User Manual



SUNNY DESIGN

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Table of contents

1 Information on this Document 9
1.1 Validity 9
1.2 Target Group 9
1.3 Symbols in the Document 9
1.4 Typographies in the document 9
1.5 Designations in the Document 10
1.6 Additional Information 10
2 Product overview 11
2.1 Product Description 11
2.2 Functions upon access authorization 11
2.3 Project Overview 12
2.4 Functions per project type 12
2.5 System Requirements 13
3 Signing up and starting off 14
3.1 Signing up for Sunny Design 14
3.2 Starting Sunny Design 14
4 User Interface 15
4.1 Design of the personal home page on the user interface 15
4.2 Design of the project pages 17
4.3 Design of the protect tree 18
5 General Operation 19
5.1 Changing the Password 19
5.2 Exiting Sunny Design 19
5.3 Calling up Support 19
6 "My Sunny Design" menu 20
6.1 General Settings 20
6.2 Making general settings 20
6.3 Making string design settings 20
6.4 Design settings 20
6.5 Make settings for the design 21
6.6 Making settings for results values 21
6.7 Making settings for the letterhead 21
6.8 Settings for the profitability analysis 21
6.9 Defining settings for the profitability analysis 22
6.10 PV systems with self-consumption: Defining tariff information 22
6.11 Creating texts for quotations 22
6.12 Manage teams 23
6.13 Creation and administration of own PV modules 23
6.13.1 Creating a new PV module without template 23
6.13.2 Creating a new PV module with template 23
6.13.3 Editing or deleting PV modules 24
6.13.4 Adding a PV module to favorites 24
6.14 Managing your own locations 24
6.15 Creation and administration of own load profiles 24

6.15.1 Administration of own load profiles ... 24
6.15.2 Requirements on your own consumption data ... 24
6.15.3 Example of your own consumption data ... 25
6.15.4 Importing Own Consumption Data ... 25
6.15.5 Importing Consumption Data from Sunny Portal ... 26
6.15.6 Creating consumption data manually ... 26
6.15.7 Deleting a load profile ... 26
6.16 Managing the prices for PV modules and inverters ... 27
6.16.1 Entering Prices for PV Modules ... 27
6.16.2 Entering prices for PV modules in the My Sunny Design menu ... 27
6.16.3 Entering prices for PV modules via the Configure PV system page ... 27
6.16.4 Entering Prices for Inverters ... 27
6.17 Managing your own charging stations ... 28
6.18 Managing your own electric vehicles ... 28
6.19 Deleting User-Defined E-Mobility Templates ... 28
6.20 Creation and administration of own customer data ... 29
6.20.1 Administration of own customer data ... 29
6.20.2 Editing own customer data ... 29
6.20.3 Creating own customer data ... 29
6.20.4 Importing customer data via vCards ... 29
6.21 Creation and administration of own cost items and templates ... 30
6.21.1 Creating and managing own cost items and templates ... 30
6.21.2 Creating and managing own templates ... 30
6.22 Sunny Design Pro: Creating and managing user-defined tariffs ... 30
6.22.1 Sunny Design Pro: User-designed tariffs ... 30
6.22.2 Sunny Design Pro: Adding a purchasing tariff ... 30
6.22.3 Sunny Design Pro: Adding a new feed-in tariff ... 31

7 Sunny Design Pro ... 32
7.1 Testing Sunny Design Pro ... 32
7.2 Entering the Sunny Design Pro activation key ... 32
7.3 Ordering Sunny Design Pro ... 32

8 Managing project data ... 33
8.1 Uploading SMA 360° documents ... 33
8.2 Importing project data into Sunny Design ... 33
8.3 Importing project data ... 33
8.4 Transferring missing PV module data ... 33
8.5 Sunny Design Pro: Exporting time series ... 34
8.6 Sunny Design Pro: Using tools for configuring SMA components ... 34

9 Creating and managing projects ... 35
9.1 Quick planning and detailed planning ... 35
9.2 Creating a new project ... 35
9.3 Managing Existing Projects ... 35
9.4 Opening an Existing Project ... 35
9.5 Managing Projects with Your Team ... 36
9.6 Duplicating projects ... 36
9.7 Saving a project as a template ... 36
9.8 Creating a project from a template ... 36
9.9 Exporting a project via the "Manage projects" page ... 37
9.10 Exporting a project via the main navigation area of a project ... 37

9.11 Sunny Design Pro: Exporting Polysun projects ... 37
9.12 Sunny Design Pro: Comparing projects ... 37
9.13 Deleting a project ... 38

10 Procedure for designing projects ... 39
10.1 Procedure when designing a PV system with total power feed-in to grid ... 39
10.2 Procedure when designing a PV system with self-consumption ... 39
10.3 Procedure when designing an off-grid system ... 40
10.4 Procedure when designing a PV hybrid system ... 40
10.5 Procedure when designing a large-scale energy system ... 41
10.6 Procedure when designing an energy system ... 41
10.7 Special Battery Applications ... 42
10.7.1 Optimizing Self-Consumption through Storage of PV Energy ... 42
10.7.2 Activating Peak Load Shaving ... 42
10.7.3 Defining the battery charge time window ... 43
10.7.4 Peak shaving with increased self-consumption (multiuse) ... 44
10.7.5 Parameters for the "Multiuse" function ... 44
10.7.6 Enabling peak shaving with increased self-consumption with three-phase battery storage systems ... 45
10.7.7 Enabling peak shaving with increased self-consumption with single-phase battery storage systems ... 45
10.8 E-mobility settings ... 46
10.8.1 Procedure with e-mobility in projects with self-consumption ... 46
10.8.2 Procedure for e-mobility settings for known vehicles ... 46
10.8.3 Procedure for e-mobility settings for unknown vehicle behavior ... 47
10.8.4 Defining a driving profile ... 47
10.8.5 Defining time windows for electric vehicles ... 48
10.8.6 Defining absences for electric vehicles ... 49
10.8.7 Adding charging stations ... 49
10.8.8 Adding electric vehicles ... 50
10.8.9 Defining statistical charging station usage ... 51

11 Project design ... 53
11.1 Project page "Project data" ... 53
11.2 Entering project data ... 53
11.3 Upload project images ... 53
11.4 "Advanced project data" area ... 54
11.5 Entering advanced project data ... 54
11.6 Configuring systems with medium voltage ... 54
11.7 With quick planning: entering load profile details ... 54
11.8 With quick planning: configuring a system ... 55
11.9 Visual roof planning ... 56
11.9.1 Specifying buildings ... 56
11.9.2 Operating the visual roof planning tool ... 56
11.9.3 Defining a building ... 57
11.9.4 Sunny Design Pro: Importing 3D models ... 58
11.9.5 Sunny Design Pro: Exporting 3D models ... 58
11.9.6 Defining restrictions ... 59
11.9.7 Layout of the PV modules ... 59
11.9.8 Positioning PV modules ... 60
11.9.9 Defining the layout of PV modules ... 60
11.9.10 Creating a new electrical design ... 61
11.9.11 Designation of the strings ... 61
11.9.12 Representation of PV modules and strings ... 62
11.9.13 Defining the electrical design ... 62
11.9.14 Changes to existing electrical design ... 62

11.9.15 Editing subarrays ... 63
11.9.16 Manually connecting PV modules to strings ... 63
11.9.17 Connecting the string to the inverter input ... 63
11.9.18 Recalculating strings ... 64
11.9.19 Editing a string ... 64
11.10 Defining load profiles ... 64
11.11 Entering load profile details ... 64
11.12 With off-grid systems: Defining the peak load ... 65
11.13 Adding specific loads ... 65
11.14 Entering e-mobility information ... 65
11.15 For PV hybrid systems: Configuring gensets ... 66
11.16 For PV hybrid systems: Defining design conditions for gensets ... 66
11.17 Defining scenarios ... 66
11.17.1 For energy systems: Entering building details ... 66
11.17.2 For energy systems: Defining thermal energy requirements ... 67
11.18 Energy System ... 67
11.18.1 Structure of Energy System Page ... 67
11.18.2 Status of the system components ... 69
11.18.3 Configuration of utility grid components ... 69
11.18.3.1 Configuring the electrical connection ... 69
11.18.3.2 Adding fuel information ... 69
11.18.4 Configuring energy system components ... 69
11.18.4.1 Editing the building ... 69
11.18.4.2 Configuring the PV System ... 70
11.18.4.3 Configuring the battery system ... 70
11.18.4.4 Planning the Energy Management ... 70
11.18.4.5 Configuring combined heat and power plant (CHP plant) ... 71
11.18.4.6 Configuring heat pump ... 71
11.18.4.7 Configuring the boiler ... 71
11.18.4.8 Strategy for overcrowding of the charging stations ... 72
11.18.4.9 Configuring charging stations ... 72
11.18.5 Configuring loads ... 72
11.18.5.1 Configuring electrical loads ... 72
11.18.5.2 Configuring the heat demand ... 73
11.18.5.3 Sunny Design Pro: Configuring the Cooling Energy Demand ... 73
11.18.5.4 Configuring e-mobility ... 74
11.19 PV systems ... 74
11.19.1 Project page "Configure PV system" ... 74
11.19.2 Configuring a subproject ... 74
11.19.3 "PV arrays" area ... 75
11.19.4 Configuring PV modules ... 75
11.19.5 "Inverter design" area ... 75
11.19.6 Selecting inverters manually ... 76
11.19.7 Selecting inverters from design suggestions ... 76
11.19.8 Calculating automatic design suggestions ... 76
11.19.9 "PV inverter" area ... 77
11.19.10 Add a device for active power limitation ... 77
11.19.11 Configuring off-grid systems with the system assistant ... 77
11.19.12 Configuring PV hybrid systems with the system assistant ... 78
11.19.13 Having design suggestions displayed ... 78
11.19.14 Criteria for sorting the design suggestions ... 79
11.19.15 Setting Criterion for Sorting the Design Suggestions ... 79
11.20 Configuring the battery system ... 80
11.21 With off-grid systems: Configuring a genset ... 80

11.22 "Cable sizing" project page ... 80
11.23 "Determine self-consumption" project page ... 81
11.24 "Planning the energy management" project page ... 82
11.25 Definition of the requirements on the energy system ... 82
11.26 Definition of the requirements on energy management ... 83
11.27 Selecting the communication products for energy management ... 83
11.28 Overview of the communication products used ... 84
11.29 Direct selling order with SMA SPOT ... 84
11.30 Analyzing efficiency ... 85
11.30.1 "Analyze Profitability" project page ... 85
11.30.2 Determining costs with simplified cost entries ... 85
11.30.3 Determining costs with detailed cost entries ... 85
11.30.4 Editing tariffs ... 86
11.30.5 Adjusting financial terms and conditions ... 86
11.30.6 Create quotation ... 87
11.31 For off-grid system: "Analyses of the energy and power in the system" project page ... 87
11.32 "Results" project page ... 87
11.33 With energy systems: Overview of the results ... 88
11.34 With energy systems: "Summary" project page ... 88
11.35 Issuing project documentation ... 89
11.36 Other project files ... 89
11.37 Downloading further project files ... 90
12 Creating a harmonics calculation ... 91
13 Glossary ... 92
14 Contact ... 98

1 Information on this Document

1.1 Validity

This document is valid for:

- "Sunny Design" as of software version 6.0

1.2 Target Group

This document is intended for PV system designers. The PV system designers must have the following skills:

- Knowledge of how an inverter works and is operated
- Knowledge of all applicable laws, standards and directives

1.3 Symbols in the Document

Symbol	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates a requirement for meeting a specific goal
☑	Required result
	Example
	Content applies to PV systems without self-consumption
	Content applies to PV systems with self-consumption
	Content applies to off-grid systems
	Content applies to PV hybrid systems
	Content applies to PV power plants
	Content applies to energy systems

1.4 Typographies in the document

Typography	Use	Example
bold	• Messages • Terminals • Elements on a user interface • Elements to be selected • Elements to be entered	• Connect the insulated conductors to the terminals **X703:1** to **X703:6**. • Enter **10** in the field **Minutes**.

Typography	Use	Example
>	• Connects several elements to be selected	• Go to **Settings > Date**.
[**Button**] [**Key**]	• Button or key to be selected or pressed	• Select [**Enter**].
#	• Placeholder for variable components (e.g., parameter names)	• Parameter **WCtlHz.Hz#**

1.5 Designations in the Document

Complete designation	Designation in this document
Sunny Design Pro	Sunny Design
Sunny Design Web	Sunny Design

1.6 Additional Information

For more information, please go to www.SMA-Solar.com.

Title and information content	Type of information
"Designing PV Plants Optimised for Economic Efficiency"	Technical Information
"Leading Leakage Currents" Information on the Design of Transformerless Inverters	Technical Information
"Grid Connection"	Technical Information
"Performance Ratio"	Technical Information
"Reverse Current"	Technical Information

2 Product overview

2.1 Product Description

Sunny Design is a software for planning and designing PV systems with and without self-consumption, off-grid systems, PV hybrid systems, PV power plants as well as energy systems. Sunny Design provides you with design recommendations for your planned systems. Sunny Design proposes a combination of PV array(s) and inverter(s) which meet, as closely as possible, your requirements regarding power class, energy yield and efficiency.

In addition, you have the option of determining and optimizing your potential self-consumption, sizing cables, evaluating efficiency and, in case of PV hybrid systems and off-grid systems, configuring gensets.

Sunny Design Pro:
Additional access authorization required

You require an additional access authorization for Sunny Design Pro to be able to design an energy system and to use the advanced settings. In the **SUNNY DESIGN PRO** area on your personal home page you will be provided with information and can order access to Sunny Design Pro.

2.2 Functions upon access authorization

Function	Anonymous user Sunny Design	Registered user Sunny Design	Registered user Sunny Design Pro
Creating PV systems without self-consumption option	✓	✓	✓
Creating PV systems with self-consumption option	✓	✓	✓
Creating off-grid systems	–	✓	✓
Creating PV hybrid systems	–	✓	✓
Creating PV power plants	✓	✓	✓
Saving and managing projects	–	✓	✓
Calculating harmonics	–	✓	✓
Creating own PV modules, locations and load profiles	–	✓	✓
Creating energy systems	–	–	✓
Importing and exporting 3D models	–	–	✓
Storage simulation for peak load shaving	–	✓	✓
Managing tariffs	–	–	✓
Consumption and load profile analysis	–	–	✓
Support of SMA 360° documents	–	✓	✓
Using the tool for configuring SMA components	–	–	✓
Advanced project documentation	–	–	✓

Function	Anonymous user Sunny Design	Registered user Sunny Design	Registered user Sunny Design Pro
Project exposé	–	–	✓
Export of time series	–	–	✓

2.3 Project Overview

Using Sunny Design, you can plan and design various project scenarios with all available SMA inverters, considering legal and industrial requirements. The following project types are available in Sunny Design:

	PV system with total power feed-in to grid	PV system that is connected to the utility grid and where self-consumption is not taken into account
	PV system with self-consumption option	PV system that is connected to the utility grid and where self-consumption is taken into account
	Off-grid system	PV system that is not connected to the utility grid
	PV hybrid system	PV system to which electric generators are connected
	Large Scale Energy System	Optimized for the design of PV power plants
	Energy system	Energy system with integrated energy **Information:** This project type is only available with Sunny Design Pro.

2.4 Functions per project type

Depending on the selected project type, Sunny Design provides the following functions:

Function						
Determining the potential fuel and CO2 savings	–	–	–	✓	–	✓
Determining and optimizing self-consumption	–	✓	–	–	–	✓
Enabling direct selling function with SMA Spot	✓	✓	–	–	–	✓
Defining load profile	–	✓	✓	✓	–	✓
Configuring DC Combiners	–	–	–	–	✓	–
Configure Gensets	–	–	✓	✓	–	–
Sizing lines	✓	✓	✓	✓	✓	✓
Planning energy management	✓	✓	–	✓	✓	✓

Function						
Analyzing efficiency	✓	✓	–	✓	✓	✓
Adding prices for PV modules and inverters	✓	✓	✓	✓	✓	✓
Creating project templates with default values	✓	✓	✓	✓	✓	✓
Printing project documentation or saving it as PDF file	✓	✓	✓	✓	✓	✓
Printing extended project documentation or saving it as PDF file	✓	✓	✓	✓	✓	✓
Downloading the project exposé as PPT	–	–	–	–	–	✓
Cross-sectoral view	–	–	–	–	–	✓
Defining e-mobility for known vehicles	–	✓	–	–	–	✓
Defining statistical use of e-mobility	–	–	–	–	–	✓
Enabling Peak Load Shaving	–	✓	–	–	–	✓

2.5 System Requirements

- ☐ A computer with Internet access must be available.
- ☐ JavaScript must be enabled in the web browser.
- ☐ A supported web browser must be installed on the computer.
- ☐ Supported web browsers:
  - Microsoft Edge from version 123
  - Mozilla Firefox from version 123
  - Google Chrome from version 123
  - Opera from version 107
  - Apple Safari from version 17.1

Note that, depending on the performance of your end device, there may be restrictions and longer response times for roof planning.

3 Signing up and starting off

3.1 Signing up for Sunny Design

You require an SMA ID to use Sunny Design. If you already have an SMA ID, you can use it to log into Sunny Design. If you do not yet have an SMA ID, first create an SMA ID.

Procedure:

1. Start your Internet browser.
2. Go to **www.SunnyDesignWeb.com**.
   ☑ The Sunny Design home page opens.
3. Click on **[Sign up now - free of charge]** on the Sunny Design's home page.
   ☑ You will be redirected to the SMA ID home page.
4. If you already have an SMA ID, click on **[Login]**.
5. To create an SMA ID, click on **[Create SMA ID]** and follow the instructions on the screen.

3.2 Starting Sunny Design

Requirement:

☐ You have an SMA ID.

Procedure:

1. Start your Internet browser.
2. Go to **www.SunnyDesignWeb.com**.
   ☑ The Sunny Design home page opens.
3. Log in with your SMA ID in the **Login** window.
4. When you log into Sunny Design for the first time, you must agree to the terms of use and data protection declaration.

4 User Interface

4.1 Design of the personal home page on the user interface

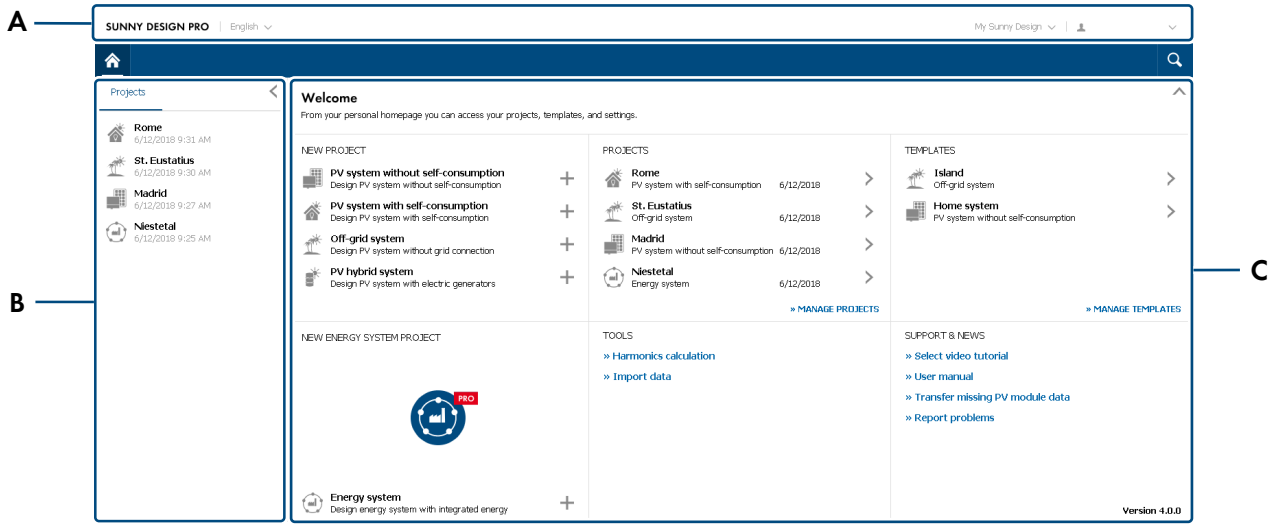


Figure 1: Personal home page in Sunny Design after login (example)

Position	Designation	Explanation
A	Header	The following functions are available here: • Language selection • **[My Sunny Design]** drop-down menu: – Settings regarding location information, information dialogs, units of measurement and temperature – Settings regarding calculating design suggestions, displaying result values, the letterhead on project documentation, efficiency analyses and tariff information Setting made using **My Sunny Design > Settings** will be saved as default settings and preset for new projects. – Creating own PV modules and favorites – Creating own locations – Creating own load profiles – Creating own price lists for inverters – Creating own charging stations – Creating own electric vehicles – Own templates e-mobility – Own customer data – Own cost items and templates – Creating user-defined tariffs **Information:** This function is only available in the Sunny Design Pro version. • **[User name]** menu: – **[Change password]** – **[Logout]**
B	Navigation area	This section contains a list of your planned projects.
C	Workspace	In this section, you have access to your projects, templates and settings. Furthermore, the lower area contains links to information and help.

4.2 Design of the project pages

The project pages are displayed after you have selected a project on the home page. You plan your project on the project pages.

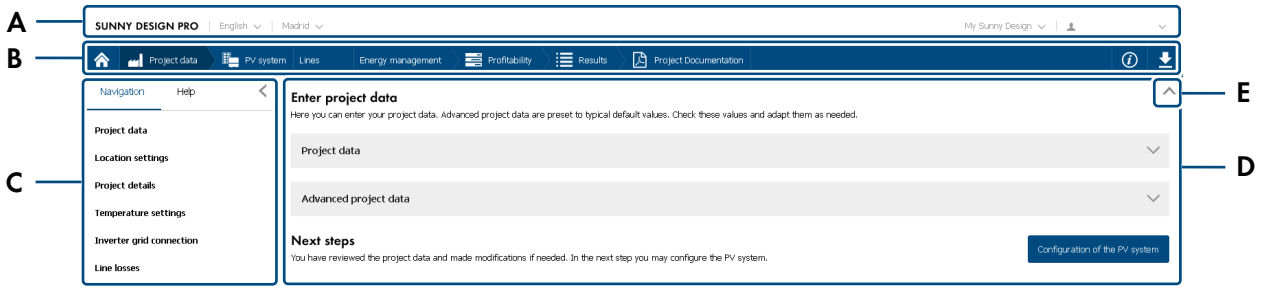


Figure 2: Project page **Enter project data** (example)

Position	Designation	Explanation
A	Header	• General functions (see Section 4.1, page 15) • Additional functions on the project pages: – **[Project name]** – Add alternative: Creating and comparing alternatives Sunny Design Pro: Comparing projects
B	Main navigation	Using this navigation, you can go to the project planning pages in the workspace section. The main navigation shows the steps for planning a project. Using the main navigation, you can click on the individual menu items if all previous steps have been executed. On small screens, the menu items are aggregated and the button ⌄ is shown. Using this button, you can hide and display the menu items.
C	Navigation Area	The entire navigation area is automatically hidden on smaller screens. The button › will appear. Using this button, you can then hide or display the entire navigation area. • **Navigation** In the **Navigation** tab, you can switch between sections on the page currently displayed. In this section, you can switch between Detailed planning and Quick planning during the planning of your project. You can use the Quick planning mode for the simplified configuration of components. In the detailed planning mode, you can provide all components with detailed information. The load profile, PV systems, cables, self-consumption and energy management can be configured on seperate pages.

Position	Designation	Explanation
D	Workspace	In this section, the content of the page currently selected in the main navigation is displayed. Here you can plan your project and make settings for the project. The eManual can opened via ⓘ. • **Next steps** At the end of each page in the workspace section, the next possible steps are displayed under **Next steps**. The buttons in this section can only be selected if you have made the necessary settings on the current page.
E	-	Button to hide and display header and main navigation

4.3 Design of the protect tree

The project tree in the navigation area displays important project information, provides quick access to functions and enables navigation between individual elements of the project.

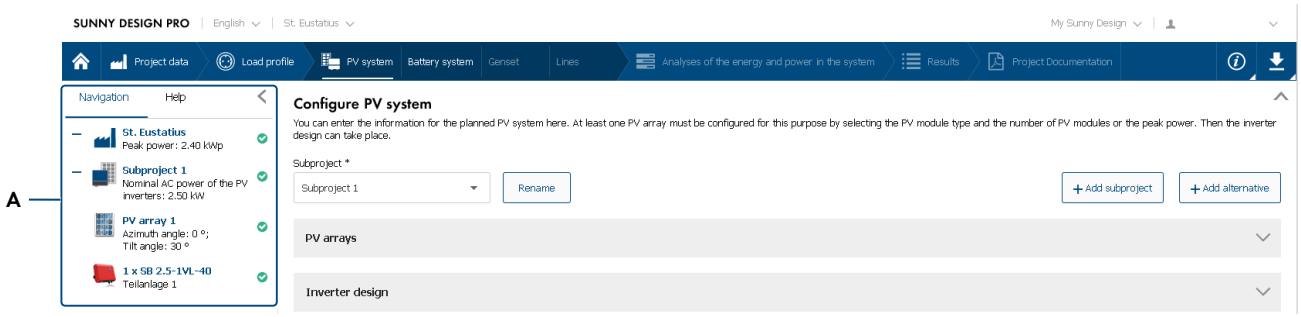


Figure 3: Project tree (example)

Position	Designation	Explanation
A	Navigation Area	On the project page **Configure PV System**, the planned PV system is displayed in the navigation area in the form of a project tree. If you click on an element in the project tree, a menu is displayed where you can rename, delete or duplicate the element, for example. You can also cut elements from a subproject and add them to a different subproject.

5 General Operation

5.1 Changing the Password

Requirements:

☐ You must be logged in to Sunny Design.

Procedure:

1. In the menu **[User name]** click on the button **[Change password]**.
   ☑ You will be redirected to the SMA ID home page.
2. Select **[Log in]** on the website of the SMA ID.
   ☑ A login screen for SMA ID opens.
3. Click on **[Forgot password?]** and follow the instructions on the screen.

5.2 Exiting Sunny Design

- In the header, select **[User name] > Logout**.

5.3 Calling up Support

1. On your personal home page in the **SUPPORT & NEWS** area, select the option **Help & support**.
   ☑ The SMA Online Service Center website will open.
2. Enter your chosen search term in the search field.
3. To create your own service requests, register for the SMA Online Service Center.

6 "My Sunny Design" menu

6.1 General Settings

In the menu **My Sunny Design > Settings > General**, you can make the following settings. These settings are later used for future projects.

- Select project type
- Selection whether the project should be started in Quick planning or Detailed planning mode.
- Region, country and city of the planned project
- Linear measures, temperature units and decimal separator used
- PV modules used and certification of PV modules used
- Visibility of projects and templates on your personal home page

6.2 Making general settings

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open. The **General** menu is already open.
2. Make your settings in the areas **Specifications for new projects** and **Units**.
3. To change the default setting of PV modules, select the magnifying glass icon under **PV module**.
   Note: You can add further PV modules using the **Add new PV module** button.
4. Click on the PV module you want and select **[Apply PV module]** in the context menu.
5. To change the required PV module certification, choose between the buttons [**EU**], [**EU+UL**] and [**UL**] in the **Certification** area.
6. To display deactivated messages again, click on the button **[Display deactivated messages again]** in the **Information dialog** area.
7. To hide projects and templates on your personal home page, enable the checkbox **Hide projects and templates on home page** under **Visibility of projects**.

6.3 Making string design settings

In the menu **My Sunny Design > Settings > String design** you can make settings for the preferred string orientation, the starting point for the string plan, and the string/module identification.

Procedure:

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open.
2. Select the **String design** menu.
3. Make the desired settings in the areas **Preferred conductor pathway**, **Starting point for the string plan** and **String / module identification**.
4. To have the optimum string orientation determined and to adopt this recommendation, select **Automatically determine optimum string orientation and starting point**.

6.4 Design settings

In the menu **My Sunny Design > Settings > Design**, you can make the following settings:

- Selection whether the nominal power ratio or dimensioning factor is used for calculation
- Method for calculating suggested designs
- Determination of the portion of the costs of the inverters in the total investment costs
- Minimum cross-section for cable sizing

- Settings for the inverter used: SMA product type, specific properties and restrictions in terms of use

6.5 Make settings for the design

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open.
2. Select the **Design** menu.
3. To change the power ratio used, select the ratio you want under **Power ratio used**.
4. If necessary, under **Calculating and assessing suggested designs**, select the required method from the drop-down list **Method for calculating suggested designs**.
5. If necessary, under **Calculating and assessing suggested designs**, set the portion of inverters in the total investment costs in the field **Portion of the inverters on the investment costs**. The portion can be between 0% and 20%.
6. To change the minimum cross-section for cable sizing, make the required settings under **Minimum cross-section for cable sizing**.
7. To adjust the inverter filter settings, adjust the settings for the design recommendation under **Setpoint for inverter filter**.

6.6 Making settings for results values

You can specify which result values should be displayed and specify the order in which they are displayed in the project information display, in the overview and in the output documents.

Procedure:

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open.
2. Select the menu **Result values**.
3. To define which result values are to be shown, enable or disable the checkbox of the respective result value.
4. If required, adjust the order of the result values using the arrows.

6.7 Making settings for the letterhead

You can specify what data is to be shown on the title page of the output documentation.

Procedure:

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open.
2. Select the menu **Letterhead**.
3. Under **Letterhead** and **Additional information (telephone, fax)**, fill out the relevant information.
4. To add a logo, enable the checkbox **Logo** and upload a logo by clicking on the button [**Select logo**].
   Supported file formats: .bmp, .gif, .jpg, .png

6.8 Settings for the profitability analysis

You can define the following settings for the profitability analysis:

- General settings:
  - Currency used
  - Equity ratio of investment costs
  - Analysis period of profitability
  - Credit period

  - Specific investment costs of the turnkey PV system
  - Interest rate
  - Imputed rate of interest
  - Inflation rate
- Settings for PV projects:
  - Grant amount
  - Annual fixed costs
- Settings for PV hybrid projects:
  - OpEx
  - Effective fuel costs
  - Annual increase in fuel costs
  - Inverter portion of costs

6.9 Defining settings for the profitability analysis

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open.
2. Select the menu **Profitability**.
3. Change the information with regard to the project.

6.10 PV systems with self-consumption: Defining tariff information

You can make settings regarding the basic electricity tariff and the special electricity tariff for PV systems with self-consumption.

Procedure:

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open.
2. Select the menu **Tariff information**.
3. Adjust the settings for the basic electricity tariff in the **Basic electricity tariff** area.
4. Adjust the settings for the special electricity tariff in the **Special electricity tariff** area.
5. To take a special electricity tariff into account, enable the checkbox **[Take this special tariff into account]**. Several special electricity tariffs can be enabled.

6.11 Creating texts for quotations

In the menu **My Sunny Design > Settings > Quotations**, you can enter the standard texts for the tendering and conclusion of quotations. In addition to the customer's address and the information from the profitability analysis, the texts are added to the quotation and cannot be adapted subsequently for the individual quotations.

Procedure:

1. In the header, open the menu **My Sunny Design > Settings**.
   ☑ The **Settings** window will open.
2. Select the menu **Quotations**.
3. Enter the desired tendering text of the quotation in the tab **Introduction text**. There are several formatting options here.
4. Enter the desired concluding text on the page **Concluding text**. There are several formatting options here.

6.12 Manage teams

In the **My Sunny Design > My teams** menu, you can create one or more planning teams and invite other Sunny Design users to join. Within the team, projects can be collaboratively viewed and edited. Each team member can individually assign permissions for their own projects.

Procedure:

1. In the header, open the menu **My Sunny Design > My teams**.
   ☑ The **Manage teams** window will open.
2. Select + **New team**.
   ☑ The **Create team** window will open.
3. You can enter the team name and description, and select **[OK]**.
4. Roles and permissions, workspaces, and access management can be configured within teams.

6.13 Creation and administration of own PV modules

6.13.1 Creating a new PV module without template

1. In the header, select the menu **My Sunny Design > Own PV modules**.
   ☑ The **Own PV modules** window opens.
2. Click on the button **[Add new PV module]**.
3. Enter the manufacturer in the field **Manufacturer**.
4. Enter the PV module name in the field **PV module**.
5. If the PV module is discontinued, disable the checkbox **Current PV module**.
6. Select the cell technology from the drop-down list **Cell technology**.
7. Select the recommended grounding from the drop-down list **Grounding recommendation**.
8. Activate the available certification in the **Certification** area.
9. Enter the values of the PV module in the **Required data** area.
10. If required, open the **Supplementary data** are to enter further values.
11. Click on **[Save PV module]**.

6.13.2 Creating a new PV module with template

1. In the header, select the menu **My Sunny Design > Own PV modules**.
   ☑ The **Own PV modules** window opens.
2. Click on the button **[Add new PV module]**.
   ☑ The **New PV module** window will open.
3. Click on the button **[Select PV module]**.
   ☑ The **PV module selection** window will open.
4. In the drop-down lists **Manufacturer** and **PV module**, select the PV module you want and then click on **[Apply template]**.
   or
   Click on the magnifying glass icon and select the desired PV module in the dialog box **Find PV modules** and then click on **[Apply PV module]** in the context menu.
5. In the dialog box **New PV module**, make the desired changes and click on [**Save PV module**].

6.13.3 Editing or deleting PV modules

1. In the header, select the menu **My Sunny Design > Own PV modules**.
   ☑ The **Own PV modules** dialog box opens.
2. Select the desired PV module.
3. To edit the PV module, click on **[Edit]** in the context menu and make the desired changes, and then click on **[Save PV module]**.
4. To delete the PV module, click on **[Delete]** in the context menu and confirm the security prompt with **[Yes]**.

6.13.4 Adding a PV module to favorites

1. In the header, select the menu **My Sunny Design > PV module favorites**.
   ☑ The **PV module favorites** dialog box will open.
2. Click on [**Add to favorites**].
   ☑ The **Find PV modules** dialog box will open.
3. To limit the selection of PV modules, use the free text search or provide the relevant information in the **Search options** area.
4. Select the desired PV module and click on **[Add to favorites]** in the context menu.

6.14 Managing your own locations

In the menu **My Sunny Design > Own locations**, you can add new locations, edit locations and delete them. Locations used in the project are used for selection of meteorological data on the page **Project data**.

Procedure:

1. In the header, select the menu **My Sunny Design > Own locations**.
   ☑ The **Own locations** window will open.
2. Select the desired location.
3. To delete a location, click on **[Delete]**.
4. To edit a location, click on **[Edit]**.
5. Make the required settings and click on **[Save location]**.

6.15 Creation and administration of own load profiles

6.15.1 Administration of own load profiles

In the menu **My Sunny Design > Own load profiles**, you can create and manage your own load profiles for determining the self-consumption. To create your own load profile, you can import your own consumption data, import consumption data from Sunny Portal, and create consumption data manually.

6.15.2 Requirements on your own consumption data

If you want to import your own consumption data for the load profile, the data must meet the following requirements:

- The data series begins on January 1 at 00:00 a.m.
- The values cover a complete year (365 days or a leap year with 366 days) or an entire week (7 days). If the values cover 7 days, a complete year is created from this data.
- The values have a time interval of 5, 10, 15, 30 or 60 minutes.
- The power or energy values are positive and indicated in the following units: W, kW, Wh or kWh.
- All values are in the first column.
- Either a period (.) or a comma (,) is used as decimal separator.

- The data is in CSV format (.csv).

6.15.3 Example of your own consumption data

An excerpt from a CSV file containing data of one year (365 days) with a time interval of 15 minute:

	A	B
1	86,8934325	
2	78,152673	
3	70,5687788	
4	64,1417497	
5	59,3857482	
6	56,0436931	
7	53,8585033	
8	52,4445569	
9	51,5447728	
10	50,9020699	
35038	117,361203	
35039	107,342563	
35040	97,4540363	
35041		
35042		

6.15.4 Importing Own Consumption Data

1. In the header, select the menu **My Sunny Design > Own load profiles**, and in the window **Own load profiles**, click on the button **[Add new load profile]**.
   or
   In an open project, on the page **Define load profile**, click on the button [**Add new load profile**].
   ☑ The **New load profile** dialog box will open.
2. Under **Name**, enter a name for the load profile.
3. If required, enter a description for the load profile under **Description**.
4. If not yet enabled, enable the field **Import consumption data**.
5. Make the settings in the area **Import consumption data**. These settings are mandatory.
   Note: The setting **First day of the year** is needed for the efficiency analysis.
6. Select **[Import consumption data]**.
   ☑ A window for uploading files will open.
7. Select the file containing the consumption data to be imported and click on **[Open]**.
   ☑ A message confirming that the import was successful will be displayed. The calculated energy consumption per year will be displayed automatically in the field **Default setting "annual energy consumption"**.
8. If a message is displayed stating that the import failed, an error has occurred.
   ☑ Click on [**Details**] and read the message.
9. If the number of data points is not consistent, check the settings for **Number of days** and **Time interval** and change these so that the expected number of data points corresponds to the number of data points found in the file.
10. If the consumption data in the file is not in the first column or if there is data in the other columns, open a spreadsheet program (e.g., Excel), copy the consumption data series, insert it into a new document in the first column, save as a CSV file and then repeat the import procedure.
11. Select [**Save load profile**].

6.15.5 Importing Consumption Data from Sunny Portal

You can import consumption data from a PV system of Sunny Portal if you have access to a PV system in Sunny Portal using the e-mail address with which you log into Sunny Design.

Procedure:

1. In the header, select the menu **My Sunny Design > Own load profiles**, and in the window **Own load profiles**, click on the button **[Add new load profile]**.
   or
   In an open project, on the page **Define load profile**, click on the button [**Add new load profile**].
   ☑ The **New load profile** dialog box will open.
2. Under **Name**, enter a name for the load profile.
3. If required, enter a description for the load profile under **Description**.
4. Enter the annual energy consumption in the field **Default setting "annual energy consumption"**.
5. Select [**Consumption data from Sunny Portal**].
   ☑ The **Login** window will open. Log in using your Sunny Portal access data.
6. Select the required Sunny Portal system from the drop-down list **Sunny Portal system**.
7. Select the time period from which the data is to be imported from the drop-down list **Time period**. You can chose whether the last twelve months (365 days retroactively from the previous day at 12 p.m.) are to be imported or the entire previous calendar year from January to December.
8. Select **[Import consumption data]**.
   ☑ A message confirming that the import was successful will be displayed. The calculated energy consumption per year will be displayed automatically in the field **Default setting "annual energy consumption"**.
9. If a message is displayed stating that the import failed, it may be that no consumption data or insufficient data is available for the selected Sunny Portal system.
10. Select a different Sunny Portal system from the drop-down list **Sunny Portal system**, and then select [**Import consumption data**].

6.15.6 Creating consumption data manually

1. In the header, select the menu **My Sunny Design > Own load profiles**, and in the window **Own load profiles**, click on the button **[Add new load profile]**.
   or
   In an open project, on the page **Define load profile**, click on the button [**Add new load profile**].
   ☑ The **New load profile** dialog box will open.
2. Under **Name**, enter a name for the load profile.
3. If required, enter a description for the load profile under **Description**.
4. Enter the annual energy consumption in the field **Default setting "annual energy consumption"**.
5. Select **[Create consumption data]**.
6. If required, adjust the data on the seasons under **Breakdown of seasons into months**. To do this, select the dates for the beginning and end of summer and winter.
7. Create the required number of daily load profiles and assign to the different seasons.
8. Select [**Save load profile**].

6.15.7 Deleting a load profile

Prerequisite:

☐ The load profile to be deleted must not be in use in any current projects. An error message is displayed if the load profile is used in a project.

Procedure:

1. In the header, select the menu **My Sunny Design > Own load profiles**.
   ☑ The **Own load profiles** window will open.
2. Select the load profile that is to be deleted.
3. Select **[Delete]** and confirm the security prompt with **[Yes]**.

6.16 Managing the prices for PV modules and inverters

6.16.1 Entering Prices for PV Modules

You can enter prices for PV modules. If you use a price-tagged PV module in the project, the price of the PV module is adopted as the default setting for the efficiency analysis. Prices for PV modules can either be entered in the menu **My Sunny Design > Own PV modules** or while designing a project on the page **Configure PV system**.

6.16.2 Entering prices for PV modules in the My Sunny Design menu

1. In the header, select the menu **My Sunny Design > Own PV modules**.
   ☑ The **Own PV modules** dialog box opens.
2. Select the desired PV module select **[Edit]** in the context menu.
   ☑ The **New PV module** dialog box will open.
3. Open the **Supplementary data** area.
4. Enter the price in the field **Price per PV module**.

6.16.3 Entering prices for PV modules via the Configure PV system page

Prerequisite:

☐ You must have opened a project and planned it up to the page **Configure PV system**.

Procedure:

1. On the page **Configure PV system**, open the magnifying glass icon in the **PV arrays** area.
   ☑ The **Find PV modules** dialog box will open.
2. Select the desired PV module.
3. In the context menu, select **[Edit price]** and make the desired settings.

6.16.4 Entering Prices for Inverters

You can enter the prices for inverters in the menu **My Sunny Design > Own price list**. If you use an inverter in the project, the price of the inverter is adopted as the default setting for the efficiency analysis.

Procedure:

1. In the header, select the menu **My Sunny Design > Own price list**.
   ☑ The **Own price list** dialog box will open.
2. To limit the selection of inverters, select the enable the desired checkboxes in the **Limit products** area.
3. Select the desired inverter.
   ☑ The **Change price** dialog box will open.
4. Enter the price.
5. Click on **[OK]**.

6.17 Managing your own charging stations

You can also create and manage your own charging stations in addition to the already defined charging stations in the menu **My Sunny Design > Own charging stations**. You can use these charging stations while configuring the e-mobility section.

When you configure a new charging station during the design of a project, this will also be saved under **Own charging stations** and can be managed there.

Procedure:

1. In the header, select the menu **My Sunny Design > Own charging stations**.
   ☑ The **Own charging station** dialog box will open.
2. To add a new charging station, select **[Add new charging stations]**.
   ☑ The **Charging stations** dialog box will open.
3. Make the desired settings and click on **[OK]**.
4. To edit an existing charging station, left-click on the desired charging station, open the context menu via left-click, select **Edit**, and adjust the respective settings in the **Charging stations** dialog box.
5. To delete an existing charging station, select the desired charging station, open the context menu via left-click select **Delete**.

6.18 Managing your own electric vehicles

You can create and manage your own electric vehicles aside the already defined ones. You can use these electric vehicles while configuring the e-mobility section.

When you configure a new electric vehicle during the design of a project, this will also be saved under **Own electric vehicles** and can be managed there.

Procedure:

1. In the header, select the menu **My Sunny Design > Own electric vehicles**.
   ☑ The **Own electric vehicles** window will open.
2. To add a new electric vehicle, click on the button **[Add new electric vehicle]**.
   ☑ The **Electric vehicle** dialog box will open.
3. Make the desired settings and click on **[OK]**.
4. To edit an existing electric vehicle, select the desired electric vehicle, open the context menu via left-click, select **Edit** and edit the respective settings in the **Electric vehicle** dialog box.
5. To delete an existing electric vehicle, select the desired electric vehicle, open the context menu via left-click, and select **Delete**.

6.19 Deleting User-Defined E-Mobility Templates

In the menu **My Sunny Design > Own templates e-mobility**, you are given an overview of your e-mobility templates and, if desired, delete the templates.

Procedure:

1. In the header, open the menu **My Sunny Design > Own templates e-mobility**.
   ☑ The **Own templates e-mobility** dialog box will open. Here, you can see an overview of the e-mobility templates that you have created.
2. Select the templates to be deleted and click on **Delete** in the context menu.
3. Click on **Yes** to delete the template.

6.20 Creation and administration of own customer data

6.20.1 Administration of own customer data

In the menu **My Sunny Design > Own customer data**, you can search for already created customer data, edit it and delete it, send e-mails to customers and assign customers to a project. Furthermore, you can create new customer data here and import customer data from vCards.

6.20.2 Editing own customer data

You can edit customer data in the menu **My Sunny Design > Own customer data** or in an open project.

Procedure:

1. To edit customer data via the **My Sunny Design** menu, select **My Sunny Design > Own customer data** in the header.
2. To search for customer data by name or address, enter the desired text in the field **Search term**. Here, You can also search for parts of the name or address.
3. To search via the surname, company or customer location, enter the desired text in the respective field and confirm via the enter key.
4. To edit customer data, select the customer in the results list, open the context menu via left-click and select **Open customer**.
   ☑ The **Customer data** dialog box will open.
5. Make the desired changes and select **[OK]**.
6. To delete customer data, open the context menu via left-click and select **Delete customer**.

6.20.3 Creating own customer data

1. In the header, select the menu **My Sunny Design > Own customer data**.
2. Select **[+ new customer]**.
   ☑ The **Customer data** dialog box will open.
3. Enter the customer data.
4. Select **OK**.

6.20.4 Importing customer data via vCards

You have the option of importing customer data into Sunny Design via vCards. vCards are electronic business cards.

Prerequisite:

☐ The vCards to be imported must be in the ".vCard" file format.

Procedure:

1. In the header, select the menu **My Sunny Design > Own customer data**.
2. Select **[Import vCard]**.
   ☑ A window for selecting a file will open.
3. Select a file and click on **open**.
   ☑ The customer data set will be created.

6.21 Creation and administration of own cost items and templates

6.21.1 Creating and managing own cost items and templates

In the menu **My Sunny Design > Own cost items and templates**, you can create, edit and delete recurring cost items to effectively manage projects. To avoid unintentional changes to existing templates and projects, deleted cost items are stored in templates and profitability calculations even after deletion.

Procedure:

1. In the header, select the menu **My Sunny Design > Own cost items and templates**.
   ☑ The **Own cost items and templates** dialog box will open.
2. Select the **Cost items** tab.
3. To create a new cost item, click on [**Add new cost item**].
   ☑ The **Cost item** dialog box will open.
4. Make the entries and save by clicking on **[OK]**.
5. To edit existing cost items, open the context menu via left-click, select **[Edit]** and edit the entries.
6. If cost items are to be included automatically for detailed cost entry, enable the option **Default setting**.
7. To delete existing cost positions, open the context menu via left-click and select **Delete**.

6.21.2 Creating and managing own templates

In the menu **My Sunny Design > Own cost items and templates**, you can create your own templates from the defined cost items. These templates can be used for efficiency analysis.

Procedure:

1. In the header, select the menu **My Sunny Design > Own cost items and templates**.
   ☑ The **Own cost items and templates** dialog box will open.
2. Select the **Templates** tab.
3. To create a new template, select **[Add new template]**.
   ☑ The **Cost item** dialog box will open.
4. Enter the name of the template.
5. Select the required cost items one after the other and add them to the template by clicking on **[+]**.
6. To change the sequence of cost items in a category, select a cost item of the category to be changed and move it in the list by clicking on the appropriate buttons.
7. To remove cost items from the template again, select the respective cost item and remove it from the template by clicking on **[-]**.
8. Click on **[OK]** to save the template.
9. To edit existing templates, open the context menu via left-click, select **Edit** and edit the entries.
10. To delete existing templates, open the context menu via left-click and select **Delete**.

6.22 Sunny Design Pro: Creating and managing user-defined tariffs

6.22.1 Sunny Design Pro: User-designed tariffs

In the menu **My Sunny Design > User-defined tariffs** You can create and manage your own grid feed-in tariffs and purchasing tariffs.

6.22.2 Sunny Design Pro: Adding a purchasing tariff

If you add a purchasing tariff, you can select this tariff for calculating energy purchase costs or energy consumption.

Procedure:

1. In the header, select the menu **My Sunny Design > User-defined tariffs**.
   ☑ The **User-defined tariffs** dialog box will open.
2. Click on [**Add a new purchasing tariff**].
   ☑ The **Purchasing tariff** dialog box will open.
3. To use a template, click on [**Select template**] and select the desired tariff in the drop-down list and click on [**Select template**].
4. Enter the desired name in the **Name** field.
5. In the **Currency** drop-down list, select the desired currency.
6. In the **Energy carrier** drop-down list, select the energy carrier.
7. If desired, enter a description in the **Description** field.
8. In the **Accounting period** drop-down list, select the desired accounting period. With peak load prices, the accounting period has an impact on the cost-relevant monthly and annual peak load values.
9. Enter the desired values in the fields **Proportion of the renewable energy**, **CO2 emission factor** and **Annual rate of price increases**.
10. In the **Basic tariff** area, enter the **Energy charge** and **Demand charge** prices.
11. To add a tariff module, click on **[Add tariff module]**.
12. Select the desired module type in the **Module type** drop-down list and click on **[Use module]**.
    ☑ The **Select module type** dialog box will open.
13. Enter the desired value in the dialog box of the selected module type and click on **[Use module]**.
14. Click on [**Save tariff**].

6.22.3 Sunny Design Pro: Adding a new feed-in tariff

1. In the header, select the menu **My Sunny Design > User-defined tariffs**.
   ☑ The **User-defined tariffs** dialog box will open.
2. Click on **[Add a new feed-in tariff]**.
   ☑ The **Feed-in tariff** dialog box will open.
3. To use a template, click on [**Select template**] and select the desired tariff in the drop-down list and click on [**Select template**].
4. Enter the desired name in the **Name** field.
5. In the **Currency** drop-down list, select the desired currency.
6. In the **Energy carrier** drop-down list, select the energy carrier.
7. If desired, enter a description in the **Description** field.
8. If desired, enter a CO_2 credit.
9. In the **Accounting period** drop-down list, select the desired accounting period.
10. In the **Basic tariff** area, select the feed-in tariff model you require from the "Feed-in tariff (reimbursement) model" drop-down list.
11. Enter the desired values in the fields **Feed-in tariff / selling price**, **Duration of feed-in tariff**, **Selling price on expiry of the feed-in tariff**, **Levy (-) or feed-in tariff (+) of self-consumption and fixed cost**.
12. Select the required reference value from the drop-down list **Reference value**.
13. Click on [**Save tariff**].

7 Sunny Design Pro

7.1 Testing Sunny Design Pro

You can try out Sunny Design Pro free of charge for 30 days. You will receive a message when you log on in Sunny Design before the Sunny Design Pro test phase expires.

Access to Sunny Design Pro will be blocked once the test phase expires. You will then no longer have access to the energy system projects. These projects will not be deleted and can be edited again as soon as you are signed back up to Sunny Design Pro.

Procedure:

1. On your personal home page in the area **SUNNY DESIGN PRO**, select the option **Test it now**.
   ☑ A window with information on how to proceed further will open.
2. Follow the on-screen instructions.

☑ The test access to Sunny Design Pro will be enabled for 30 days.

7.2 Entering the Sunny Design Pro activation key

Once you have an activation key for Sunny Design Pro, you will have free access to Sunny Design Pro. This access is subject to a time limit.

Procedure:

1. On your personal home page in the **SUPPORT & NEWS** area, click on the option **Enter activation key**.
   ☑ The **Sunny Design Pro activation key** dialog box will open.
2. Enter the activation key.
3. Click on **[Activation]**.

☑ Your access to Sunny Design Pro will be enabled.

7.3 Ordering Sunny Design Pro

1. On your personal home page in the area **SUNNY DESIGN PRO**, select the button **[Order now]**.
2. Follow the on-screen instructions.

8 Managing project data

8.1 Uploading SMA 360° documents

In the SMA 360° app, additional project information can be used. You can upload the required files in Sunny Design so that it can be used by the app. You can upload up to 6 PDF documents with maximum of 3 MB.

Procedure:

1. In your personal home page in the **Tools** area, click on the option **SMA 360° documents**.
   ☑ The **SMA 360° documents** dialog box will open.
2. Select **[+ New document]**.
3. In the field **Name**, enter the name under which the document should be displayed in the app.
4. Click on **[Import]** and select the location of the file to be uploaded.
5. Click on **[OK]** to upload the file.

8.2 Importing project data into Sunny Design

You can import your own PV modules and locations as well as project data of other users into Sunny Design. The relevant data must first be saved in the database files.

Information: Own locations and own PV modules are automatically designated with a * symbol in Sunny Design.

Requirements:

☐ The database file must not have been imported into Sunny Design previously.

☐ The database file must be available in one of the following file formats:

- Project files: ".sdpa", ".sdp2", ".sdp3"
- Own PV modules and own locations: ".sdud"

☐ The country of the location to be imported must be available in the country list.

8.3 Importing project data

1. On your personal home page in the **Tools** area, click on the button **[Import data]**.
   ☑ The **Import data** window will open.
2. Drag the required files into the file selection window or click the **[Select files]** button.

☑ The data of the selected database file will be imported and information on the number of imported data records will be displayed. If the database already has an own PV module with the same name as the own PV module to be imported, Sunny Design adds a sequential number to the file name of the PV module that has been imported. If the selected database file cannot be imported, it is possible that the requirements on the database file have not been met.

8.4 Transferring missing PV module data

To have missing PV modules included in Sunny Design, you can transmit the product datasheet of the manufacturer to SMA Solar Technology AG. The data of the PV module will be added in Sunny Design with the next database update.

Procedure:

1. On your personal home page in the **SUPPORT & NEWS** area, click on the option **Transfer missing PV module data**.
   ☑ An e-mail will open.
2. Complete the e-mail, attach the datasheet and send the e-mail.

8.5 Sunny Design Pro: Exporting time series

To analyze simulated data, you can export the generated time series as CSV files.

Prerequisite:

☐ You must have a project open.

Procedure:

1. In the header of the open project, select .
2. In the drop-down menu, select **[Export time series]**.
   ☑ The **Export time series** dialog box will open.
3. Select the required time series for export.
4. Click on **[Export]** to export the time series.

☑ The time series will be saved in the directory defined in your web browser.

8.6 Sunny Design Pro: Using tools for configuring SMA components

PV systems starting at a maximum active power of 135 kW AC must observe the Technical Application Rule AR-N 4110 of the VDE/FNN in Germany. If you have access to Sunny Design Pro, you can use Excel tools for configuring SMA components.

Procedure:

1. On your personal home page in the **Tools** area, select the option **Tool for parameterization as per VDE AR-N 4110**.
   ☑ The **Tool for parameterization as per VDE AR-N 4110** dialog box will open.
2. Select the desired configuration tool.
   ☑ The Excel file will be downloaded.
3. To use the tool for configuration, open the Excel file.

9 Creating and managing projects

9.1 Quick planning and detailed planning




To configure your project, you can choose between Quick planning and Detailed planning. In the menu **My Sunny Design > Settings**, you can specify the default planning mode with which each project should be started.

You can use the Quick planning mode for the simplified configuration of components. When you create a new project, you can enter the project data and define the load profile on the **Project data** page. You can configure PV arrays, PV inverters, battery systems for PV systems with self-consumption as well as energy management in the Quick planning area on the **Configure system** page. You can switch from quick planning to detailed planning at any time. You will find the button **Detailed Planning** in the navigation area.

In the detailed planning mode, you can provide all components with detailed information. The load profile, PV systems, cables, self-consumption and energy management can be configured on seperate pages. You can switch to Quick planning as long as no new subproject, alternative or 2nd load profile has been created in Detailed planning, or a heat pump, e-mobility or direct selling have not been selected. You will find the button Detailed Planning in the navigation area.

9.2 Creating a new project

1. On your personal home page in the **New project** area, select the desired project type.
   ☑ The **Enter project data** page will open.
2. Create a project step by step.

9.3 Managing Existing Projects

1. On your personal home page in the **Projects** area, click on the **Manage projects** option.
   ☑ The **Manage projects** page will open.
2. There are various search fields available on the left-hand side enabling you to search for specific projects.
3. To edit the status of a project, select the current status from the **Project status** drop-down list in the desired project.
4. To open an individual project, duplicate it, rename it, export it, save it as a template, delete it or to assign it to a customer, click on the desired project and select the desired option in the context menu.
5. To delete, export or zip several projects, highlight the desired projects in the checkboxes of the first column and select the desired option at the top.

9.4 Opening an Existing Project

You can open projects that you have already created and want to plan further via your personal home page or via the project management function.

Procedure:

- To open a project via your personal home page, either select the desired project in the **Projects** drop-down list on the left-hand side.
  or
  Select the desired project in the **Projects** area.
- To open a project via the project management function, on your personal home page in the **Projects** area, select the **Manage projects** option, select the desired project, open the context menu via left-click and click on **Open**.

9.5 Managing Projects with Your Team

Once you have created one or more planning teams, you can invite other Sunny Design users.
Information: Sunny Design users receive the invitation directly via Sunny Design, not via a separate e-mail. Each team member can individually assign the three permission levels for their own projects.

- Display project list
- Open projects
- Edit projects

Procedure:

1. In the main navigation, select your team.
   ☑ Your team and its associated projects will be displayed.
2. There are various search fields available on the left-hand side enabling you to search for specific projects.
3. To edit the status of a project, select the current status from the **Project status** drop-down list in the desired project.
4. To open an individual project, duplicate it, rename it, export it, save it as a template, delete it or to assign it to a customer, click on the desired project and select the desired option in the context menu.

9.6 Duplicating projects

1. On your personal home page in the **Projects** area, click on the **Manage projects** link.
   ☑ The **Manage projects** page will open.
2. Open the desired project via left-click.
3. In the project context menu, select **Duplicate**.
   ☑ The **Duplicate project** window will open.
4. Enter the required project name in the field **Project name**.
5. Select **[Save copy]**.

9.7 Saving a project as a template

1. On your personal home page in the **Projects** area, click on the **Manage projects** link.
   ☑ The **Manage projects** page will open.
2. Open the desired project via left-click.
3. In the project context menu, select **Save as template**.
   ☑ The **Create project template** window will open.
4. In the **Project template** field, enter the template name.
5. Click on **[OK]**.

9.8 Creating a project from a template

1. On your personal home page in the **Templates** area, click on the desired template.
   or
   On your personal home page in the **Templates** area, click on the **Manage templates** link.
   ☑ The **Manage templates** page will open.
2. Select the preferred template.
3. In the project context menu, select **New project with this template**.
   ☑ The **Create project** window will open.

4. Enter the required project name in the field **Project name**.
5. Click on **[Accept changes]**.

9.9 Exporting a project via the "Manage projects" page



To archive projects, you can export the projects as database files.

1. On your personal home page in the **Projects** area, click on the **Manage projects** link.
   ☑ The **Manage projects** page will open.
2. Select the project to be exported.
3. Click on **[Export (.sdp3)]**.

☑ The project file will be saved under the project name in the download directory of your computer.

9.10 Exporting a project via the main navigation area of a project



1. Open the desired project.
2. In the main navigation area, select and in the drop-down menu, select the option **Save as Sunny Design project file**.

☑ The project file will be saved under the project name in the download directory of your computer.

9.11 Sunny Design Pro: Exporting Polysun projects



With energy-system projects, you also have the option of exporting Polysun project files. These files can be used to continue your design of thermal projects with Polysun of the company Vela Solaris AG.
Information: This function is only available if the project includes thermal components and a simulation has already been performed.

- Open the desired project, select in the main navigation area and, in the drop-down list, select the option **Export Polysun project file**.

9.12 Sunny Design Pro: Comparing projects



It is useful to compare different project scenarios against one another when designing a system. Copy the active project to compare different project scenarios. The copy can be edited and immediately compared with other projects. However, it can also be copied and edited again instead. You can compare several alternatives with each other.

Procedure:

1. Open the desired project.
2. Click on the drop-down list **Add alternative** in the header and select **Add alternative**.
   ☑ A copy is made of the current project named "Alternative 1".
3. Select the desired alternative from the drop-down list (if necessary).
4. To configure the individual system components, select the respective system component.
5. To edit the project design, adjust the required configurations.

6. To add another alternative, open the drop-down list in the header once again. Then click on the **[+]** button beside the project you want to copy.
7. To compare the alternatives, open the drop-down list in the header once again. Then click on the option **Compare alternatives**.
   ☑ An overview opens, showing a tabular comparison of all project alternatives.
8. To adopt the design of an alternative for further planning, click on **[Adopt design]**. A dialog box opens, confirming that the alternative has been adopted.
9. In the following query, select whether the current original is to be adopted as an alternative. If you click on **[Yes]**, the previous original will be renamed as "Alternative *". If you click on **[No]**, the previous original will be deleted.
10. To delete an alternative, click on the trash can icon on the right-hand side, either in the comparison overview or drop-down list.

9.13 Deleting a project

1. On your personal home page in the **Projects** area, click on the **Manage projects** link.
   ☑ The **Manage projects** page will open.
2. Left-click in the context menu to select the desired project and click on **Delete**.
   ☑ A dialog box will open.
3. Confirm the security prompt with **[Yes]**.

10 Procedure for designing projects

10.1 Procedure when designing a PV system with total power feed-in to grid



Procedure		See
1.	Starting Sunny Design	Starting Sunny Design
2.	Creating a new project or opening an existing project	Creating a new projectOpening an Existing Project
3.	Entering project data	Entering project data
4.	Configuring entire system (in quick planning)	With quick planning: configuring a system
5.	Configuring PV system (in detailed planning)	Project page "Configure PV system"
6.	Cable sizing (optional, only in detailed planning)	"Cable sizing" project page
7.	Planning energy management (optional)	"Planning the energy management" project page
8.	Analyzing efficiency (optional)	"Analyze Profitability" project page
9.	Overview of the results	"Results" project page
10.	Creating project documentation.	Issuing project documentation

10.2 Procedure when designing a PV system with self-consumption



Procedure		See
1.	Starting Sunny Design	Starting Sunny Design
2.	Creating a new project or opening an existing project	Creating a new projectOpening an Existing Project
3.	Entering project data	Entering project data
4.	Configuring entire system (in quick planning)	With quick planning: configuring a system
5.	Defining a load profile (in detailed planning)	Entering load profile details
6.	Configuring PV system (in detailed planning)	Project page "Configure PV system"
7.	Cable sizing (optional, only in detailed planning)	"Cable sizing" project page

Procedure		See
8.	Determining self-consumption (optional, only in detailed planning).	"Determine self-consumption" project page
9.	Planning energy management (optional)	"Planning the energy management" project page
10.	Analyzing efficiency (optional)	"Analyze Profitability" project page
11.	Overview of the results	"Results" project page
12.	Creating project documentation.	Issuing project documentation

10.3 Procedure when designing an off-grid system



Procedure		See
1.	Starting Sunny Design	Starting Sunny Design
2.	Creating a new project or opening an existing project	Creating a new projectOpening an Existing Project
3.	Entering project data	Entering project data
4.	Defining a load profile	Entering load profile details
5.	Configuring the PV system	Project page "Configure PV system"
6.	Configuring a battery system (optional)	Configuring the battery system
7.	Configuring a genset (optional)	With off-grid systems: Configuring a genset
8.	Sizing cables (optional)	"Cable sizing" project page
9.	Viewing analysis of the energy and power in the system (optional)	For off-grid system: "Analyses of the energy and power in the system" project page
10.	Overview of the results	"Results" project page
11.	Creating project documentation.	Issuing project documentation

10.4 Procedure when designing a PV hybrid system



Procedure		See
1.	Starting Sunny Design	Starting Sunny Design

Procedure		See
2.	Creating a new project or opening an existing project	Creating a new projectOpening an Existing Project
3.	Entering project data	Entering project data
4.	Defining a load profile	Entering load profile details
5.	Configuring gensets	For PV hybrid systems: Configuring gensets
6.	Configuring the PV system	Project page "Configure PV system"
7.	Sizing cables (optional)	"Cable sizing" project page
8.	Analyzing efficiency (optional)	"Analyze Profitability" project page
9.	Overview of the results	"Results" project page
10.	Creating project documentation.	Issuing project documentation

10.5 Procedure when designing a large-scale energy system



Procedure		See
1.	Starting Sunny Design	Starting Sunny Design
2.	Creating a new project or opening an existing project	Creating a new projectOpening an Existing Project
3.	Entering project data	Entering project data
4.	Configuring the PV system	Project page "Configure PV system"
5.	Sizing cables (optional)	"Cable sizing" project page
6.	Planning energy management (optional)	"Planning the energy management" project page
7.	Analyzing efficiency (optional)	"Analyze Profitability" project page
8.	Overview of the results	"Results" project page
9.	Creating project documentation.	Issuing project documentation

10.6 Procedure when designing an energy system



Procedure		See
1.	Starting Sunny Design	Starting Sunny Design
2.	Creating a new project or opening an existing project	Creating a new projectOpening an Existing Project
3.	Entering project data	Entering project data
4.	Defining scenario	For energy systems: Entering building detailsFor energy systems: Defining thermal energy requirements
5.	Configuring energy system	Structure of Energy System Page
6.	Overview of the results	With energy systems: Overview of the results
7.	Viewing summary	With energy systems: "Summary" project page
8.	Creating project documentation.	Issuing project documentation

10.7 Special Battery Applications

10.7.1 Optimizing Self-Consumption through Storage of PV Energy

To increase self-consumption and to be as independent as possible from the utility grid, the excess PV energy produced in projects with self-consumption and in energy system projects can be stored in batteries for later use.

Prerequisites:

- For projects with self-consumption:
  - You have opened a project and planned it up to the project page **Determine self-consumption**.
- For energy system projects:
  - You have opened a project and planned it up to the project page **Energy system**.
  - On the project page **Define scenario**, the **Battery system** option has been enabled in the **System components** area.

Procedure:

1. For projects with self-consumption: on the **Determine self-consumption** page, enable the option **Intermediate storage of excess PV energy**.
2. For energy systems: on the **Energy system** page, click on the button **Battery system** and ensure that, the option **Self-consumption increase** is enabled in the **Application** drop-down list.

10.7.2 Activating Peak Load Shaving

With the "Peak load shaving" function, you can optimize the behavior of the battery inverter with respect to the power exchange at the grid point of interconnection. This is useful when a higher supply of power and energy would lead to a higher electricity cost. With the "Peak Load Shaving" function, certain grid-exchange power outputs to which the battery inverter is adjusted depending on its power and battery capacity available can be set. Power peaks and additional costs can thus be avoided.

Information: To use the peak load shaving function, a purchasing tariff including peak load prices is necessary.

Prerequisites:

- For projects with self-consumption:

  - You have opened a project and planned it up to the project page **System** (quick planning) or **Determine self-consumption** (detailed planning).
  - On the page **System** (quick planning), the option **Take battery-storage systems into account** is enabled, or on the page **Determine self-consumption** (detailed planning), the option **Intermediate storage of excess PV energy** is enabled.
- For energy system projects:
  - You have opened a project and planned it up to the project page **Energy system**.
  - On the project page **Define scenario**, the **Battery system** option has been enabled in the **System components** area.
  - On the project page **Defining the battery system**, the option **Take battery-storage systems into account** has been enabled.

Procedure:

1. For projects with self-consumption: on the page **System** (quick planning) or on the page **Determine self-consumption** (detailed planning), select the option **Peak load shaving** in the **Application** drop-down list.
2. For energy system projects: on the page **Energy system**, click on the button **[Battery system]** in the central workspace.
   ☑ The page **Defining the battery system** will open.
3. In the **Application** drop-down list, select the option **Peak load shaving**.
4. In the **Consumption Limit** field, enter the value of the grid-supplied power at which the battery system begins to reduce the grid-supplied power by discharging the energy storage system.
5. To have a proposal for the grid-supply limit calculated, select [**Determine consumption limit**].
6. To adopt the calculated grid-supply limit, click **[Apply proposal]**.

10.7.3 Defining the battery charge time window

In projects with self-consumption, the Sunny Home Manager can control the battery system in such a way that costs can be saved in terms of time-of-use electricity tariffs. For this purpose, you must define the time windows in which the battery can be charged with energy drawn from the utility grid.

Prerequisites:

☐ You have opened a project with self-consumption and planned it up to the project page **Determine self-consumption**.

Procedure:

1. On the page **Determine self-consumption**, enable the option **Energy management** and, if necessary, select a Sunny Home Manager 2.0 or Sunny Home Manager as an energy-management device.
   Information: If an SMA Cluster Controller or SMA Data Manager M has been selected on the "Configure PV system" page, this option cannot be selected.
2. Enable the option **Intermediate storage of excess PV energy**.
3. Click on the field **Battery charge time window**.
   ☑ The **Battery charge time window** dialog box will open.
4. Select the days for which the time window is to be defined.
5. Select the start and end of the time window via the **from** and **to** drop-down lists.
6. Enter the maximum charging power.
7. If you want to define another battery charge time window, select **[Add a time period]** and the appropriate settings.

8. To delete a time period, click on the trash can icon.
9. Select **[OK]** to save the settings.

10.7.4 Peak shaving with increased self-consumption (multiuse)

In projects with self-consumption and in energy system projects, the "multiuse" function can be used to optimize the inverter behavior for power exchange at the grid point of interconnection. In the process the "peak shaving" function and increased self-consumption are combined to further reduce the energy costs.

The "multi-use" function divides the useful range of the battery area of use into 2 sections:

- Section below the SOC limiting value
  If the battery state of charge is below the limiting value, the battery is used for peak shaving.
  To do this, the battery-storage system is discharged in this range if the grid-supplied power exceeds the specified grid-supply limit. The battery is charged from the utility grid or with surplus PV energy if the feed-in power is higher than the specified feed-in limit.
  If the battery is charged with energy drawn from the utility grid, a negative value must be entered for the load limit.
  Example: If the peak load must be limited above 50 kW and the battery must be charged below 50 kW, 50 kW must be entered as the grid-supply limit and -50 kW as the load limit.
- Section above the SOC limiting value
  If the state of charge of the battery is above the limiting value, self-consumption must preferably be optimized.
  To do so, the battery-storage system is discharged in this range to limit the utility grid-supplied power to the specified maximum value. As a rule, this is 0 kW. The battery is typically charged using excess PV energy. In the case of increased self-consumption, the battery-storage system can be discharged up to the specified SOC limiting value. If the battery is not charged with energy drawn from the utility grid, 0 kW must be entered for the feed-in limit.

10.7.5 Parameters for the "Multiuse" function

The "multi-use" function can be defined with the following settings:

Parameter	Description
Purchased energy limit	Definition of the maximum power that may be obtained from the utility grid. If this power is exceeded, the battery is discharged to reduce the peak load. The supply limit can be separately defined for both ranges.
SOC limiting value	Distributing the total capacity of the battery to use "peak shaving" or for increased self-consumption
Hysteresis	Extension of the range for the switching limit defined by the **SOC limiting value**. This extension is applied symmetrically around the **SOC limiting value**. A hysteresis of 3% at a **SOC limiting value** 50% means a switching range of 47% to 53%. **Information:** This setting is only possible for Sunny Tripower Storage 60.
Feed-in limit	Definition of the power from which the battery is recharged. This value depends on the peak loads to be expected and must be defined on a project-by-project basis. Positive values indicate the feed-in power above which the battery is charged. Negative values indicate a power draw level below which the battery is charged. The feed-in limit can be separately defined for both ranges. **Information:** This setting is only possible for Sunny Tripower Storage 60.

Information: To use the peak load shaving function, a purchasing tariff including peak load prices is necessary.

10.7.6 Enabling peak shaving with increased self-consumption with three-phase battery storage systems

Prerequisites:

- For projects with self-consumption:
  - You have opened a project and planned it up to the project page **System** (quick planning) or **Determine self-consumption** (detailed planning).
- For energy system projects:
  - You have opened a project and planned it up to the project page **Energy system**.

Procedure:

1. For energy systems, on the **Energy system** page, click the button **[Battery System]** in the central workspace and enable the option **Take battery-storage systems into account**.
2. For PV systems with self-consumption, on the page **System** (quick planning), enable the option **Take battery-storage systems into account**, or on the page **Determine self-consumption** (detailed planning), enable the option **Intermediate storage of excess PV energy**.
3. Select the **Three-phase** option.
4. In the **Application** drop-down list, select the option **Peak load shaving and increased self-consumption (multiuse)**.
5. In the **Device** drop-down list, select the option **Sunny Tripower Storage 60**.
6. To have a suggestion for the peak load shaving limit calculated, select **[Determine consumption limit]**. It only makes sense to configure the following settings with a grid-supply limit that is suitable for the system.
7. Select **[Apply proposal]**.
8. To define the "multiuse" function, select **[Settings]**. The suggestion for the grid-supply limit has been applied in the dialog box.
9. In the **Grid-supply limit** field for the “increased self-consumption” range, enter the value of the grid-supplied power at which the battery system begins to reduce the grid-supplied power by discharging the energy storage system. SMA Solar Technology AG recommends entering 0.0 kW.
10. Enter the required values in the **SOC limiting value**, **Hysteresis** and **Load limit** fields. For the load limit for the “peak load shaving” range, SMA Solar Technology AG recommends entering the value of the grid-supply limit with a negative sign and 0.0 kW for the “increased self-consumption” range.
11. Click on **[OK]** to save the settings.

10.7.7 Enabling peak shaving with increased self-consumption with single-phase battery storage systems

Prerequisites:

- For projects with self-consumption:
  - You have opened a project and planned it up to the project page **System** (quick planning) or **Determine self-consumption** (detailed planning).
- For energy system projects:
  - You have opened a project and planned it up to the project page **Energy system**.

Procedure:

1. For energy systems, on the **Energy system** page, click the button **[Battery System]** in the central workspace and enable the option **Take battery-storage systems into account**.

2. For PV systems with self-consumption, on the page **System** (quick planning), enable the option **Take battery-storage systems into account**, or on the page **Determine self-consumption** (detailed planning), enable the option **Intermediate storage of excess PV energy**.
3. Select the **single-phase** option button.
4. In the **Application** drop-down list, select the option **Peak load shaving and increased self-consumption (multiuse)**.
5. In the **Device** drop-down list, select the desired device.
6. To have a suggestion for the peak load shaving limit calculated, select **[Determine consumption limit]**. It only makes sense to configure the following settings with a grid-supply limit that is suitable for the system.
7. Select **[Apply proposal]**.
8. To define the "multiuse" function, select **[Settings]**. The suggestion for the grid-supply limit has been applied in the dialog box.
9. In the field **SOC limiting value**, enter the desired value.
10. If necessary, click the **Adaptive increase of the grid-supply limit** options.
11. If the **Adaptive increase of the grid-supply limit** was clicked, if necessary click the **Automatic reset at the end of the accounting period** option button and select the duration of the accounting period.
12. Click on **[OK]** to save the settings.

10.8 E-mobility settings

10.8.1 Procedure with e-mobility in projects with self-consumption



Procedure	See
On the project page **Define load profile**, select the option **Take electric vehicle into account** and enter the information on the driving profile and average mileage.	Entering load profile details
Click on the charging station to be used or configure a new one.	Adding charging stations
Click on the electric vehicle to be used or configure a new one.	Adding electric vehicles
Adding absences of more than 24 hours	Defining absences for electric vehicles

10.8.2 Procedure for e-mobility settings for known vehicles



Procedure	See
Configuring charging stations	Adding charging stations
On the project page **Energy system** under the option **Mobility**, select the driving profile of the electric vehicles used or configure new driving profiles.	Defining a driving profile
Click on the electric vehicle to be used or configure a new one.	Adding electric vehicles
Adding absences of more than 24 hours	Defining absences for electric vehicles

10.8.3 Procedure for e-mobility settings for unknown vehicle behavior



Procedure	See
On the project page **Energy system** under the option **Charging stations**, enable the option die Option **Take charging stations into account**.	Configuring charging stations
On the project page **Energy system** under the option **Mobility** configure the statistical usage of the charging stations.	Defining statistical charging station usage

10.8.4 Defining a driving profile




Prerequisites:

- For projects with self-consumption:
  - You must have opened a project and planned it up to the project page **Define load profile**.
  - E-mobility will also be planned in the project. In the **E-mobility** area, the option **Take e-mobility into account** is enabled.
- For energy system projects:
  - You must have opened a project and planned it up to the project page **Energy system**.
  - E-mobility will also be planned in the project. On the project page **Define scenario**, the **Charging stations** option has been enabled in the **System components** area.

Procedure:

1. In projects with self-consumption: On the page **Define load profile** in the **E-mobility area**, click on the ✎ button next to the desired driving profile.
   ☑ The **Driving profile** dialog box will open.
2. In energy system projects: on the page **Energy system** in the **Loads** area, click on the **Mobility** button.
   ☑ The **Mobility** dialog box will open.
3. In the **Mobility** dialog box, click on the ✎ button next to the desired driving profile.
   ☑ The **Driving profile** dialog box will open.
4. To use an existing standard template, click on **[Select template]**.
5. To define a new driving profile, enter the profile name of the new driving profile in the **Driving profile** field.
6. To save an adjusted profile as a template, click on the button **[Save as template]**. Thus, this profile can be used with other projects.
7. Select the corresponding electric vehicle in the **Vehicle brand** area.
8. To define the time window for the different uses of the electric vehicle or charging station, click on the required time window. You can also click on **[+ New time period]** to define the time window.
9. If at least 1 time window is defined for **Driving** in the usage profile, adjust the data in the field **Average mileage per day**.
10. Click on ✎ under **Absences** to add absences of more than 24 hours or to delete past absences.

11. Click on **[OK]** to save the driving profile.
12. To define e-mobility with known usage behavior, select a suitable **Charging station** from the drop-down list in the **E-mobility** section.

10.8.5 Defining time windows for electric vehicles




You must define time windows with regard to the different types of use of electric vehicles and availability of charging stations. You may add a certain tolerance to each time window. Potential shortages in terms of self-consumption can be better identified.

Prerequisites:

- For projects with self-consumption:
  - You must have opened a project and planned it up to the project page **Define load profile**.
  - E-mobility will also be planned in the project. In the **E-mobility** area, the option **Take e-mobility into account** is enabled.
- For energy system projects:
  - You must have opened a project and planned it up to the project page **Energy system**.
  - E-mobility will also be planned in the project. On the project page **Define scenario**, the **Charging stations** option has been enabled in the **System components** area.

Procedure:

1. In projects with self-consumption: On the page **Define load profile** in the **E-mobility area**, click on the ✎ button next to the desired driving profile.
   ☑ The **Driving profile** dialog box will open.
2. In energy system projects: on the page **Energy system** in the **Loads** area, click on the **Mobility** button.
   ☑ The **Mobility** dialog box will open.
3. In the **Mobility** dialog box, click on the ✎ button next to the desired driving profile.
   ☑ The **Driving profile** dialog box will open.
4. In the **Usage profile** area, click on the calendar.
   ☑ The **Time window** dialog box will open.
5. To define a time window for charging an electric vehicle, click on the option **Charging** in the **Type of the time period** area.
6. Select the days for which the time window is to be defined. If the time window applies to every day of the week at the same time, select the option **Every day**.
7. Select the beginning of the time window from the drop-down list.
8. Select the end of the time window from the drop-down list.
9. Possible delays to the start or end of the time window can be selected from the respective drop-down list.
10. If you have selected **Charging** for the time window, select the location of the charging station to be used. The calculation of e-mobility uses only the consumption for charging on site.
11. Click on **[OK]** to save your settings for the time window.

10.8.6 Defining absences for electric vehicles




To better plan self-consumption using electric vehicles, you have the option of specifying day-to-day absences. Absences are longer time periods during which the charging station is not used. You can enter up to 10 time periods during which the defined time window is not taken into account. These absences are not specified for a specific year and should be deleted if they are not recurring absences, such as fixed company shutdowns.

Prerequisites:

- For projects with self-consumption:
  - You must have opened a project and planned it up to the project page **Define load profile**.
  - E-mobility will also be planned in the project. In the **E-mobility** area, the option **Take e-mobility into account** is enabled.
- For energy system projects:
  - You must have opened a project and planned it up to the project page **Energy system**.
  - E-mobility will also be planned in the project. On the project page **Define scenario**, the **Charging stations** option has been enabled in the **System components** area.

Procedure:

1. In projects with self-consumption: On the page **Define load profile** in the **E-mobility area**, click on the ✎ button next to the desired driving profile.
   ☑ The **Driving profile** dialog box will open.
2. In energy system projects: on the page **Energy system** in the **Loads** area, click on the **Mobility** button.
   ☑ The **Mobility** dialog box will open.
3. In the **Mobility** dialog box, click on the ✎ button next to the desired driving profile.
   ☑ The **Driving profile** dialog box will open.
4. In the **Absences** area, click on the ✎ button.
   ☑ The **Absences** dialog box will open.
5. To define an absence, either click on [**Add absence**] or, in the case of an absences that is no longer valid, click on ✎.
6. Enter the required data in the fields **First day of absence** and **Last day of absence**.
7. To delete absences that are no longer valid, click on the trash can icon.
8. Click on [**OK**] to save your settings for absences.

10.8.7 Adding charging stations




There are 3 ways to add a new charging station:

- In menu **My Sunny Design > Own charging stations**
- For projects with self-consumption: in the project on the page **Define load profile**
- For energy-system projects: in the project on the page **Energy system** under **Charging stations**

Prerequisites:

- For projects with self-consumption:

  - You must have opened a project and planned it up to the project page **Define load profile**.
  - E-mobility will also be planned in the project. In the **E-mobility** area, the option **Take e-mobility into account** is enabled.
- For energy system projects:
  - You must have opened a project and planned it up to the project page **Energy system**.
  - E-mobility will also be planned in the project. On the project page **Define scenario**, the **Charging stations** option has been enabled in the **System components** area.

Procedure:

1. In the menu **My Sunny Design > Own charging stations**: select **[Add new charging stations]**.
   or
   In a project with self-consumption: On the page **Define load profile** in the area **E-mobility**, click on the button **[New charging station]**.
   or
   In an energy system project: on the page **Energy system** in the graphic, select the button **Charging stations**.
   ☑ The **Charging stations** window will open.
2. Enter the **type** of the charging station.
3. Adjust the number of charging points of the charging station in the field **Number of charging points**.
4. Enter the **Maximum charging power AC** of the charging station.
5. Enter the **Maximum charging power DC** of the charging station.
6. Click on **[OK]** To add the new charging station.

10.8.8 Adding electric vehicles




There are 3 way to add a new electric vehicles:

- In the menu **My Sunny Design > Own electric vehicles**
- For projects with self-consumption: in the project on the page **Load profile**
- For energy-system projects: in the project on the page **Energy system** under **Mobility**

Information: In projects, new electric vehicles are added via the button **[Add driving profile from template]**.

Prerequisites:

- For projects with self-consumption:
  - You must have opened a project and planned it up to the project page **Define load profile**.
  - E-mobility will also be planned in the project. In the **E-mobility** area, the option **Take e-mobility into account** is enabled.
- For energy system projects:
  - You must have opened a project and planned it up to the project page **Energy system**.
  - E-mobility will also be planned in the project. On the project page **Define scenario**, the **Charging stations** option has been enabled in the **System components** area.

Procedure:

1. In the menu **My Sunny Design > Own electric vehicles**: select **[Add new electric vehicle]**.
   or
   In a project with self-consumption: On the page **Load profile** in the area **E-mobility**, click on the button **[Add driving profile from template]** and then click on **[New electric vehicle]**.
   or
   In an energy system project: On the page **Energy system** in the graphic, click on the button **Mobility** and then select **[+Add driving profile from template]** and the click on **[New electric vehicle]**.
   ☑ The **Electric vehicle** window will open.
2. Select the **Vehicle brand** of the electric vehicle from the drop-down list.
3. Enter the **Model** of the electric vehicle.
4. Enter the **Consumption** of the electric vehicle.
5. Enter the **Battery capacity** of the electric vehicle.
6. Enter the **Maximum charging power AC** of the electric vehicle.
7. Enter the **Maximum charging power DC** of the electric vehicle.
8. Select the **Charging plug** of the electric vehicle from the drop-down list.
9. Click on **[OK]** To add the new electric vehicle.

10.8.9 Defining statistical charging station usage



In energy system projects, you can add driving profiles with statistical usage behavior on the page **Energy system** in the area **Loads > Mobility**.

You have 2 different options available for improving charging behavior planning:

Option	Explanation
Queuing	Assumption: the majority of vehicles are waiting for a free charging station.
Skipping the charging process	Assumption: The majority of vehicles are skipping the charging process.

You have 2 different options available for improving charging duration planning:

Option	Explanation
The vehicle leaves the charging station upon completing the length of stay (e.g., grocery store)	Assumption: the majority of vehicles do not perform a full charge.
Vehicle is being fully charged.	Assumption: the majority of vehicles perform a full charge.

Prerequisites:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

☐ E-mobility will also be planned in the project. On the project page **Define scenario**, the **Charging stations** option has been enabled in the **System components** area.

Procedure:

1. On the page **Energy system** in the **Loads** area, click on the **Mobility** button.
   ☑ The **Mobility** dialog box will open.

2. In the area **Application**, select the option **Statistical charging station usage**.
3. To select a template regarding the statistical usage of the charging station, click on **[Select template]**.
4. Enter the maximum charging power range of the arriving vehicles in the respective fields.
5. Select the desired option button in the **Behavior when more vehicles are arriving than charging stations are available** field.
6. Select the expected charging behavior of the vehicles under the **Charging time** option button.
7. To configure the number and distribution of electric vehicle arrival over a 24 hour period, click on [**Add new arrival profile**] and make the corresponding settings.
8. To assign an arrival profile to a certain day of the week, enable or disable the corresponding weekdays within the required arrival profile.
   Note: Enabled weekdays are highlighted in blue.
9. To delete profiles, click on the trash can icon of the corresponding arrival profile
10. Click on **[Accept changes]** to save the changes.

11 Project design

11.1 Project page "Project data"



On the page **Project data**, enter the project data, such as the status of the project, customer data and information on the location. You can also add project images here. Here, 6 images with a maximum of 12 MB can be uploaded in Sunny Design. You can either upload images or take photos during the visual roof planning.

11.2 Entering project data

1. Add a new project or open an existing project.
   ☑ The **Enter project data** page will open.
2. Enter the desired **Project name**.
3. Upload images if desired.
4. Select **Project status** from the drop-down list.
5. Enter customer data in the field **Customer**. Here, a drop-down list will customers will appear when you click in the field and customer data has already been saved.
6. To add a new customer, click on **[New customer]**.
   ☑ The **Customer data** window will open. Enter the customer data.
7. To edit a selected costumer, click on .
8. Click to assign a customer from the customer database.
   ☑ The **Customer data** window will open.
9. To assign customer data to the project, select the customer in the results list and then click on **Apply customer** in the context menu.
10. In the area **Location of building**, select the desired project location.
11. Under **Voltage level**, select either **[Low voltage]** or **[Medium voltage]**.
12. If you have selected [**Low voltage**], select the required grid voltage from the drop-down list **Inverter grid connection**. You can adjust this entry as required after selecting the inverter. Under **Preferred minimum nominal power ratio**, set a specification for the preferred minimum nominal power ratio.
13. If you have selected **[Medium voltage]**: Select **System type**, set a specification for the preferred minimum nominal power ratio under **Preferred minimum nominal power ratio**, set a specification for the **Medium voltage** and, in the drop-down list **Inverter grid connection**, enter the desired grid voltage.
14. If required, open the area **Advanced project data** and make additional settings.

Also see:

- Entering advanced project data ⇒ page 54

11.3 Upload project images

1. Add a new project or open an existing project.
   ☑ The **Enter project data** page will open.
2. Click on **[Upload images]**.
   ☑ The **Upload project images** window will open.
3. To select a file, click on **[Upload another image]**.

4. In the file selection window, select the desired file and click on **[Open]**.
   ☑ The image is displayed in the preview.
5. To select an image for project documentation, click on the image you want to use and select the option **Apply as project image**.
   ☑ The selected image can be identified by the red frame in the area **Project data**.
6. If desired, enter an **Image title** and a **Caption** for the current image in the respective fields.
7. To crop the image, click on **[Edit image]**. Change the cropped image using the gripping points and click on **[Accept changes]**.
8. To delete an image, select the respective image and click on **[Delete image]**.
9. Click on **[Accept changes]**.

11.4 "Advanced project data" area

In the **Advanced project data** area you can make additional settings if required. Some settings in this area are already preset in accordance with the your settings in the **Project data** area. Depending on the selected project, you can also provide details on: grid connection, electrical connection in termins of off-grid systems and specifications laid down in legislation and standards.

11.5 Entering advanced project data

1. Add a new project or open an existing project.
   ☑ The **Enter project data** page will open.
2. Open the **Advanced project data** area.
3. Click on the button **[Edit]** in the desired area and adjust the settings.
4. If the direct selling of energy not used by the owner is desired for PV systems in Germany that provide a DC power of at least 100 kWp, select the **[Edit]** button in the **Location settings** area.
5. Enable the option **If possible, take direct selling (SMA SPOT) into account**. This will add the project page **Direct selling**.

11.6 Configuring systems with medium voltage

1. Add a new project or open an existing project.
   ☑ The **Enter project data** page will open.
2. In the area **Voltage level**, select the option **Medium voltage**.
3. Depending on which inverters you wish to use in the PV system, select either **Decentralized inverters** or **Central inverters** under **System type**.
4. Enter a specification for the **Preferred minimum nominal power ratio**.
5. Enter the desired **Medium voltage**.
6. If you have selected the **Decentralized inverters** option, select the required output voltage of the inverters from the **Inverter grid connection** drop-down list.
7. If required, enable the checkbox **Carry out optimized reactive power adjustment with Integrated Plant Control**.

11.7 With quick planning: entering load profile details

1. Add a new project or open an existing project.
   ☑ The **Enter project data** page will open.
2. Open the area **Load profile details**.

3. In the drop-down list **Type of load profile**, select the desired option. Here, you can only select the option **Own load profile** if you have already created your own load profile.
4. Select the required load profile from the drop-down list **Load profile**. You find a description of the selected load profile in the field **Description**.
5. If required, adjust the setting in the field **Annual energy consumption**.

Also see:

- Administration of own load profiles ⇒ page 24

11.8 With quick planning: configuring a system

In Quick planning, all components of the planned PV system can be planned on this page. If required, you can switch to detailed planning at any time during the planning process via the button **[Switch to detailed planning]** in the **Navigation** area. Up to 6 PV arrays can be created.

Prerequisite:

☐ You must have opened a project and planned it up to the page **Configure system**.

Procedure:

1. To plan the PV array with the visual roof planning tool, either select **[Visual roof planning]** or click on the photo.
2. To define the PV array components without further planning of the roof area, click on **[Manual roof planning]**.
3. If **[Manual roof planning]** has been selected: Click on the field **[Manufacturer / PV module / module level power electronics]** and select the desired PV module.
   ☑ The window **Change the manufacturer and PV module** will open.
4. Make the desired PV module settings.
5. If desired, enable the option **Take Bifacial Gain into account**.
6. Click on **[OK]**.
7. Click on the field **[Number of PV modules/Peak power]** and, in the dialog box **Number of PV modules and peak power**, determine the size of the PV array using the number of PV modules or the peak power.
8. Select the field **[Change orientation or mounting type]** and select the desired properties.
9. To add more PV modules, select **[Add PV array]** and make the appropriate settings.
10. To select inverters manually, click on **[Manual design]**.
    ☑ The **Manual design** dialog box will open.
11. To restrict the list of displayed inverters, enable the required checkboxes under **Limit products**.
12. Select the desired inverter via the checkbox.
13. Click on **[OK]**.
    ☑ The desired inverter will be added and displayed in the area **PV inverter**.
14. To add further inverters, click on **[Manual design]**.
15. To select inverters from design suggestions, click on **Design suggestions** to have design suggestions displayed.
16. To have inverters selected automatically by Sunny Design, select **[Automatic design]**.
17. To limit the selection of inverters, click on **[Inverter filter]** and enable the desired checkboxes.
    ☑ The **Design** dialog box will open.
18. If required, change the displacement power factor and the method for calculating design suggestions.

19. Click on **[Accept changes]**.
    ☑ If the PV system is operated in Germany and provides a DC power of at least 100 kWp, a message appears asking you whether you want to sell unused energy directly to the grid.
20. Click on **[Yes]** if direct selling is to be used. This will add the project page **Direct selling**.
21. To define the battery system, enable the option **Take battery-storage systems into account**.
22. Select whether a single-phase or a three-phase system should be defined.
23. In the **Device filter** window, select the devices that are to be considered for the design.
24. Select the battery inverter you want to use from the drop-down list **Device**.
25. If electric vehicles are to be used, enable the option **Take e-mobility into account**.
26. Enter the **Name**.
27. Select the **Charging station** from the drop-down list.
28. Select the **Driving profile**.
29. In the "Energy management" area, select **[Automatic design]**.
    or
    To have further design suggestions displayed, select **[Design alternatives]**.
30. If desired, add further communication products via the button **[Add communication product]**.

11.9 Visual roof planning

11.9.1 Specifying buildings

On the page **Project data**, 1 building with a rectangular footprint will be placed automatically at the entered address. Below you can define the shape and dimensions of the building, the shape and pitch of the roof and the orientation of the building on the lot. You can either work with the mouse or enter the values in the input fields.

In addition to the automatically created building, you can also create other buildings in the surrounding area. During this process, you can also plan PV modules on 5 further roof areas. You can use the remaining buildings to create shading.

11.9.2 Operating the visual roof planning tool

Action	Operation with the mouse
Changing the scaling of the display	• Use the mouse wheel to change the size of the map. or • You can change the size of the map using the buttons **[+]** and **[-]** at the right-hand edge of the map.
Switching the view between 2D and 3D (possible during the entire planning process)	• To display the map in top view, open the eye symbol at bottom left and switch off the option **3D** with the mouse. This makes it easier to adjust the floor plan and orientation of the building.
Aligning the map to the north	• Click on the symbol .
Changing the display view	• Move the map with the left mouse button pressed down. • With the right mouse button pressed down, change the inclination of the map.

Action	Operation with the mouse
Change map view	• To switch the map view on or off, open the map symbol at the bottom left and activate or deactivate the **Map** option. • To change the map type, open the drop-down list and select the desired map material. • To use Google Solar, activate the **Use Google Solar** option. This service can be used to determine the potential of PV systems based on PV data for the selected location. If Google Solar is activated, further options are displayed. Activate the desired options.
Changing size of the house and roof pitch	• Click on the house using the mouse. This will turn the house blue. • Move the mouse over the edge to be changed. The edge that can be changed turns yellow and the cursor becomes a hand. • With the left mouse button pressed down, drag the respective edge in the appropriate direction. The dimensions change both in the graphic and in the overview in the right part of the screen.
Changing positioning of house	• Click on the house using the mouse. This will turn the house blue. • With the left mouse button pressed down, move the house to required position. During positioning, the house appears green. • With the right mouse button pressed down, move the house to required position. During positioning, the house appears green.

Information: The roof plan will only be adopted once you click on **[Save]**.

11.9.3 Defining a building

Requirements:

☐ You must have opened a project and planned it up to the page **Configure system** (quick planning) or **Configure PV system** (detailed planning).

☐ You must have opened the visual roof planning tool on the page **Define building**.

Procedure:

1. By default, a building with a rectangular footprint will be added. If required, adjust the shape of the building and the type of roof via the drop-down list on the right-hand side (**Standard** or **Angled**). If you cannot find the required roof shape, select the roof with the strongest similarity. To depict complex building shapes, you can create several buildings and slide them into each other.
   Information: It is not possible to define asymmetrical roof halves for gable roofs. If the roof halves are very different and possibly no PV modules should be mounted on one part, the choice of a pitched roof and the corresponding change in house dimensions is recommended.
2. In the **BUILDING** tab, adjust the size of the building using the mouse or via the input fields.
3. Adjust the position and roof pitch of the house.

4. Adjust the orientation of the house with regard to the direction. This information is also used for further calculations.
5. For **Offset height profile**, enter the offset of the height profile. This option is only relevant if you have activated the **Use Google Solar** option.
6. Select the material for the roof and facade.
7. Select the **ROOF OVERHANGS** tab and adjust the dimensions of the roof overhangs and the roof thickness using the input fields.
8. To add a further building, click on the map and deselect the positioned building, adjust the shape via **Angled building** with **[Yes]** or **[No]** and select the roof type.
   To add the building, select **[Add new building]**.
   Note: You can import 3D models with Sunny Design Sunny Design Pro: Importing 3D models.
9. Continue defining limitations by clicking **[Next]**.

11.9.4 Sunny Design Pro: Importing 3D models

If you have access to Sunny Design Pro, you can import 3D models for the visual roof planning tool.

Requirements:

☐ You must have opened a project and planned it up to the page **Configure system** (quick planning) or **Configure PV system** (detailed planning).

☐ You must have opened the visual roof planning tool.

☐ Supported file formats for the 3D model: ".obj", ".dae", ".mtl", ".zip"

☐ Supported file formats for textures: ".png", ".jpg"

☐ The models may consist of a maximum of 10 files with a maximum total of 20 MB.

Procedure:

1. In the visual roof planning tool window, click on the button **[Add 3D import]**.
   ☑ The **3D import** dialog box will open.
2. Select the file to be imported or drag into the window and drop.
3. If required, adjust the scaling.
4. Click on **[OK]**.

Tip: If you activate the **Deactivate collision detection** option, collisions with imported 3D models are ignored and you can move PV modules into protruding objects. This can be helpful, for example, if the imported 3D model still contains objects, such as ventilation pipes, that are to be removed from the system.

11.9.5 Sunny Design Pro: Exporting 3D models

If you have access to Sunny Design Pro, you can export 3D models from the visual roof planning tool in the ".obj" file format. The files will be exported as a ZIP archive.

Prerequisites:

☐ You must have opened a project and planned it up to the page **Configure system** (quick planning) or **Configure PV system** (detailed planning).

☐ You must have opened the visual roof planning tool and defined a building.

Procedure:

1. In the visual roof planning tool window, click on the button **[3D export]**.
   ☑ The **3D export** dialog box will open.
2. Via the checkboxes, select whether the 3D model is to be exported with PV modules and with textures.

3. Select **File type** from the drop-down list.
4. Click on **[OK]**.

☑ The 3D model will be downloaded to your computer as a ZIP file.

11.9.6 Defining restrictions

On this page, you can specify limitations for the roof. These can be dormers, skylights or similar objects that influence the installation of PV modules or also chimneys, trees or walls that might shade the roof. In addition, you can define distances that should be kept to the ridge, the roof edge and the eaves. Ask a roofer for their roof recommendations.

PV modules may be planned on the different dormers if needed. Restrictions such as skylights, round dormer windows or building blocks are regarded exclusively as interfering objects. No PV modules can be planned on them.

Prerequisites:

☐ You must have opened a project and planned it up to the page **Configure system** (quick planning) or **Configure PV system** (detailed planning).

☐ You must have opened the visual roof planning tool on the page **Define restrictions**.

Procedure:

1. Select the type of obstacle (**Dormers**, **Roof objects**, **Facade objects**, **Free-standing objects**) and place it in the required position. Dormers, skylights, building blocks and cylinders can only be placed on the roof. Chimneys, trees and walls can be placed on the lot. If the surface is not large enough to insert the obstacle and in case of intersections with other objects, the obstacle appears red.
2. In the case of dormers, skylights, building blocks and cylinders, enter the dimensions and the distances of the obstacles to the edges of the roof.
3. To change the position and size of a dormer, click on the respective dormer with the mouse and adjust it. If several identical dormers are to be adjusted at once, the dormers can be selected one after the other by clicking on them and pressing the [Ctrl] key simultaneously. To make the entries easier, an input field will open on the right-hand side. Click on [**Sace**] to save your entries.
4. In the case of chimneys, buildings and walls, enter the dimensions and the position of the obstacles.
5. To use a defined obstacle multiple times, select the required obstacle and copy it by clicking the **[Copy]** button in the upper left corner.
6. Move the mouse pointer over the place where the obstacle is to be inserted. If the obstacle can be inserted at the location, it will appear green. If the roof area is not large enough to insert the obstacle and in case of intersections with other objects, the obstacle appears red.
7. To remove an obstacle, click on the respective obstacle and delete it. Click on either Del on the keyboard or on the **[Delete]** button in the upper left-hand corner.
8. To continue the selection of PV modules, click on **[Continue]**.

11.9.7 Layout of the PV modules

Up to 6 areas with PV modules can be defined. The areas can be laid out on the roof surfaces and on dormers. This allows you to plan for several roofs, select different PV modules and specify different orientations of the PV modules. Here, you can define 1 module type and 1 orientation per surface. For flat roofs with an east-west inclination, 2 PV arrays are automatically set up. This reduces the number of individual surface areas in the project that PV modules can be planned for.

The PV modules can be automatically arranged, moved and copied. In order to provide corridors for the maintenance of the PV modules on the roof, the option **Additional separations** can be used to insert spaces between a definable number of rows and columns.

When planning the PV modules, the shading caused by obstacles can be taken into account. The shading of the PV modules can be displayed on this page. Here, the different sun position during the various seasons is taken into account.

You can edit the modules using the mouse.

11.9.8 Positioning PV modules

Action	Operation with the mouse
Move individual PV modules on the grid	Click the required module and drag.
Moving all PV modules on the module field grid	Use [**Ctrl**] +**A** to select all PV modules and drag them.
Free movement of individual PV modules	Use [**Ctrl**] to select the desired PV module and drag.
Canceling the module selection	Select **[Esc]**.

11.9.9 Defining the layout of PV modules

Requirements:

☐ You must have opened a project and planned it up to the page **Configure system** (quick planning) or **Configure PV system** (detailed planning).

☐ You must have opened the visual roof planning tool on the page **Layout of PV modules**.

Procedure:

1. If necessary, add additional areas. This is possible as long as a maximum of 2 areas are defined.
2. Resize the already defined module area so that the additional area can be added. For this purpose, click on the corresponding module area with the mouse. Marker points appear at the corners of the area, which you can use to adjust the size.
3. In the right-hand side of the window, under **Select or add surface**, click on the button **[+]** and click on a free area on the roof. This will add another roof area.
4. If necessary, adjust the names of each individual area.
5. To calculate the maximum number of PV modules according to the selected module type, orientation and available area, click on the option **Maximum peak power**. This means that the number of PV modules can no longer be changed manually.
6. To define the PV modules, select the **PV modules** tab.
7. If the number of PV modules for the activated area should be defined manually, enter the number of modules.
8. If required, adjust the PV modules used via the buttons under **PV module** in the window **Change the manufacturer and type of PV module**.
9. Adjust the orientation of the PV modules via the buttons in the area **Orientation** at the lower right-hand edge.
10. In case of a flat roof: Under **Mounting type**, select whether the modules should be mounted horizontally or with substructure.
11. Enter data for row spacing, gaps and distance between modules and obstacles.
    When planning a flat roof: Additionally enter the inclination of the modules and the azimuth of the module field.
12. Click on **[Align PV modules]** wählen. This automatically arranges the PV modules according to roof surface specifications.
13. To add corridors for maintenance or thermal separation, click on **Additional separations**.
14. To define the width and arrangement of the corridors, enter the desired values in the fields **Row separation**, **Gap separation** and **Frequency**. Frequency refers to how many modules per row or column a corridor should be arranged after.
15. If the arrangement or selection of PV modules has been changed, click on **[Accept change]**.
16. To view the shading of the PV modules, select the **Shading** tab.
17. To have the shading calculated throughout the year, enable the **Annual shading** option.

18. Select **[Calculate shading]**.
    ☑ The calculated shading of the selected area can be displayed in false colors with the **Shading of the roof area** option or as a percentage of shading.
19. To visualize the path of the shading, open the button with the sun symbol on the left-hand lower edge and enable the option **Sun position indicator**.
20. Select the date and time of the required shading display. Here, the time does not take daylight savings time into account.
21. To move individual PV modules, select the desired PV module with the mouse and move it.
    Tip: Activate the **Deactivate collision detection** option to ignore collisions in imported 3D models and to be able to move PV modules into protruding objects. This can be helpful, for example, if the imported 3D model contains objects, such as ventilation pipes, that are to be removed from the system.
22. To complete the visual roof planing, click on **[Save]**.
    ☑ You can return to the page **Configure PV system** (with detailed planning) or the page **Configure system** (with quick planning).
23. Click on **[Next]** to define the electrical design.

11.9.10 Creating a new electrical design

On this page, you can design the circuitry for the PV modules and assign them to the inverters or make changes in the design suggestions.

The electrical design can be created in 3 different ways:

- **Design suggestions**: Different design suggestions are automatically calculated in shown on a list. The list can be sorted by the number of inverters, efficiency or by energy yield to make it easier to select the design. The inverters used can be limited in retrospect based on various properties and restrictions. On the list of calculated designs, the recommended inverters, nominal power ratio, energy yield and efficiency are included. Based on this information, one of the suggestions can be selected for the further design or multiple suggestions can be compared to each other. An additional design suggestion replaces a previously available electrical design.
  If more than 3 PV arrays are designed, users must decide which 3 PV generators a design should be calculated for.
- **Automatic design**: Different design suggestions are automatically calculate and the suggestion that the system rates as optimal will be selected. An additional automatic design replaces a previously available electrical design. This type of calculation is only possible if a maximum of 3 PV arrays are designed.
- **Manual design**: It is possible to manually select the inverters used. The inverter selection can be limited by SMA product family, various properties and restrictions. Each system section is selected separately. The design refers to the PV modules or PV arrays that have not yet been connected to inverter inputs. In manual design, new system sections are created.

11.9.11 Designation of the strings

For all design suggestions, the individual PV modules are connected to form strings and assigned to system sections. The preferred string alignment and starting point can be selected in the **String design** gewählt dialog. In the process, a unique designation is assigned to each individual PV module. The string designation is assigned automatically in accordance with the selection in the settings:

- **Inverter.String.Module**: The string designation refers to the inverter that the strings are connected to (e.g. 1A.1.3: at inverter 1 at input A on string 1 the 3rd module).
- **Roof.String.Module**: The string designation refers to the roof area on which the strings are located (e.g. 2.2.3: on roof area 2 on string 2 the 3rd module).

System sections are created if necessary. System sections can contain multiple inverters of the same type with the same configuration. The results of the design are shown in the right-hand section of the user interface.

11.9.12 Representation of PV modules and strings

Display	Explanation
Red outline	The PV module is not connected to a string. There are no connection lines between PV modules.
Red connection line	The string is not connected to an inverter input.
Red module surface	The string is too short or too long.
Yellow connection line	The string is connected to an inverter input.
Green module surface	The string is selected and the string length is correct.

Tip: The strings can be displayed in different colors for a better overview. To display the strings in color, select the **Colored** option in the visual roof design either in the **String design** dialog box or in the **Electrical design** tab under **Display**.

11.9.13 Defining the electrical design

Prerequisites:

☐ You have opened a project and planned it up to the page **Configure system** (quick planning) or **Configure PV system** (detailed planning).

☐ You have opened the visual roof planning tool on the page **Electrical design**.

Procedure:

1. To calculate the design suggestions, click the button for the desired type of calculation (**Design suggestions**, **Automatic design** or **Manual design**).
2. Select the rules for string design in the **String design** dialog.
3. For the **Design suggestions** type of calculation, click multiple suggestions and click **[Compare selection]** if necessary.
   ☑ The selected design suggestions will be juxtaposed for better comparison.
4. For the **Design suggestions** type of calculation in the **Compare alternatives** dialog, click the **[Apply design]** button for the desired alternative.
5. For the **Design suggestions** or **Manual design** types of calculation, select the desired design and click on **[Adopt design]**.

☑ The strings are calculated and represented in the roof area planning as yellow lines. In the right-hand section, the system section are shown with the inverters whose inputs the strings are connected to.

11.9.14 Changes to existing electrical design

You can make various changes to the existing electrical design. If you click on a string on the roof area or at the inverter input, the icon appears. You can make the following changes to the existing design:

Change	Icon	Explanation
Recalculation		The electrical design can be recalculated for the selected string, the current roof area or all roof areas, as required.
Switching poles	+-	The poles of the selected string are switched. The assignment does not have an effect on the design: only the representation is changed.

Change	Icon	Explanation
Disconnecting the string		The selected string is disconnected from the current input and represented as an unconnected string. This function can also be selected in the inverter design.
Delete		For strings: The selected string is deleted and the modules are represented as unconnected again. This function can also be selected in inverter design.

11.9.15 Editing subarrays

Prerequisite:

☐ You must have opened a project and planned it up to the page **Configure PV system** (detailed planning) or **Configure system** (quick planning).

Procedure:

1. To edit the subarray, select the inverter in the area **PV inverter**.
   ☑ The **Edit system section** dialog box will open.
2. Make the required changes. If you reduce the number of PV modules at an input, the PV modules will be removed at the negative pole of the string. If you increase the number of PV modules at an input, the number is compared to the PV modules that are available. In case of error, a warning is output and the change cannot be saved.
3. Click on **[OK]**.
4. To delete a subarray, click on the trash can symbol.

11.9.16 Manually connecting PV modules to strings

Prerequisites:

☐ You must have opened a project and planned it up to the page **Configure PV system** (detailed planning) or **Configure system** (quick planning).

☐ You must have opened the visual roof planning tool.

Procedure:

1. Select the first unconnected PV module of the string. This PV module is automatically assigned to the positive pole and drawing mode is activated.
2. Select the PV modules to be connected one after the other, and click to add them.
3. To complete string creation, press Enter or click on **[OK]**.
4. Alternatively, you can draw the string by clicking and holding the left mouse button. The PV modules will automatically be connected to the string by a mouseover across the middle of the PV module.
   ☑ When you release the mouse, the string is saved.
5. To switch the pole assignment to the first and last PV module of the string, click in the menu **Edit**.

11.9.17 Connecting the string to the inverter input

Prerequisites:

☐ You must have opened a project and planned it up to the page **Configure PV system** (detailed planning) or **Configure system** (quick planning).

☐ You must have opened the visual roof planning tool.

Procedure:

- Select the unconnected string and click the symbol for the required inverter input.
  or
  Select the unconnected string, select the system section from the drop-down list of the system sections of the required inverter and select the required input from the drop-down list of the inputs.

11.9.18 Recalculating strings

The strings can be recalculated at any time. You can select whether the selected string, current roof area or all roof areas should be recalculated.

Strings must have the right system voltage in order to be connected to the inverter.

Prerequisites:

☐ You must have opened a project and planned it up to the page **Configure PV system** (detailed planning) or **Configure system** (quick planning).

☐ You must have opened the visual roof planning tool.

Procedure:

1. Select the desired string and click on > .
   ☑ The **String calculation** dialog box will open.
2. Select the strings to be recalculated.
3. Select the preferred string design and starting point.
4. Click on **[OK]**.

☑ The calculation will be carried out and the result will immediately be shown on the bottom of the screen in the 3D area.

11.9.19 Editing a string

Prerequisites:

☐ You must have opened a project and planned it up to the page **Configure PV system** (detailed planning) or **Configure system** (quick planning).

☐ You must have opened the visual roof planning tool.

Procedure:

1. To change the length of a string, carry out a mouseover on the beginning or end point of the required string. The string must not be selected.
   ☑ Drawing mode is activated.
2. To remove the last connected PV module from the string, click the required module.
3. To add an unconnected PV module to the string, click the required module.
4. To apply the changes, press Enter or click on **[OK]**.

11.10 Defining load profiles

You can select typical load profiles or create and edit your own load profiles. 2 load profiles can be combined in case of off-grid and self-consumption projects. 5 templates can be combined in case of energy systems. In the menu **My Sunny Design > Own load profiles**, you can create and manage your own load profiles.

11.11 Entering load profile details

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Define load profile**.

Procedure:

1. Under **Load profile type**, select the required option. You can only select the option **Own load profile** if you have already created your own load profile.
2. Select the required load profile from the drop-down list **Load profile**.
   Note: To call up information on the selected load profile, select the button **[Profile information]**.
3. If required, adjust the setting in the field **Annual energy consumption**.
4. To edit the load profile, click on the button **[Edit load profile]** and adjust the load profile.
5. To add a new load profile, click on the button **[New load profile]**.

11.12 With off-grid systems: Defining the peak load

Sunny Design calculates an expected output of 30 minutes from the sum of defined load profiles. You can define a power reserve here to ensure that your system is supplied with energy as planned during peak loads.

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Define load profile**.

Procedure:

- Enter the expected peak load in the field **Specification peak load**.

11.13 Adding specific loads

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Define load profile**.

Procedure:

1. If you are using a heat pump, activate the checkbox **Heat pump** in the **Specific loads** area and, from the drop-down list, select the use of the heated water.
2. If desired, enable the **Specified thermal power** checkbox and enter the thermal power of the heat pump manually.
3. Under **Hot water requirement**, enter the number of persons and the hot water requirement.
4. Under **Details of building**, enter the type of building, the number of floors and the heated area of each floor.
5. To get information on the load profile with heat pump, click on the button **[Profile information]**. You can only click on the button **[Profile information]** if the **Heat pump** checkbox is enabled.

11.14 Entering e-mobility information

The self-consumption can be increased if charging stations are used for charging electric vehicles. You can select up to 3 charging stations and 3 vehicles. You have the option of defining a new driving profile or a using a template.

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Define load profile**.

Procedure:

1. If you use one or more electric vehicles, enable the **Take e-mobility into account** checkbox in the **E-mobility** area.
2. Define the driving profile of the electric vehicle.
3. To obtain information on the load profile of the electric vehicle, click on **[Profile information]**.
4. Select the charging station from the drop-down list.

11.15 For PV hybrid systems: Configuring gensets

Prerequisite:

☐ You must have opened a PV hybrid system project and planned it up to the page **Gensets**.

Procedure:

1. To adjust the parameters of a genset, select any field in the row of the required genset.
   ☑ The **Genset** dialog box will open.
2. If desired, change the name of the genset in the **Name** field.
3. Select the fuel for the genset from the drop-down list **Fuel**.
4. If required, change the other settings for the genset.
5. Click on **[OK]**.
6. To add additional gensets, click on the button **[Add genset]**.
7. To delete a genset, select the trash can symbol in the row of the genset to be deleted. At least one genset must remain permanently present and cannot be deleted.
8. In the **Details** area, check whether the gensets can provide sufficient power for the load profile previously selected.

11.16 For PV hybrid systems: Defining design conditions for gensets

Prerequisite:

☐ You must have opened a PV hybrid system project and planned it up to the page **Gensets**.

Procedure:

1. In the area **Design conditions** in the field **Load-related minimum power**, enter the minimum power that the gensets are to make available to the loads. You should also take account of the power reserve.
2. In the area **Design conditions** in the field **Minimum PV power to be expected**, enter the minimum PV power to be expected for the PV system location.

11.17 Defining scenarios

11.17.1 For energy systems: Entering building details

The information on this page defines the absolute energy requirement and the technical features of the energy system. Depending on the selected building type and dimensions, system components and energy requirements will be suggested. When defining the scenario, you can freely choose the system components.

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. In the **Energy system** area page, click on the **[Buildings]** button and select **[Adjusting the scenario]** in the context menu.
   ☑ The page **Define scenario** will open.
2. In the area **Details of building**, select the building type from the drop-down list **Building type**. Depending on the selection, the system components and the absolute energy requirement are suggested.
3. In the "Structure" area, click on the button **[New building]** or **[Existing building]**. Depending on the selection, the system components and the absolute energy requirement are adjusted.
4. In the area **Size**, choose between the buttons **[Small]**, **[Medium]** and **[Large]**. Depending on the selection, the system components and the absolute energy requirement are adjusted.

5. Select the components used within the system under **System components**. The selected components can be identified by the checkmark underneath the icon. They can be viewed in the overview of the energy system.
6. From the drop-down list **Heat transfer system**, select the system used for space heating.
7. If you selected two power generators in the **System components** area, select within the **Feed-in priority** area the system component whose current is primarily fed in.
8. Enter the volume of the buffer storage in liters in the area **Volume buffer storage**. The program suggests a volume based on building type and size, and heating energy requirements.

11.17.2 For energy systems: Defining thermal energy requirements

In thermal systems with 2 heat generators, the combined heat and power plant or the heat pump accepts the base load and the boiler the peak load. In systems with a combined heat and power plant and a heat pump, the heat pump absorbs the peak load. Combined heat and power plants are heat-operated.

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

☐ You must have selected thermal components, such as a heat pump or combined heat and power plant.

Procedure:

1. In the **Energy system** area page, click on the **[Buildings]** button and select **[Adjusting the scenario]** in the context menu.

   ☑ The page **Define scenario** will open.
2. In the area **Thermal energy demand**, click on the button **[Heating energy requirement]** or **[Building size]**.
3. If you have clicked on the button [**Heating energy requirement**] under **Basis for calculation**, click on the button [**Absolute**] or [**Specific**] in the **Heating energy requirement** area and enter the heating energy requirement per year.
4. If you clicked on the button [**Specific**] under **Heating energy requirement**, enter the heated area and specific heating energy requirement.
5. If you have clicked on the button **[Building size]** in the area **Basis for calculation**, select the corresponding building type from the drop-down list and then enter the values for the building length and width, number of floors, height of the floors, target room temperature for day and night, and daily hot water demand.
6. Enter the average hot water requirement per day in liters under **Hot water requirement**.

11.18 Energy System

11.18.1 Structure of Energy System Page

The project page for energy systems serves as a starting point for the configuration of the system components. The page is divided into the central workspace and the section **Key figures relating to the energy system.** The central workspace is divided into the areas **Energy system**, **Grids** and **Loads**. The key figures relating to the energy system can be found in the lower area. You can access the configuration of the system components either via the main navigation or via the buttons of the respective components in the central workspace.

When you move the pointer of the mouse over the arrows between the components, the determined values are shown. The meaning of the various arrows and connecting lines between the components is explained in the bottom section of the central workspace.

Quick configuration and detailed configuration for PV system and battery system

For the configuration of the system components PV system and battery system, you can choose between a quick configuration and a detailed configuration. You can use the quick configuration for a simplified configuration of your PV system and battery system. You can provide detailed information in the tab **Technical configuration** with the detailed configuration. The tab **Technical configuration** in the detailed configuration for the PV system matches the page **Configure PV system**. The tab **Technical configuration** in the detailed configuration for the battery system matches the page **Configure battery system**.

When you switch from the quick to the detailed configuration, the data from the quick configuration are transferred to the detailed configuration. Switching from detailed configuration to quick configuration is no longer possible.

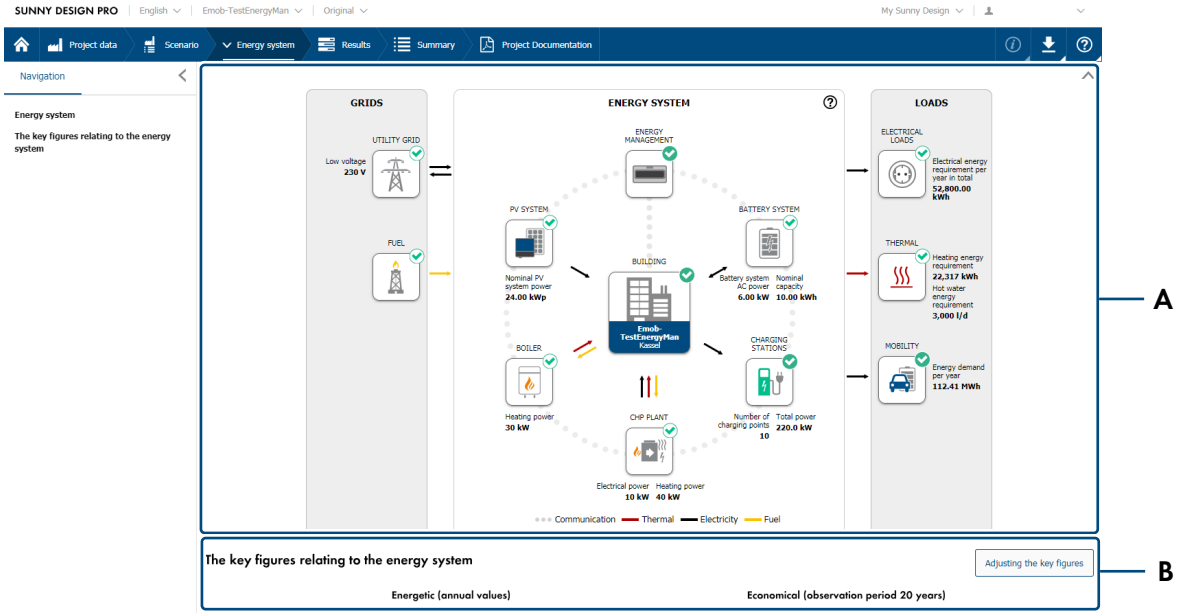


Figure 4: Configure energy system (example)

Position	Designation	Explanation
A	Central workspace for energy systems	In this section, you can access system components and key figures of the energy system. The system components shown have been defined on the page **Scenario**. This area is divided into **Energy system**, **Grids** and **Loads** for a better overview.
B	"The key figures relating to the energy system" section	In this section, you can view and configure the key figures of the energy system. By clicking on the button [**Adapt key figures**], you can select up to 10 key figures for your energy system. All other figures and information can be viewed on the results page and in the summary.

11.18.2 Status of the system components

The individual components are indicated by symbols in the overview of the energy system, showing the configuration status.

Symbol	Explanation
	The system component is not configured or disabled.
	The system component is configured correctly. Default values have been used.
	The system component is configured correctly and tested.
	The system component ist not optimally configured.
	The system component is incompatible.

11.18.3 Configuration of utility grid components

11.18.3.1 Configuring the electrical connection

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. In the **Grids** area, click on the button **[Utility grid]**.
   ☑ The **Utility grid** dialog box will open.
2. Make the required changes and click on **[Apply changes]**.

11.18.3.2 Adding fuel information

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. In the **Grids** area, click on the button **[Fuel]**.
   ☑ The **Fuel** dialog box will open.
2. Make the required changes and click on **[Apply changes]**.

11.18.4 Configuring energy system components

11.18.4.1 Editing the building

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. Click on the button **[Building]** in the central workspace.

2. To adjust the project data, click on **[Adjusting the project data]**.
3. To adjust the scenario, click on **[Adjusting the scenario]**.

11.18.4.2 Configuring the PV System

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. In the central workspace, click on the button **[PV System]**.
   ☑ The **PV system quick configuration** dialog box will open.
2. To make a quick configuration, make the required settings in the tab **Technical configuration**.
   or
   To configure detailed settings, Click on the button **[To the detailed configuration]** and make the required settings in the tab **Technical configuration**.
3. Make the desired settings in the tabs **Investment and operating costs**, **Financing** and **Tariffs**.
4. If you designed the PV system in the quick configuration view, click on **[Apply changes]**.
5. If you designed the PV system in the detailed configuration view, in the tab **Technical configuration**, click on the button [**Cable sizing**] in the **Next steps** area.

11.18.4.3 Configuring the battery system

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. In the central workspace, click on the button **[Battery system]**.
   ☑ The **Battery system quick configuration** dialog box will open.
2. If the project is to be designed without battery system, disable the checkbox **Take battery-storage system into account** and click on **[Apply changes]**.
3. To make a quick configuration, make the required settings in the tab **Technical configuration**.
   or
   To configure detailed settings, Click on the button **[To the detailed configuration]** and make the required settings in the tab **Technical configuration**.
4. Make the desired settings in the tabs **Battery inverter**, **Financing** and **Tariffs**.
5. If you designed the battery system in the quick configuration view, click on **[Apply changes]**.
6. If you designed the battery system in the detailed configuration view, click on the button **[Energy system]** in the tab **Technical configuration** in the area **Next steps**.

11.18.4.4 Planning the Energy Management

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. Click on the **[Energy management]** button in the central workspace.
   ☑ The page **Planning the energy management** will open.
2. Make the required settings.
3. In the area **Next steps**, click on the button **[Energy system]**.

11.18.4.5 Configuring combined heat and power plant (CHP plant)

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

☐ On the project page **Define scenario**, the **Combined heat and power plant** option has been enabled.

Procedure:

1. Click on the button **[CHP plant]** in the central workspace.
   ☑ The **CHP plant quick configuration** dialog box will open.
2. Make the required settings under the tabs **Technical configuration**, **Investment & operating costs**, **Financing** and **Tariffs**.
3. Click on **[Accept changes]**.

11.18.4.6 Configuring heat pump

Requirement:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

☐ On the project page **Define scenario**, the **Heat pump** option must be enabled.

Procedure:

1. Click on the button [**Heat pump**] in the central workspace.
   ☑ The **Heat pump quick configuration** dialog box will open.
2. Make the required settings under the tabs **Technical configuration**, **Investment & operating costs**, **Financing** and **Tariffs**.
3. If the heat pump is also to be used for cooling, select the **Heating + cooling** operating mode in the **Technical configuration** tab. This operating mode can only be selected for Sunny Design Pro.
4. Click on **[Accept changes]**.

11.18.4.7 Configuring the boiler

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

☐ On the project page **Define scenario**, the **Boiler** option has been enabled.

Procedure:

1. Click on the button [**Boiler**] in the central workspace.
   ☑ The **Boiler quick configuration** dialog box will open.
2. Make the required settings under the tabs **Technical configuration**, **Investment & operating costs**, **Financing** and **Tariffs**.
3. Click on **[Accept changes]**.

11.18.4.8 Strategy for overcrowding of the charging stations

For planing the strategy when charging stations are overcrowded, there are 2 options. You can define with strategy is to be used with the option **Strategy for overcrowding of the charging stations** in the tab **Technical configuration**.

Option	Explanation
When reaching full charge, clear for other vehicles.	For the calculation of the charging station utilization, waiting times are not expected.
Clear for other vehicles only when leaving	For the calculation of the charging station utilization, waiting times are expected.

11.18.4.9 Configuring charging stations

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. Click on the button **[Charging stations]** in the central workspace.
   ☑ The **Charging station quick configuration** dialog box will open.
2. In the upper area in the **Technical configuration** tab, select whether a **Uniform charging tariff for all types of charging stations** is to be used or **Different charging tariffs per charging station type** are to be used.
3. Select the type and number of used charging stations under the tab **Technical configuration**. You can select a charging station from a list of typical charging stations and the charging stations defined under **My Sunny Design > Own charging stations**.
4. To add an additional charging station, select **[Add charging station]**.
5. To delete charging stations from the configuration, click on the trash can icon.
6. To limit the total power of the charging stations, click on the option **Intelligent charging power limitation** and enter the limit for the charging power. When the charging station is limited to the entered value, the provided charging power is distributed among the individual vehicles.
7. To specify the strategy in the event of the charging station being overcrowded, select **When reaching full charge, clear for other vehicles** or **Clear for other vehicles only when leaving**.
8. In the field **Calculation charging tariff**, you can select whether and how the energy charged or usage time should be offset.
9. If the charging tariff is calculated per kWh or per minute, enter the tariff in the field **Charging tariff**. The positive values indicate a yield increase. A negative value corresponds to costs incurred as a result of operating the charging stations.
10. To define the time window for the different uses of the charging station, click on the required time window. You can also click on **[Add new time period]** to define the time window.
11. Make the desired settings under the tabs **Investment & operating costs** and **Financing**.
12. Click on **[Accept changes]**.

11.18.5 Configuring loads

11.18.5.1 Configuring electrical loads

You can configure up to 5 loads.

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. Click on the button [**Electrical loads**].
   ☑ The **Electrical loads** dialog box will open.
2. Make the required changes under the tab **Electrical load profiles**.
3. If necessary, add a new load profile. To do so, click on **[Add new load profile]**.
4. To add another load profile, click on the button **[Add additional load profile]**.
5. Make required changes under the tab **Electricity purchase and costs (before)**.
6. To copy the electricity purchase from the information provided under the tab "Load profiles", enable the checkbox **such as load profiles**.
7. To calculate the electricity purchase costs according to the defined purchasing tariff, select the option **Calculation using purchasing tariff**.
8. Click on **[Accept changes]**.

11.18.5.2 Configuring the heat demand

Here you can define the heating energy demand of the building and the hot water demand.

Requirement:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

☐ On the project page **Define scenario**, the **Heat pump** option has been enabled.

Procedure:

1. Click on the button **[Thermal]**.
   ☑ The **Heat demand** dialog box will open.
2. Make the desired changes in the tab **Thermal energy demand**.
3. Make the desired changes in the tab **Energy consumption and costs (before)**. To apply the heating energy requirement from the information given under the tab **Thermal energy demand**, enable the checkbox **As thermal energy demand**.
4. To calculate the energy consumption according to the defined purchasing tariff, select the option **Calculation using purchasing tariff**.
5. Click on **[Accept changes]**.

11.18.5.3 Sunny Design Pro: Configuring the Cooling Energy Demand

Here you define the cooling energy demand of the building.

Requirement:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

☐ On the project page **Define scenario**, the **Heat pump** option must be enabled.

☐ The **Heating + cooling** option must be activated when configuring the heat pump.

Procedure:

1. Select the **[COOLING]** button.
   ☑ The **Cooling** dialog window opens.
2. Make the desired changes in the **Cooling energy demand** tab.
3. Make the desired changes in the tab **Energy consumption and costs (before)**. To copy the cooling energy demand from the information provided under the tab **Cooling energy demand**, enable the checkbox **such as cooling energy demand**.

4. To calculate the energy consumption according to the defined purchasing tariff, select the option **Calculation using purchasing tariff**.
5. Click on **[Accept changes]**.

11.18.5.4 Configuring e-mobility

Prerequisite:

☐ You must have opened an energy system project and planned it up to the project page **Energy system**.

Procedure:

1. Click on the button [**Mobility**].
   ☑ The **Mobility** dialog box will open.
2. For a fixed user group and known vehicle types, for example in the case of apartment buildings, select the option **Known vehicles and their usage**.
3. If the group of users is unknown, for example in the case of a hotel, select the option **Statistical charging station usage**.
4. Make the desired changes in the tab **Electric vehicles and usage profile**.
5. Make required changes under the tab **Mobility and costs (before)**.
   Note: Enable the checkbox **As e-mobility (calculated)** to adopt the mobility costs from the tab **Electric vehicles and usage profile**.
6. Click on **[Accept changes]**.

11.19 PV systems

11.19.1 Project page "Configure PV system"



The settings on the page **Configure PV system** always refer to the currently selected subproject. A subproject consists of 1 to 6 PV arrays and at least 1 inverter per PV array. In the project types PV system with total power feed-in to grid and with self-consumption option, off-grid system and PV hybrid system, you can add alternatives for each subproject, for example, to compare alternative designs.

The entire system can be configured by a system assistant in terms of PV hybrid systems. If the settings in terms of the profitability, genset configuration and load profile enable the operation of a PV hybrid system, the system assistant appears automatically after you select the page **Configure PV system**.

11.19.2 Configuring a subproject

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Configure PV system**.

Procedure:

1. To change the name of the subproject, click on the **[Rename]** button on the project page **Configure PV system**, enter the name you want to use and confirm with **[OK]**.
2. To add a subproject, click on **[Add subproject]**, enter the name you want to use and confirm with **[OK]**.
   ☑ The subproject is then added to the drop-down list **Subproject**.
3. To add an alternative, click on **[Add alternative]**.
   ☑ The alternative is added as a tab.

11.19.3 "PV arrays" area

If necessary, you can define PV modules as a standard. On this page, these modules are configured automatically under **PV arrays**.

The specification of the roof and assignment of the PV modules can be done by visual planning or manual planning. When you select visual roof planning, a new window opens. You can make the following settings here:

- Specifying buildings
- Adding possible objects on the roof or terrain that restrict the mounting of PV modules or create shading
- Selecting the PV modules used

When planning PV arrays manually, it is not possible to specify objects on the roof or the terrain.

11.19.4 Configuring PV modules

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Configure PV system**.

Procedure:

1. On the line of the PV array, click the **Manufacturer / PV module / module level power electronics** field and select the required PV module in the dialog box **Change the manufacturer and type of PV module**. To use the search function, click on **[Detailed search]**.
2. To get information on the selected PV module, click on the info symbol.
   ☑ The **Information on PV modules** window will open.
3. Click on the field **Number of PV modules/Peak power** and, in the dialog box **Number of PV modules and peak power**, determine the size of the PV array using the number of PV modules or the peak power.
4. Select the field **Orientation/Mounting type** and select the desired properties in the dialog box **Change orientation or mounting type**.
5. To add a further PV array, select **[Add PV array]**. The settings of the existing PV array are copied automatically. Up to 6 PV arrays can be added to the PV system.
6. If required, change the settings of the added PV array. You can change the settings for all PV arrays at the same time by enabling the checkbox **Change all PV arrays** in the relevant dialog box for entering changes.
7. To delete a PV array, click on the trash can icon in the row of the PV array.
   Note: When all PV arrays have been removed, you can switch to visual roof planning.

11.19.5 "Inverter design" area

In this section, you select suitable inverters for the current subproject. You have several options for designing the inverter:

- Using design suggestions
  Suggestions are calculated for the current PV arrays with the various inverters. If more than 3 PV arrays have been created, the plan includes distributing the PV arrays among several inverters.
- Automatic design
  A suggestion for optimal use of the PV arrays will be calculated. If more than 3 PV arrays have been created, this option is not available for selection.
- Manual design
  It is possible to manually select the inverters used.

For off-grid systems, the inverter design can be configured by a system assistant.

11.19.6 Selecting inverters manually

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Configure PV system**.

Procedure:

1. In the area **Inverter design**, click on the button **[Manual design]**.
   ☑ The **Manual design** dialog box will open.
2. To restrict the list of displayed inverters, enable the required checkboxes under **Limit products**.
3. Select the row of the desired inverter.
   ☑ The selected row will be highlighted in light gray.
4. Click on **[OK]**.
   ☑ The **Inverter grid connection** dialog box will open.
5. Select the inverter grid connection from the drop-down list.
6. Click on **[OK]**.
   ☑ The desired inverter will be added and displayed in the area **PV inverter**.
7. To add further inverters, click on **[Manual design]**.
8. If direct selling is desired for PC systems larger than 100 kWp, confirm the query. This will add the project page **Direct selling**.
9. To generate a system proposal for off-grid systems, click on **[System assistant]**.
   ☑ The proposed inverters are added to the subproject and displayed in the area **PV inverter**.

11.19.7 Selecting inverters from design suggestions

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Configure PV system**.

Procedure:

1. To select inverters from design suggestions, click on the button **[Design suggestions]** in the area **PV inverter**.
   ☑ The dialog box **Design suggestions** will open.
2. To limit the selection of inverters, select the desired checkboxes in the **Limit products** area.
3. Select the desired inverter.
4. Select **[Adopt design]**.
   ☑ The **Select design** dialog box will open.
5. Select the design suggestion.
6. Click on **[OK]**.

11.19.8 Calculating automatic design suggestions

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Configure PV system**.

Procedure:

1. In the area **Inverter design**, click on the button **[Automatic design]**.
   ☑ The **Design** dialog box will open.
2. Make the desired settings.

3. Click on **[OK]**.
   ☑ The proposed inverters are added and displayed in the area **PV inverter**.
4. To generate a system proposal for off-grid systems, click on **[System assistant]**.

11.19.9 "PV inverter" area

Area	Action
Information and solution proposals	Information and suggested solutions for the inverter design are displayed here.
Configuring Strings	You can configure the DC strings here. To do so, click on the buttons next the inverter icon and adjust the settings. If you selected the option **Optimization** during PV array configuration, the shaded modules can be adjusted. If the DC string design does not fit the planned PV system, the settings in the button are shown in red after leaving the dialog.
Displacement power factor cos φ	You can adjust the displacement power factor cos φ here.
Limitation of AC active power	You can adjust the AC active power limitation here.
Overview	The details of the design are displayed here.
Delete inverter	You can remove an inverter from the design here.
Add inverter	You can add further inverters here.

11.19.10 Add a device for active power limitation

If the inverter is to limit active power or the battery charging time period is to be defined, you can add a device for active power limitation on the project page **Configure PV system** in the area **Device for active power limitation**.

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Configure PV system**.

Procedure:

1. In the area **Device for active power limitation**, click on the button **[Add a device for active power limitation]**.
   or
   Click on the button with the current device for active power limitation and select the desired device for active power limitation in the dialog box **Select product**.
2. To delete the device for active power limitation, click on the trash can icon.

11.19.11 Configuring off-grid systems with the system assistant

With the system assistant, a valid system configuration for an off-grid system will be calculated based on your project-related requirements and specifications. You can adjust this system configuration manually to make the system better meet you needs.

Prerequisite:

☐ You must have opened a project and planned it up to the project page **Configure PV system**.

Procedure:

1. In the area **Inverter design**, click on the button **[System assistant]**.
   ☑ The **System assistant** dialog box will open.
2. In the tab **Requirements and specifications**, select whether the system must be able to withstand the conditions of the month with the most unfavorable weather.
3. Enter the nominal power ratio.
4. Enter the required autonomous time.
5. Select the battery type from the drop-down list.
6. If desired, click on the option **Take gensets into account** and make the respective settings.
7. Enter the required solar coverage rate.
8. To adopt the changes in the system proposal, click on **[Calculate system proposal]**.
   ☑ The calculated system proposal will be displayed in the **System proposal** tab.
9. If desired, change the settings for the nominal AC power of the PV inverter, The AC nominal power of the storage system, and the usable storage capacity.
10. To check the compatibility of the current settings, click on **[Check compatibility]**.
11. To adopt the system proposal, click on **[Apply proposal]**.
    ☑ The dialog box **Design** for designing the inverter design will open after closing the system assistant.

11.19.12 Configuring PV hybrid systems with the system assistant

With the system assistant for PV hybrid systems, you can determine the optimum PV share according to system requirements. If no system has been configured, the system assistant start automatically. It creates an optimum proposal in terms of AC and DC power. The proposal can adopted directly or adjusted (if necessary).

To guarantee smooth operation with the gensets, the share of PV power in the PV hybrid system must not exceed the maximum apparent power of 60% of the gensets operated at the same time during the day.

Prerequisite:

☐ You must have opened a PV hybrid system project and planned it up to the page **Configure PV system**.

Procedure:

1. Enter the nominal AC power of the inverters.
2. Enter the peak power of the inverters.
   ☑ The current estimation results are calculated and shown.
3. To calculate the system proposal, click on **[OK]**.

☑ On the page **Configure PV system**, the proposals for the inverters and, if necessary, possible change notes are shown. You can make these changes directly made on this page.

11.19.13 Having design suggestions displayed

Requirements:

☐ You must have opened a project and planned it up to the page **Configure PV system**.

☐ You must have set the required PV arrays on the page **Configure PV system**.

Procedure:

1. On the page **Configure PV system**, under **Inverter design**, click on the button **[Design suggestions]**.
   ☑ The **Design** dialog box will open.

2. If required, adjust the settings in the dialog box **Design** and click on **[OK]**.
   ☑ The dialog box **Design suggestions** will open.
3. To limit the selection of inverters, select the area **Limit products** and enable desired checkboxes.
4. Go to the area **Select inverter** and enable the required checkboxes.
5. Select **[Recalculate]**.
6. To change the criterion for sorting the design suggestions, select the required type of sorting from the drop-down list **Sorting**.
7. To compare design suggestions, select **[Compare selection]**.
   ☑ The **Compare alternatives** dialog box will open.
8. To adopt a design suggestion, select **[Adopt design]** in the column of the required design suggestion.
9. To save a design suggestion as an alternative design, click on **[Apply as alternative]** in the column of the required design suggestion.
   ☑ Above the section **PV arrays**, the tab **Original** is added and also a numbered tab **Alternative** for each design suggestion. In addition, the button **[Compare alternatives]** is added to the right of the tabs.
10. To add a design suggestion as an alternative design, enable the checkboxes of the required design suggestions and click on **[Add selection as an alternative]**.
    ☑ Above the section **PV arrays**, the tab **Original** is added and also a numbered tab **Alternative** for each design suggestion. In addition, the button **[Compare alternatives]** is added to the right of the tabs.
11. To adopt a design suggestion, enable the desired design proposal and select **[Adopt design]**.
    ☑ The selected design will be displayed in the area **PV inverter**.

11.19.14 Criteria for sorting the design suggestions

You can select a criterion in Sunny Design to form the basis for the evaluation and sorting of design options. The following criteria are possible:

- **Energy yield** (energetic optimum)
- **Efficiency** (consideration of the nominal power ratio and the inverter share of capital expenditure)
- **Number of inverters** (number of inverters in the design)

11.19.15 Setting Criterion for Sorting the Design Suggestions

Prerequisites:

☐ You must have opened a project and planned it up to the page **Configure PV system**.

☐ You must have set the required PV arrays on the page **Configure PV system**.

Procedure:

1. On the page **Configure PV system**, under **Inverter design**, click on the button **[Design suggestions]**.
   ☑ The **Design** dialog box will open.
2. Make the required settings in the dialog box **Design**.
3. Click on **[OK]**.
4. In the dialog box **Design suggestions**, select the required criterion from the drop-down list **Sorting**. The more a design suggestion corresponds to a criterion, the higher up the list it is displayed.

11.20 Configuring the battery system




Depending on the selected inverter, you can select up to 3 different batteries here.

Prerequisite:

☐ You must have opened a stand-alone grid project and planned it up to the page **Defining the battery system**.

Procedure:

1. If you have selected a three-phase system, on the **Defining the battery system** page, if necessary, enable the **Multicluster Box** checkbox in the area **Battery system** and select the desired Multicluster Box device type in the drop-down list.
2. Select the desired battery inverter in the drop-down list **Device**.
3. With multicluster systems, click on **[Add cluster]** to add additional clusters. With multicluster systems, all batteries are automatically configured identically.
4. To adjust the parameters of a battery, click on the field **Settings** in the row of the desired battery.
   ☑ The **Configure storage** dialog box will open.
5. Select the required battery type from the drop-down list **Batteries**.
6. If required, change the other settings for the battery.
7. Click on **[OK]**.
8. For stand-alone grid projects: Check the system compatibility in the **Details** area.

11.21 With off-grid systems: Configuring a genset



Prerequisites:

☐ You must have opened a stand-alone grid project and planned it up to the page **Genset**.

☐ The **Take genset into account** has been enabled.

Procedure:

1. To adjust the parameters of a genset, go to the area **Genset** and select any field in the row of the desired genset.
   ☑ The **Genset** dialog box will open.
2. If required, change the name of the genset in the **Name** field.
3. Select the fuel for the genset from the drop-down list **Fuel**.
4. If required, change the other settings for the genset.
5. Click on **[OK]**.
6. You can check the system compatibility under **Details**.

11.22 "Cable sizing" project page








On the **Cable sizing** project page, you can have the power loss of the selected cable sizing calculated.

Settings in the **Overview** area:

- If a subdistribution is required in the PV system, enable the checkbox **Project subdistribution available (LV3)**. The **Graphic** section is adjusted and the **AC2 cables** tab is added.
- If an MV transformer is to be present in the PV system, enable the checkbox **Medium-voltage line and MV transformer available (MV)**. The **Graphic** section is adjusted and the **MV transformer** tab is added.

Configuration area:

The graphic in the **Configuration** area shows the cable identification in the planned PV system:

- **DC** indicates the cables from the first PV module in the string to the inverter.
- **LV1** indicates the cables from the inverter to a possible subdistribution, to the MV transformer or to the feed-in point.
- **LV2** indicates the cables from a possible subdistribution in the subproject to the subdistribution of the total project, to the MV transformer or the feed-in point.
- **LV3** indicates the lines from the possible subdistributions to the possible MV transformer or to the feed-in point.
- **MV** indicates the cables from a possible MV transformer to the feed-in point.

Settings in the tabs **Cables DC**, **Cables LV1**, **Cables LV2**, **Cables LV3**, **Cables MV**:

Procedure:

1. To take account of the line losses in the yield forecast, click on **Enter project data** in the main menu navigation. Go to **Advanced project data > Line losses**, click on the [**Edit**] button and enable the checkbox **DC** or **AC**.
2. Click on the tab of the desired cable.
3. Select the required fields in the **Cable material**, **Single length** and **Cross-section** columns and make the required settings. The values for **Current**, **Voltage**, **Voltage drop** and **Rel. power loss** are calculated automatically.

11.23 "Determine self-consumption" project page



On the **Determine self-consumption** project page, you can determine your possible self-consumption with and without increased self-consumption.

Settings in the area **Increased self-consumption**:

In this section, you can select devices to better assess self-consumption.

- To change the selection of devices, click on **[Devices filter]** and enable the required checkboxes.
- With multicluster systems, click on **[Add cluster]** to add additional clusters. With multicluster systems, all batteries are automatically configured identically.
- For increased self-consumption with the Sunny Home Manager, enable the checkbox **Energy management**.
- To configure increased self-consumption with systems for intermediate storage of energy, enable the **Intermediate storage of excess PV energy** checkbox.
- In the column **Device**, select the required device.
- Click on **Settings** in the row of the required device and configure the storage.
- If **Energy management** and **Intermediate storage of excess PV energy** have been selected, click on **Battery charging time window** in the **Settings** area.

Settings in the area **Specific loads**:

In this section, you can select devices to better assess self-consumption. The consumption of these devices is taken into account in the calculation with and without optimization in the section **Result**.

- To configure self-consumption with specific loads, enable the checkbox **Specific loads**. The checkbox is already enabled if you have selected a heat pump as a load on the page **Define load profile**. If required, you can adjust the settings here.
- Click on **Settings** in the line of the required device and adjust the properties.
- To configure self-consumption with an electric vehicle, enable the checkbox **Take e-mobility into account**. The checkbox is already enabled if you have selected an electric vehicle as a load on the page **Define load profile**. If required, you can adjust the settings here.
- Click on the field **Settings** and adjust the driving profile.

Result area:

In this section, the increased self-consumption details are displayed graphically.

Settings in the area **Load analysis**:

Information: This section is only shown if you are logged in as a Sunny Design Pro user.

- To open the load analysis for the load profile, click on **[Open load analysis]**.

11.24 "Planning the energy management" project page



On the **Planning the energy management** project page, you can add communication products for PV system monitoring, control, for energy management and for the visualization of key system data.

11.25 Definition of the requirements on the energy system

In the "Specifications" area, you can select the requirements and preconditions of the planned PV system monitoring. You can select several requirements.

Requirement	Explanation
Optimizing self-consumption	You wish to obtain action recommendations for manual switching of loads in order to make optimal use of own PV energy on site (self-consumption).
Analysis of consumption and management of loads	You wish to obtain an analysis of your consumption. You also wish to have automatic intelligent switching of loads in order to make optimal use of own PV energy on site.
System monitoring via the internet and visualization of PV system data	You wish to monitor the PV system via the Internet and visualize the PV system data in the Internet.
Online archiving	You wish to archive the PV system data in the Internet.
Remote diagnosis	You wish to analyze PV system faults via the Internet.
Visualization of PV system data on site	You wish to view the PV system data on site.
PV system maintenance and parameterization on site	You wish to enable maintenance and parameterization of the PV system on site.
Storage of PV system data on site	You wish to store the PV system data on site.
Connecting external sensors	You wish to connect sensors from third-party manufacturers to the PV system (e.g. anemometer, ambient temperature sensor).
Measuring global irradiation	You wish to measure the global irradiation.

Requirement	Explanation
Reading out energy meters	You wish to read out the data of the feed-in meter, the PV production meter and the purchased electricity meter.
Feed-in management	You wish to or need to participate in feed-in management with your PV system. In accordance with the Renewable Energy Sources Act (EEG) 2012, PV system operators with installed power of 30 kW to 100 kW must participate in feed-in management (variable active power limitation). PV system operators with installed power less than 30 kW have a choice: they can participate in feed-in management or they can limit the active power of their PV system to 70% (fixed active power limitation).
Control of large-scale PV power plants	You wish to control and regulate your large-scale PV power plant (connection to a SCADA system).
Wireless data transmission	You would like to wirelessly call-up the PV system data.
Notification in case of disturbances	You wish to be notified if disturbances occur in the PV system.

11.26 Definition of the requirements on energy management

In the **Specifications** area, you can specify the requirements that apply to your PV system. Depending on the selected prerequisites, the requirements on energy management that are actually available may vary.

Requirement	Explanation
Internet access is available	The PV system can be connected to the Internet.
Own operation control system is available	A control room (SCADA system) is available.
S0 meter interface is available	An S0 meter interface is available in the PV system.
D0 meter interface is available	A D0 meter interface is available in the PV system.

11.27 Selecting the communication products for energy management

In the area **Design** on the **Planning the energy management** project page, you can select the communication products for energy management. Here, you have various options for adding the communication products:

- [**Automatic design**]: The communication products are automatically selected.
- **[Design alternatives]**: Various proposals with communication products are generated. Use the button **[Adopt design]** to select the desired design alternative.
- [**Add communication product**]: Select a communication product from the list of all communication products. If you have enabled the checkbox **Only take current communication products into account**, you can only select current communication products in the list.

In the **Design** area, you can also make the following settings:

- If you enable the checkbox **Only take current communication products into account**, only current (not discontinued) communication products will be used in the design.
- With the button **[Delete system monitoring]** you can delete all communication products from the design.

11.28 Overview of the communication products used

On the **Planning the energy management** page in the **Result area**, you are given an overview of the internal and external communication products used in the project and the type of data transmission.

Button	Explanation
Subproject	The selected subproject.
Within the PV system	The selected internal communication products are displayed here.
External	The selected external communication products are displayed here.
Type of data transmission	The type of data transmission.
Padlock symbol	If a communication product is to be included in the design alternatives, click on the lock icon next to the communication product. The lock icon is displayed closed.
X	To delete a communication product, click on **[X]** next to the communication product.

11.29 Direct selling order with SMA SPOT



PV systems in Germany that provide a DC power of 100 kWp cannot offer unused energy via the platform SMA SPOT for direct selling. If you plan a project that meets these requirements, a message will appear stating that direct selling can be used. The option for direct selling will be enabled automatically and the project page **Direct selling** will be added.

You can directly download the contract between operator and Coneva GmbH after entering all details on the operator, PV system, bank details (optional) and costs. This contract must then be sent by mail to Coneva GmbH.

Calculation for direct selling only in euros

The calculations for direct selling will be carried out exclusively in euro. If you have selected USD as the currency in the personal settings in the menu **My Sunny Design**, calculation errors occur because the units are not converted internally.

Requirements:

- ☐ The PV system must be located in Germany.
- ☐ The PV system must provide a DC output of at least 100 kWp and a maximum of 1000 kWp.
- ☐ You must have opened a project on the project page **Direct selling with SMA Spot**.

Procedure:

1. Enter information on the operator and PV system in the **Contract documents** area.
   Note: Fields marked with an asterisk (*) are mandatory.
2. Select the system type and yield profile in the **Costs for direct selling** area.
3. In the **Customer master data** area, enter information on the operator, installer and, optionally, bank details.
4. To download the direct selling documents, click on **[Download contract documents]**.

11.30 Analyzing efficiency

11.30.1 "Analyze Profitability" project page



You can edit the details on the cost structure and consider an analysis of the efficiency of the system on the **Analyze Profitability** project page.
In the **Costs** area, you can determine the costs for the system planned. You can choose between simplified cost entry and detailed cost entry. After you have completed the cost entry, you can have a quotation generated automatically for the current customer in the detailed cost entry.
In the **Results** area, you can adjust the electricity purchase costs and the feed-in tariff for the current project.
Note: To make default settings regarding the feed-in tariff, electricity purchase costs and financing model, go to **My Sunny Design > Settings > Profitability** and **My Sunny Design > Settings > Tariff information**.

Information: For PV hybrid systems, only the areas **Profitability** and **Cashflow** are available on the **Analyze Profitability** project page. In the **Cashflow** area, choose between on **[Nominal cash flow]** and **[Discounted cash flow]**. The type of cash flow has an effect on the expected amortization period in the area **Profitability**.

11.30.2 Determining costs with simplified cost entries

Enter the following values to obtain a simplified calculation:

- Standard costs for the PV system in Euros/kWp
- Standard costs for the storage system in Euros/kWp
- Other costs as standard amount
- Standard annual fixed costs as a proportion of capital expenditure

Prerequisite:

☐ You must have opened a project and planned it up to the page **Analyze Profitability**.

Procedure:

1. In the **Costs** area, click on the button **[Simplified costs entry]**.
2. If you want to continue calculating the project with a fixed price, enabled the option **Fixed price**. This means that no entries are necessary for the various components.
3. Enter standard costs for PV system, storage system, other costs fixed costs.
4. To include a financing model in the calculation, click on **[Add financing model]** and make the necessary entries. **Note:** The entries defined under **My Sunny Design > Settings > Profitability** will be used as templates.

11.30.3 Determining costs with detailed cost entries

Enter the following values to obtain a detailed calculation:

- Specific costs for PV modules
- Specific costs for inverters
- Specific costs for storage system
- Use templates for regular costs
- Other costs, broken down by individual cost units as required
- Standard annual fixed costs as a proportion of capital expenditure

Information: No price management is available for energy management products. You can make default settings for the cost structure in the menu **My Sunny Design > Own cost items and templates**.

Requirement:

☐ You must have opened a project and planned it up to the page **Analyze Profitability**.

Procedure:

1. In the **Costs** area, click on the button **[Detailed costs entry]**.
2. To use already defined templates, click on **[Select template]** and select the respective template from the list.
3. Enter specific costs for PV modules, inverters, storage system, other costs and fixed costs.
4. To add a product description, select ✎ in the line of the respective product and enter the relevant text in the **Product description** dialog box. The product description is displayed in offers.
5. To create a new position, select **[New position]**.
   ☑ The **Cost item** dialog box will open.
6. Make the respective entries for the cost item.
7. Select the category under which the costs should be listed in the cost entry.
8. If you want to save the cost item as default and use it for other projects, enable the option **Default setting for projects**. This cost item is now stored in the user-defined cost items and can be used in the templates.
9. Click on **[OK]** to save the new cost item.
10. To include a financing model in the calculation, click on **[Add financing model]** and make the necessary entries. The entries defined under **My Sunny Design > Settings > Profitability** will be used as templates.

☑ In the **Results** area, you can view the results of the efficiency of the system.

11.30.4 Editing tariffs

In the **Results** area on the project page **Analyze Profitability**, you can adjust the electricity purchase costs and the feed-in tariff for the current project.
Note: To make default settings regarding the feed-in tariff, electricity purchase costs and financing model, go to **My Sunny Design > Settings > Profitability** and **My Sunny Design > Settings > Tariff information**.

Prerequisite:

☐ You must have opened a project and planned it up to the page **Analyze Profitability**.

Procedure:

1. In the "Results" area, click on the button **[Edit tariff]**.
   ☑ The **Tariff information** dialog box will open.
2. Select the Feed-in tariff (reimbursement) model from the drop-down list.
3. Make the desired settings for the purchasing tariff and the feed-in tariff.
4. To add a special tariff, select [**Add special tariff**].
5. Click on **[OK]**.

11.30.5 Adjusting financial terms and conditions

On the project page **Analyze Profitability**, you can adjust the financial terms and conditions for the current project.
Note: You can define the financial default settings using **My Sunny Design > Settings > Profitability**.

Prerequisite:

☐ You must have opened a project and planned it up to the page **Analyze Profitability**.

Procedure:

1. To adjust financial terms and conditions entries, click on the button **[Settings]** in the upper area of the **Analyze Profitability**.
   ☑ The **Profitability** dialog box will open.

2. Make the desired settings.
3. To save the financial terms and conditions settings, click on **[OK]**.

11.30.6 Create quotation

Once you have entered all the profitability information, you can have an automatic quotation calculated on the **Analyze Profitability** project page. For this, the customer data of the project are used as well as the texts for introduction and conclusion of the quotation entered at **My Sunny Design > Settings > Quotations**. These texts cannot be adapted to the individual quotations.
The quotation contains the customer's address, the quotation number, a project cost overview, the standardized texts and a field for your signature.

Prerequisite:

☐ You must have opened a project and planned it up to the page **Analyze Profitability**.

Procedure:

1. Determine the planned project costs by using the detailed costs entry.
2. On the project page **Analyze profitability** in the "Costs" area in the "Detailed costs entry", enter the number of the quotation intended for the customer in the field **Quotation no.**.
3. Click on the button **[Create quotation]** to have the quotation form generated.

☑ The quotation will be created as a PDF file and downloaded to your computer.

Also see:

- Determining costs with detailed cost entries ⇒ page 85

11.31 For off-grid system: "Analyses of the energy and power in the system" project page



On the project page **Analyses of the energy and power in the system**, you will receive an analysis of the energy flows and the power distribution in the system here.

Power area:

In this section, the compatibility of the system configuration will displayed.

- If notes are displayed, observe the notes and solution suggestions and adjust the design.

Energy area:

In this section, details of the energy flows will be displayed.

Solar fraction area:

In this section, the solar energy flows and solar fraction rate per month will be displayed.

11.32 "Results" project page

On the **Results** project page, you will receive an overview of the entries, results and current information on the design of the system. Check the information before creating the project documentation.

Project information area:

You will receive an overview of the planned project data here.

System overview area:

You will receive and overview of the PV arrays and PV inverters used here.

Information area:

This area is displayed if information on the design is available.

- Note the information and adjust the design.

Project data area:

You will receive an overview of the location settings, temperature settings, project details and the inverter grid connection here.

Results areas:

- Select the desired tab to view the results. The tabs **Diagram**, **PV system**, **Grud connection**, **Performance** and **Cable sizing** are available.
- To save the values from this area as a CSV file, click on [**Export**].

11.33 With energy systems: Overview of the results

In this page you will find all results on the energetic and profitable key figures of the energy system.

Results areas:

In the load-curve analysis, the results in terms of peak loa shaving and increased self-consumption are taken into account.

- Tab **Energetic (annual values)**:
  - By hovering the cursor over **Generation and consumption** and **Thermal energy**, a table appears for each diagram with corresponding values.
  - To view the exact analysis of grid-supplied power, load profile, maximum power and the power chart, click on **[Open load analysis]** and click on the required tab in the analysis window.
  - Click on to view the individual values throughout the year.
- Tab **Economical (observation period # years)**:
  - Here you can view the time period selected in the project data. To save the values from this area as a CSV file, click on [**Export**].
  - Click on to view the individual values throughout observation period.

11.34 With energy systems: "Summary" project page

The most important project details are summarized on the **Summary** project page. Check the information before creating the project documentation.

Project data area:

- Click on the relevant tab to view the project data on location settings, project details, efficiency, temperature settings and grid connection.

Key figures section:

- Click on the relevant tab to view the energetic and economic key figures.

Information area:

This area is displayed if information on the design is available.

- Note the information and adjust the design.

Energy system schematic area:

In this section, the project setup is summarized. An overview in terms of the energy system structure is also shown.

PV system area:

- Click on the relevant tab to view the data on system overview, design, grid connection and cable sizing.
- To save the values from this area as a CSV file, click on [**Export**].

11.35 Issuing project documentation



Sunny Design issues the project documentation as a PDF file.

Prerequisite:

☐ You have a fully planned project and opened the project page **Create project documentation**.

Procedure:

1. On the project page **Create project documentation** in the area **Settings** under **Documents**, enable the checkboxes that should be contained in the project documentation. If you created project images during the project configuration or roof planning, these will be added on separate pages with the title **Project images** at the end of the project documentation.
2. Click on **[Refresh preview]** to create a preview of the current selection.
3. If you have saved design alternatives on the project page **Configure PV system**, you can choose between the original design and the design alternatives by clicking on **Select** under **Design** and enabling the required design.
4. Select the desired format in the **Paper size** area.
5. Click on **[Download project documentation]**.
   ☑ The project documentation will be created as a PDF file and downloaded to your computer.

Note: In the **Preview** area, you can see the preview of the project documentation. To scroll through the project documentation preview, click on **[<]** or **[>]**.

11.36 Other project files



You can download the following documents in the tab **Other project files**:

- Quotation
- Mounting overview
- Device list of the planned SMA system components
- Circuit diagram
- SMA SPOT contract documents
- SUNNY DESIGN project file
- Sunny Design Pro: Project exposé

11.37 Downloading further project files

Requirement:

☐ You have a fully planned project and opened the project page **Create project documentation**.

Procedure:

1. On the project page **Create project documentation**, click on the tab **Other project files**.
2. Click on the **[Download]** button next to the desired file.
3. For project exposés (only for Sunny Design Pro): Make the necessary settings in the **Project exposé** dialog box and click on **[OK]**.

☑ The file will be downloaded to your computer.

12 Creating a harmonics calculation

With the harmonics calculation you can check whether the harmonic currents at the point of interconnection are within the thresholds. The harmonics calculation can be performed single- or multi-phase for SMA inverters of various device types. If you would like a harmonics calculation for medium-voltage systems or if overstepping of the thresholds occurs, contact the sales department of the SMA subsidiary for your country. When you select a project from the overview, you can edit or delete the harmonics calculation or save the harmonics calculation report as a PDF document.

Procedure:

1. Select the option **Harmonics calculation** on the personal home page under **TOOLS**.
   ☑ The **Harmonics calculation** dialog box will open.
2. Click on **[Create new harmonics calculation]**.
3. To transfer data from an existing project, select **[Select project template]**.
4. Enter the required project name in the field **Project name**.
5. If available, enter the registration number of the planned PV system in the field **Registration number**.
6. Enter the editor's name in the field **Calculation performed by**.
7. Select the desired **Grid voltage** from the drop-down list.
8. Enter the short circuit power indicated by the grid operator in the field **Short circuit power**.
9. Enter the total connectable feed-in power indicated by the grid operator in the field **Connectable feed-in power**. If you did not receive a value, enter **0**.
10. In the area **Inverter**, click on the [**Add inverter**] button.
    ☑ The **Select inverter** dialog box will open.
11. To restrict the list of displayed inverters, enable the required checkboxes under **Limit products**.
12. Select the row of the desired inverter.
    ☑ The activated row is displayed in a different color.
13. Click on **[Apply inverter]**.
    ☑ The selected inverter is added and displayed under **Inverter**.
14. To add further inverters, click on [**Add inverters**].
15. Select the required report template from the drop-down list **Select report template**.
16. Select **[Show report]**.

13 Glossary

Amortization time

The amortization time is the period in years within which the capital tied up in an investment is returned or from which the effective savings become positive.

Amortization time (discounted)

The discounted amortization period is the time period in years after which the discounted savings become positive.

Renewable energies share

With system components (e.g. heat pump): percentage of the renewable energy of the energy generation.
At system level: percentage of renewable energy of the annual total energy consumption.

Self-sufficiency quota

The self-sufficiency quota indicates what proportion of the energy demand can be covered by self-generated energy.

Operating time

The operating time is calculated from the ratios of the total energy demand of electric current during a twelve-month period and the highest load within this period.

Operating costs

The operating costs (operating expenditure) of the system component throughout the analysis period of profitability. These are composed of the annual fixed costs taking into account the inflation rate and the costs for replacement investments due to limited technical service life. This is the sum of operating costs of all system components for the overall system.

Fuel costs

The calculated fuel purchase costs according to the selected purchase cost tariff and the tariff components defined therein (e.g. fixed costs). The annual rate of price increases is taken into account.

CO_2 emission

Annual carbon dioxide (CO_2) emission due to using fossil fuels.

CO_2 reduction

Percentage change of the annual CO_2 emission: (before - after)/before x 100. Positive values represent a reduction.

Self-consumption

The self-consumption specifies the amount of self-generated energy that is not fed into the grid but consumed by the customer. The energy can be consumed immediately or after being stored intermediately.

Self-consumption quota

The self-consumption quota describes which proportion of the energy generated is used by the customers themselves.

Fuel savings

Percentage change of the purchased fuel: (before - after)/before x 100. Positive values represent savings.

Purchased electricity savings

Percentage change of the purchased electricity (before - after)/before x 100. Positive values represent savings.

Feed-in tariff

The feed-in tariff of the electrical energy fed in and possibly self-consumed as well as the sales after expiry of the feed-in tariff according to the selected feed-in tariff The degradation of the PV modules is taken into account in the calculation for the PV system.

Electrical energy requirement of the load profiles

Sum of the electrical energy demand of all load profiles used in the project per year.

Heating energy requirement

Thermal energy requirement for heating element.

Hot water energy requirement

Thermal energy requirement for the hot water production.

Energy purchase costs

The energy purchase costs are composed of the electricity purchase costs and the fuel purchase costs.

Energy production costs

The energy production costs determine the costs for the generation of 1 kWh energy. When calculating the energy production costs, the LCOE calculation method is used. The running costs of the year under review are calculated and added up throughout the observation period. They are then discounted to the reference date using the imputed rate of interest and the one-time costs are added. The discounted costs are divided by the energy amount discounted to the reference date. LCOE is a customary calculation method for power generation costs which is used here to calculate the production costs of all energy types.

Energy cost savings

The absolute energy saving costs versus the previous energy costs (user input) or versus an alternative interpretation.

Energy consumption heating element

Thermal energy consumption of the heating element.

Energy consumption hot water

Thermal energy consumption for hot water production.

Electrical energy withdrawn

The electrical energy drawn from the battery system per year.

Electrical energy generated

Electrical energy produced from the power generating units of the energy system.

Generated renewable energy

Energy produced from power generating units of the energy system from renewable sources.

Heating energy generated

Thermal energy produced from the power generating units of the energy system per year.

Grant amount

The subsidy amount stated with the system component or the sum of the subsidy amounts of all system components for the overall system.

Debt capital

The credit costs (borrowing costs) specify the interest charges for a loan at nominal terms. They are independent from the inflation. The total interest charges depend on the type of loan.

Total savings

The total savings over the period under consideration is made up of the total energy cost savings and the feed-in tariffs. The investment costs, the financing costs and the operating costs incl. replacement investments are deducted from this. Here, the inflation rate is included in the operating expenditure and the electricity price increase rate is included in the electricity purchase costs. Furthermore, the degradation of the PV modules is taken into consideration in the feed-in remuneration.

Total heating energy requirement

The annual thermal energy demand for heating and hot water production.

Total energy requirement

The sum of the electrical energy demand from the load profiles used in the project and the thermal components per year.

Total purchased energy

The total electrical energy drawn from the utility grid and energy from fuels.

Total energy consumption

The total annual consumption of electrical energy and energy from fuels.

Total fuel energy consumption

The total annual energy consumption of fuels.

Total electrical energy consumption

The total annual power consumption is calculated from the purchased electricity and the electric current generated, minus grid feed-in and the change in the energy quantity in the electrical storage between the start and the end of the calculation period.

Total energy supply costs

The total energy supply costs includes, in addition to the costs for the purchased energy carriers (more specifically, the energy costs) all costs for the internal energy conversion, distribution, storage and disposal. They also include the capital costs, the replacement investments and the operating expenditure. The impacts of the inflation rate and the energy price increase are taken into account throughout the analysis period of profitability. The total energy supply costs of the operational energy supply are also referred to as input energy costs.

Investment costs

One-time investment costs (CAPEX) for the system component (turnkey PV system) At the overall system level, it is the sum of the investment costs (CAPEX) of all system components.

Annual performance factor

The annual performance factor is a measure for the efficiency of a heat pump. It states how much thermal energy is generated by the heat pump in relation to the current used in the course of a year.

Annual nominal energy throughputs of the battery

The annual nominal energy throughputs of the battery are calculated from the total electrical energy stored intermediately per year, divided by the battery's nominal energy.

Annual return

The return is calculated as an internal interest rate (internal rate of return). This effective rate of return reflects the economic advantageousness of the investment as the mathematically calculated return of all payment flows of the investment during the selected period under review compared to the before-after values or an alternative interpretation.

Max. grid-supplied power

The maximum value of the electrical power drawn from the utility grid during the period under review.

Net present value

The net present value method is used to add up all income and expenses of a planned system within the selected period under review and with the interest rate adjusted. The income takes into account the feed-in tariffs, energy procurement costs savings, subsidy amounts and credits compared to the before values or to an alternative. The payments in the individual years are discounted to the current point in time with the selected imputed rate of interest. From this, the so-called present values of the payments result. The net present value (or present value) is a possible way of expressing the economic advantageousness of an investment.

Grid-supplied power

Electrical energy drawn from the utility grid.

Grid feed-in

Electrical energy fed into the utility grid.

Percentage of purchased energy savings

Percentage change of the total purchased energy from electric current and fuels: (before - after)/before x 100. Positive values represent savings.

Percentage energy consumption saving

Percentage change of the total energy consumption: (before - after)/before x 100. Positive values represent savings.

Reduction of the purchased power peak

Change of the maximum value of the electrical power drawn from the grid during the analysis period of profitability: maximum value before - maximum value after. Positive values represent a reduction.

Relative energy cost savings

The energy savings costs as a percentage versus the previous energy costs (user input) or versus an alternative interpretation.

Relative heating cost savings

The heating cost savings as a percentage versus the previous heating costs (user input) or versus an alternative interpretation.

Return on assets (IRR)

The calculation of return is based on the return on assets. The return on assets refers to the total capital employed (capital expenditure) and puts this in relation to the profit (feed-in tariff + savings in purchasing costs + self-consumption tariff – self-consumption apportionment – operating costs). The financing costs through debt capital are not included in the return on assets. Long-term influences on the rate of return due to inflation, module degradation and the electricity price increase rate are also taken into account. For energy system projects, this also includes

replacement investments and residual values. The rate on return is therefore calculated dynamically using the IRR method over the entire period under review (internal interest rate, internal rate of return). It indicates the average mean annual return on the investment and corresponds to the interest at which the discounted returns represent the capital employed.

Residual value

The residual value of the system component or of the system at the end of the period under review with linear depreciation and amortization. The service life, the system components and the replacement investments are taken into account in the calculation.

Solar fraction (SF)

Solar fraction is the amount of energy provided by the solar technology divided by the total energy required.

Specific yield

The estimated specific annual yield specifies how much energy the PV system can supply per installed kilowatt peak.

Specific investment costs

One-time investment costs for the system component per activity unit or capacity, depending on the component under review.

Specific electricity purchase costs

The costs calculated from the energy drawn from the utility grid per kWh according to the selected purchase cost tariff and the tariff components defined therein (e.g. fixed costs or peak load price). The annual rate of electricity price increases is taken into account.

Specific heating costs

The specific heating costs are composed of purchase costs and generation costs per kWh.

Electricity and fuel consumption

The total annual consumption of electrical energy and energy from fuels.

Electricity purchase costs

The costs calculated from the energy drawn from the utility grid according to the selected purchase cost tariff and the tariff components defined therein (e.g. fixed costs or peak load price). The annual rate of electricity price increases is taken into account.

Avoided fuel costs

The difference in the fuel purchase costs (costs before - costs after), taking into account the specified inflation rates

Electricity purchase costs avoided

The difference in the electricity purchase costs (costs before - costs after)

Heating costs

The absolute heating costs are composed of the purchase and generation costs.

Heating cost savings

The absolute heating cost savings versus the previous heating costs (user input) or versus an alternative interpretation.

Intermediately stored electrical energy

The intermediately stored electrical energy in the battery system per year.

14 Contact

You can find your country's contact information at:

https://go.sma.de/service

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www.SMA-Solar.com