

# Calculation aid II for 2000-Watt Sites: User manual

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Further information at [www.2000watt.swiss](http://www.2000watt.swiss)



Project Manager 2000-Watt Sites  
Daniel Kellenberger  
Intep — Integrale Planung GmbH  
Pfingstweidstrasse 16  
8005 Zurich  
Tel: 043 488 38 98  
areal@2000watt.ch

#### Certification Office

Maren Kornmann  
c/o ENCO Energie Consulting AG  
Munzachstrasse 4  
4410 Liestal BL  
Tel: 061 965 99 00  
zertifizierung@2000watt.ch

Programme responsibility 2000-Watt Sites  
Ricardo Bandli  
Swiss Federal Office of Energy SFOE – Buildings  
Section  
Mühlestrasse 4,  
3063 Ittigen  
Tel: 058 462 54 32  
ricardo.bandli@bfe.admin.ch

#### Technical development

Heinrich Gugerli  
c/o Gugerli Dolder GmbH  
Solistrasse 2  
8180 Bülach  
Tel: 079 704 26 82  
Enquiries:  
technik@2000watt.ch

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Contact: Ricardo Bandli

PROJECT COORDINATION/CONTRACTOR  
Gugerli Dolder GmbH  
on behalf of the Swiss Federal Office of Energy  
Contact: Heinrich Gugerli

AUTHORS AND PROGRAMMING  
Martin Jakob, TEP Energy GmbH, Project Manager Contractor  
Giacomo Catenazzi, TEP Energy GmbH, responsible energy modelling  
Raphael Looser, TEP Energy GmbH  
Marco Morf, TEP Energy GmbH  
Marc Melliger, TEP Energy GmbH

PROJECT TEAM (CORE GROUP)  
Heinrich Gugerli, Gugerli Dolder GmbH  
Daniel Kellenberger, Intep – Integrale Planung GmbH  
Arne Sussdorf, Intep – Integrale Planung GmbH  
Urs Vogel, Amstein + Walthert AG  
Stefan Schneider, Planungsbüro Jud AG  
Daniel Hirzel, Planungsbüro Jud AG

TECHNICAL COMMISSION  
Heinrich Gugerli Gugerli Dolder GmbH, technical development (lead)  
Daniel Kellenberger Intep - Integrale Planung GmbH, project leader 2000-Watt Sites  
Céline Pahud Label Commission 2000-Watt Sites, Canton of Vaud  
Katrin Pfäffli Architekturbüro Pfäffli, SIA Energy Efficiency Path  
Stefan Schneider Planungsbüro Jud AG, mobility expert  
Urs Vogel Amstein + Walthert AG  
Franzine Wegmüller Weinmann Énergies SA, Representation Romandie

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## Download

Calculation aid II and the user manual can be downloaded from  
<https://www.2000watt.swiss/bibliothek.html> by registered users.

## Foreword

**V1.4.1 of calculation aid II** contains the following new features:

- **Conceptual simplifications and adaptations**
  - Strategic Planning: input operating energy simplified
  - Various content-related and calculation adaptations
  - Data input of mobility surveys for all categories of buildings
- **Expansions in the field of construction**
  - *Preliminary Study/Preproject*: incorporation of calculation of embodied energy according to SIA 2032 in line with SIA 2040 calculation aid
- **Adaptations for new building categories.** Guide and target values, additional requirements and default values for
  - building category *University* (data processed by an external project)
  - building category *Administration with high space efficiency*
- **Cockpit**
  - Aligned with management tool
  - Data required for the management tool determined in the cockpit (new: local shares produced / quality of final energy)
- **Output-Export specification and application**
  - Export interface for all data in Excel file

The **user manual** has the following new features:

- **Functionalities:** adapted to the new or changed functionalities in V1.4
- **Section 9. Cockpit** greatly expanded
- **Section 10. Workflow** New
- **ATTENTION / WARNING / TIP** references were greatly expanded based on the testers' experiences.

Heinrich Gugerli  
Head, 2000-Watt Site Technical Commission

## Abbreviations and colour codes

### Abbreviations

CAII	Calculation aid II
ERS	Energy reference surface
FA	Floor area
FTE	Full-time equivalent
GEPAMOD	Building park model, expansion pursuant to SIA Energy Efficiency Path <sup>1</sup>
GHGE	Greenhouse gas emissions
GHGEc	Greenhouse gas emissions coefficient
GUI	Graphic user interface
kW	Kilowatt
kWh	Kilowatt-hour
MJ	Megajoule
MIT	Motorised individual traffic
PE <sub>tot</sub>	Primary energy total
PE <sub>ne</sub>	Primary energy non renewable
PE	Primary energy
PEF	Primary energy factor
SIA	Swiss Society of Engineers and Architect

### Colour codes

Text relating exclusively to *Site in transformation* is identified using this colour.

TIP: Support for optimal use of CAII and external calculations.

WARNING: Information to prevent errors and ensure proper interpretation of results.

ATTENTION: Alerts the user to tricky operations. Pay close attention to these!

<sup>1</sup> Jakob M., Catenazzi, G., Forster, R., Egli, T., Kaiser, T., Looser, R., Melliger, M., Nägeli, C., Reiter, U., Soini, M., Sunarjo, B. *Erweiterung des Gebäudeparkmodells gemäss SIA-Effizienzpfad Energie* [Development of the building park model according to the SIA Energy Efficiency Path]. Bern, 2016

## 1. Introduction to calculation aid II

### 1.1 Purpose of the user manual

This user manual walks you through CAII for 2000-Watt Site quantitative proof. It explains the user interface, software behaviour and important input variables/output results.

### 1.2 Calculation aid II functionalities

Figure 1 provides an overview of the CAII structure. The methodology is explained in *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>2</sup> (see in particular Subsection 5.5.3) and in the final report on CAII<sup>3</sup>.

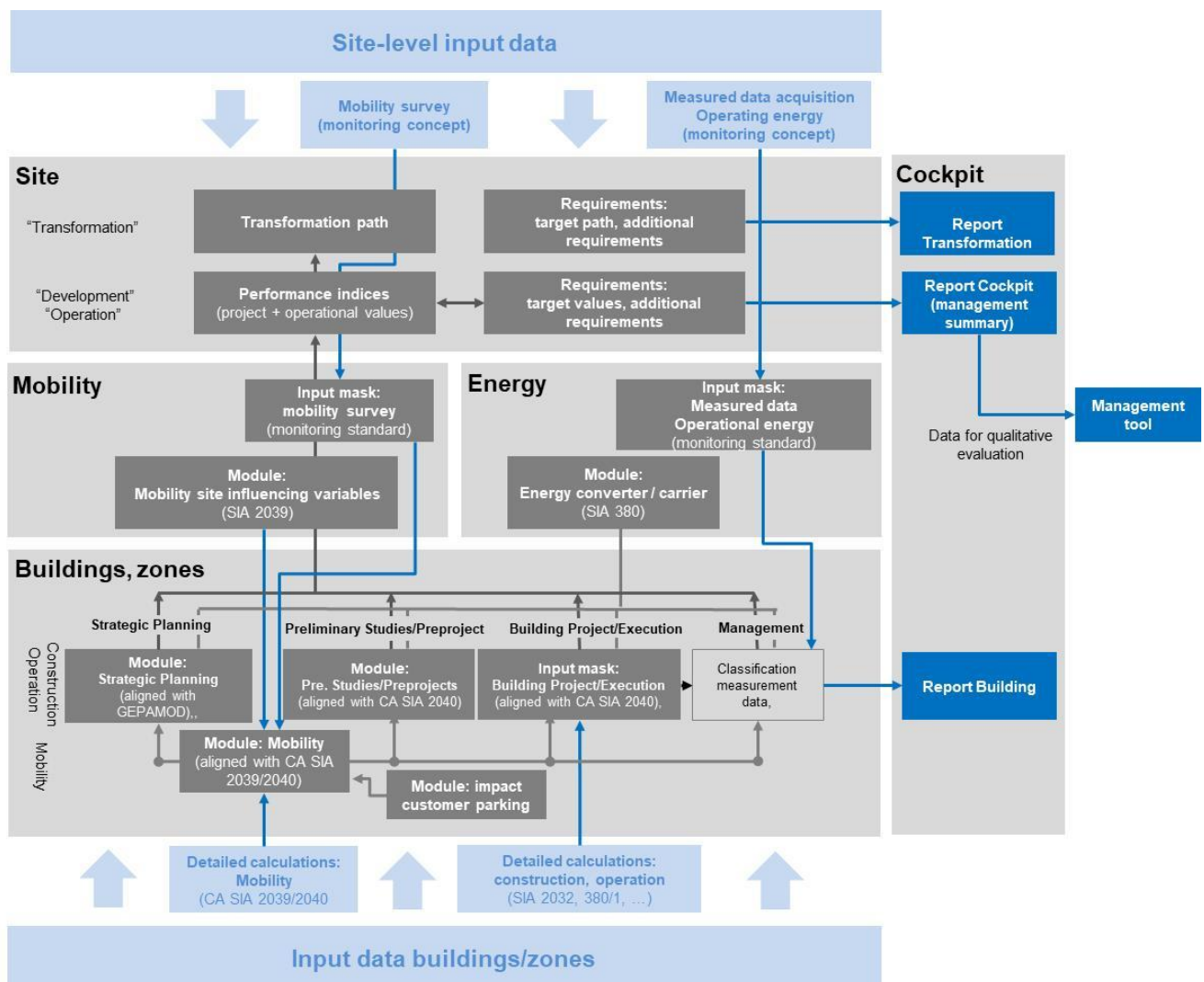


Figure 1 Structure of CAII with presentation of the various tabs, modules and input masks, input data and outputs

First-time CA II users are recommended to follow the workflow set out in Section 10 when inputting 2000-Watt Sites.

<sup>2</sup> *Handbuch zum Zertifikat 2000-Watt-Areal* [Handbook for the 2000-Watt Site Certificate]. swissenergy, version 1.0, July 2019.

<sup>3</sup> *Rechenhilfe II für 2000 Watt Areale. Schlussbericht inklusive Methodik Einfluss Kundenparkplätze* [Calculation Aid for 2000-Watt Sites. Final Report, including methodology influence customer parking places]. swissenergy, V1.1, May 2019.

## 2. Installation and system requirements

### 2.1 Windows 7, Windows 10 and later versions

Operation of CA II requires a current version of the system's standard browser. In Windows, it was tested using Internet Explorer 11.

To install CAII, download the corresponding Windows files. There are two versions: one for the 64-bit version of Windows currently in wide use and a special one for the older, 32-bit version of Windows. Execute the corresponding installation files (those ending in .exe). No administrator rights are required.

### 2.2 MacOS

On Macs, CAII was tested using MacOS 10.12 and 10.13 (*Sierra* and *High Sierra*). To install it, download the corresponding Mac files. No administrator rights are required.



### 3. User interface

#### 3.1 Components of the user interface

The screenshot shows the 'Gebäude' (Building) page in the CAII system. The interface is divided into several sections, each with specific input fields and controls. Annotations in green boxes identify key UI elements:

- Left-hand menu bar:** Located at the top left, containing navigation links like 'Rechenhilfe II', 'Areal', 'Gebäude', 'Energie', 'Mobilität', and 'Cockpit'.
- Right-hand menu bar:** Located at the top right, containing 'Speichern' and a settings icon.
- Input field:** A text box for 'Gebäude 6' under 'Gebäudename'.
- Selection field:** A dropdown menu for 'Gebäudestrategie' set to 'Neubau'.
- Button:** A red button labeled 'Gebäude und Zonen löschen'.
- Note:** A section titled 'Angaben Gebäude' with a note icon and a red error message: 'Es muss ein Gebäudetyp ausgewählt werden.'
- Section:** A bracketed area on the right side of the page, encompassing the 'Angaben Gebäude' and 'Zonen des Gebäudes' sections.
- Navigation bar:** A green bar at the bottom with buttons for '← Zurück', '↑ Vorheriges Gebäude', and '↓ Nächstes Gebäude'.

Figure 2: presentation of the “Building” page with description of GUI elements

**Components:** The CAII GUI is made up of the following components (Figure 2):

- Left- and right-hand **menu bars** and a navigation bar
- Input fields for text and numerical values
- Selection fields with dropdown menus
- Option fields (*not shown*)
- Note function
- **Buttons**
- **Links**
- Information pop-ups (*not shown*)
- **pages**, **subpages**: indicated by headings
- **sections**: indicated by headings and thick horizontal lines

**Pages:** CAII has four types of page:

- Standard input mask (as in Figure 2), with only one column (target state values for *Site in development*, current state values for *Site in operation*)
- Standard input mask for *Site in transformation*, with two kinds of input mask:
  - One column for general input (non-time-dependent)
  - Several columns: the first column is for the initial state, followed by one column per certification time (past, future)

- Cockpit for *Site in development* and *Site in operation*: Results pages with results shown in a table and a diagram.
  - Cockpit report in the form of a management summary with quantitative proof (target values, additional requirements, energy mix requirement, indicators) and characteristic values for qualitative evaluation of the site (management tool)
  - Building report with selected results for plausibility testing
- Cockpit for *Site in transformation*. In addition:
  - Cockpit and building reports, each with a results page per certification time. The presentation year is selected above.
  - Transformation report with results history for quantitative proof (target path, additional requirements)
- Special input masks for external tools: They facilitate the input of results from external tools during the *Building Project/Execution* and *Management* phases.

## 3.2 Use

You can choose between two ways of using CAI:

- Navigation with a mouse and input of values using the keyboard
- Navigation and input of values using the keyboard

### 3.2.1 Navigation with a mouse and input of values using the keyboard

You can navigate CAI using the mouse.

- [Links](#) and [Buttons](#) commands are executed with one click.
- In order to enter or edit values in the **input fields** (text and numerical values), click on the corresponding field. Confirm the entry by clicking in a field outside the input field.

### 3.2.2 Navigation and input of values using the keyboard

You can navigate CAI using the keyboard.

- [Links](#), [Buttons](#), input fields, selection fields, option fields and notes can be reached using the keyboard (Tab). The current field is highlighted. In order to access previous fields, use Shift + Tab.
- In order to confirm values in the input fields for numerical values, press on Enter or change the highlight using the tab key.
- You can navigate between options and selection fields using the cursor keys.
- A value can be erased using the backspace key; it is replaced with the default value in editable input fields.

### 3.3 General behaviour of input fields

#### 3.3.1 Status of input fields

Both the input fields for texts and numerical values and the selection and option fields can have one of the following statuses and are highlighted using colours:

Status	Colour	Description
No value	White	No value available, nor is one needed.
Default value	Blue	The CAII default value is used.
Calculated	Light blue	Value calculated using previous indications.
Copied	Light yellow	Value calculated using previous times.
OK	Green	Value meets requirements.
Warning	Yellow/amber	Value may be problematic.
Error	Red	Value is incorrect and must be corrected.
Not editable	Grey	Value is not editable.

In addition, appropriate notifications appear in the event of an error or a warning.

#### 3.3.2 Overwriting and restoring default values

In editable input fields, you can overwrite the default values. Doing so changes the status from “Default value” to “OK”. To restore the default value, delete the user input using the backspace key.

**WARNING:** In the current version it is not possible to restore the default values in selection fields.

#### 3.3.3 Figures



The program gives first priority to figures with decimal points; the separators used by your operating system have secondary priority. Any apostrophes are read as indicating thousands, full stops or commas as decimal separators.

To present figures, the program uses whatever thousands separator is installed in the operating system.

The program saves figures as “floating” point-type figures. The local settings of your calculator therefore have no impact on CAII data.


#### 3.3.4 Status of synoptic tables

The **Buildings and zones**, **Energy** and **Mobility** pages each provide an overview of the corresponding components (i.e. buildings, zones, energy mix and surveys). Any errors or warnings they contain are indicated as follows in the “Status” column:

 x error	There are x errors to correct.
 y notifications	There are y warnings to heed. Despite the warnings, the results can be correctly calculated.
OK	All values correspond to the specifications.

### 3.4 Note function

You can use the note function to show sources and enter other notes, using the buttons located next to most input fields. The following buttons are used:

	No notes exist.
	Notes exist.


The notes are numbered continuously from the start of the page. When notes are created, an overview of all notes is given at the end of each page (see Figure 3)

<h2>Notizen</h2> <p>#1: Zieljahr Integer mollis dui vel sapien viverra, at efficitur ante pulvinar. Etiam ornare massa aliquam eros cursus, at rhoncus metus vestibulum</p> <p>#2: Gemeindetyp Vestibulum ultrices laoreet libero</p> <p>#3: ÖV-Gütekasse Maecenas non tellus id sapien vestibulum accumsan et id metus</p> <p>#4: Distanz zu Detailhandel Nam cursus tortor ipsum</p>
--

Figure 3: Overview of notes at the end of the page

You can also use the additional, bigger note field available on most pages under the input field “Name”.

### 3.5 Settings and help

The *Settings and help*  menu is located in the right-hand menu bar and allows the user to apply general settings and ask for help.

- **Preferred units:** This setting applies to the display of energy units in the corresponding input fields (e.g. electricity mix or project values). You can choose to display units in kWh or MJ. You can also choose a specific unit (i.e. in relation to the ERS for buildings and to the energy level for energies). The values under the setting *Units: ... (absolute)*, on the other hand, relate to total ERS or energy production.
- **Maximum number decimal places:** Calculated values can show any number of decimal places. This option allows you to personalize the display of decimal places. You can choose between no, one to five or all internally saved decimal places.  
Please note that this option has no impact on some of the manually input values, i.e. you can decide yourself on the number of decimal places for those values.
- **Language:** You can choose between English, French and German.
- **Publication information and disclaimer**

TIP: The user manual is available in English, French and German.<sup>4</sup>

<sup>4</sup> User manual for the calculation aid II for 2000-Watt Sites, swissenergy, May 2019 [www.2000watt.swiss](http://www.2000watt.swiss) / Bibliothek

## 4. Project administration

Project administration is automatically displayed when CAII is started. It can also be reached by clicking on *Calculation aid II* in the left-hand menu bar.

Here you will find an overview of all recently edited projects (the most recent project is at the top). Any project currently uploaded to CAII will be indicated here.

### 4.1 New project, open and save

CAII saves sites in the file format \*.rh2. Use the following functions to create, open and save a project:

- New project
- Open
- **Save**: save in the current file
- **Save as ...**: save in a new file

Please note: When creating a new project, you first have to choose **Save** (you will be directed there when you open the **Site** page). From here on in the save function appears in the right-hand menu bar.

ATTENTION: If you do not save them, any changes you make between sessions will be lost.

### 4.2 Open an existing project

With CAII you can also open an existing \*.rh2 file. If the file was created using an earlier version of CAII, you must check that the input data are complete. Complete new data fields in the current version.

### 4.3 Write protection

A file can be opened in read-only mode. In a read-only file, no new results can be calculated and the save function is deactivated.

Use the [Save as write-protected](#) link in the **This project** section of Project administration to provide the current project with write protection.

TIP: After a file has been saved in read-only mode, the data can no longer be changed. In order to re-edit the file, you will have to resave it with a new name in Project administration.

In order to open a specific project *temporarily* with write protection, select [Open write-protected](#) in the Project administration sidebar. Write protection will apply until the next session.

### 4.4 Export function

The data in the current file can be exported for further editing as an MS-Excel file with the name *areal.xlsm*. In the Project administration sidebar ([Calculation aid II tab](#)), select [Export under...](#)

## 5. Site data

The **Site data** page is reached via the **Site** tab. This is where you name the site and record your address and certificate data.

### 5.1 Certificate

In the **Certificate** section you record the desired type of certificate and the related times. In the *Recertification* selection field you can choose between *First certification* and *Recertification #1*. If you choose the second option, the selection field is expanded to allow further recertifications to be entered.

ATTENTION: If you want to change the type of certification of an existing project, we recommend that you save the project under a new name.

#### 5.1.1 Site in development

In CAI, you enter only the planned values for the target state, except for *Building strategy* (*New building/Conversion/Deconstruction/Existing building*), which pertains to the transformation of the initial state (changes the indicative values), and the *Phase according to SIA 112* input, which pertains to the current phase of the building (or the available data) and which changes the masks and tools used to calculate the project values.

#### 5.1.2 Site in transformation

In *Site in transformation*, you have to enter the initial state (first column) and the current and future certification times (past times are optional) up to the target state. The reducing path is calculated. CAI chooses default values with data from previous times or calculates using earlier data from the same certification period. The data can always be overwritten.

The data should represent the planned values at the time the column was labelled, except in the case of *Building strategy* (*New building/Conversion/Deconstruction/Existing building*), which pertains to the transformation of the initial state (changes the indicative values), and the *Phase according to SIA 112* input, which pertains to the current phase of the building (or the available data) and which changes the masks and tools used to calculate the project values.

#### 5.1.3 Site in operation

CAI needs only the values for the current state.

TIP: In the input mask Measured values Operation, enter the average annual value since the last certification.

WARNING: According to Subsection 5.1 of the *Handbuch zum Zertifikat 2000-Watt-Areal*,<sup>2 page 6</sup> in *Site in operation*, fulfillment of target values and additional requirements is subject to a +10% tolerance. This is indicated on the **Report Cockpit** page as *Fulfilled (tolerance)* (see Subsection 9.1.2).

## 5.2 New project

When creating a new project, you will initially be directed to the **Site data** page. Before you can edit the site, you will have to select a type of certification and save the site under a name. Please refer to the note at the bottom of the page.

## 6. Buildings and zones

The **Buildings and zones** page is accessed via the **Building** tab.

This page displays an overview of your buildings and the relevant zones. The synoptic table contains the building name, the building strategy and the phase according to SIA112.

The following functions are available:

- **Add new building:** Add a new building and open the **Building** subpage by clicking on the link [Add new building](#) (under the synoptic table).
- **Edit building:** You can edit a building by clicking on the [Building name](#). On the following subpage you can also delete buildings and zones.

The Status column will alert you to all warnings and errors (see page 11).

### 6.1 Building

The **Building** subpage contains fields for entering characteristic building values and zones and allows the user to add or delete zones (Subsection 6.1.3) and to delete or copy buildings, including their zones. Individual zones have to be deleted on the corresponding zone subpage.

#### 6.1.1 Overview of input fields for buildings

- **Name of building:** This is where you enter the building's desired name. Every building name can be used only once per project.
- **Building strategy:** Select the desired strategy.

TIP: When you select the building strategy, you determine the guide and target values, and the additional requirements, for the zones and buildings.

TIP: A replacement new building must be entered as two separate buildings: a deconstruction and a new building.

- **Building in management?** This question appears only for the "New building" and "Deconstruction" building strategies and only in *Site in transformation*. Only once you have ticked the box will buildings and calculations for the year selected be taken into account. This is implicit for other strategies and types of certification.
- **Planned phases according to SIA 112 (for information only):** only for *Site in transformation*, can only be selected for a conversion: "*Management before conversion*", "*Management during conversion*", "*Management after conversion*".
- **Phase according to SIA 112 /Current phases according to SIA 112:** The phase is selected in the light of the planning status and the available data, and determines the calculation procedure.
- **Type of building:** Enables selection according to GEPAMOD in the *Strategic Planning* phase.

#### 6.1.2 Indices and guide values

Click on [Display indices and guide values](#) to display the building's resultant project, guide and target values. No changes can be made to the fields displayed.

WARNING: For *Site in transformation*, the building's target values (target state) are indicated, not a target path.

### 6.1.3 Deleting or copying buildings and zones

In order to delete a building, including its zones, click on **Delete buildings and zones**. Confirm the deletion in the subsequent dialog box.

With **Add new zone**, you can add a new zone to the building concerned. Click on **Copy values from another building** to copy values from another building and its zones. You select the buildings to be copied from the subsequent dialog box.

ATTENTION: Deletion removes the entire building and its zones.

Changes can only be undone if you close the current project without saving it and then open it again.

### 6.1.4 Construction and operating energy data with overview by phase

For each phase there are various input fields for determining the construction performance indices and for entering the operating energy at building level. They are derived from various instruments, standards and tools (see Figure 1, page 7).

#### Strategic Planning

The default values and calculations for buildings in the *Strategic Planning* phase are to a large extent based on the GEPAMOD<sup>1</sup> page 6.

- The building strategy, the type of building and the building data determine *Performance indices construction*. Selecting a building type will call up pre-defined default zones that can be manually adapted.
- ERS and FA are calculated by default using information on the floors.
- The default value of the thermal envelope factor is calculated using the construction period and the type of building. It can be adapted (e.g. to take account of extensions) manually.
- For *Project values operating energy*, higher-level input can be entered on the **Building** page in the **Operating energy** section. Enter the heat requirement for space heating and select the heat supply and electricity mix. Those values can be overwritten in the individual zones.

#### Preliminary Study/Preproject

The *Preliminary Study/Preproject* phase is aligned with the detailed calculating procedure set out in SIA 2040:2017. Building default values and calculations are essentially aligned with the SIA 2040 calculation aid.

- *Performance indices construction* are calculated on the **Building** page in the **Construction** section in line with the SIA 2040 calculation aid “construction” worksheet. The share of construction for photovoltaic installations, geothermal probes and thermal solar plants, which are entered in the **Energy** tab, is automatically determined. The share of construction for ventilation installations is determined on the basis of the zone information.
- For the *Performance indices operating energy*, higher-level input can be entered on the **Building** page in the **Operating energy** section. Enter the heat requirement for space heating and select the heat supply and electricity mix. Those values can be overwritten in the individual zones.

#### Building Project/Execution and Management

The *Building Project/Execution* phase is aligned with the detailed calculating procedure with external tools. Input is largely based on the SIA 2040 calculation aid “building project” worksheet.

- The building's *performance indices construction* as per SIA 2032 must be determined using a recognised software solution (see [www.minergie.ch](http://www.minergie.ch)). For that purpose, transfer the corresponding results for primary energy non renewable and greenhouse gas emissions in the construction indices row in the **Indices** section on the **Building** page. If the external software solution does not deter-



mine *Primary energy total* (no input), it will be automatically calculated using *Primary energy non renewable* (factor 1.10)<sup>5</sup>.

The building *Management* phase according to SIA 112 complies with the *Monitoring-Standard für Gebäude und Areale* (monitoring standard for buildings and sites). For correct calculation of the building's *Performance indices construction* use the same data as for the *Building Project/Execution* phase.

### 6.1.5 Summary of the building's zones

Enter the building's zones in the **Zones of building** section (after having first selected a phase). Open a new zone using the **Add new zone** button.

#### Overview of input fields

- **Building category, floor area, energy reference surfaces, parking places:**  
see Subsection 6.2 Zones

To edit a zone's energy indices and mobility values, click on

[Edit zone details, operating energy and mobility](#). You will be taken to the **Zone** subpage.

## 6.2 Zones

A zone is part of a building with a homogeneous use characterized by a building category. The **Zone** subpage contains the masks for entering zone details and operating and mobility values, and allows the user to delete individual zones.

### 6.2.1 Overview of zone input fields

- **Name of zone:** This is where you enter the zone's desired name. Each zone name may be used only once per project.
- **Building:** Shows to which building the zone is assigned.
- **Building strategy:** By default, the same building strategy will be used as for the building. It is nevertheless possible to select a different strategy for each zone.
- **Building category:** Select the corresponding SIA 2040 building category. CAII has two more building categories than SIA 2040:2017 and two special categories.
  - The principles for the two additional building categories *Administration with high space efficiency* and *University* are described in *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>2 page 7</sup> and in the corresponding reports.
  - *Other uses (not included in SIA 2040 and not included in project values):* The first of the two special building categories does not take account of the zone's energy and emissions in the results for buildings and sites. However, certification under Subsection 3.4.2 of the *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>2 page 7</sup> requires that at least 90% of the site's ERS must be assigned to an SIA 2040 category.
  - *Underground car parks and other zones (included in project values):* The second of the two special building categories takes account of the results pertaining to energy and emissions (but not ERS). This category is used for central facilities and underground car parks for which it is not yet clear to which building they should be linked (if any). These are zones that, according to SIA 380, are situated outside the thermal building envelope and are not conditioned (but for which embodied and operating energy, such as ventilation and lighting, are relevant).

<sup>5</sup> SIA 2040:2017, Annex C2, Figure C.2.1

WARNING: All data and results for the *Underground car park* category are based, not on ERS (ERS = 0), as is the case for all other zones, but on FA.

- **ERS:** The data are indicated either in m<sup>2</sup> or as percentage of the building's total ERS. The former is calculated on the basis of the latter, on condition that it is less than the total ERS for the building. [Reference: FA for underground car parks].
- **FA:** FA is automatically determined on the basis of ERS (factor 0.85).
- **Number of households:** This input field is used for the purposes of documentation. It is only visible for zones in the "Residential" building category. The number of households is derived from the default values per building period (84 to 122 m<sup>2</sup> ERS per household) in standard usage. This value can be overwritten with the actual number of households/apartments.

### 6.2.2 Indices and guide values

Click on [Display indices and guide values](#) to display the resultant indices and guide values for this zone. No changes can be made to the fields displayed.

### 6.2.3 Deleting and copying zones

Click on [Delete zone](#) to delete the current zone. Confirm the deletion in the subsequent dialog box.

Click on [Copy values from another zone](#) to copy values from another zone. Select the zone you want to copy from in the subsequent dialog box.

ATTENTION: Deleting removes the entire zone and copying overwrites all (!) the values in the current zone.

Changes can only be undone if you close the current project without saving it and then reopen it.

### 6.2.4 Operating energy

In the [Operating energy](#) section, enter the details on the various usages in the zones. Various functions are available, depending on the SIA 112 phase (see Figure 1):

- Calculation using simplified input (standard building with default values) or detailed input on the usage (in *Strategic Planning* and *Preliminary Study/Preproject* phases)
- Manual transfer of results from external calculations (only *Building Project/Execution* and *Management* phases)
- Entry of management data according to the *Monitoring-Standard*: measured data are entered in the [Energy](#) tab, [Measured values](#) page, [Input mask Measured values](#) link. That link only appears when at least one building is in the *Management* phase (see Subsection 7.2). The Operating energy Project values in the [Building](#) tab also have to be completed.

#### Calculation

In the *Strategic Planning* and *Preliminary Study/Preproject* phases, the project values for operating energy are calculated by CAII. Under *General standard of the building* select:

- either a specific building standard (SIA 2040 New building, conversion or GEPAMOD) with default values for the simplified input of energy demand for individual usages; or
- "Detailed information" for the detailed input of individual usages.

#### Manual transfer

In the *Building project* and *Management* phases, energy demand is calculated using external tools. Enter the individual usages in the zones. Also indicate the energy converter, the energy mix and the allocation of energy bills to landlords (common electricity) or tenants (tenant electricity).

WARNING: Values for the *Other uses ...* building category are not taken into account for buildings and site. The share of construction and energy produced on site should nevertheless be entered for the entire building.

WARNING: For the *Underground car park ...* building category all values relate to FA and not to ERS. Primary energy and emissions are reflected in the site's indices.

### Overview of input fields

Input for operating energy is mandatory for the *Strategic Planning*, *Preliminary Study/Preproject* and *Building Project/Execution* phases. The values must also be entered in the *Management* phase for indicative purposes, in order to distribute the measured values among the zones.

- **General standard of the building** (only in the *Strategic Planning* and *Preliminary Study/Preproject* phases): This is where you define the default values for energy demand using *Existing* (GEPAMOD), *New building* (SIA 2040) and *Conversion* (SIA 2040). These values depend on the building category selected.
- **Heat requirement** (for space heating): Manual input of heat requirement. During the strategic phase, the heat requirement is determined using the building data from GEPAMOD.
- **Heat requirement for hot water**: Manual input. The SIA 2040:2017 default value depends on the building category selected.
- **Energy demand** (for other usages): Manual input. This field is overwritten using SIA 2040:2017 or GEPAMOD default values if you selected a strategy under General standard of the building for the *Strategic Planning* or *Preliminary Study/Preproject* phase.
- **Energy bill allocation** (in the *Building Project/Execution* and *Management* phases): allocation to landlords/tenants, to ensure proper distribution of measured values. Allocation is automatic for criteria assessment (see Cockpit) during all other phases (landlords: ventilation, general building services; tenants: heat, lighting, appliances).
- **Heating installation/Hot water systems/Refrigeration plant**: link to relevant installation.
- **Electricity mix** (only visible for relevant usages): Select the electricity mix used for the usage at hand. By clicking on [Add new electricity mix here](#), you can add a new electricity mix to the current usage and go to the corresponding subpage for editing. Use the menu to return to the zone. For newly established electricity mixes, this corresponds to the CH consumer mix.

### Overview of additional input fields for ventilation and space cooling

The following additional questions arise for *Strategic Planning* and *Preliminary Planning/Preprojects*:

- **Type**: Here you select the type of installation. If no installation is selected, the subsequent input fields are hidden.

#### 6.2.5 Mobility

In the **Mobility** section, you enter information on zone-specific mobility, choosing among three acquisition methods:

- Calculation pursuant to the SIA 2039 technical specification (internal using CAII);
- Manual transfer of results of external calculations;
- Survey pursuant to the *Monitoring-Standard*. Operating values are determined in zones and data imported from a corresponding survey into the **Mobility** tab, **Survey** page (see Subsection 8.1).

## Calculation

During the *Strategic Planning*, *Preliminary Study/Preproject*, *Building Project/Execution* and *Management* phases, CAII calculates the mobility energy demand according to the SIA 2039:2016 technical specification. Project values are calculated on the basis of mean Swiss consumption, standard person areas and influencing variables, which are taken into account using correction factors. These parameters vary from one building category to another. Edit the influencing variables by clicking on [Edit the mobility influencing variables](#) (see Subsection 6.3).

- In addition to the building categories according to SIA 2040:2017, you can also use CAII to calculate mobility energy for *Administration with high space efficiency* and *University* according to the *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>2 page 6</sup>.
- Pursuant to SIA 2040:2017, the additional usages covered by SIA 2039:2016 – *Office* and *Service with significant customer share* – cannot be used as proof and are not implemented in CAII.
- In the *Restaurant* building category a selection field appears that allows you to further specify the category (*Restaurant*, *Canteen (without customer mobility)*).
- The influence of customer parking places is automatically factored into customer mobility in the *Food store*, *Specialised store* and *Restaurant* building categories<sup>3 page 6</sup>. Adapt the information on parking accordingly.

## Manual transfer

You are allowed to enter an externally calculated mobility energy demand ( $PE_{ne}$ , GHGE) only in the *Building Project/Execution* and *Management* phases. Total primary energy is automatically calculated on the basis of primary energy non renewable (factor 1.09 for Fleet 2050)<sup>6</sup>.

TIP: Corresponding values can be determined using the SIA 2039 calculation aid (without the “University” building category) or the SIA 2040 calculation aid (without the “Administration with high space efficiency” and “University” categories).

For external calculation in the “Administration” and “Administration with high space efficiency” categories, you have to input in the SIA 2039 calculation aid the standard person area according to SIA 2040 and the *Handbuch zum Zertifikat 2000-Watt-Areal* (50m/FTE and 50m/customer, and 35m/FTE and 35m/customer, respectively).

WARNING: Mobility project values can vary slightly depending on whether they have been determined using CAII (linear interpolation of basic values for correction factors under SIA 2039) or the SIA 2039 or SIA 2040 (non-linear interpolation functions) calculation aid. Both procedures are permitted for proof.

## Survey

Operating values can be entered with a mobility survey only in the *Management* phase (see Subsection 8.1).<sup>7</sup>

- For the *Residential* and *Residential with occupancy regulations* building categories, select the *Residents* survey to enter data.
- For all other building categories, two selection fields appear:
  - In the first, you have to select a survey of *employees* to enter employee mobility;

<sup>6</sup> SIA 2040:2017, Annex C, paragraph 2.3

<sup>7</sup> *Monitoring-Standard für Areale und Gebäude* [Monitoring standard for sites and buildings], swissenergy, 2017.  
[www.2000watt.swiss/](http://www.2000watt.swiss/) / [Bibliothek](#)

- In the second, you can select a *customer* or a *students/further education* survey (see Subsection 8.1). If no survey is selected, the project values are automatically used for the calculation.

WARNING: If the *Other* building category is selected, CAI will automatically select manual transfer for the acquisition of user-defined values.

#### Overview of input fields

- **Number of parking places:** The value shown is determined using the mobility calculation. If the parking spaces are permanently assigned to the zone, you can overwrite them and indicate the actual number. For larger disparities, adapt the influencing variables.

WARNING: For the purpose of calculation, the parking places are assigned to the zone. An underground car park cannot be assigned any parking places.

### 6.3 Adjusting Mobility influencing variables according to SIA 2039 by zone

You can edit the influencing variables at zone level or for the entire site. Should you wish to make adjustments throughout the entire site or in several zones, please read Subsection 8.2.

Should you wish to edit the influencing variables for the zone only, click on [Edit Mobility influencing variables](#) to go to the **Mobility according to SIA 2039: Influencing variables** page. In the **Mobility** section of the zone concerned, the standard values for the site are adopted by default (see Section 8.2). Should you wish to record different values for a zone, please select or enter the corresponding values here.

## 7. Energy

### 7.1 Overview

The **Energy** page is accessed via the **Energy** tab. This is where you enter measured values and define energy converters and carriers to calculate operating energy.

The following functions are available:

- Enter measured values (only when at least one building is in the *Management* phase)
- Enter heat supply systems
- Enter cooling systems
- Enter electricity mixes (including electricity produced on site)
- Enter district heating mixes
- Enter gas mixes

The synoptic tables (see Figure 4) show the predefined (in this case: CH consumer mix) and user-defined mixes. Click on **Add new mix** to enter a new mix and click on the names to display or edit mixes (this is not possible for all mixes). When new zones are created, the mixes with the highest ID (#) are set as default values (see page 18).

#### Strommix (Elektrizität vom Netz und aus Eigenproduktion)

#	Name	Mix Standard	Mit Eigenproduktion	Status
1	CH-Verbrauchermix	KBOB 2009/1:2014		OK
2	Strommix 2	—		OK
<a href="#">+ Neuen Mix hinzufügen</a>				

Figure 4 Synoptic table electricity mix

The energy mixes also serve to determine the share for management tool Criteria 4.1.1 and 4.1.2. The results are to be found in the **Cockpit** tab, **Report Cockpit** page, 3.3 Characteristic values for the subject area “4. Supply”. The evaluation criteria are set out in Annex A4 of the CAII final report<sup>3</sup> page 7.

#### Overview of input fields common to all subpages

- **Name:** This is where you enter the desired name. Each name can be used only once per project.

### 7.2 Measured values

Use the **Measured values** page to enter operating values pursuant to the *Monitoring-Standard*. The page will only appear if at least one building is in the *Management* phase. The indications for the final energy values calculated and measured apply to all zones in the building in the *Management* phase. The measured values are recorded using the energy carriers for the entire site or for individual buildings. They are allocated among landlords/tenants and among usages based on the share of project values (see Subsection 6.2.4).

ATTENTION: The operating energy project values under the **Building** tab must also be completed for the *Management* phase.



## 7.3 Energy converter

Click on **Add new installation** to add an installation. The installation can be deleted by clicking on **Delete installation** on the subpage of the relevant installation, which can be accessed by clicking on the name of the installation.

The energy converter parameters (e.g. annual energy efficiency ratio/COP) can be changed for each individual certification time for *Sites in transformation*.

### 7.3.1 Heat supply

Enter details of the “space heating” and “hot water” usages on the **Heat supply** subpage. You can define up to five heating installations. You must select at least one installation.

For every heating installation, indicate what percentage of the total space heating requirement (total all installations) and total hot water requirement (total all installations) is covered. The sum of the shares of space heating across all installations and the sum of the shares of hot water across all installations must each add up to 100%. Check using the sum indicated in the upper part of the mask (*Sum of the shares space heating* and *Sum of the shares hot water*).

#### Overview of input fields

- **Type of heating installation:** For log wood, wood chips, pellets or biogas, select the data set “... CH or local production” when that energy carrier is verifiably locally produced. This allows Criteria 4.1.1, Aspect 1, *Heat produced locally or on site* and 4.1.2 Aspect 1, *Ecological quality of heat* to be correctly assessed (see **Report Cockpit** page under the **Cockpit** tab).
- **Share space heating:** This is where you indicate the share of heating installations producing heat for space heating (0 to 100%).
- **Share hot water:** This is where you indicate the share of heating installations producing heat for hot water (0 to 100%).
- **Energy efficiency ratio:** Annual energy efficiency ratio/COP for the heating installation concerned.
- **Mix** (only visible for relevant installations): Requires the electricity, gas or district heating installation, such that the mix used must be specified here. For details on electricity mix, see Subsection 7.4.

In the *Strategic Planning* and *Preliminary Study/Preproject* phases, the share of construction energy for on-site production (geothermal probes, thermal solar plants) is automatically calculated. In the *Building Project/Execution* phase, the share of construction must be entered on the **Building** page under share of construction.

### 7.3.2 Cooling plant

#### Overview of input fields

- **Energy efficiency ratio:** Annual energy efficiency ratio/COP for the cooling plant concerned.
- **Mix** (only visible for relevant installations): The electricity mix used must be specified here. For details on electricity mix, see Subsection 7.4.
- **Energy bill allocation** (in the *Building Project/Execution* and *Management* phases): Allocation to *landlords/tenants* for proper distribution of measured values.

## 7.4 Electricity mix, district heating mix and gas mix

The **Electricity mix**, **District heating mix** and **Gas mix** subpages are constructed identically, except that the electricity mix subpage has different components and on-site production. This is where you select from among default mixes and apply your own mixes.

Click on the corresponding **Delete mix** subpage to delete a mix. Confirm the deletion in the subsequent dialog box. This will remove all links to the zones. Standard mixes cannot be deleted.

**Results:** In this row you will see:

- **Consumption:** Site-wide consumption of the electricity, district heating and gas mixes;
- **Primary energy total/non renewable** and **Greenhouse gas emissions:** When you select specific units in the *Settings and help* menu, this field shows PEF and GHGEc. If you select total unit, the total values are displayed.

For standard mixes, you can only review these results. For user-defined mixes, you can determine the electricity mix by indicating the individual energy carrier as a %. If the energy carriers indicated do not add up to 100%, the remaining share will be automatically topped up with CH consumer mix (electricity mix), central heating system oil (district heating mix) or natural gas (gas mix).

The mix with the highest ID in the mix list (see Figure 4 with electricity mix example) is selected as the standard mix. In the case of recently created electricity mixes, this corresponds to the most recently created electricity mix.

The energy carrier shares can be changed for each individual certification time for *Sites in transformation*.

#### 7.4.1 Electricity mix

**Electricity produced on site** (**Electricity mix** subpage): Solar or wind energy can be specified as the energy source to indicate the project values for on-site production. In the *Strategic Planning* and *Preliminary Study/Preproject* phases, the share of construction for on-site production is calculated automatically. In the *Building Project/Execution* phase, the share of construction has to be entered on the **Building** page under **Performance indices**.

Actual on-site production is completed using the input mask "Measured values Operation" (only in the *Management* phase).

TIP: For buildings in management, the results analysis is simplified if a separate electricity mix with another name (e.g. "electricity mix management") is defined.

**Select energy carrier for electricity from the grid** (**Electricity mix** subpage): Select the data set ... *naturemade star or equivalent* for hydroelectric, wind and photovoltaic power if they have been verifiably obtained. This will allow you to review the requirements for the electricity mix according to the *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>2 page 7</sup> and correctly to determine the shares for Criterion 4.1.2 *Quality of final energy used* in line with the catalogue of criteria (see Report Cockpit). This determination calculates a share of 62% of renewable electricity in the CH consumer mix (Totalwert 2016, [Cockpit Stromkennzeichnung Schweiz](#), Stand September 2020).

#### 7.4.2 District heating mix

**Select energy carrier** (**District heating mix** subpage): Select the data set *CH or local production* for central heating system wood, cogeneration wood, combined heat and power unit biogas if they have been verifiably obtained. The energy carriers must be selected such that Criterion 4.1.2 *Quality of final energy used* according to the catalogue of criteria can be properly evaluated (see Report Cockpit).

#### 7.4.3 Gas mix

**Select energy carrier** (**Gas mix** subpage): The energy carriers must be selected such that Criterion 4.1.1 *Quality of energy used* (see Report Cockpit) according to the catalogue of criteria can be properly evaluated. Use the data set *Biogas CH or local production* if that quality is being verifiably obtained.



## 8. Mobility

The **Mobility: Site level** page is accessed via the **Mobility** tab. Here you define the surveys of mobility behaviour and the default values at site level for mobility according to SIA 2039. Should you wish to edit the influencing variables for a specific zone, please see Subsection 6.3.

### 8.1 Survey

The survey is aligned with the mobility survey according to the *Monitoring-Standard für Gebäude und Areale*. Several surveys can be created for each site; they must be assigned to the zones. In this regard, see Subsection 6.2.5.

Click on **Delete survey** on the relevant subpage to delete the corresponding survey. Confirm the deletion in the subsequent dialog box. This will remove all links to the zones.

#### Overview of input fields

- **Survey ID:** Here is where you enter the desired name. Each name can be used only once per project.
- **Consumption:** MIT (passenger cars, motorcycles) consumptions are not subject to further processing in CAII as no operating values are produced for the current fleet.

#### Overview of surveys

CAII makes available surveys (building categories) for:

- Residents (*Residential* and *Residential with occupancy regulations* categories)
- Employees (*Administration*, *Administration with high space efficiency*, *School*, *University*, *Specialised store*, *Food store*, *Restaurant*)
- Customers (*Administration*, *Specialised store*, *Food store*, *Restaurant*)
- Pupils (*School*)
- Students/further education (*University*)

ATTENTION: The number of people influences the guide and target values and the additional requirements in the *Residential* / *Residential with occupancy regulations* building categories (actual person areas<sup>8</sup>). This is also the case for the number of FTE in the *Administration* / *Administration with high space efficiency* building categories <sup>2 page 7</sup>, but not for the remaining categories.

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<sup>8</sup> SIA 2040:2017, Annex B

## 8.2 Determining SIA 2039-compliant default values for mobility influencing variables for the entire site

See Subsection 3.3.2 on the adjustment of default values.

Calculation according to SIA 2039 is based on average mobility demand, which is weighted with influencing variables. You can edit these variables for the entire site or at zone level in each building category (see Subsection 6.3).

TIP: Please refer to the exact description of each variable in the information pop-ups and in the SIA 2039 technical specification.

Should the variables be identical for the entire site or in several zones, you are recommended to determine default values at site level. To do this, open the **Mobility** page in the **Mobility** tab.

### Determining general influencing variables

Given that the same variables apply to several groups of people (e.g. public transport quality class or population density), you can adjust them in the **General influencing variables** section for the site as a whole. The values are then automatically transposed to the relevant groups of people and input fields. In order to remove these values, turn off manual input (restore default values, see page 11). If general influencing variables are specified, they are adopted for all building categories. Otherwise, the values per building category apply.

### Determining the influencing variables for each building category

On this page, the default values are generally adjusted for each group of people (residents, employees, customers, etc.) in the building categories.

The default values apply to each zone for which no different information has been entered (see Subsection 6.3).

## 9. Cockpit

In the **Cockpit** tab, on the **Report Cockpit** page, a Management Summary is displayed that summarises proof and current results. On the upper part of the page you can display selected results from the **Report Building** page in order to review the results for plausibility.

In *Site in transformation*, **Report Cockpit** and **Report Building** have the same structure as the other certificate types. Select the desired presentation year in the upper right. On the upper part of the page, you can also use **Report Transformation** to display the chronological sequence.

All reports can be printed by clicking on **Print report**.

TIP: To print a report in PDF format, select *Microsoft Print to PDF* in the Print menu.

### 9.1 **Report Cockpit** page

Report Cockpit contains the Management Summary with the results for quantitative proof (guide and target values, additional requirements, requirement electricity mix) and the characteristic values for qualitative evaluation in the management tool.

#### 9.1.1 Site and certificate

Cockpit, Section 1:

- Certificate, areas and exploitation

#### 9.1.2 Quantitative proof

- Summary of fulfillment of quantitative proof for target values, additional requirements and requirement electricity mix (Cockpit, Subsection 2.1)

ATTENTION: If the share of "From the grid: naturemade star or equivalent" exceeds 50%, a warning appears. For proof, you have to increase on-site production or reduce the share of naturemade star to the point that the reference to naturemade star or equivalent from the grid accounts for at most 50% of the total energy requirement.

A warning will also appear if the share "From the grid: other" does not contain exclusively "CH consumer mix". For proof, you have to remove the other electricity mixes.

- Shares relating to the guide values or fulfillment level of target values and additional requirements of the site's performance indices (project or operating values) for the indicators  $PE_{tot}$ ,  $PE_{ne}$  and GHGE (Cockpit, Subsection 2.2)

WARNING: For the "operating" certificate type, a notification appears if the fulfillment level of target values and additional requirements changes by more than the +10% tolerance (Subsection 5.1, *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>2</sup> page 7).

- Fulfillment level for performance indices relating to target values and additional requirements, and share of guide values for individual indicators

### 9.1.3 Characteristic values for qualitative evaluation (management tool)

In *Site in transformation*, select the presentation year in the target state, review the values and transfer them to the management tool.

#### For the subject area 0. Summary

- ERS by building category

MANAGEMENT TOOL TIP: Transfer the ERS by building category to the "Summary" worksheet.

#### For the subject area 3. Site use and urban development

- Characteristic values for number of persons and density

#### For the subject area 4. Supply

- Characteristic values for Criterion 4.1.1 Final energy (heat and electricity) produced locally or on site
- Characteristic values for Criterion 4.1.2 Quality of final energy used

MANAGEMENT TOOL TIP: For Criteria 4.1.1 and 4.1.2, transfer the shares of the total to the "Weighting supply" worksheet.

Should the site make no distinction between common and user electricity (common electricity or user electricity = 0), transfer the same values for common and user electricity to the management tool.

ATTENTION: To evaluate management tool Criteria 4.1.1 and 4.1.2, you can nonetheless input the actual electricity mix, even if it falls short of the 50% rule. In that case, document the actual electricity mix, e.g. in a print-out of the Cockpit Report.

#### For the subject area 5. Buildings

- List of Buildings

MANAGEMENT TOOL TIP: Transfer the building names, ERS and SIA112 phases from the Table List of Buildings to the "Building weighting" worksheet.

- Characteristic values for New/existing site: Surface distribution according to building strategies
- Characteristic values for Planning status: Area distribution according to SIA 112 phases

MANAGEMENT TOOL TIP: Check whether the area distributions according to SIA 112 phases in the "Building weighting" worksheet correspond to the information in the Cockpit Report.

- Characteristic values for Criterion 5.4.1 *Control of the surface per person*  
Project values: Standard person areas of the building categories  
Operating values: Surveyed values insofar as surveys have been conducted. Otherwise also standard person areas

MANAGEMENT TOOL TIP: Transfer energy reference surfaces and person areas for *Residential* and *Administration* to the "Building weighting" worksheet. Make the transfer by building or in a separate row with no building name or ERS. Alternative methods of determining project values for person areas are described in the management tool.

### For the subject area 6. *Mobility*

- Characteristic values for number of parking places
- Characteristic values for Criterion 6.1.1 *Parking places for motor vehicles*

MANAGEMENT TOOL TIP: Transfer the number of parking places/100 m<sup>2</sup> ERS to Criterion 6.1.1 in the "6. Mobility" worksheet.

- Characteristic values for Criterion 6.3.1 *Public transport services*

MANAGEMENT TOOL TIP: Check that the public transport quality classes in the calculation aid correspond to the indications in the "Mobility" worksheet.

## 9.2 [Report Building](#) page

This page displays selected results at building level:

- Building name, ERS and final energy
- Building performance indicators (project or operating values), target values, additional requirements and guide values as PE<sub>tot</sub>, PE<sub>ne</sub> and GHGE

For *Site in transformation*, guide values, target values and additional requirements are displayed in the target state in **Report Building** and not a target path.

- Final energy (including environmental heat and thermal solar plants), PE<sub>tot</sub>, PE<sub>ne</sub> and GHGE, according to building and energy carrier/electricity mix
- Shares of energy produced locally or on site (management tool, Criterion 4.1.1) and high ecological quality (Criterion 4.1.2)

## 9.3 [Report Transformation](#) page

For *Site in transformation*, **Report Transformation** contains the same results as the Cockpit report, but takes the form of a time-dependent presentation.

## 10. Workflow

### 10.1 Introduction, general information

This section contains information on the workflow for the most efficient possible recording of sites in CAI. The information is intended above all for first-time users. CAI allows the experienced user to input data in many different ways.

The **Site**, **Energy**, **Mobility** and **Cockpit** tabs (Cockpit Report) are fed by input data at site level, the **Building** tab by input data at building and zone level (see Figure 1).

You are recommended to establish the site structure (type of certificate, buildings, zones, energy mixes, influencing variables and mobility surveys) in a **first round** (Subsection 10.2, Steps ❶ to ❺) (see Figure 5). In a **second round** (Steps ❻ to ❿), enter the data required to calculate or capture project and operating values. Lastly, review the results (Step ❿).

Site	Building, zone	Energy	Mobility	Cockpit
<b>First round: Steps ❶ to ❺</b>				
<b>❶ Enter general information</b> <ul style="list-style-type: none"> <li>Select certificate type</li> <li>Create transformation path</li> </ul>	<b>❷ Create buildings and zones</b> <ul style="list-style-type: none"> <li>Building strategy</li> <li>SIA 112 phases</li> <li>Zones/building categories</li> </ul>	<b>❸ Create/enter energy mix</b> <ul style="list-style-type: none"> <li>Energy converter (heating, cooling mix)</li> <li>Electricity mix (incl. photovoltaic)</li> <li>Energy carrier (district heating, gas)</li> </ul>	<b>❹ Enter influencing variables</b> <b>❺ Create surveys and enter data</b>	
<b>Second round: Steps ❻ to ❿</b>				
	<b>❻ Buildings: Calculate/enter share of construction</b> <b>❼ Calculate/enter zones, operating energy</b> <b>❽ Calculate/enter zones, mobility energy</b>	<b>❾ Enter measured values operating energy</b>		<b>❿ Review results</b> <ul style="list-style-type: none"> <li>Review electricity mix requirements and adjust as required</li> <li>Review proof fulfillment</li> <li>Check plausibility</li> </ul>

Only if the building is in Management

Figure 5 Workflow for entering sites into CAI in two rounds.

### 10.2 10-step process

The following instructions outline a possible procedure for completing the calculation aid in 10 steps and provide tips for preparing the data you need for input.

### Step 1: **Site** tab, enter general information

PREPARATION: Determine the planned transformation path and certification dates from the site's development concept.

1. Enter general information.
2. Enter the transformation path for *Site in transformation*. By ticking the box, you determine how many recertifications are planned until the target state is achieved. Enter the respective certification dates (year of certification).

### Step 2: **Building** tab, create buildings and zones

PREPARATION: Divide the site into buildings and zones, with different zones according to building category. Compile apartments/households per zone.

1. Create the building, select the building strategy and SIA 112 phase, and enter the ERS. FA is calculated automatically from the ERS (factor 0.85) or can be input manually.
2. For *Site in transformation*, the buildings' SIA 112 phases can be specified for each certification time. The first row (information only) is used to show the actual state of the building at the respective certification date. The selection in the second row determines how the data for the current certification date can then be recorded and should correspond to the currently available project state for all future certification states.
3. *Management before conversion* phase (first row): Buildings are about to be converted and are usually entered as in *Management*. Accordingly, the **Input mask Measured Values Operation** is used for operating energy (see Step 9). External values must be re-entered for construction embodied energy, even if the embodied energy was estimated with CAI in the *Strategic Planning* phase (see Step 6).
4. *Management during conversion* phase (first row): Buildings are being converted at the time of certification. As a rule, project values are entered in the *Building Project/Execution* phase.
5. Create the zones, select the building category and enter the ERS per zone as a percentage of the building ERS or in absolute terms. FA is calculated automatically from the ERS (factor 0.85) or can be recorded manually. The number of households is determined using default values per construction period (84 to 122 m<sup>2</sup> ERS per household) based on standard usage. You can overwrite this value with the actual number of households/apartments.

### Step 3: **Energy** tab, create and record energy mix

Before the operating energy of a building's zones can be recorded, the corresponding systems and energy mixes (heat supply, cooling system, electricity mix, district heating mix, gas mix) must be recorded.

PREPARATION: Define a system for structuring electricity mixes: separate electricity mixes per building (e.g. if solar power systems are assigned to the individual buildings). Separate electricity mixes for common and tenant electricity (if different). Only one electricity mix for private consumption communities (association for own consumption).

1. Under **Energy converter**, enter the **Heat supplies** and **Cooling systems**. Buildings that have different types of heating installations also need a separate heat supply.

- (a) For the type of heating installation, select the data set "... CH or local production" for log wood, wood chips, pellets or biogas if they are verifiably procured locally. Required for management tool Criterion 4.1.1.
2. Enter the **Electricity mixes** with a view to meeting requirements<sup>9</sup>. Make any modifications relating to management tool evaluations (Criterion 4.1.2) only once you have completed the input (Step 10). For buildings generating their own electricity, a separate electricity mix is created that must then also be saved in the heating mix (heat supply) of the relevant building for the heat pump and cooling system.
  - (a) In accordance with the provisions of SIA 2040,<sup>10</sup> enter the total annual production to be deducted from demand under on-site production.
  - (b) Under **Electricity from the grid**, select the data set "... *naturemade star or equivalent*" for hydroelectric, wind and solar power only if this quality is verifiably obtained. Other products (e.g. hydroelectric power) cannot be selected as they cannot be taken into account for proof. CALL automatically assigns the remaining share to the CH consumer mix. Also required for management tool Criterion 4.1.2.
3. In this step, enter the **District heating mix**.
  - (a) For central heating system wood, cogeneration wood, combined heat and power unit biogas, select the data set "... *CH or local production*" if those qualities have been verifiably obtained. Required for management tool Criterion 4.1.1.
4. In this step, enter the **Gas mix**.
  - (a) Select the data set "*Biogas CH or local production*" if that quality has been verifiably obtained. Required for Criterion 4.1.1.
5. Site in transformation: For energy converters and energy mixes, you can store different parameters (energy efficiency ratio, shares of energy sources, etc.) at each certification time.

TIP: The results are easier to interpret if you select different installations and mixes for buildings and zones in management and in earlier phases.

#### Step 4: **Mobility** tab, enter mobility influencing variables

PREPARATION: Derive influencing variables from WEB-Gis, etc.

1. On the **Mobility according to SIA 2039: Influencing variables** page, enter the parameters that apply to the entire site in the **Mobility according to SIA 2039: Influencing variables** and **Influencing variables per building category** sections. Enter divergent parameters in individual zones in Step 9.

#### Step 5: **Mobility** tab, create Mobility surveys and enter data

This step is required only if one, several or all buildings are in the *Management* phase and mobility surveys were conducted. It is mandatory for the "Operation" certificate type.

PREPARATION: Overview of the zones and groups of people that were recorded with surveys. Prepare the input data from the survey data in accordance with the *Monitoring-Standard*.

<sup>9</sup> Handbuch zum Zertifikat 2000-Watt-Areal, 2019, Subsection 5.3.3; SIA 2040:2017, Numbers 2.3.1.3 and 2.3.1.4

<sup>10</sup> SIA 2040:2017, Number 2.3.9.1



1. Enter the results of mobility surveys conducted on the site. Enter the reference values, the passenger kilometers for MIT, public transport and non-motorised traffic, consumption for MIT and additional values.

WARNING: Consumption for MIT relates to the current fleet and is not processed further in CAII, which currently only determines operating values for the Fleet 2050. You are nevertheless recommended to record the current fleet consumption surveyed pursuant to *Monitoring-Standard 2017* in CAII.

2. A warning appears if the survey ERS does not correspond to the sum of the assigned zones. Check in the **Building** tab > **Zones** > **Mobility** whether the acquisition method is set to *Survey* in all related zones.

WARNING: The guide values, target values and additional requirements for the *Residential/Residential with occupancy regulations* and *Administration/Administration with high space efficiency* building categories are corrected based on the actual surface per person surveyed,.

### Step 6: **Building** tab, calculate/enter share of construction

PREPARATION: Building characteristic values (*Strategic Planning* phase), building component types and surfaces (*Preliminary Studies/Preprojects*) or external calculation of embodied energy using recognized software solutions (*Building Project/Execution, Management*).

1. For the *Strategic Planning* phase, enter the building characteristic values to determine the performance indices construction, which CAII then calculates. These indices can be overwritten in order to enter the unamortized embodied energy of existing buildings and conversions according to the *Handbuch zum Zertifikat 2000-Watt-Areal*.
2. For the *Preliminary Project/Preproject* phase, enter the building component types, building component surfaces and building services installations to determine the performance indices construction. These values can be overwritten in order to enter the unamortized embodied energy of existing buildings and conversions according to the *Handbuch zum Zertifikat 2000-Watt-Areal*.
3. For the *Building Project/Execution* and *Management* phases, enter the project values of the external calculation for  $PE_{ne}$  and GHGE;  $PE_{tot}$  is calculated automatically.

### Step 7: **Building** tab > **Zones**, calculate/enter operating energy

PREPARATION: Building characteristic values (*Strategic Planning*), building component surfaces (*Preliminary Project/Preproject*) or external calculation of operating energy (*Building Project/Execution, Management*)

1. In the *Strategic Planning* and *Preliminary Study/Preproject* phases, select the general standard of the building (*new building, conversion, existing building*) to calculate the project values for the zone's operation. If there are ventilation or space cooling systems, specify the corresponding system type. You also have to enter the number of elevators and escalators in general building Services. Under General standard of the building, however, you can also select *Detailed information*, in which case you will have to provide the relevant information for all usages during these phases.
2. In the *Building Project/Execution* and *Management* phases, enter heat, cooling and electricity requirements determined using external detailed calculating procedures for individual usages in each zone.

3. For all usages, you must assign the heat supply, cooling system and electricity mix required by CAII that were created and recorded in Step 3.

TIP: If a heat pump is used for heating, the heat requirement, and not just the electricity requirement, of the heat pump must always be specified here so that total primary energy is calculated correctly.

### Step 8: **Building** tab > **Zones: determine/enter mobility energy**

PREPARATION: Conduct any mobility calculations with the SIA 2039 or SIA 2040 calculation aid (*Building Project/Execution and Management* phases).

1. First select the acquisition method.
2. For *Calculation according to SIA 2039*, first change any zone influencing variables that differ from the site influencing variables, by clicking on [Edit Mobility influencing variables](#).
3. The *manual transfer* of results from the SIA 2039 or SIA 2040 calculation aid is only authorized in the *Building Project/Execution and Management* phases. Enter the project values for  $PE_{ne}$  and GHGE;  $PE_{tot}$  is calculated automatically.
4. Under *Survey*, assign the corresponding survey for residents (*Residential* building categories) or *Employees* (*Administration, School, University, etc.*) to the zone. The survey for customers and students is optional. If no survey was selected, customer mobility is calculated according to SIA 2039. The mobility surveys were created and recorded in step 5.
5. Finally, enter the parking places available for the zone. For comparison, CAII shows the number of parking places that correspond to the mobility calculation (e.g. influencing variable *Number of available parking and garage spaces* for the *Residential* building category). In the event of a wide discrepancy, adjust the influencing variable by clicking on [Edit Mobility influencing variables](#)

### Step 9: **Energy** tab > **Measured values Operation**, enter measured values

This step is only required if at least one building is in the *Management* phase.

WARNING: Before entering the measured values, enter the complete operating energy project values in the **Building** tab, **Zone** page.

PREPARATION: Process average annual values based on the measured results for operating energy since the last recertification. Start as soon as reliable measured data are available (approx. 1 to 2 years after the commissioning of new buildings or conversions).

1. Enter the measured values for final energy (not including environmental heat) for all new buildings and conversions in the *Management* phase. Acquire the individual buildings.
2. Site in transformation: Enter buildings before transformation as existing buildings in the *Management before conversion* phase. In the absence of measured values, adopt the project values.

### Step 10: **Cockpit** tab, verification of results

1. Check the **Electricity mix** requirements in the **Report Cockpit**, **2.1 Summary** section. "Fulfilled" will appear if the site's electricity mix meets the proof requirements. Continue to point 2. Should "Not fulfilled" appear, adjust the indications in the **Energy** tab on the **Electricity mix** page until the electricity mix requirements in the Cockpit are fulfilled:
  - a. If the share of *From the grid, naturemade star or equivalent* exceeds 50% (Warning "Not fulfilled"), it must be reduced to 50%;

- b. If energy carriers other than CH consumer mix are listed under *From the grid, other* (Warning “Not fulfilled”), remove them.
2. Check in the **Report Cockpit**, **2.1 Summary** section whether the **target values and additional requirements** have been “Fulfilled”. If “Fulfilled (tolerance)” appears in the “Operation” certificate type, the site has to take account of the tolerance of +10% (Subsection 5.1, *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>2 page 7</sup>). If “Not fulfilled” appears, adjust the Construction, Operation and/or Mobility areas until the target values and additional requirements move to “Fulfilled”.
3. Site in transformation: The verifications under Points 1 and 2 above can also be made in the **Report Transformation**. The target state requirements must in all cases be met. As a rule, this also applies to the intervening certification states. For exceptions, see Subsection 5.1 and Annex.A.3, “*Umgang bei Nicht-Erreichung der geplanten Ziele*” (how to deal with failure to achieve the planned target values) in the *Handbuch zum Zertifikat 2000-Watt-Areal*<sup>1 page 7</sup>.
4. To evaluate management tool Criteria 4.1.1 and 4.1.2, you can use the actual electricity mix. CH consumer mix includes a 62%-share of renewable electricity (Cockpit Stromkennzeichnung, 2016). If the shares indicated with a CH consumer mix show a better ecological quality (e.g. water power), this can be taken into account here. Save the relevant data in a separate file before making the requisite changes to **Electricity mix (electricity from the grid)** under **Energy**.
5. For **3.1 Characteristic values for “0. Summary”**
  - (a) Transfer the ERS per building category into the “Summary” worksheet of the management tool.
6. For **3.3 Characteristic values for “4. Supply”**
  - (a) For Criteria 4.1.1 and 4.1.2, transfer the share of the total into the “Weighting Supply” worksheet of the management tool. Should the site not differentiate between common and user electricity (common or user electricity = 0), transfer the same values for common and user electricity to the management tool.
7. For **3.4 Characteristic values for “5. Buildings”**
  - (a) Transfer the building name, ERS and SIA112 phase from the Table List of Buildings to the “Weighting Supply” worksheet of the management tool.
  - (b) Check that the surface shares according to SIA 112 phases in the “Weighting Supply” worksheet correspond to the information in the **Report Cockpit**.
  - (c) Transfer the ERS and the person areas for the *Residential* and *Administration* building categories to the “Weighting Supply” worksheet. Make the transfer per building or on a separate row without building names and ERS. Alternative methods of determining person area are described in the management tool.
8. For **3.5 Characteristic values of “6. Mobility”**
  - (a) Transfer the number of parking places/100 m<sup>2</sup> ERS to Criterion 6.1.1 in worksheet “6. Mobility” of the management tool.
  - (b) Check that the public transport quality class in the calculation aid corresponds to the indications in the “Mobility” worksheet.
9. Conduct other plausibility tests, on the basis in particular of the **Report Building** and the exported Excel file. Zone-level results are to be found under the **Building** tab, **Zone** page.

## 11. Troubleshooting

The table below lists potential and known issues. Follow the solution indicated to resolve the problem.

Type	Problem	Solution
<b>Program error</b>	The menu bar is red.	A fatal error has occurred. Leave the current page and save the project in the project administration under a new name, if possible.  If possible, please send a description with the details (e.g. print screen) of how the error occurred to the helpdesk.
	The delete key does not work.	Use the backspace key.
<b>Values</b>	The calculated project values do not seem realistic, even after a careful plausibility check.	Please contact the helpdesk.
<b>Print</b>	No "PDF printer"	Install the relevant driver ( <a href="https://answers.microsoft.com/en-us/windows/forum/windows_10-hardware/how-to-add-or-reinstall-the-microsoft-pdf-printer/70377c34-e50a-42be-b9f3-92345d6e25df">https://answers.microsoft.com/en-us/windows/forum/windows_10-hardware/how-to-add-or-reinstall-the-microsoft-pdf-printer/70377c34-e50a-42be-b9f3-92345d6e25df</a> ) or use XPS.

Technical helpdesk see handbook imprint or  menu