**.
   - Select **User-Defined Input** in **Type**.
     i. Set **Volumetric Charge Type** and the electricity price as required.

     NOTE

     If you want to set a time-of-use electricity price, set **Volumetric Charge Type** to **Time-of-Use**. For details, see **7.1 How Do I Set the Time-of-Use Electricity Prices?**

     ii. Set the demand charge rate as required.
     - If you set the demand charge rate to **By Actual Demand**, you need to set parameters such as **Maximum Demand Mode** and **Monthly Demand Charge**.
     - If you set the demand charge rate to **Transformer Capacity**, you need to set parameters such as **Transformer Capacity** and **Price**.

Parameter	Description
Maximum Demand Mode	Set the settlement period of the maximum demand charge. The statistics can be collected by year, month, or time period.
Monthly Demand Charge	The basic demand charges are calculated based on the maximum demand statistical period and are converted into monthly electricity bills.
Volumetric Charge Type	The volumetric charge type can be set to **Fixed** or **Time-of-Use**.

   - Select **Template Input** in **Type**.
     i. Click **Select Template**.
     ii. Select the required template and click **OK**.

     NOTE

     - If a price template has been configured in the SmartPVMS, the **Template Input** option is provided for the electricity purchase price type. You can select the option as required.
     - If the price template does not meet the requirements, you can configure a template in the SmartPVMS.

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- Set **Type** to **Data Import**.
  i. Click **Download Template**, enter the load data in the template as required, and save the template.
  ii. Click **Add File**, and select and upload the saved template.

3. Set **Purchase Price**.
   a. Set the volumetric charge rate as required.
      - Set the parameters related to the volumetric charge rate by user-defined input.
        1) Select **User-Defined Input** in **Type**.
        2) Set **Volumetric Charge Type** and the electricity price as required.

        NOTE

        If you want to set a time-of-use electricity price, set **Volumetric Charge Type** to **Time-of-Use**. For details, see **7.1 How Do I Set the Time-of-Use Electricity Prices?**
      - Set the parameters related to the volumetric charge rate by data import.
        1) Set **Type** to **Data Import**.
        2) Click **Download Template**, enter the electricity price data in the template as required, and save the template.
        3) Click **Add File**, and select and upload the saved template.

   b. Set the demand charge rate as required.
      - If you set the demand charge rate to **By Actual Demand**, you need to set parameters such as **Maximum Demand Mode** and **Monthly Demand Charge**.
      - If you set the demand charge rate to **Transformer Capacity**, you need to set parameters such as **Transformer Capacity** and **Price**.

Parameter	Description
Maximum Demand Mode	Set the settlement period of the maximum demand charge. The statistics can be collected by year, month, or time period.
Monthly Demand Charge	The basic demand charges are calculated based on the maximum demand statistical period and are converted into monthly electricity bills.
Volumetric Charge Type	The volumetric charge type can be set to **Fixed** or **Time-of-Use**.

Consumption Settings

- Creating an energy consumption model through model generation

a. Set **Type** to **Generate Model**.
b. Set **Annual Energy Consumption** and **Monthly Energy Consumption** as required.
c. Set **Workday Model** and **Weekend Model** as required. The system displays the daily load curve based on **Workday Model** and **Weekend Model**.
d. **Optional:** If the preconfigured models do not meet your requirements, set **Workday Model** or **Weekend Model** to **Custom** and click  to edit the model.
e. Select a type of consumption growth rate and set related parameters based on site requirements.

- Creating an energy consumption model by uploading data
  - Creating an energy consumption model by importing the load point table
    i. Select **Data Import** from the **Type** drop-down list.
    ii. Click **Add File** and choose **Import Load Point Table**.
    iii. Select a type of consumption growth rate and set related parameters based on site requirements.
  - Creating an energy consumption model by importing data
    i. Select **Data Import** from the **Type** drop-down list.
    ii. Click **Download Template**, enter the load data in the template as required, and save the template. For details, see **7.2 How Do I Generate an Energy Consumption Model by Importing Data?**
    iii. Click **Add File** and select **Import Standard Template**.
    iv. Select a type of consumption growth rate and set related parameters based on site requirements.

    NOTE

    - The **Import Load Point Table** function is available only in China. Obtain the load point table data from the SGCC or CSG official website.
    - If the uploaded data is incorrect or missing, you can click **Edit Data** to change the data.

Maximum Load Surge Power Settings

In the off-grid and on/off-grid modes, you need to set the maximum surge power for all surge loads.

Outage Model Settings

In the off-grid and on/off-grid modes, you need to set the load shedding model and set related parameters based on the site requirements.

NOTE

- In the off-grid mode, you can set **Maximum Load Shedding Ratio** only.
- In the on/off-grid mode, you can set **Maximum Load Shedding Ratio**, load shedding models, and other parameters.

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5.3.1.3 System & Cost

When you access the **System & Cost** module for the first time, a dialog box is displayed prompting you to set the system and cost parameters.

PV

Set the PV module model, inverter model, target capacity ratio, and PV O&M cost as required.

NOTE

If the frequently used PV module does not meet your requirements, click **Frequently Used PV Module** to access the **Frequently Used PV Modules** setting page and add one.

ESS

- On-grid
  - Set **ESS Type**, **ESS Operating Mode**, and **ESS Price** as required.
  - (Optional) Select **Support ESS replacement** as required and set the parameters.

ESS Operating Mode	Description
Maximum Self-Consumption	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. If the ESS is fully charged or is being charged at full power, the surplus PV energy is fed to the grid. When PV energy is insufficient or cannot be generated at night, the ESS discharges energy to loads. This improves the self-consumption rate and energy self-sufficiency rate, and reduces electricity costs.
TOU	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy in accordance with the TOU policy. That is, the ESS is charged based on the maximum charge power calculated by the algorithm during the charge period. In the **No Charge, No Discharge** period, the surplus PV energy is used to charge the ESS.
TOU+Peak Shaving	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy in accordance with the TOU policy. That is, in the ESS charge period, the charge power is controlled based on the demand calculated by the algorithm. During the **No Charge, No Discharge** period, if the sum of grid and PV power does not meet the consumption requirements, the ESS discharges if it has energy so that the grid can obtain power from the ESS.

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ESS Operating Mode	Description
AI Dispatching	AI dispatching provides intelligent energy scheduling. Based on big data analysis, it implements intelligent electricity storage, purchase, and sales, achieve optimal system performance, improve the utilization rate of green power, and maximize financial revenue.

NOTE

- If the ESS operating mode is set to **TOU+Peak Shaving** or **TOU**, the system will automatically recommend the ESS configuration policy.
- If the recommended ESS configuration policy does not meet the requirements, click to customize the configuration.
- If the ESS configuration parameters are changed, click , and then the system will recommend the ESS configuration policy again.
- In the ESS and PV scenarios, the ESS operating mode can be set to **AI Dispatching**.

- On/Off-grid mode
  - Set **ESS Type**, **ESS Operating Mode** and **ESS Price** as required.
  - (Optional) Select **Support ESS replacement** as required and set the parameters.

ESS Operating Mode	Description
Maximum Self-Consumption	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. If the ESS is fully charged or is being charged at full power, the surplus PV energy is fed to the grid. When PV energy is insufficient or cannot be generated at night, the ESS discharges energy to loads. This improves the self-consumption rate and energy self-sufficiency rate, and reduces electricity costs.
TOU	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy in accordance with the TOU policy. That is, the ESS is charged based on the maximum charge power calculated by the algorithm during the charge period. In the **No Charge, No Discharge** period, the surplus PV energy is used to charge the ESS.

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ESS Operating Mode	Description
TOU+Peak Shaving	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy in accordance with the TOU policy. That is, in the ESS charge period, the charge power is controlled based on the demand calculated by the algorithm. During the **No Charge, No Discharge** period, if the sum of grid and PV power does not meet the consumption requirements, the ESS discharges if it has energy so that the grid can obtain power from the ESS.

NOTE

- If the ESS operating mode is set to **TOU+Peak Shaving** or **TOU**, the system will automatically recommend the ESS configuration policy.
- If the recommended ESS configuration policy does not meet the requirements, click to customize the configuration.
- If the ESS configuration parameters are changed, click . The system will recommend the ESS configuration policy again.

- Off-grid mode
  - Set **ESS Type** and **ESS Price** as required.
  - (Optional) Select **Support ESS replacement** as required and set the parameters.

Genset

Set the genset model, genset system price, and genset O&M cost as required.

NOTE

- Click to add a genset.
- Click to view the genset specifications.

Communication Components and Meters

Set **Communication Component Model** and **Meter Model** as required.

Economic Settings

You can set parameters related to investment, loan, or government subsidy policies, if applicable.

Advanced Settings

You can click **Advanced Settings** to set parameters such as **PV System**, **ESS**, **ESS Degradation**, and **Economic Parameters**.

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- **PV System**: Select a PV system to set the service life, azimuth, and other parameters of PV modules.
- **ESS**: Select an ESS to set the end-of-charge/discharge SOC, RTE, and other parameters of the ESS.
- **ESS Degradation**: Select **ESS Degradation** to set the degradation type and related parameters as required.
- **Economic Parameters**: Select **Economic Parameters** to set the discount rate, investment parameters, and other related parameters.

Calculation Results

The system calculates the capacity scheme based on the basic information, electricity price, load parameters, and cost parameters.

1. Click **Design Capacity** and set **Planning Objective**, **Baseline IRR**, and **Minimum Consumption Ratio** as required.
2. Click **OK**. The system calculates the capacity scheme.
3. Click **Calculate All**. The system further calculates the economic benefits and energy data.
4. Click **Next** to save the result.

   NOTE

   - The **Minimum Consumption Ratio** parameter can be set only in the version for China.
   - Click  to edit an existing scheme as required.
   - Click  to delete an existing scheme.
   - Click to add a scheme.

5.3.1.4 Report

In the report module, you can compare the investment return and energy data of multiple schemes in cards, tables, and charts.

Overview

You can view the optimal economic benefit indicators of each scheme.

Report Table

You can view the detailed information about multiple design schemes in the table, covering parameters such as system capacity, economic benefits, and energy management, and compare the technical features and economic effects of different design schemes.

- Click  to view the scheme report details.
  - Interpreting a scheme report

Parameter	Description	Remarks
Basic Info	Displays the project name and address in the design scheme.	
Project Overview	Displays the system capacity and device list in the design scheme.	
Economic Benefits	Displays the expected economic benefits and investment return of the design scheme in the future.	
Electricity Bills Analysis	Displays the electricity bills comparison before and after PV+ESS or ESS installation.	
Energy Management	Displays the detailed energy distribution in the scheme.	When the net load scenario and PV capacity are 0, the consumption ratio is not displayed.
ESS Configuration Policy	Displays the operating mode, charge and discharge configuration policy, and RTE of the ESSs.	When the ESS operating mode is maximum self-consumption or AI scheduling, the charge and discharge configuration policies are not displayed in the **ESS Configuration Policy** area.
Networking Diagram	Displays the networking diagram of devices.	

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Parameter	Description	Remarks
Power Curve	Displays the comparison of the grid power before and after PV+ESS or ESS installation in each month of a year, the charge and discharge power in a day, and the electricity price curve.	You can select a day to view the charge and discharge power curve on that day. The exported report shows the statistics on the day you select.
ESS Benefits	Displays the benefits when the ESS type is liquid-cooled ESS. The benefits of Huawei's ESSs include C2C dual-link safety, LCOS, and flexible application in all scenarios.	
First-Year Environmental Benefits	Displays the statistics of the scheme's contributions to energy saving and emission reduction.	
Simulation Parameters	Is used to calculate the simulated energy yield.	

NOTE

- If the values of the PV capacity, ESS capacity, number of PV modules, or number of inverters are 0 in the report, you are advised to check whether the purchase price and load are properly set based on the actual situation.
- If the values of economic parameters such as the payback period are 0 in the report, you are advised to check whether the PV+ESS system price and O&M cost are properly set based on the actual situation.

– Switching schemes: Click the drop-down list in the upper right corner to switch schemes.
– Customizing a report: Click **Custom** to select the parts that need to be displayed in the report. For details about the parameters in the report, see **8.2 Report Parameters**.
– Exporting a report: Click **Export Report** to export the report of this scheme.
– Sharing a report

  Click **Share Report**. In the **Share Report** dialog box, copy the static report link and share the generated report.

  By default, the report sharing link is open and valid for six months. To set the sharing link, perform the following operations:

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i. In the **Share Report** dialog box, click **Set Permissions**.
ii. Set the validity period of the sharing link and whether to allow sharing. When **Share** is disabled, the static report content cannot be viewed.

Report Chart

You can view the economic indicators in the chart to compare the economic benefits of different schemes.

5.3.2 Capacity Design (Old Version)

Enter the capacity design project and tap **Old Version** in the upper right corner. The following figure shows the process of creating a capacity design project and generating a report.



5.3.2.1 Entering Basic Information

The basic information includes the PV plant location and weather station.

1. Enter the project name, and set basic information such as the address of the PV plant, weather station, and project lifecycle based on site requirements.

   NOTE

   - **Project Lifecycle** indicates the period from the start to the end of a project. The period ranges from 5 to 30 years.
   - If no weather stations provided by the system meet the requirements, click to upload the meteorological data. For details about the upload requirements, see **7.5 How Do I Import Meteorological Data?**

2. Set the on-grid/off-grid mode and related parameters for the project. The system supports three modes: on-grid, on/off-grid, and off-grid.
3. Press and hold in the map area and move the pointer to the location where you want to install the PV plant.
4. Click **Next** to save the settings.

5.3.2.2 Electricity Price & Consumption

After parameters such as the electricity price and energy consumption load are set, the system calculates the revenue and self-consumption of a PV plant system based on the energy consumption.

Electricity Price Settings

To configure ESSs and ensure the accuracy of benefit calculation, set the effective electricity price and related parameters in **Electricity Price Settings** as required.

1. Click **Set** and select a currency unit as required.
2. Set **Feed-in Tariff**.

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3. Set **Purchase Price**.

   Set parameters such as **Maximum Demand Mode**, **Monthly Demand Charge**, and **Volumetric Charge Type** as required.

Parameter	Description
Maximum Demand Mode	Set the settlement period of the maximum demand charge. The statistics can be collected by year, month, or time period.
Monthly Demand Charge	The basic demand charges are calculated based on the maximum demand statistical period and are converted into monthly electricity bills.
Volumetric Charge Type	The volumetric charge type can be set to **Fixed** or **Time-of-Use**.

   NOTE

   If you want to set a time-of-use electricity price, set **Volumetric Charge Type** to **Time-of-Use**. For details, see **7.1 How Do I Set the Time-of-Use Electricity Prices?**

   If a price template has been configured in the SmartPVMS, you can select **User-Defined Input** or **Template Input** as required.

   If no price templates have been configured in the SmartPVMS, you can set **Maximum Demand Mode**, **Monthly Demand Charge**, and **Volumetric Charge Type** based on the actual situation.

4. Set **Electricity Price Growth Rate**.

NOTE

In the off-grid mode, you need to set **Off-grid Electricity Price** only.

Consumption Settings

- Creating an energy consumption model through model generation
  a. Set **Type** to **Generate Model**.
  b. Set **Annual Energy Consumption** and **Monthly Energy Consumption** as required.
  c. Set **Workday Model** and **Weekend Model** as required. The system displays the daily load curve based on **Workday Model** and **Weekend Model**.
  d. **Optional:** If the preconfigured models do not meet your requirements, set **Workday Model** or **Weekend Model** to **Custom** and click  to edit the model.
  e. Select a type of consumption growth rate and set related parameters based on site requirements.
- Creating an energy consumption model by uploading data
  – Creating an energy consumption model by importing the load point table
    i. Select **Data Import** from the **Type** drop-down list.

ii. Click **Add File** and choose **Import Load Point Table**.

iii. Select a type of consumption growth rate and set related parameters based on site requirements.

– Creating an energy consumption model by importing data

i. Select **Data Import** from the **Type** drop-down list.

ii. Click **Download Template**, enter the load data in the template as required, and save the template. For details, see **7.2 How Do I Generate an Energy Consumption Model by Importing Data?**

iii. Click **Add File** and select **Import Standard Template**.

iv. Select a type of consumption growth rate and set related parameters based on site requirements.

NOTE

- The **Import Load Point Table** function is available only in China. Obtain the load point table data from the SGCC or CSG official website.
- If the uploaded data is incorrect or missing, you can click **Edit Data** to change the data.

NOTE

- If no load is connected, set **Annual Energy Consumption** to **0**.
- If you need to configure ESSs, set valid electricity prices and loads first.

Maximum Load Surge Power Settings

In the off-grid and on/off-grid modes, you need to set the maximum surge power for all surge loads.

Load Shedding Model Settings

In the off-grid and on/off-grid modes, you need to set the load shedding model and set related parameters based on the site requirements.

NOTE

- In the off-grid mode, you can set **Maximum Load Shedding Ratio** only.
- In the on/off-grid mode, you can set **Maximum Load Shedding Ratio**, load shedding models, and other parameters.

5.3.2.3 Plan Settings

Plan Settings and PV System Settings

- On-grid mode and on/off-grid mode
  – A PV system is available.
    i. Select **Enable PV**, select **PV+ESS Operating Mode** as required, and set parameters such as **Planning Objective**.

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PV+ESS Operating Mode	Description
Maximum Self-Consumption	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. If the ESS is fully charged or is being charged at full power, the surplus PV energy is fed to the grid. When PV energy is insufficient or cannot be generated at night, the ESS discharges energy to loads. This improves the self-consumption rate and energy self-sufficiency rate, and reduces electricity costs.
Maximum Self-Consumption +TOU	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy based on the TOU policy. That is, the ESS is charged based on the maximum charge power calculated by the algorithm during the charge period. In the **No Charge or Discharge** period, the surplus PV energy is used to charge the ESS.
Maximum Self-Consumption +Peak Shaving	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. In the ESS charge period, the power obtained from the grid is controlled based on the demand calculated by the algorithm. In the **No Charge or Discharge** period, the surplus PV energy is used to charge the ESS.

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PV+ESS Operating Mode	Description
Maximum Self-Consumption +TOU+Peak Shaving	PV energy is supplied preferentially to loads, and surplus PV energy is used to charge the ESS. The ESS is charged and discharges energy based on the TOU policy. That is, in the ESS charge period, the charge power is controlled based on the demand calculated by the algorithm. In the **No Charge or Discharge** period, if the sum of the power from the grid plus the PV power does not meet the consumption requirements according to the peak shaving rule, the ESS discharges if it has energy so that the grid can obtain power from the ESS.

ii. Set PV parameters as required.

- If no existing PV system is available, set **Existing PV Project** to **No**, and configure **PV Capacity Planning Mode**, PV module manufacturer, PV module model, and inverter model as required.
- If an existing PV system is available, set **Existing PV Project** to **Yes** and set **Load Data Type** as required. If **Total Load** is selected, set parameters such as the PV capacity, PV module manufacturer, PV module model, and inverter model. If **Net Load** is selected, negative values can be imported in the load data import template.

– No PV system is available.

There is no need to select **Enable PV**. Set parameters such as **ESS Operating Mode** and **Planning Objective** as required.

ESS Operating Mode	Description
TOU	The system controls the battery charge and discharge time segments to reduce energy consumption costs. For example, if you set the low electricity price period at night as the charge period, the system charges the ESS at the maximum power in this period. If you set the high electricity price period as the discharge period, the ESS can discharge energy only during the discharge period based on the actual load power.
Peak Shaving	Lower the peak demand power purchased from the grid during peak hours, reducing electricity fees.

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ESS Operating Mode	Description
TOU+Peak Shaving	The ESS is charged and discharges energy based on the TOU policy. That is, in the ESS charge period, the charge power is controlled based on the demand calculated by the algorithm. In the **No Charge or Discharge** period, if the power from the grid does not meet the consumption requirements according to the peak shaving rule, the ESS discharges if it has energy so that the grid can obtain power from the ESS.

- Off-grid mode

  In the off-grid mode, PV is enabled by default. Set **Planning Objective** and PV system parameters based on site requirements.

  NOTE

  - Click ⊕ to add a customized PV module model.
  - Click **Frequently Used PV Module** to set the frequently used PV module models. For details, see **6.2 Setting Frequently Used PV Modules**.

ESS Settings

Set parameters such as **ESS Capacity Planning Mode** and **ESS Type** as required.

- When **ESS Capacity Planning Mode** is set to **Specified ESS Capacity**:
  a. Set **ESS Type** as required.
  b. Click **Add Device** and set the ESS model and quantity as required.
- When **ESS Capacity Planning Mode** is set to **Recommended ESS Capacity**.

  Set **ESS Type** as required. The system automatically recommends an appropriate ESS.

If PV is enabled and **PV+ESS Operating Mode** is set to **Maximum Self-Consumption+TOU** or **Maximum Self-Consumption+TOU+Peak Shaving**, or if PV is disabled and **ESS Operating Mode** is set to **TOU** or **TOU+Peak Shaving**, you can set the ESS policy as required. If you select **Custom**, you can configure the following items:

- Click **Create** to set the monthly charge or discharge time range.
- Click **Copy** to copy the existing configuration.
- Click **Add Time Range** to add a time range for charge or discharge.

Communications Device Settings

You can determine whether to select **Communications Device**. If it is selected, the system recommends its **Type** and **Model**. You can also modify the type and model as required.

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Meter Settings

You can determine whether to select **Meter**. If it is selected, the system recommends its **Type**. You can also modify the type as required.

Genset System Settings

In the off-grid and on-grid modes, you can choose whether to set **Enable Genset**.

NOTE

- Click  to view the genset specifications.
- Click  to add a customized genset model.
- If a genset model is followed by , the genset model is customized.

Advanced Settings

- PV System Settings

  If PV is enabled, to edit parameters such as **Service Life** and **Azimuth** for PV modules, click **Edit** on the right.
- ESS Settings

  To edit parameters such as **End-of-Charge SOC**, **End-of-Discharge SOC**, and **RTE** for the ESS, click **Edit** on the right.
- ESS Degradation

  When the ESS is running, the battery state of health (SOH), which means the ratio of the actual ESS capacity to the rated ESS capacity, is being degraded continuously. To edit the ESS degradation type, click **Edit** on the right.

5.3.2.4 Economic Settings

After determining the design of inverters, PV modules, and ESSs, you can analyze the PV benefits.

Cost Settings

1. Click **Set** to set the discount rate as required.
2. In **Initial Installation Cost**, enter the price based on the site requirements.
3. In **O&M Cost**, enter the O&M cost based on site requirements.

NOTE

You need to set genset parameters for the on/off-grid and off-grid modes.

Investment Settings

In the on-grid mode, if you have not enabled PV and set the investment mode to share revenue with investors, you can select **Share Revenue with Investor** and set investment-related parameters.

NOTE

The investment settings are not supported in the on/off-grid and off-grid modes.

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Loan Settings

If you have a loan, select **Loan Involved** and set **Loan Ratio**, **Max Loan Amount**, and other parameters.

Government Subsidy Settings

If local government subsidies are available, set government subsidies for better economic analysis.

1. Click **Add Government Subsidy**.
2. Select a subsidy type and set the subsidy amount and other parameters as required.
3. Click **Next** to generate a report.

5.3.2.5 Generating a Report

After a report is generated, the system provides information such as the ROI and energy consumption based on the design scheme. You can customize report contents or export the report.

Report Details

The report contains multiple parts, such as **Basic Info**, **Project Overview**, **Electricity Bills Analysis**, and **Economic Benefits**. Click **Custom** and select the parts to be displayed in the report. For details about the parameters in the report, see **8.2 Report Parameters**.

Basic Info: displays the project name and address in the design scheme.

Project Overview: displays the system capacity and device list in the design scheme.

Economic Benefits: displays the expected economic benefits and return on investment (ROI) of the design scheme in the future, and compares the benefits under various ESS capacities with those under the optimal ESS capacity.

Electricity Bills Analysis: displays the electricity bills comparison and maximum demand comparison before and after PV+ESS or ESS installation.

Energy Management: displays the detailed energy distribution in the scheme, annual energy yield changes within the project lifecycle, and annual load composition.

ESS Configuration Policy: displays the operating mode, charge and discharge configuration policy, RTE, and battery degradation curve of the ESSs.

Networking Diagram: displays the networking diagram of devices.

Power Curve: displays the comparison of the grid power before and after PV+ESS or ESS installation in each month of a year, the charge and discharge power in a day, and the electricity price curve.

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NOTE

- You can select a day to view the charge and discharge power curve on that day. The exported report shows the statistics on the day you select.
- When the PV+ESS operating mode is maximum self-consumption, the charge and discharge configuration policies are not displayed in the **ESS Configuration Policy** area.

ESS Benefits: displays the benefits when the ESS type is liquid-cooled ESS. The benefits of Huawei's ESSs include C2C dual-link safety, LCOS, and flexible application in all scenarios.

First-Year Environmental Benefits: displays the statistics of the scheme's contributions to energy saving and emission reduction.

Simulation Parameters: is used to calculate the simulated energy yield.

NOTE

- If the values of the PV capacity and ESS capacity, number of PV modules, and number of inverters are 0 in the report, you are advised to check whether the purchase price, load, and recommended maximum PV capacity are properly set based on the actual situation.
- If the values of economic parameters such as the payback period are 0 in the report, you are advised to check whether the PV+ESS system price and O&M cost are properly set based on the actual situation.

Exporting a Report

On the **Report** page, click **Export Report**.

Sharing a Report

On the **Report** page, click **Share Report**. In the **Share Report** dialog box, copy the static report link and share the generated report.

By default, the report sharing link is open and valid for six months. To set the sharing link, perform the following operations:

1. In the **Share Report** dialog box, click **Set Permissions**.
2. Set the validity period of the sharing link and whether to allow sharing. When **Share** is disabled, the static report content cannot be viewed.

6 More Settings

6.1 Custom PV Modules

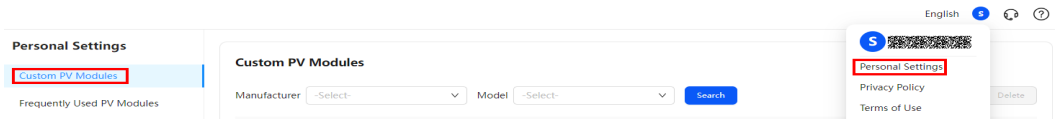
The system has preset common PV module information templates. If the preset templates cannot meet user requirements, you can customize PV module information templates.

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

Creating a Custom PV Module

Click the avatar in the upper right corner, choose **Personal Settings** from the drop-down list, and choose **Custom PV Modules** > **Create**.



1. Setting PV module parameters
   - Set PV module parameters, such as **Maximum Power (Pmax) [W]** and **Length (mm)**, according to the PV module brochure or related specifications. For details about how to obtain the values of **Solar Cells Connected in Series** and **Solar Cells Connected in Parallel**, see **Obtaining Solar Cell Parameters**.
   - You can click **Copy Existing Module** to import the preset module template.
   - You can click **Import PAN File** to import the local module template and modify related parameters as required.
2. (Optional) Uploading a PV module to the module library

   If you want to upload a PV module to the module library, select **Add to Module Library** and set **Specification Website**. After the application is approved by the administrator, **Archived** is displayed in the **Status** column,

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indicating that the PV module has been successfully uploaded to the module library and the PV module information will be available to all users.

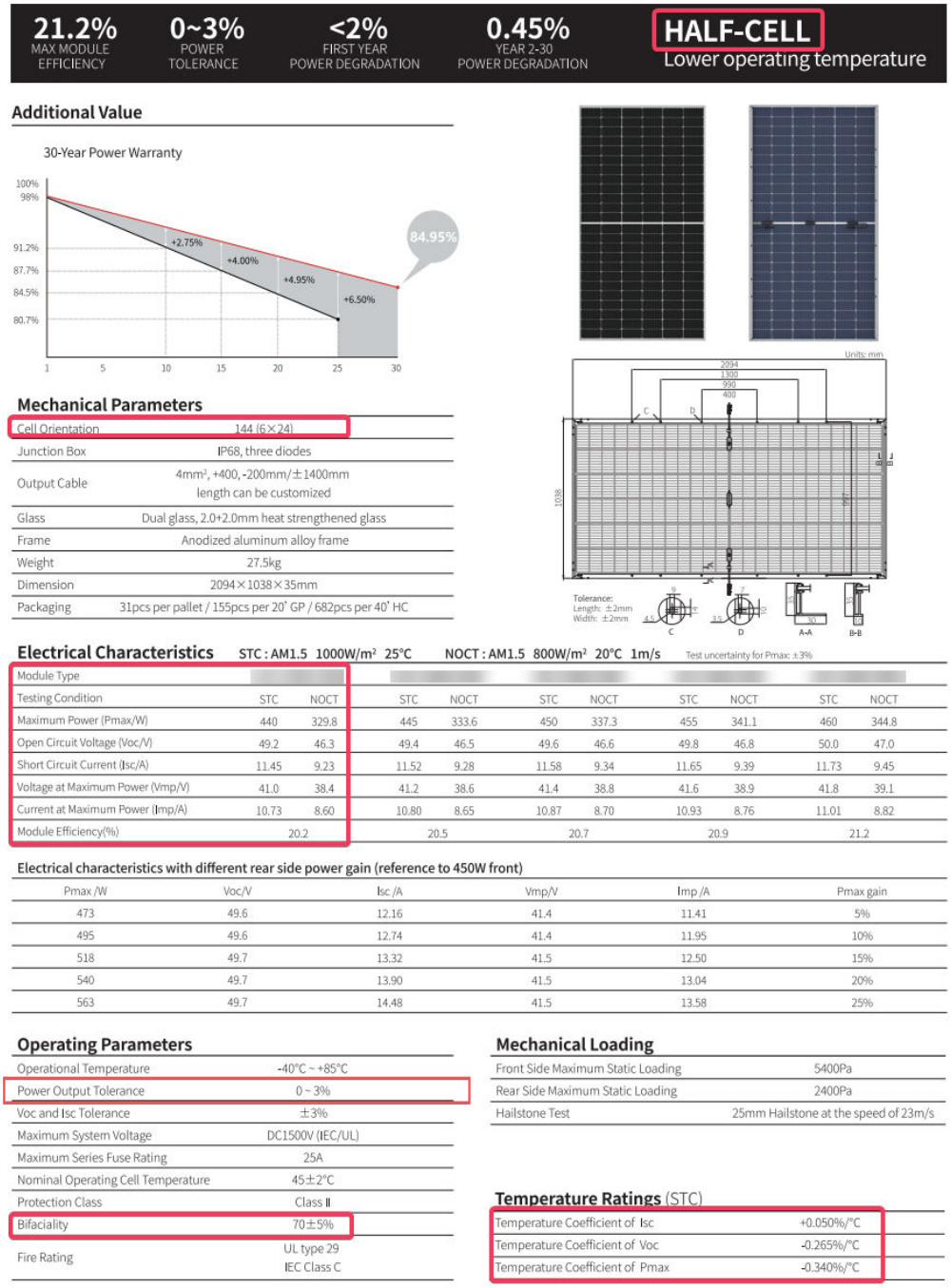
3. Click **Save**.

NOTE

- For details about the PV module brochure, specification website, or related specifications, contact the PV module vendor.
- Set parameters in the standard test conditions (STC) scenario.
- Check the unit of each parameter to avoid errors caused by inconsistent units.

The following uses the PV module of a vendor as an example:

Figure 6-1 PV module brochure



21.2% MAX MODULE EFFICIENCY
0~3% POWER TOLERANCE
<2% FIRST YEAR POWER DEGRADATION
0.45% YEAR 2-30 POWER DEGRADATION
HALF-CELL
Lower operating temperature

Additional Value

30-Year Power Warranty

100%
98%
91.2%
87.7%
84.5%
80.7%
+2.75%
+4.00%
+4.95%
+6.50%
84.95%
1
5
10
15
20
25
30

Units: mm
2094
1300
990
400
1038
Tolerance:
Length: ±2mm
Width: ±2mm
C
D
A-A
B-B

Mechanical Parameters

Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	4mm², +400, -200mm/±1400mm length can be customized
Glass	Dual glass, 2.0+2.0mm heat strengthened glass
Frame	Anodized aluminum alloy frame
Weight	27.5kg
Dimension	2094×1038×35mm
Packaging	31pcs per pallet / 155pcs per 20' GP / 682pcs per 40' HC

Electrical Characteristics STC : AM1.5 1000W/m² 25°C NOCT : AM1.5 800W/m² 20°C 1m/s Test uncertainty for Pmax: ±3%

Module Type										
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax/W)	440	329.8	445	333.6	450	337.3	455	341.1	460	344.8
Open Circuit Voltage (Voc/V)	49.2	46.3	49.4	46.5	49.6	46.6	49.8	46.8	50.0	47.0
Short Circuit Current (Isc/A)	11.45	9.23	11.52	9.28	11.58	9.34	11.65	9.39	11.73	9.45
Voltage at Maximum Power (Vmp/V)	41.0	38.4	41.2	38.6	41.4	38.8	41.6	38.9	41.8	39.1
Current at Maximum Power (Imp/A)	10.73	8.60	10.80	8.65	10.87	8.70	10.93	8.76	11.01	8.82
Module Efficiency(%)	20.2		20.5		20.7		20.9		21.2	

Electrical characteristics with different rear side power gain (reference to 450W front)

Pmax /W	Voc/V	Isc /A	Vmp/V	Imp /A	Pmax gain
473	49.6	12.16	41.4	11.41	5%
495	49.6	12.74	41.4	11.95	10%
518	49.7	13.32	41.5	12.50	15%
540	49.7	13.90	41.5	13.04	20%
563	49.7	14.48	41.5	13.58	25%

Operating Parameters

Operational Temperature	-40°C ~ +85°C
Power Output Tolerance	0 ~ 3%
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1500V (IEC/UL)
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class Ⅱ
Bifaciality	70±5%
Fire Rating	UL type 29 IEC Class C

Mechanical Loading

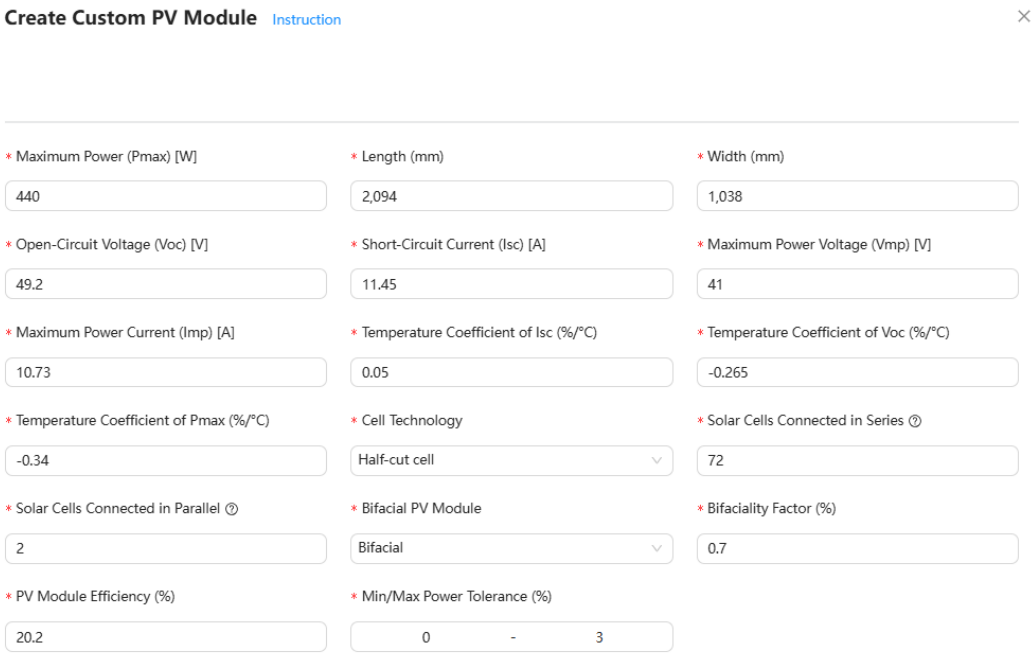
Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

Temperature Ratings (STC)

Temperature Coefficient of Isc	+0.050%/°C
Temperature Coefficient of Voc	-0.265%/°C
Temperature Coefficient of Pmax	-0.340%/°C

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Figure 6-2 Setting PV module parameters



Obtaining Solar Cell Parameters

You can obtain the values of **Solar Cells Connected in Series** and **Solar Cells Connected in Parallel** using either of the following methods:

- Method 1: Contact the module vendor.
- Method 2: Perform calculation according to the following steps.
  a. Calculate **Solar Cells Connected in Series**.

     Solar Cells Connected in Series = **Maximum Power Voltage**/MPP voltage of a single solar cell
  b. Calculate **Solar Cells Connected in Parallel**.

     Solar Cells Connected in Parallel = **Number of Cells**/**Solar Cells Connected in Series**. The value of **Number of Cells** can be obtained from the brochure.

     NOTE

     - MPP voltage of a single solar cell: The value is related to the hardware materials. For example, the recommended MPP voltage of a monocrystalline silicon solar cell is 0.45–0.65 V.
     - The value of **Solar Cells Connected in Series** shall be the maximum integer in the value range.
     - The value of **Solar Cells Connected in Parallel** shall be an integer.

Other Operations

- To view PV module parameters, click in the **Operation** column.
- To modify the parameters of a custom PV module, click in the **Operation** column.

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- To delete a custom PV module, click in the **Operation** column.
- You can view the processing status of the PV module application in the **Status** column. If the status is **Rejected**, click to view the rejection reason.

6.2 Setting Frequently Used PV Modules

If you want to display frequently used PV modules by default when you set PV modules, you can set it on the **Frequently Used PV Modules** page.

Setting Frequently Used PV Modules

1. Click the avatar in the upper right corner and choose **Personal Settings** from the drop-down list.
2. Choose **Frequently Used PV Modules**.
3. Select **Display Frequently Used PV Modules by Default**.

Other Operations

- If you want to use a specified PV module by default when creating a project, set the button in the **Preference** column of the PV module model to . Only one **Preference** can be set at a time.
- Click **Add Frequently Used PV Module** to add a new frequently used PV module model.
- Click in the **Operation** column to view the PV module specifications.
- Click in the **Operation** column to delete the frequently used PV module model.

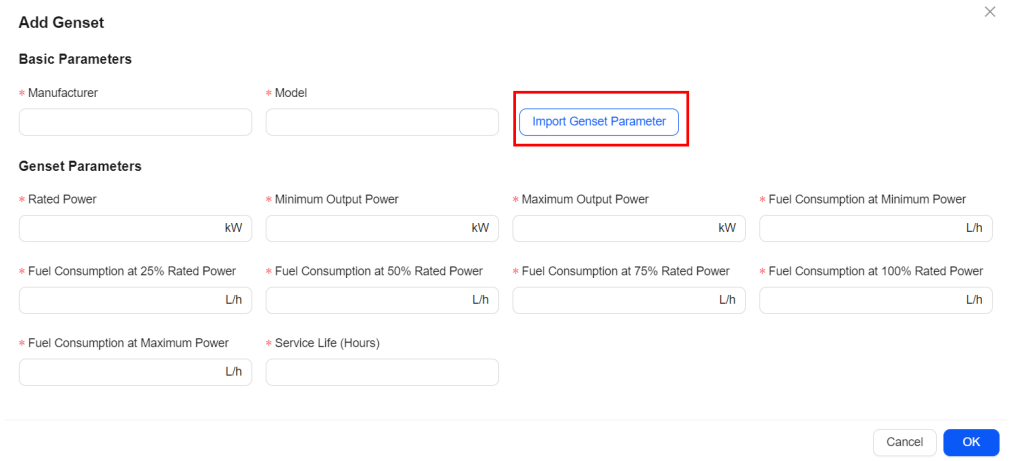
6.3 Genset Configuration

Common genset models have been preset in the system. If the preset models cannot meet your requirements, you can set **Genset Configuration** to customize genset models.

Adding a Genset Model

1. Click the avatar in the upper right corner and choose **Personal Settings** from the drop-down list.
2. Choose **Genset Configuration** > **Create**.
3. Set parameters such as **Manufacturer**, **Model**, and **Rated Power**. Click **Import Genset Parameter** to import the preset genset model template, and change related parameters as required.

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Other Operations

- To view genset specifications, click in the **Operation** column.
- To modify genset specifications, click in the **Operation** column.
- To delete a genset model, click in the **Operation** column, or select genset models in batches and click **Delete**.

6.4 Economic Settings

You can set the default values of basic economic parameters in **Economic Settings**.

1. Set **Currency Unit**, **Discount Rate**, **Pay Tax**, and **Tax Rate** as required.
2. Click **Save**.

6.5 Report Cover Settings

After the company name and logo are set, they are displayed in the online report and exported report.

1. Set **Company Name**.
2. Upload the company logo. You can modify and delete the uploaded logo.

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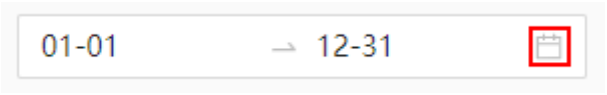
7 FAQs

7.1 How Do I Set the Time-of-Use Electricity Prices?

If the electricity prices vary with time segments in a day, you can set the time-of-use electricity prices based on site requirements.

Procedure

1. On the **Electricity Price & Consumption** page, set **Volumetric Charge Type** to **Time-of-Use**.
2. Select the month for which you want to set the time-of-use electricity prices.



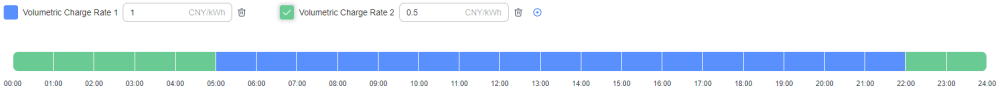
NOTE

You can set multiple date ranges for the time-of-use electricity prices. You can click **Add Date Range** to add a date range. The date ranges must cover an entire year from January 1 to December 31 and cannot overlap.

3. Click ⊕ and add a time-of-use electricity price based on site requirements.



4. Set **Volumetric Charge Rate** and click the corresponding time segment.



NOTE

- You can drag adjacent time segments to set them in batches.
- Multiple time segments can be set for each date range. The time segments must cover an entire day from 00:00:00–24:00:00.

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7.2 How Do I Generate an Energy Consumption Model by Importing Data?

The system provides preset typical energy consumption models. You can also import load data to generate energy consumption models. In this way, the system will analyze load data in the past year and provide more accurate system design suggestions.

Filling in the Energy Consumption Template

1. Click **Download Template** in the **Data Import** area.
2. Select a desired template based on site requirements.
3. Fill in the load data of one year based on site requirements.

NOTE

- Do not delete this note or change the format, time row, date column, or time interval in the template. Enter the load power or load consumption for each time segment in each date. Do not leave any cell empty.
- The template contains all data from 0:00 on January 1 to the end of the year (365 days).
- The load power can be measured in kW or W. The energy can be measured in kWh. Select either unit based on site requirements.
- Take the "Time in Row; Date in Column" template with an interval of 60 minutes as an example. Enter the load power or energy at 0:00 in column B, the load power or energy at 1:00 in column C, and so on.
- Each value must be greater than or equal to 0. If you set the unit to kW or kWh, you can enter a maximum of six decimal places for each value. If you set the unit to W, you can enter a maximum of two decimal places for each value.

Figure 7-1 Correct example

Time Interval	60			
Unit	kW			
Month/Day	0:00	1:00	2:00	3:00
1/1	10	8	7.5	4
1/2	9	8.2	5	3
1/3	6	6.2	4	4
1/4	7	8	4.6	3
1/5	8	6	6	5

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Figure 7-2 Incorrect example

Time Interval	60			
Unit	kW			
Month/Day	0:00	1:00	2:00	3:00
1/1	10	8	7.5	4
1/2	9		5	-3
1/3	6		4	-4
1/4	7	8	4.6	3
1/5	8	6	6	5

An empty cell

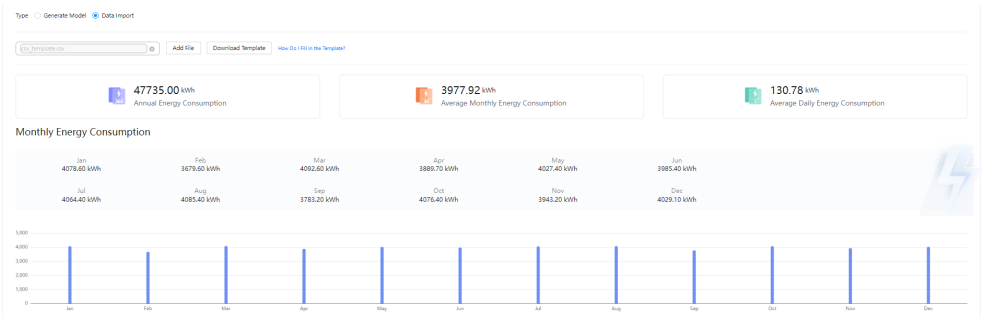
A negative value

Generating an Energy Consumption Model

NOTE

User interfaces displayed in this section are for reference only. The actual user interfaces may vary by software versions.

1. Click **Add File** in the **Data Import** area.
2. Select and upload the filled load data template. The system generates an energy consumption model based on the input load data.

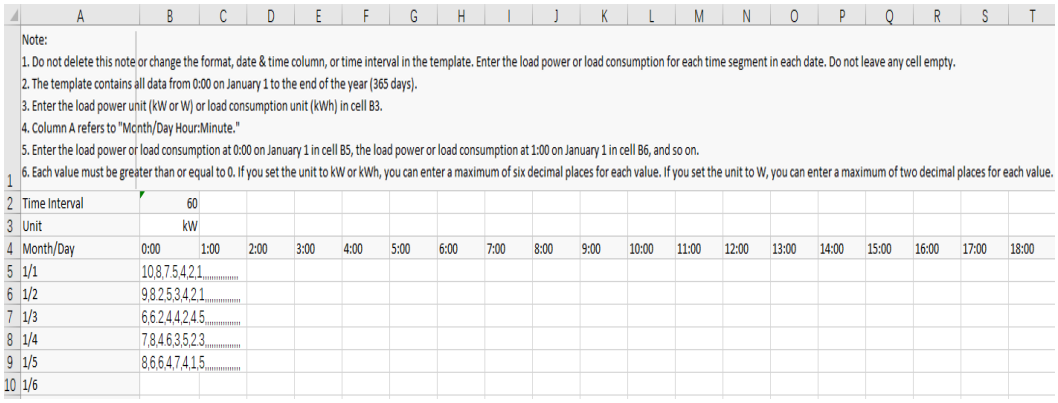


Exception Handling

When you enter the 24-hour load data in a column with separators in the load data template, as shown in **Figure 7-3**, you can sort out the data in columns by referring to **Figure 7-4**.

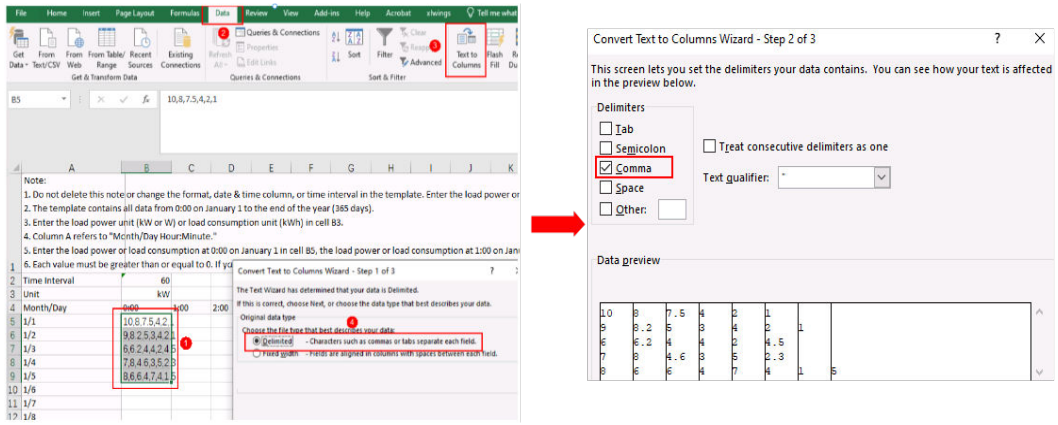
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Figure 7-3 Exception example



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Note: 1. Do not delete this note or change the format, date & time column, or time interval in the template. Enter the load power or load consumption for each time segment in each date. Do not leave any cell empty. 2. The template contains all data from 0:00 on January 1 to the end of the year (365 days). 3. Enter the load power unit (kW or W) or load consumption unit (kWh) in cell B3. 4. Column A refers to "Month/Day Hour:Minute." 5. Enter the load power or load consumption at 0:00 on January 1 in cell B5, the load power or load consumption at 1:00 on January 1 in cell B6, and so on. 6. Each value must be greater than or equal to 0. If you set the unit to kW or kWh, you can enter a maximum of six decimal places for each value. If you set the unit to W, you can enter a maximum of two decimal places for each value.																			
2	Time Interval	60																		
3	Unit	kW																		
4	Month/Day	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
5	1/1	10,8,7.5,4,2,1																		
6	1/2	9,8.2,5,3,4,2,1																		
7	1/3	6,6.2,4,4.2,4.5																		
8	1/4	7,8,4.6,3,5.2,3																		
9	1/5	8,6,6.4,7,4,1.5																		
10	1/6																			

Figure 7-4 Convert text to columns wizard



7.3 What Shall I Do When Operations on the PV Module Layout Fail?

Symptom

Symptom 1: In the PV module layout, the region attribute settings fail to apply.

Symptom 2: After editing a PV module, there is no response from multiple cancel operations by pressing **Ctrl+Z**.

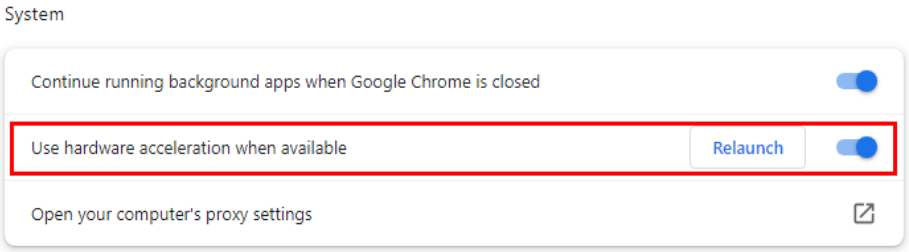
Possible Cause

Hardware acceleration is not enabled for the browser. Enable it and try again.

Solution

- For a Chrome browser, perform the following steps to enable hardware acceleration:
  a. Enter **chrome://settings/system** in the address box of the Chrome browser and press **Enter**.
  b. Choose **Settings** > **System** and enable **Use hardware acceleration when available**.

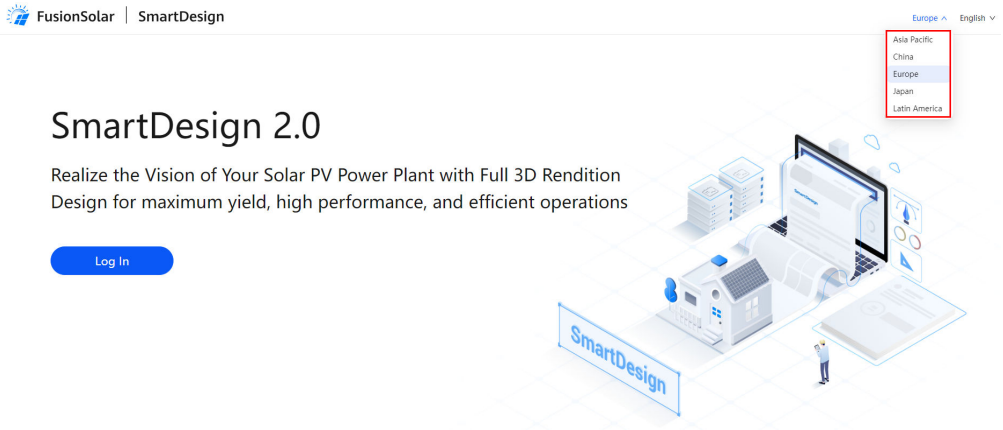
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- For a Firefox browser, enter **https://support.mozilla.org/en-US/kb/performance-settings** in the address box and enable hardware acceleration accordingly.

7.4 How Do I Log In to the SmartDesign Remotely?

1. In the upper right corner of the page, click the site name to redirect to the dedicated domain name for the specified site.



2. Click **Log In** to access the login page.
3. Enter the username and password, and tap **Login**.

7.5 How Do I Import Meteorological Data?

In addition to the preset meteorological data, this design tool also allows you to import meteorological data from other sources.

NOTE

- If you select **Upload Meteorological Data**, download the data from the official website of Solargis or Meteonorm. For details, see the operation guide on the corresponding official website.
- If the software cannot be used due to software viruses in the imported file or security attacks, this design tool will not assume any legal responsibility. You need to take security precautions.

1. On the **Weather Station** page, click .

2. Select a data type and upload the corresponding data file. The file requirements are as follows:

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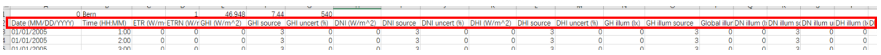
- If **Solargis_TMY_P50_PT60M** is selected, the TMY 60-minute P50 data file in .csv format can be uploaded. For details about the data format, see **Figure 7-5**.

  Figure 7-5 Solargis_TMY_P50_PT60M data format

  Day;Time;GHI;DNI;DIF;SE;SA;TEMP;WS;WD;WG;RH;AP;PWAT;PREC
  1;0:30;0;0;0;-75.05;-164.88;4.9;0.8;317;2.7;92.2;959.1;10.2;0.0
  1;1:30;0;0;0;-68.14;-125.66;4.6;0.8;306;2.9;91.8;958.7;10.2;0.0
  1;2:30;0;0;0;-57.38;-106.05;4.1;0.8;297;3.2;90.1;958.5;10.1;0.0
  1;3:30;0;0;0;-45.63;-94.20;4.0;0.8;297;3.2;87.6;958.4;10.1;0.0
  1;4:30;0;0;0;-33.70;-85.13;3.9;0.8;297;3.1;85.2;958.2;10.2;0.0

- If **Meteonorm_TMY3_Hour** is selected, the TMY3 data file in .csv format exported from Meteonorm can be uploaded. For details about the data format, see **Figure 7-6**.

  Figure 7-6 Meteonorm_TMY3_Hour data format

- If **Meteonorm_User_Defined_Hour** is selected, the user-defined data file in .csv format exported from Meteonorm can be uploaded. For details about the data format, see **Figure 7-7**.

  Figure 7-7 Meteonorm_User_Defined_Hour data format

  2nd Valley Forest
  -35.56 138.28 351 9

  y; m; dm; h;G_Gh;G_Dh;G_Bn; Ta; FF; Az; hs
  2005; 1; 1; 1;0;0;0;26.6;3.0;-10.4; 0.0
  2005; 1; 1; 2;0;0;0;26.1;2.7;-25.5; 0.0
  2005; 1; 1; 3;0;0;0;25.7;2.7;-39.1; 0.0
  2005; 1; 1; 4;0;0;0;25.4;2.9;-50.2; 0.0
  2005; 1; 1; 5;1;1;0;25.3;2.4;-59.5; 0.0
  2005; 1; 1; 6;85;69;96;26.2;2.7;-68.2;9.4

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8 Reference Information

8.1 Residential Solution Overview

Device Model Description

Scenario	Model
PV-only (on-grid)	• L1: SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 • LC0: SUN2000-8/10K-LC0 • LB0: SUN2000-3/3.68/4/4.6/5/6K-LB0 • SUN5000-LB0: SUN5000-3/6K-LB0 • M1: SUN2000-3/4/5/6/8/10/12KTL-M1/SUN2000-10KTL-BEM1 • M2: SUN2000-8/10/12/15/17/20KTL-M2 • M5: SUN2000-12/15/17/20/25KTL-M5 • MB0: SUN2000-12/15/17/20/25K-MB0 • SUN5000-MB0: SUN5000-17/25K-MB0 • MAP0: SUN2000-5/6/8/10/12KTL-MAP0/SUN2000-10K-MAP0-BE • SUN5000-MAP0: SUN5000-8/12K-MAP0 • LB0-NH: SUN2000-4.95K-LB0-NH • SUN5000-LB0-NH: SUN5000-4.95K-LB0-NH • MBL0: SUN2000-6/10/15K-MBL0 • SmartAssistant: SA4H-A02 • Smart Dongle: SDongleA-05 (WLAN-FE), SDongleB-06 (4G +WLAN AP) • Smart Power Sensor: DDSU666-H (Single-Phase); DTSU666-H 100A (Three-Phase)

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Scenario	Model
PV+ESS (on-grid)	• L1: SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 • LC0: SUN2000-8/10K-LC0 • LB0: SUN2000-3/3.68/4/4.6/5/6K-LB0 • SUN5000-LB0: SUN5000-3/6K-LB0 • M1: SUN2000-3/4/5/6/8/10/12KTL-M1/SUN2000-10KTL-BEM1 • M2: SUN2000-8/10/12/15/17/20KTL-M2 • M5: SUN2000-12/15/17/20/25KTL-M5 • MB0: SUN2000-12/15/17/20/25K-MB0 • SUN5000-MB0: SUN5000-17/25K-MB0 • MAP0: SUN2000-5/6/8/10/12KTL-MAP0/SUN2000-10K-MAP0-BE • SUN5000-MAP0: SUN5000-8/12K-MAP0 • LB0-NH: SUN2000-4.95K-LB0-NH • SUN5000-LB0-NH: SUN5000-4.95K-LB0-NH • MBL0: SUN2000-6/10/15K-MBL0 • SmartAssistant: SA4H-A02 • Smart Dongle: SDongleA-05 (WLAN-FE), SDongleB-06 (4G +WLAN AP) • Smart Power Sensor: DDSU666-H (Single-Phase); DTSU666-H 100A (Three-Phase) • SmartLogger: SmartLogger3000A • Smart Guard: SmartGuard-63A-S0,SmartGuard-63A-T0 • ESS: LUNA2000-(5-30)-S0, LUNA2000-(7-42)-S1, LUNA2000-5/7/10/12/14/15/17/19/21-S1
PV+ESS (on/off-grid)	• L1: SUN2000-2/3/3.68/4/4.6/5/6KTL-L1 • LC0: SUN2000-8/10K-LC0 • LB0: SUN2000-3/3.68/4/4.6/5/6K-LB0 • SUN5000-LB0: SUN5000-3/6K-LB0 • M1: SUN2000-3/4/5/6/8/10/12KTL-M1/SUN2000-10KTL-BEM1 • MB0: SUN2000-12/15/17/20/25K-MB0 • SUN5000-MB0: SUN5000-17/25K-MB0 • MAP0: SUN2000-5/6/8/10/12KTL-MAP0/SUN2000-10K-MAP0-BE • SUN5000-MAP0: SUN5000-8/12K-MAP0 • LB0-NH: SUN2000-4.95K-LB0-NH • SUN5000-LB0-NH: SUN5000-4.95K-LB0-NH • Smart Guard: SmartGuard-63A-S0,SmartGuard-63A-T0 • ESS: LUNA2000-(5-30)-S0, LUNA2000-(7-42)-S1, LUNA2000-5/7/10/12/14/15/17/19/21-S1

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PV-only (on-grid)

Networking	Single / Three-phase	Inverter Qty.	Inverter			Optimizer			Meter
			Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P	
SmartAssistant	Single-phase	1	L1/LC0/LB0/ SUN5000-LB0			√	√	×	×
		2	L1/LC0/LB0	L1/LC0/LB0		√	√	×	
			SUN5000-LB0	SUN5000-LB0		√	√	×	
		3	L1/LC0/LB0	L1/LC0/LB0	L1/LC0/LB0	√	√	×	
			SUN5000-LB0	SUN5000-LB0	SUN5000-LB0	√	√	×	
	Three-phase	1	M1/M2/M5/MB0/ MAP0/ SUN5000-MB0/ SUN5000-MAP0			√	√ (Not supported by M2/M5)	√ (Not supported by M1/ MAP0/ SUN5000-MAP0)	
			SUN2000-10KTL-BEM1/ SUN2000-10K-MAP0-BE			×	√	×	
			MBL0			×	×	×	

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Networking	Single / Three-phase	Inverter Qty.	Inverter			Optimizer			Meter
			Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P	
		2	M1/M2/M5/MB0	M1/M2/M5/MB0		√	√ (Not supported by M2/M5)	√ (Not supported by M1)	
			MAP0	MAP0		√	√	×	
			SUN5000-MB0	SUN5000-MB0		√	√	√	
			SUN5000-MAP0	SUN5000-MAP0		√	√	×	
			MBL0	MBL0		×	×	×	
			SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1		×	√	×	
			SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE		×	√	×	
		3	M1/M2/M5/MB0	M1/M2/M5/MB0	M1/M2/M5/MB0	√	√ (Not supported by M2/M5)	√ (Not supported by M1)	
			MAP0	MAP0	MAP0	√	√	×	
			SUN5000-MB0	SUN5000-MB0	SUN5000-MB0	√	√	√	
			SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×	
			MBL0	MBL0	MBL0	×	×	×	

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Networking	Single / Three-phase	Inverter Qty.	Inverter			Optimizer			Meter
			Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P	
			SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	×	√	×	
			SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	×	√	×	
Dongle	Single-phase	1	L1/LC0/LB0/ SUN5000-LB0			√	√	×	√
		2	L1/LC0/LB0	L1/LC0/LB0		√	√	×	
			SUN5000-LB0	SUN5000-LB0		√	√	×	
		3	L1/LC0/LB0	L1/LC0/LB0	L1/LC0/LB0	√	√	×	
			SUN5000-LB0	SUN5000-LB0	SUN5000-LB0	√	√	×	
	Three-phase	1	M1/M2/M5/MB0/ MAP0/ SUN5000-MB0/ SUN5000-MAP0			√	√ (Not supported by M2/M5)	√ (Not supported by M1/ MAP0/ SUN5000-MAP0)	
			SUN2000-10KTL-BEM1/ SUN2000-10K-MAP0-BE			×	√	×	

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Networking	Single / Three-phase	Inverter Qty.	Inverter			Optimizer			Meter
			Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P	
			MBL0			×	×	×	
		2	M1/M2/M5/MB0	M1/M2/M5/MB0		√	√ (Not supported by M2/M5)	√ (Not supported by M1)	
			MAP0	MAP0		√	√	×	
			SUN5000-MB0	SUN5000-MB0		√	√	√	
			SUN5000-MAP0	SUN5000-MAP0		√	√	×	
			MBL0	MBL0		×	×	×	
			SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1		×	√	×	
			SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE		×	√	×	
		3	M1/M2/M5/MB0	M1/M2/M5/MB0	M1/M2/M5/MB0	√	√ (Not supported by M2/M5)	√ (Not supported by M1)	
			MAP0	MAP0	MAP0	√	√	×	
			SUN5000-MB0	SUN5000-MB0	SUN5000-MB0	√	√	√	
			SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×	

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Networking	Single / Three-phase	Inverter Qty.	Inverter			Optimizer			Meter
			Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P	
			MBL0	MBL0	MBL0	×	×	×	
			SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	×	√	×	
			SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	×	√	×	
WLAN	Single-phase	1	L1/LC0/LB0/SUN5000-LB0			√	√	×	√
			LB0-NH			√	×	×	×
			SUN5000-LB0-NH			×	√	×	×
		2	LB0-NH	LB0-NH		√	×	×	×
			SUN5000-LB0-NH	SUN5000-LB0-NH		×	√	×	×

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PV+ESS (on-grid)

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
Smart Assistant	Single-phase	1	LUNAS0	L1/LC0/LB0/SUN5000-LB0			√	√	×	×	
			LUNAS1	L1/LC0/LB0/SUN5000-LB0			√	√	×		
		2	LUNAS0	L1/LC0/LB0	L1/LC0/LB0		√	√	×		
				SUN5000-LB0	SUN5000-LB0		√	√	×		
			LUNAS1	L1/LC0/LB0	L1/LC0/LB0		√	√	×		
				SUN5000-LB0	SUN5000-LB0		√	√	×		
		3	LUNAS0	L1/LC0/LB0	L1/LC0/LB0	L1/LC0/LB0	√	√	×		
				SUN5000-LB0	SUN5000-LB0	SUN5000-LB0	√	√	×		
			LUNAS1	L1/LC0/LB0	L1/LC0/LB0	L1/LC0/LB0	√	√	×		
				SUN5000-LB0	SUN5000-LB0	SUN5000-LB0	√	√	×		

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Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
	Three-phase	1	LUNAS0	M1/MB0/MAP0/SUN5000-MB0/SUN5000-MAP0			√	√	√ (Not supported by M1/MAP0/SUN5000-MAP0)		
				SUN2000-10KTL-BEM1/SUN2000-10K-MAP0-BE			×	√	×		
				MBL0			×	×	×		
			LUNAS1	M1/MB0/MAP0/SUN5000-MB0/SUN5000-MAP0			√	√	√ (Not supported by M1/MAP0/SUN5000-MAP0)		

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN2000-10KTL-BEM1/ SUN2000-10K-MAP0-BE			×	√	×		
		2	LUNAS0	M1/MB0	M1/M2/M5/MB0		√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0		√	√	×		
				SUN5000-MB0	SUN5000-MB0		√	√	√		
				SUN5000-MAP0	SUN5000-MAP0		√	√	×		
				MBL0	MBL0		×	×	×		

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Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1		×	√	×		
				SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE		×	√	×		
			LUNAS1	M1/MB0	M1/M2/M5/MB0		√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0		√	√	×		
				SUN5000-MB0	SUN5000-MB0		√	√	√		
				SUN5000-MAP0	SUN5000-MAP0		√	√	×		

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1		×	√	×		
				SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE		×	√	×		
		3	LUNAS0	M1/MB0	M1/M2/M5/MB0	M1/M2/M5/MB0	√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0	MAP0	√	√	×		
				SUN5000-MB0	SUN5000-MB0	SUN5000-MB0	√	√	√		
				SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×		

Networking	Single/ Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				MBL0	MBL0	MBL0	×	×	×		
				SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	×	√	×		
				SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	×	√	×		
			LUNAS1	M1/MB0	M1/M2/M5/MB0	M1/M2/M5/MB0	√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0	MAP0	√	√	×		
				SUN5000-MB0	SUN5000-MB0	SUN5000-MB0	√	√	√		

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Networking	Single/ Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×		
				SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	×	√	×		
				SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	×	√	×		
Dongle (It is recommended that the Smart Dongle be installed on the master inverter connected to the ESS.)	Single-phase	1	LUNAS0	L1/LC0/LB0/SUN5000-LB0			√	√	×	√	
			LUNAS1	L1/LC0/LB0/SUN5000-LB0			√	√	×		
		2	LUNAS0	L1/LC0/LB0	L1/LC0/LB0		√	√	×		
				SUN5000-LB0	SUN5000-LB0		√	√	×		
			LUNAS1	L1/LC0/LB0	L1/LC0/LB0		√	√	×		
				SUN5000-LB0	SUN5000-LB0		√	√	×		
		3	LUNAS0	L1/LC0/LB0	L1/LC0/LB0	L1/LC0/LB0	√	√	×		
				SUN5000-LB0	SUN5000-LB0	SUN5000-LB0	√	√	×		

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Networking	Single/ Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
			LUNAS1	L1/LC0/LB0	L1/LC0/LB0	L1/LC0/LB0	√	√	×		
				SUN5000-LB0	SUN5000-LB0	SUN5000-LB0	√	√	×		
	Three-phase	1	LUNAS0	M1/MB0/ MAP0/ SUN5000-MB0/ SUN5000-MAP0			√	√	√ (Not supported by M1/ MAP0/ SUN5000-MAP0)		
				MBL0			×	×	×		
				SUN2000-10KTL-BEM1/ SUN2000-10K-MAP0-BE			×	√	×		

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
			LUNAS1	M1/MB0/MAP0/SUN5000-MB0/SUN5000-MAP0			√	√	√ (Not supported by M1/MAP0/SUN5000-MAP0)		
		2	LUNAS0	M1/MB0	M1/M2/M5/MB0		√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0		√	√	×		
				SUN5000-MB0	SUN5000-MB0		√	√	√		

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN5000-MAP0	SUN5000-MAP0		√	√	×		
				MBL0	MBL0		×	×	×		
				SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1		×	√	×		
				SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE		×	√	×		
			LUNA S1	M1/MB0	M1/M2/M5/MB0		√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0		√	√	×		

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN5000-MB0	SUN5000-MB0		√	√	√		
				SUN5000-MAP0	SUN5000-MAP0		√	√	×		
				SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1		×	√	×		
				SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE		×	√	×		
		3	LUNAS0	M1/MB0	M1/M2/M5/MB0	M1/M2/M5/MB0	√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0	MAP0	√	√	×		

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN5000-MB0	SUN5000-MB0	SUN5000-MB0	√	√	√		
				SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×		
				MBL0	MBL0	MBL0	×	×	×		
			LUNAS1	M1/MB0	M1/M2/M5/MB0	M1/M2/M5/MB0	√	√ (Not supported by M2/M5)	√ (Not supported by M1)		The M2 and M5 do not support ESS. In PV+ESS scenarios, at least one inverter must support an ESS.
				MAP0	MAP0	MAP0	√	√	×		
				SUN5000-MB0	SUN5000-MB0	SUN5000-MB0	√	√	√		
				SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×		

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Networking	Single/ Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
				SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	SUN2000-10KTL-BEM1	×	√	×		
				SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	SUN2000-10K-MAP0-BE	×	√	×		
WLAN	Single-phase	1	LUNAS0	L1/LC0/LB0/SUN5000-LB0			√	√	×	√	
			LUNAS1	L1/LC0/LB0/SUN5000-LB0			√	√	×		
			LUNANHS0	LB0-NH			√	×	×	×	
				SUN5000-LB0-NH			×	√	×		
			LUNANHS1	LB0-NH			√	×	×		
				SUN5000-LB0-NH			×	√	×		
		2	LUNANHS0	LB0-NH	LB0-NH		√	×	×		
				SUN5000-LB0-NH	SUN5000-LB0-NH		×	√	×		

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Networking	Single/ Three-phase	Inverter Qty.	ESS	Inverter			Optimizer			Meter	Remarks
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P		
			LUNA NHS1	LB0-NH	LB0-NH		√	×	×		
				SUN5000-LB0-NH	SUN5000-LB0-NH		×	√	×		
Smart Logger	Single-phase	1	LUNA NHS0	JPL1			√	×	×	×	The JPL0/ NHL2 does not support ESS configuration. In PV +ESS scenarios, at least one inverter must support an ESS.
		10	LUNA NHS0	JPL1	JPL1/ JPL0/ NHL2		√ (Not supported by JPL0)	√ (Not supported by JPL1/ JPL0)	×		

PV+ESS (on/off-grid)

Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer		
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P
Smart Guard	Single-phase	1	LUNA S0	L1/LC0/LB0/SUN5000-LB0			√	√	×
			LUNA S1	L1/LC0/LB0/SUN5000-LB0			√	√	×
	Three-phase	1	LUNA S0	M1/MB0/MAP0/SUN5000-MB0/SUN5000-MAP0			√	√	√ (Not supported by M1/MAP0/SUN5000-MAP0)
			LUNA S1	M1/MB0/MAP0/SUN5000-MB0/SUN5000-MAP0			√	√	√ (Not supported by M1/MAP0/SUN5000-MAP0)
		2	LUNA S0	MAP0	MAP0		√	√	×
				SUN5000-MAP0	SUN5000-MAP0		√	√	×

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Networking	Single/Three-phase	Inverter Qty.	ESS	Inverter			Optimizer		
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P
			LUNAS1	MAP0	MAP0		√	√	×
				SUN5000-MAP0	SUN5000-MAP0		√	√	×
		3	LUNAS0	MAP0	MAP0	MAP0	√	√	×
				SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×
			LUNAS1	MAP0	MAP0	MAP0	√	√	×
				SUN5000-MAP0	SUN5000-MAP0	SUN5000-MAP0	√	√	×
WLAN	Single-phase	1	LUNANHS0	LB0-NH			√	×	×
				SUN5000-LB0-NH			×	√	×
			LUNANHS1	LB0-NH			√	×	×
				SUN5000-LB0-NH			×	√	×
		2	LUNANHS0	LB0-NH	LB0-NH		√	×	×
				SUN5000-LB0-NH	SUN5000-LB0-NH		×	√	×
			LUNANHS1	LB0-NH	LB0-NH		√	×	×

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Networking	Single / Three-phase	Inverter Qty.	ESS	Inverter			Optimizer		
				Inverter 1	Inverter 2	Inverter 3	SUN2000-450W-P2 or SUN2000-600W-P	SUN2000-600W-PA0	MERC-1100W-P or MERC-1300W-P
				SUN5000-LB0-NH	SUN5000-LB0-NH		×	√	×

8.2 Report Parameters

Parameter		Description
ESS Configuration Policy	ESS RTE	Round-trip efficiency (RTE) of the ESS refers to the ratio of the energy discharged from the ESS to energy charged to the ESS.
	ESS DOD	Depth of discharge (DOD) of the ESS is the end-of-charge SOC minus the end-of-discharge SOC.
Electricity Bills Analysis	Total Electricity Fees Saved in the First Year	Electricity fee saved in the first year after the PV or PV+ESS system is installed.
	Annual Volumetric Charges	Fee of consumed electricity (unit: kWh) per year.
	Annual Demand Charge	Fee of the annual electricity demand (unit: kW or kVA).
	Maximum Demand	Maximum electricity demand per month (unit: kW or kVA).
Economic Benefits	Accumulated Net Profits	Economic benefits excluding the initial investment cost, total O&M cost in the lifecycle, and total taxes.
	Initial Investment Cost	Initial investment in purchasing the devices, including the initial self-paid costs and the loan principal but excluding the loan interest.
	Own Funds	Initial self-paid costs for purchasing the devices, excluding loans.

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Parameter		Description
	O&M Cost	Includes O&M expenses and genset fuel expenses.
	NPV	Net present value (NPV) is the total present value of future compensation minus the total construction investment.
	IRR	Internal rate of return (IRR) is a discount rate that makes the NPV of all cash flows equal to zero.
	Payback Period	Duration for recovering the cost of an investment.
	LCOE	Average net present cost of electricity generation for a generator over its lifetime.
	Loan Principal	Amount of money borrowed from the lender, excluding interest.
	Overall Cost	Includes the initial device purchase cost, O&M cost, and fuel purchase cost.
	Device Purchase Cost	Total expenses for purchasing all devices.
	Purchased Power Cost	Total expenses for purchasing electricity from the grid.
	Maintenance Cost	Total expenses for maintaining PV devices and ESS devices.
	ROI	Calculation result excluding the device purchase cost, electricity purchase cost, and maintenance cost.
	Feed-in Revenue	Revenue generated from electricity fed by the PV+ESS plant to the grid.
	Savings	Sum of the volumetric charge saved by the electricity supplied from the PV system and ESS to the loads, and the demand charge saved after the PV system and ESS are installed.
	Cumulative Cash Flow	Sum of economic benefits by the end of the current year, excluding the device purchase cost, electricity purchase cost, and maintenance cost.
Energy Management	PV	Theoretical energy yield (including the actual energy yield and curtailed PV energy).
	Grid	Energy purchased from the grid.
	ESS	Energy discharged from ESSs.
	Consumption	Energy consumed by loads.
	Genset	Energy generated by gensets.
	Used by Loads	Energy charged to loads by the PV system, ESS, grid, and genset.
	Charged to ESS	Energy charged to the ESS by the PV system, grid, and genset.

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Parameter		Description
	Energy Fed to Grid	Energy fed to the grid from the PV system and ESS.
	Curtailed	Energy generated by the PV system that cannot be consumed by the grid or loads.
	Energy Lost	Lost energy caused by factors such as the RTE and degradation of the ESS.
	From PV	Energy supplied from the PV system to loads.
	From ESS	Energy supplied from the ESS to loads.
	From Genset	Energy supplied from the gensets to loads.
	From Grid	Energy supplied from the grid to loads.
	PV Yield	Total amount of energy supplied from the PV system to the loads, ESS, and grid.
	Discharged by ESS	Total amount of energy supplied from the ESS to the loads or grid.
	Genset Yield	Total amount of energy supplied from the gensets to the loads or ESS.
	Consumed	Energy directly or indirectly supplied from the PV system to the loads, including the energy directly supplied from the PV system to the loads, and the energy generated by the PV system, supplied to the ESS, and then discharged by the ESS to the loads.
	Self-consumption Rate	Ratio of the self-consumed energy to the PV energy yield.
	Unmet Load	Energy required by loads minus energy supplied.
	PV Curtailment Rate	Ratio of the curtailed PV energy yield to the actual energy yield.
	Consumption Ratio	Ratio of the total PV energy consumed by loads and stored in the ESS to the PV energy yield.
System Loss Diagram	Global horizontal irradiation	Total amount of shortwave irradiation from the sun, including the normal irradiation and horizontal irradiation. The calculation result is related to the meteorological information at the time.
	Global incident in coll. plane	Result of the transposition of the irradiance from horizontal to the plane of the array. The angle can be adjusted to the optimal angle to increase the irradiation.
	Near shading loss	Irradiation loss caused by shading. The calculation result is related to the irradiation data.

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Parameter		Description
	Incidence angle (IAM) loss	The calculation result is related to the PV module direction, tilt angle, geographical location, meteorological data, and irradiance. Generally, the calculation result is less than 5%.
	Energy after PV conversion	Energy yield excluding the irradiation losses such as the near shading loss and incidence angle loss.
	PV loss due to irradiance level	PV loss due to disadvantaged irradiance level. The calculation result is related to the irradiation data.
	PV loss due to temperature	PV loss caused by disadvantaged temperature. The calculation result is related to the temperature of the PV modules (temperature, power, layout mode, and wind speed).
	Optimizer efficiency loss	The calculation result is related to the optimizer model and power (actual working power).
	Module quality loss	Calculated based on the minimum/maximum power tolerance of PV modules.
	Mismatch loss	Loss caused by characteristic differences between PV modules. The elements that affect the mismatch loss include PV module shading, preset peak power error, and module-level mismatch.
	DC ohmic wiring loss	Ohmic resistance of the wiring circuit leads to energy loss, resulting in the gap between the available power of the PV modules and the power of the array terminals.
	Array virtual energy at mpp	Remaining energy yield excluding the losses due to the temperature, optimizer efficiency, PV module quality, and mismatch.
	Inverter loss	Includes the inverter losses caused by the normal inverter operation, the maximum input current, the normal voltage, the power threshold, and the voltage threshold. The calculation result is related to the time-based power, voltage, current, power, and inverter efficiency curves.
	Available energy at inverter output	Available AC energy converted from DC energy through the inverter.
	User power consumption loss	Energy consumed by the user's loads.
	Energy injected to grid	Energy fed into the grid, excluding the energy consumed by the user's loads and grid-connection loss.
	Energy Yield Coefficient	Annual energy yield loss ratio, which is related to the monthly energy yield and monthly energy yield coefficient.

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8.3 Acronyms and Abbreviations

C	
C2C	cell to consumption
CT	current transformer
D	
DXF	Drawing Exchange Format
DOD	depth of discharge
I	
IRR	internal rate of return
L	
LCOE	levelized cost of electricity
M	
MPPT	maximum power point tracking
N	
NPV	net present value
P	
PCS	power control system
R	
ROI	return on investment
RSD	rapid shutdown
RTE	round-trip efficiency
S	
SOC	state of capacity
SOH	state of health
T	
TOU	time of use

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