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BUILD_ME

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IKI Project - Accelerating 0-emission building sector ambitions in the MENA region

Training for TG1:

Financial institution: EBRD - GEFF

16.07.2024

Supported by:

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag

Welcome words

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Objectives of the training

EBRD - GEFF

1. Recap - Overview of the project and its objectives
2. Provide an understanding of the tool and the EPC process
3. Enable the utilisation of the BEP tool to calculate the energy performance of a building

Agenda

Welcome words and short introduction of the project	5 min
Background of the BEP Tool	5 min
The BEP tool 2.0 and automated EPC process	15 min
Walk through the website	30 min
Case study and discussion	20 min
Q&A	15 min

Short introduction to the project

Introduction to the BUILD_ME Project

Overarching storyline of BUILD_ME phases

Phase 1
2016 - 2018

Analysis & Recommendations

- Analysis of boundary conditions and stakeholder perspectives
- Formulating recommendations for implementation

Phase 2
2019 - 2022

Prepare the Implementation

- Developing tools for implementation
- Connecting with stakeholders to initiate the implementation

Phase 3
2022-2025

Support the Roll-Out

- Piloting the roll-out to reach implementation on all levels
- Scaling up activities to enlarge the impact

Problem Identification

The lack of a baseline hindering the assessment of low energy buildings in the BUILD_ME countries

Lack of enforcement and/or availability of EEBCs

Lack of data about BaU constructions

No benchmarking of buildings' energy performance

NO

energy consumption baseline

Bottleneck

To finance energy efficient buildings

Background of the BEP Tool

Objective of the BEP Tool

Easier access to financing for energy efficient buildings

How to design and finance an energy efficient project?

BEP Tool shows:

- ✓ [20-30]% energy saving in comparison with **baseline**
- ✓ Financing available at local bank

Intermediating **bank grants credit** based on trusted classification scheme

Project is realised as energy efficient building

Our Integrated Solution

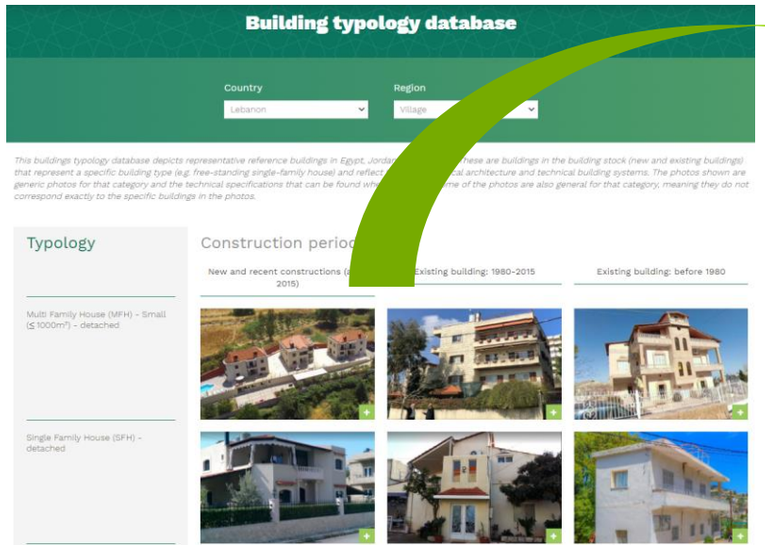
Define own baselines and develop tailored energy labelling scheme for new buildings

- Data from real constructions not older than 3 years
- At least 5 cases per building type covered in each country building typology
- Data from subsidy programs, literature, interviews with relevant stakeholders, permits documents etc.

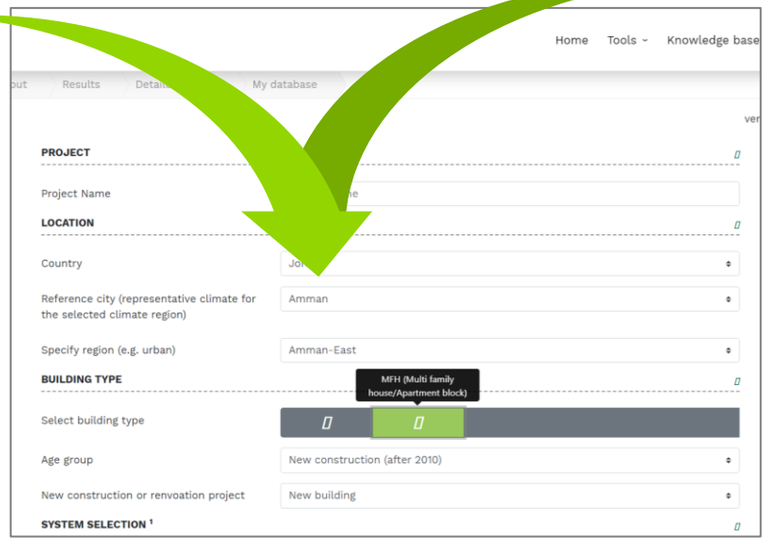
- BEP tool based on ISO 52016, fed with local data used as calculation engine.

- Researched buildings in building typology represents baseline, which is shown in the BEP Tool as default value.

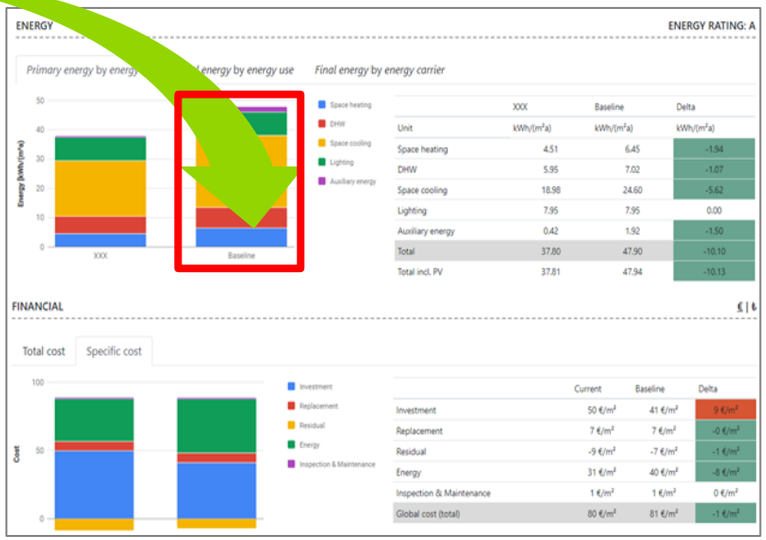
Reference Buildings and Building Typology



BUILD_ME Building Energy Performance Calculation tool



Classification of buildings compared to baseline



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Developed for the MENA region

Database from **local partners** & **international** calculation methodology

Baseline buildings

Local investment cost & energy prices

Tool was successfully applied in **building projects in the MENA region**

International calculation methodology: ISO 52016

Focus is on the countries: **Egypt, Jordan and Lebanon**

Baseline reflects the **country specific building** standard

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Methodology is applicable worldwide

Climate data of all countries in the MENA region

Local PEF and CO_2 emission Factors

All data input is collected and verified by **local partners** and project developers

The calculation standard is internationally acknowledged.

Internal market data is **collected from local partners** for Egypt, Jordan and Lebanon.

International energy calculation methodology.

Country specific climate data, incl. multiple climate zones within each country.

BEP Tool

Developed for the MENA region: Database from **local partners** & **international** calculation methodology

Internal market data is **collected from local partners** for Egypt, Jordan and Lebanon.

International energy calculation methodology.

Country specific climate data, incl. multiple climate zones within each country.

The BEP tool 2.0 and automated EPC process

Jince John
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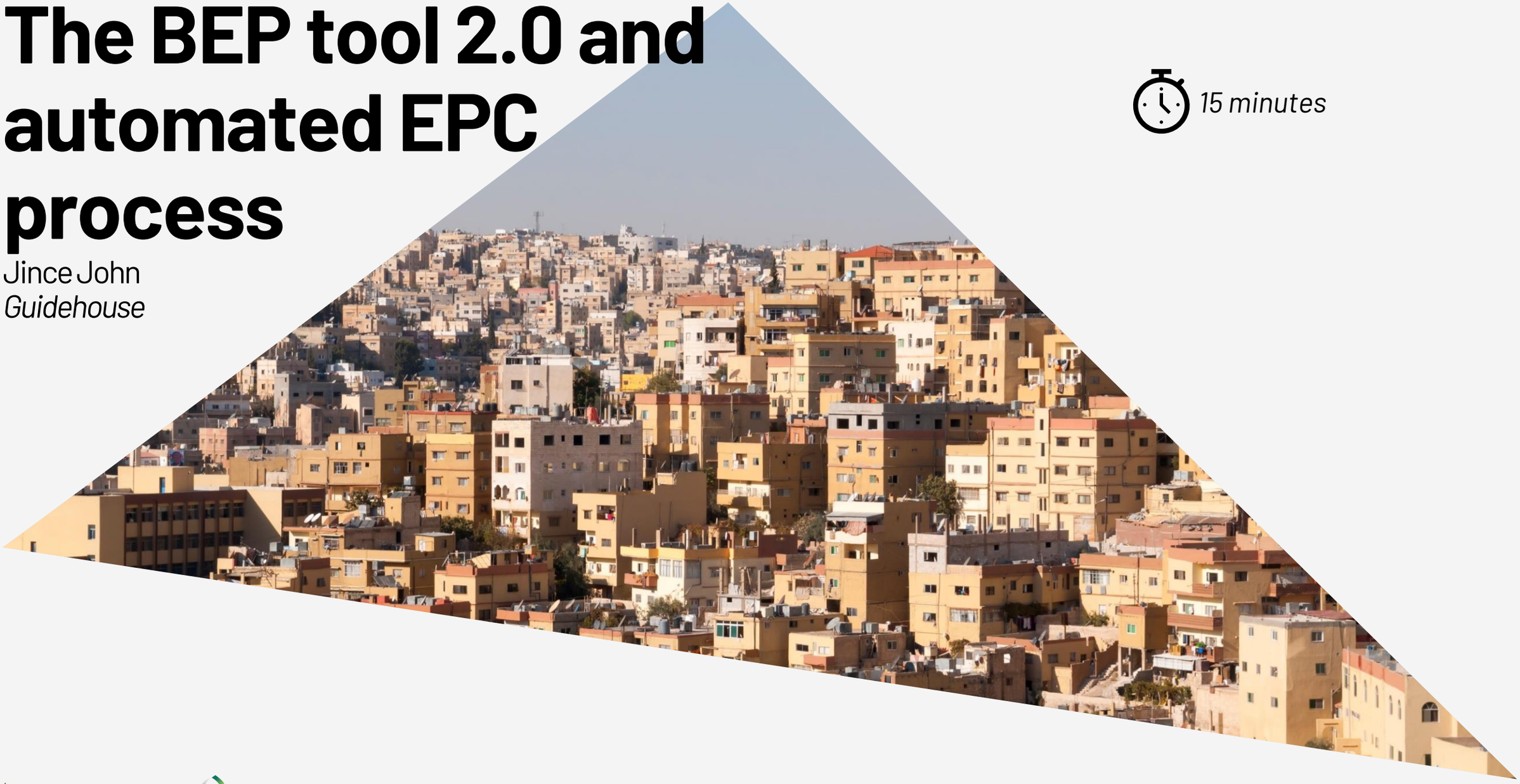
15 minutes



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Building Energy Performance (BEP) tool 2.0

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Logic of the BEP tool (1)

Customisable, transparent, adapted to the MENA region

Performance of energy efficiency measures & RE

- Calculate **energy demand** of building
- Compare it to the **country's baseline** buildings or other personal projects
- Determine the **energy savings** of single or multiple efficiency measures and the use of renewable energies

Calculation of monetary savings

- Identify **cost savings** resulting from the energy efficiency measures and get the **cost-optimal** case
- **Local market data** is already available for Egypt, Jordan and Lebanon (investment cost, energy prices) …
- …or enter the real investment cost and energy prices of the specific project *(not in beta)*

Free web application

- Tool is **free to use as browser application**
- Optimized for **mobile devices**
- Provides **default input values** for faster application, but also **advanced mode** for experienced user

Proven methodology

- Energy calculation is based on the **international norm** for modelling thermal building performance (EN ISO 52016)
- The BEP-Tool was already **successfully applied** in various projects and countries
- **Full transparency** with a detailed user manual, incl. all calculation steps and internal assumptions.

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Logic of the BEP tool (2)

Customisable, transparent, adapted to the MENA region

In comparison to other available tools, the BEP tool is

MENA Specific

Up-to-date baseline in the 3 countries

Up-to-date cost data and prices based on market analysis

Updated energy consumption patterns for building types

Easy/Simple to use

No modelling needed

No advanced knowledge required

Allows for Editable Inputs and creating own baseline

Can compare with codes/rating systems

Useful for analysing the retrofitting option

Provides Detailed Explanation of the Results

Can convert to primary energy outputs

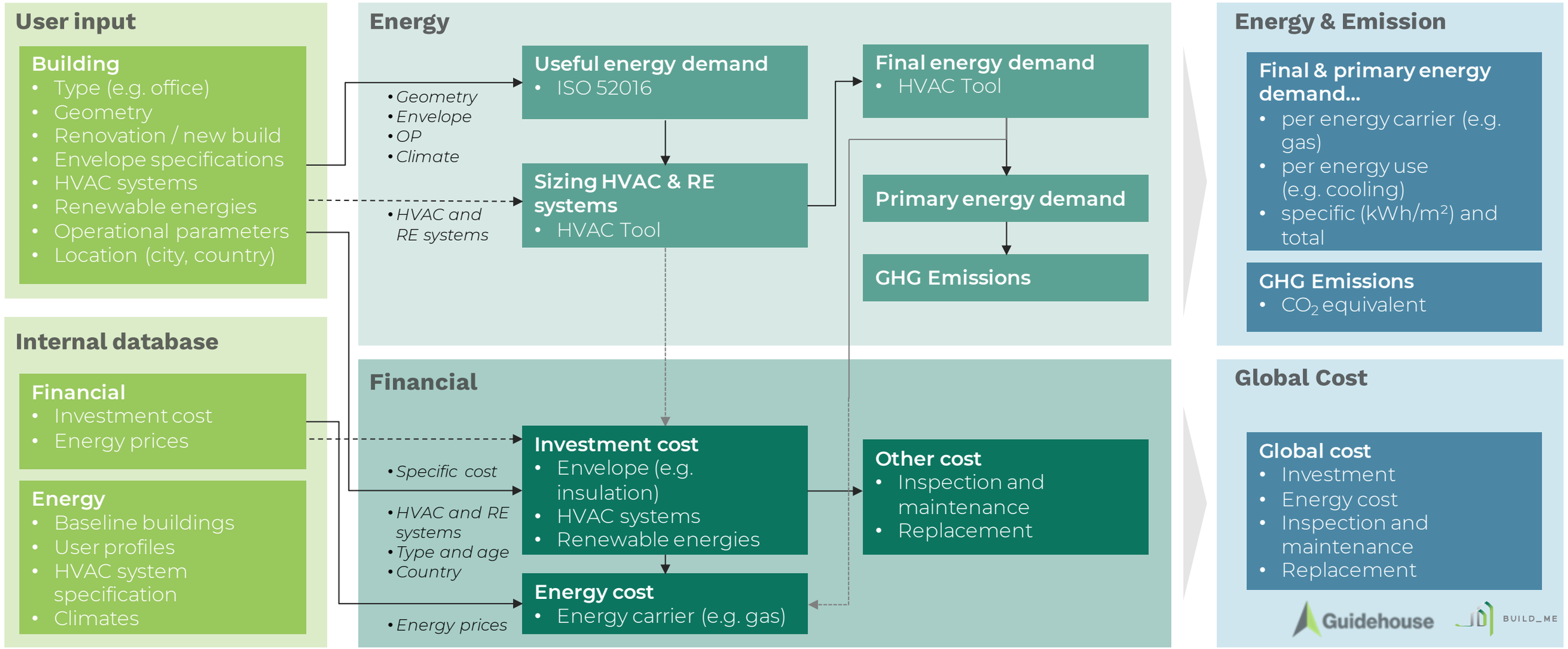
Can show the distribution of CO2 savings per energy consumer

Calculation methodology

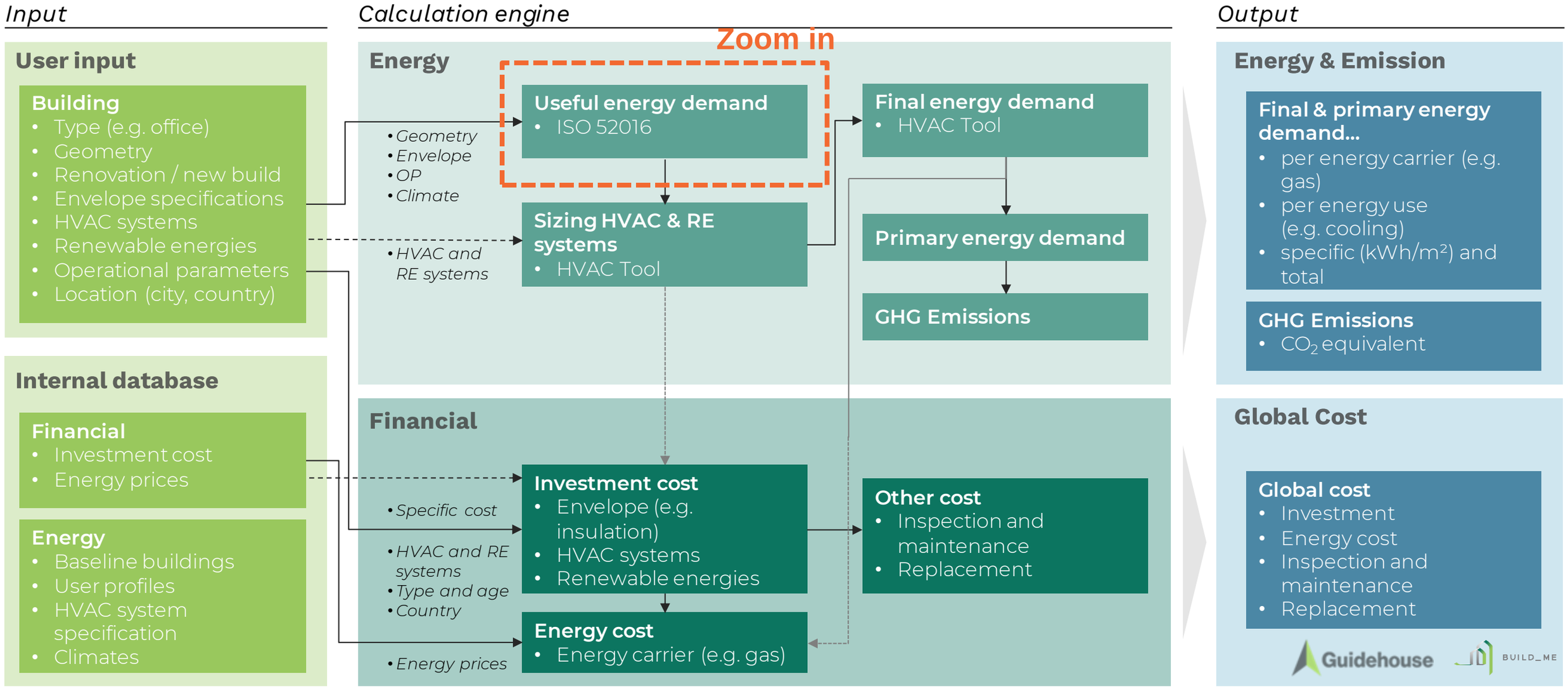
Input

Calculation engine

Output



Calculation methodology



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Calculation methodology – Zoom into: Useful energy H&C

Inputs

Building
- Type
  - User profiles
- Geometry
  - Area
  - Orientation
- Envelope specifications
  - Thermal transmittance (u-value)
  - Specific heat capacity
  - Absorption
  - Thermal heat bridge
  - Shading variant
  - Air change rate (Free ventilation, Infiltration)
- Operational parameters
  - Conditioned area
  - Set point temperatures for heating and cooling

Climate data
- External air temperature
- Solar irradiation per direction

Calculations

Internal heat gain
- Based on user profiles of different building types - considering no. of occupants, appliances etc

Solar heat gain
- Considering area of windows, direct and diffuse solar irradiance on windows and the shading reduction factor

Heat transfer through Ventilation
- Based on the heat capacity of air per volume and the air change rate

Heat transfer through thermal heat bridge
- Based on the heat transfer coefficient for thermal bridges

Heat transfer through building elements
- Based on the geometry, u-value, specific heat capacity and absorption

Output

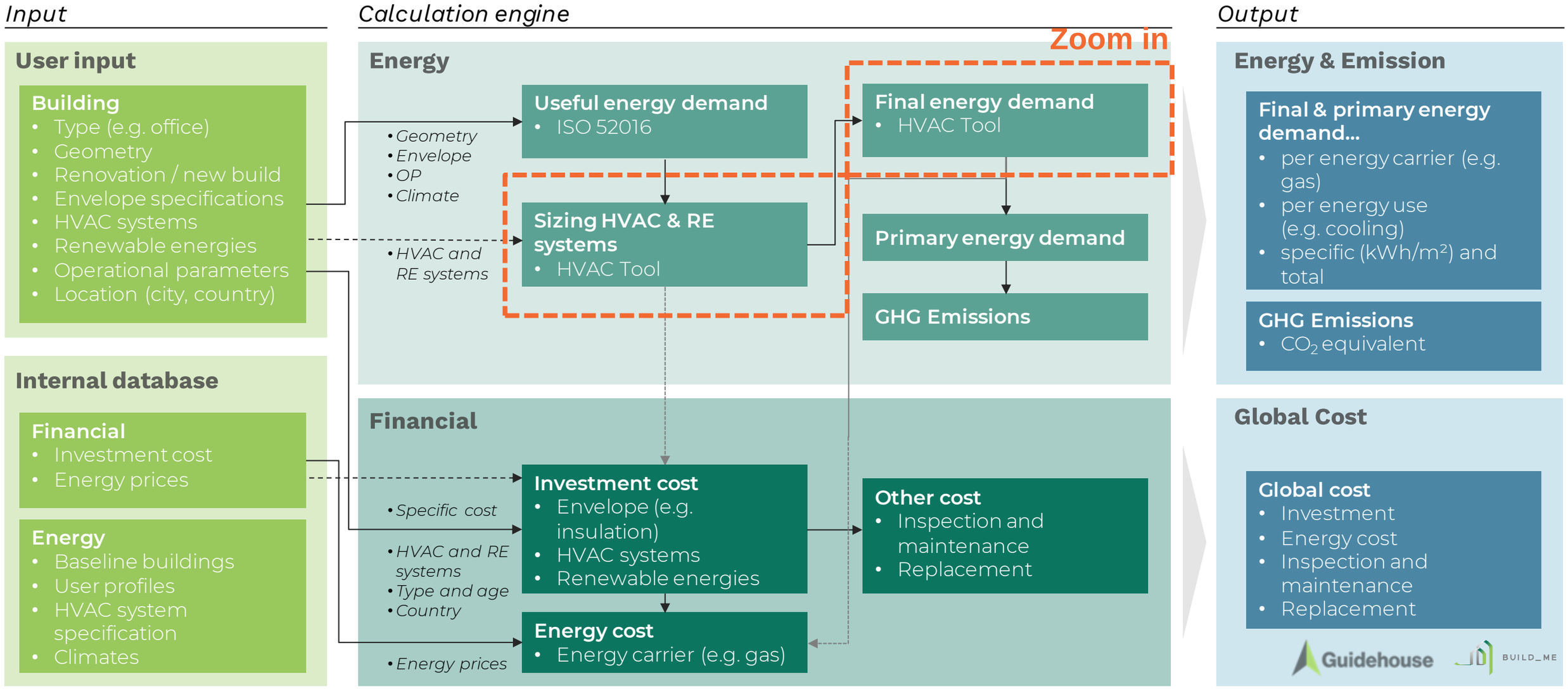
Total internal gains
Internal heat gain + Solar heat gain

Total heat transfer
Heat transfer through Ventilation + Heat transfer through thermal heat bridge + Heat transfer through building elements

Internal air temperature
Based on total internal gains and heat transfers

Heating and Cooling energy demand
Based on internal air temp, internal operative temp, and operational parameters of the building

Calculation methodology



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Calculation methodology – Zoom into: Final Energy

Inputs (Results of previous calculations)

Useful energy demand
- For space heating
- For cooling
- For hot water

Additional Inputs

User Profiles
- For lighting
- For hot water

HVAC systems

- Systems in use
- Efficiency class

RE systems

- PV system in use and module area
- Solar thermal system for hot water

Calculations

Dimensioning of HVAC systems
- Based on useful energy demand, efficiency (COP, EER, etc), user profiles, and operational parameters

Dimensioning of distribution systems
- Considering the pipe length and specific heat loss

Auxiliary energy need
- Based on the HVAC systems and operational parameters

Energy need Lighting
- Based on the lighting technology and the user profiles

RE Production
- From PV (Based on the solar irradiance and PV system parameters)
- Solar thermal system (Based on the system)

Output

Final energy demand of HVAC systems

Useful energy demand / Resulting Efficiency

Energy demand for lighting and auxiliary systems

Energy need for auxiliary systems for Space heating and hot water

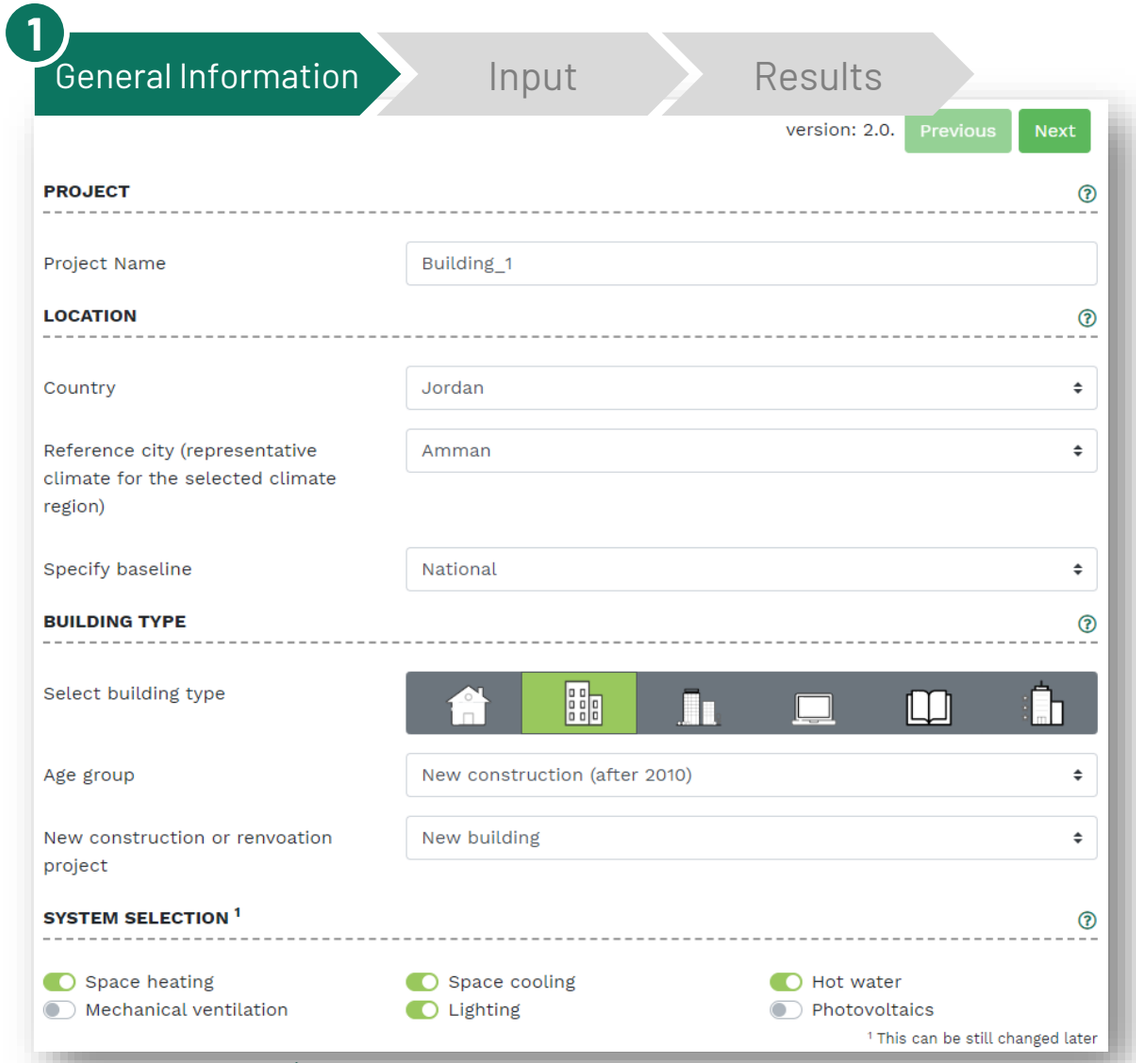
Total final energy demand

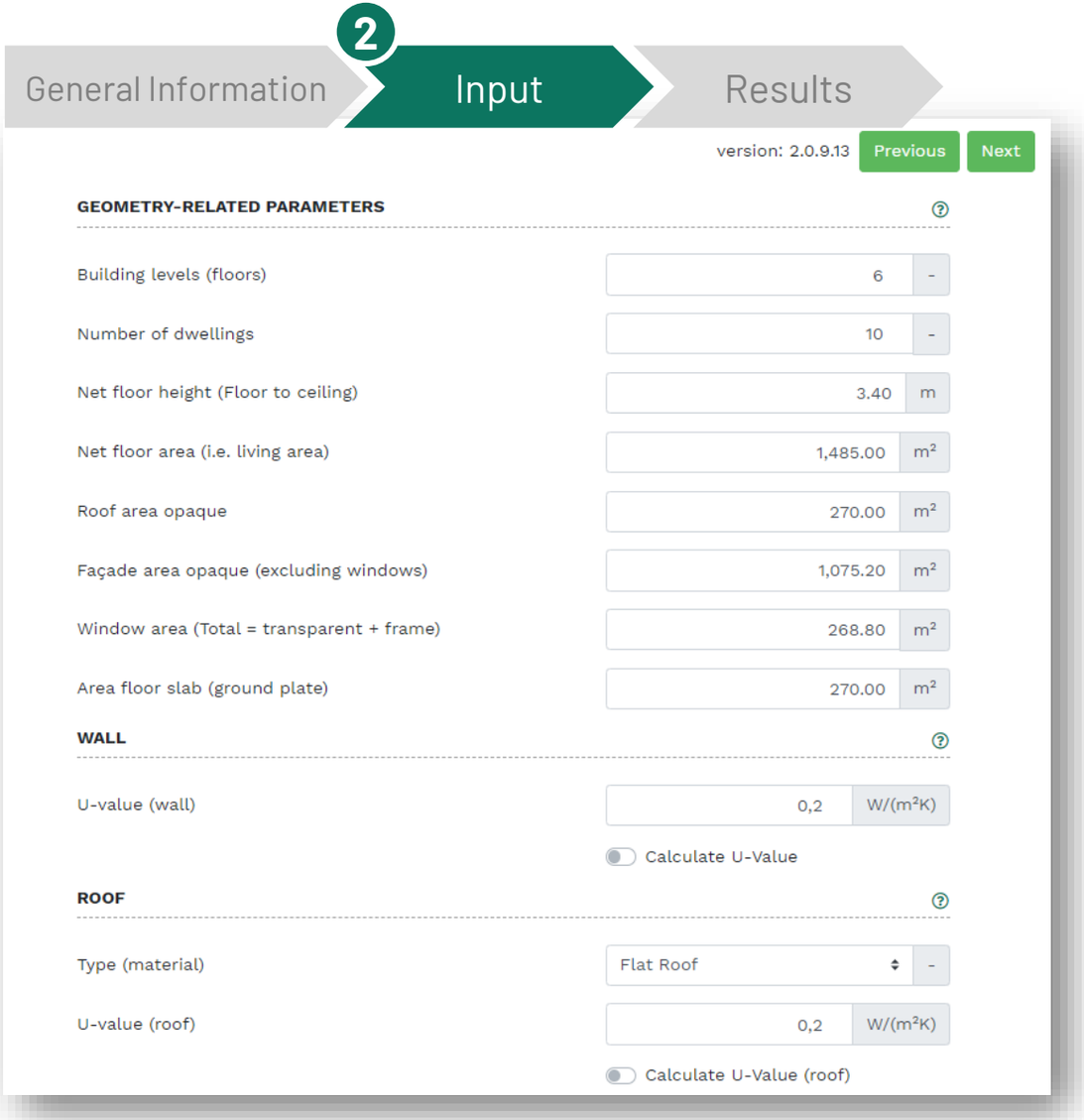
Sum of all final energy demands

Remaining final energy demand

Total FE demand – demand covered by RE

Online Web App – Input





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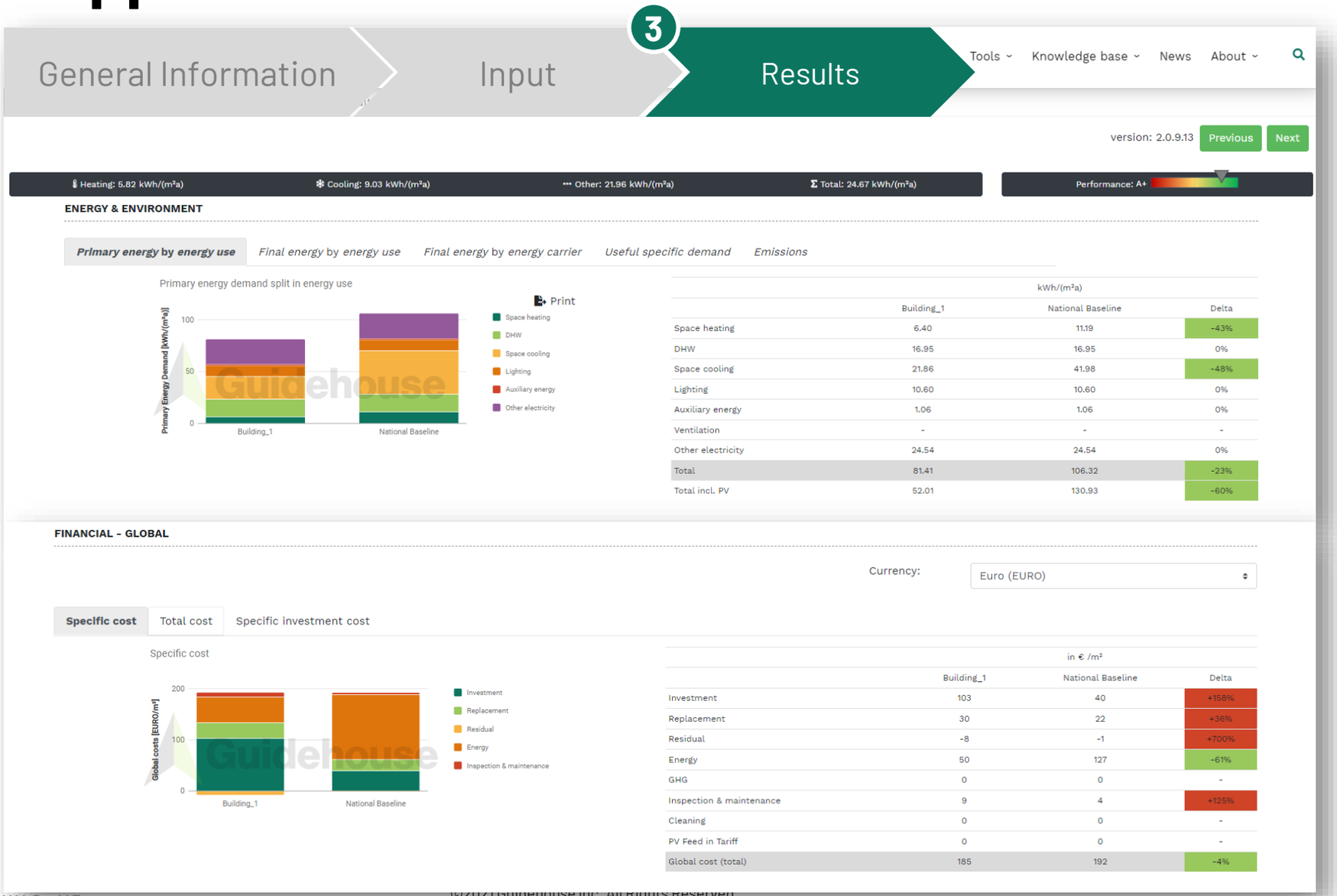
Online Web App – Results



Online Web App – Results detail

1| Quick overview

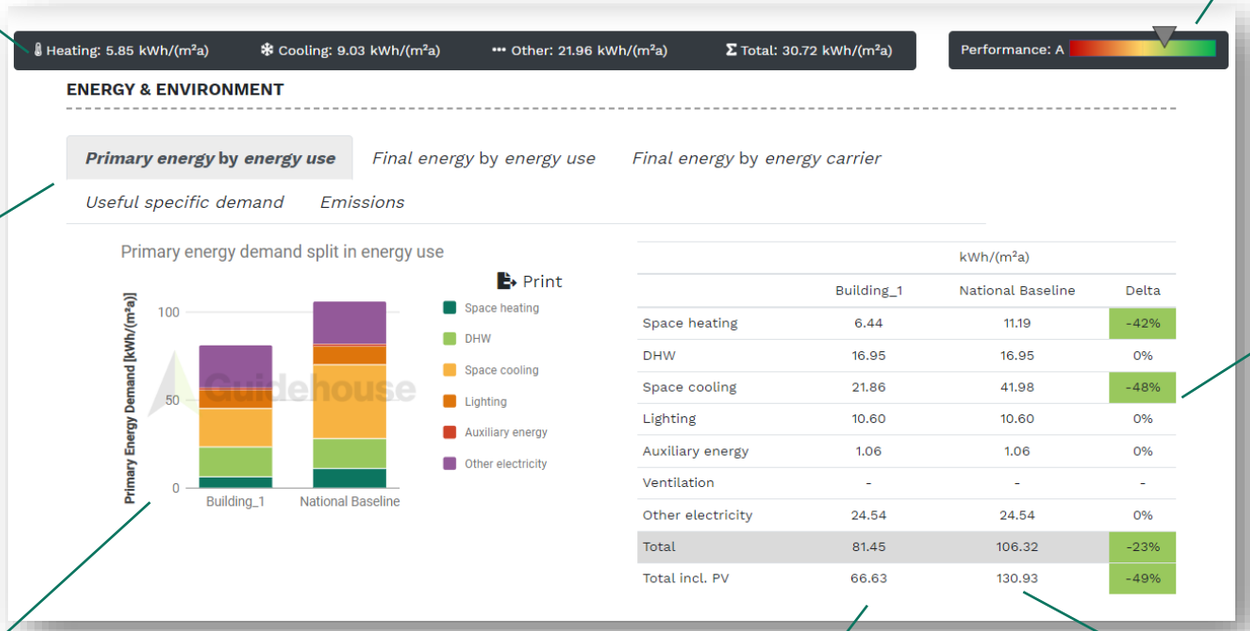
The main facts.

2| Output selection

4 tabs to select the energy performance indicator.

3| Overview chart

Comparison to the baseline building.



4| Results table

Detailed results in numbers.

5| Baseline building

Detailed results of the baseline building.

6| Comparison

Difference to the baseline buildings.

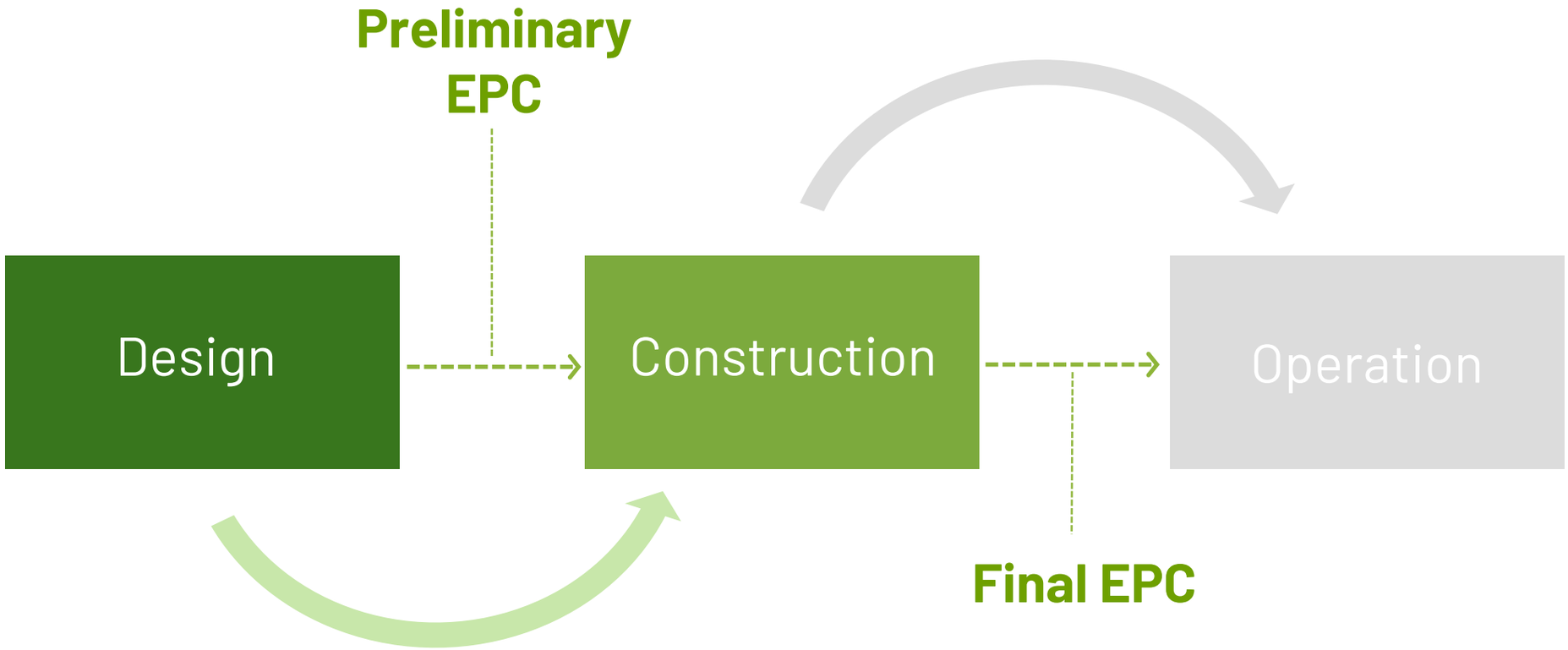
7| Performance rating

C = equal to baseline

Energy Performance Certificate

Energy Performance Certificate

EPC process



Initial **Preliminary EPC** for design stage and a **Final EPC** after construction stage. There is no EPC for operation stage.

Energy Performance Certificate

EPC Process - Functions & Roles

Developer/Owner
Project Team/ EPC expert

- Perform self-assessment in EPC software (BEP tool)
- Register for certification
- Prepare & submit supporting documents

EPC Auditor

- Review & approve supporting documents
- Perform site visit
- Recommend certification

EPC Scheme Operator

- Issue EPC certificate
- Provides quality assurance
- Trains EPC Auditors
- Provides education & customer support

Energy Performance Certificate

EPC Process - Functions & Roles

Developer/Owner
Project Team/ EPC expert

- Help determine which strategies to use
- Complete calculations & self assessments
- Compile documentation & submit to Auditor
- Provide clarifications & coordinate site visits

EPC Auditor

- Review documentation package submitted by the EPC expert
- Conduct site Audit
- Recommend project certification to the scheme operator
- Answer technical questions

EPC Scheme Operator

- Lead and manage the process of EPC
- Review documents submitted by EPC Auditor
- Provide quality control

Energy Performance Certificate

EPC Process - Functions & Roles

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- Review documents submitted by EPC Auditor
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Independent at Project Level

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Energy Performance Certificate

EPC process exemplary for Egypt

Design Inputs into EPC → Project Registration → Design Documentation Submission → Auditor Review → EPC Check by HBRC → Preliminary EPC

As-Built Inputs into EPC → Project Final Registration → As-Built Documentation Submission → Auditor Review and Site Audit → EPC Final Check by HBRC → Final EPC

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Energy Performance Certificate

Design of the certificate - Example of a Preliminary EPC

General building info

KPIs

Recommendations

Explanations

Energy Performance Certificate

Design of the certificate - Example of a final EPC

General building info

KPIs

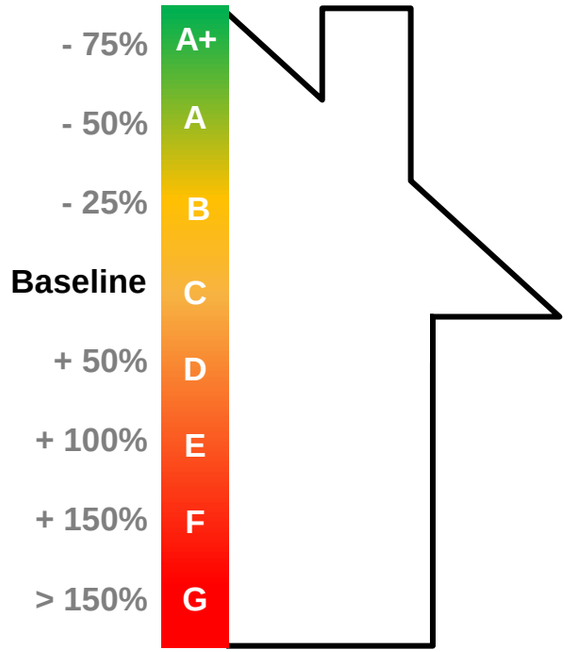
Explanations

Energy Performance Certificate

Rating score

Rating scores for BUILD_ME building types

Class	Term	Score
A+	better than the Energy Performance Regulation Reference (+75%)	≤ 0.25
A	better than the Energy Performance Regulation Reference (+50%)	0.26 - 0.5
B	better than the Energy Performance Regulation Reference (+25%)	0.51 – 0.75
C	**1 stands for the Energy Performance Regulation (new buildings according to EEBC / national Build_ME baseline)**	**0.76 – 1**
D	between the Energy Performance Regulation Reference, and the Building stock reference	1.01 – 1.5
E	Building stock reference starts here	1.51 - 2.0
F	poorer than the Building Stock Reference	2.01 – 2.5
G	poorer than the Building Stock Reference	> 2.5



Automated EPC process through BEP 2.0

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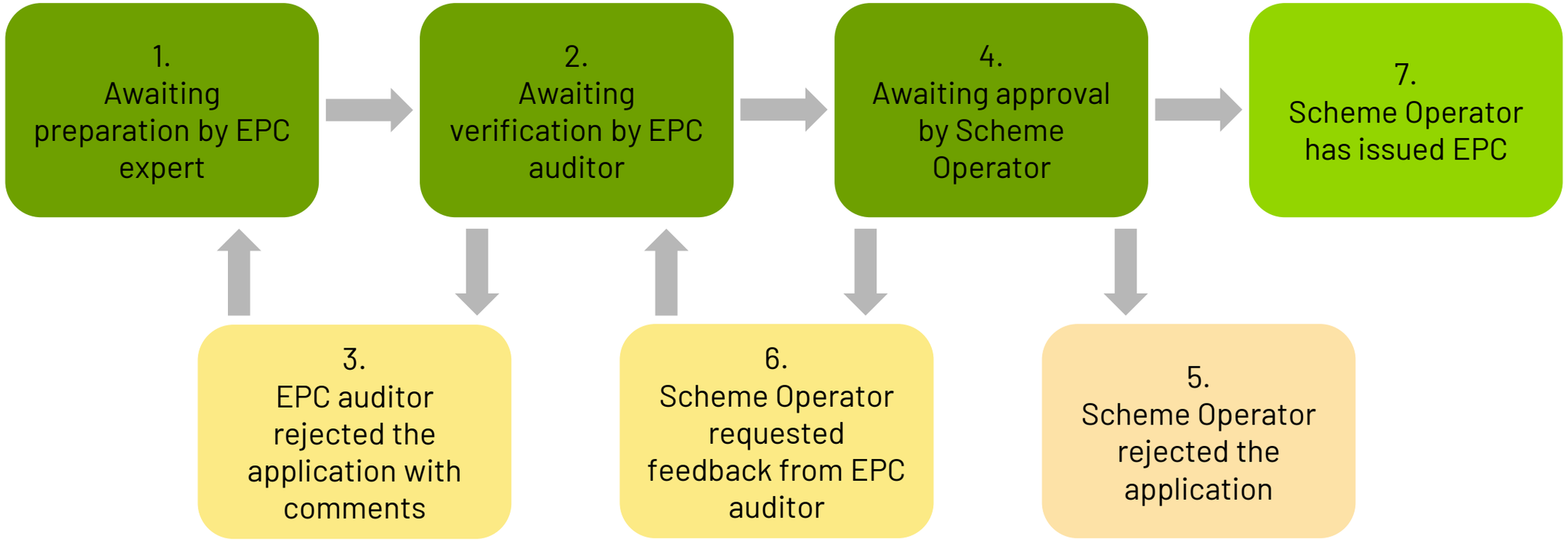
Automated EPC process through BEP 2.0

Workflow on the website



Automated EPC process through BEP 2.0 (Cont…)

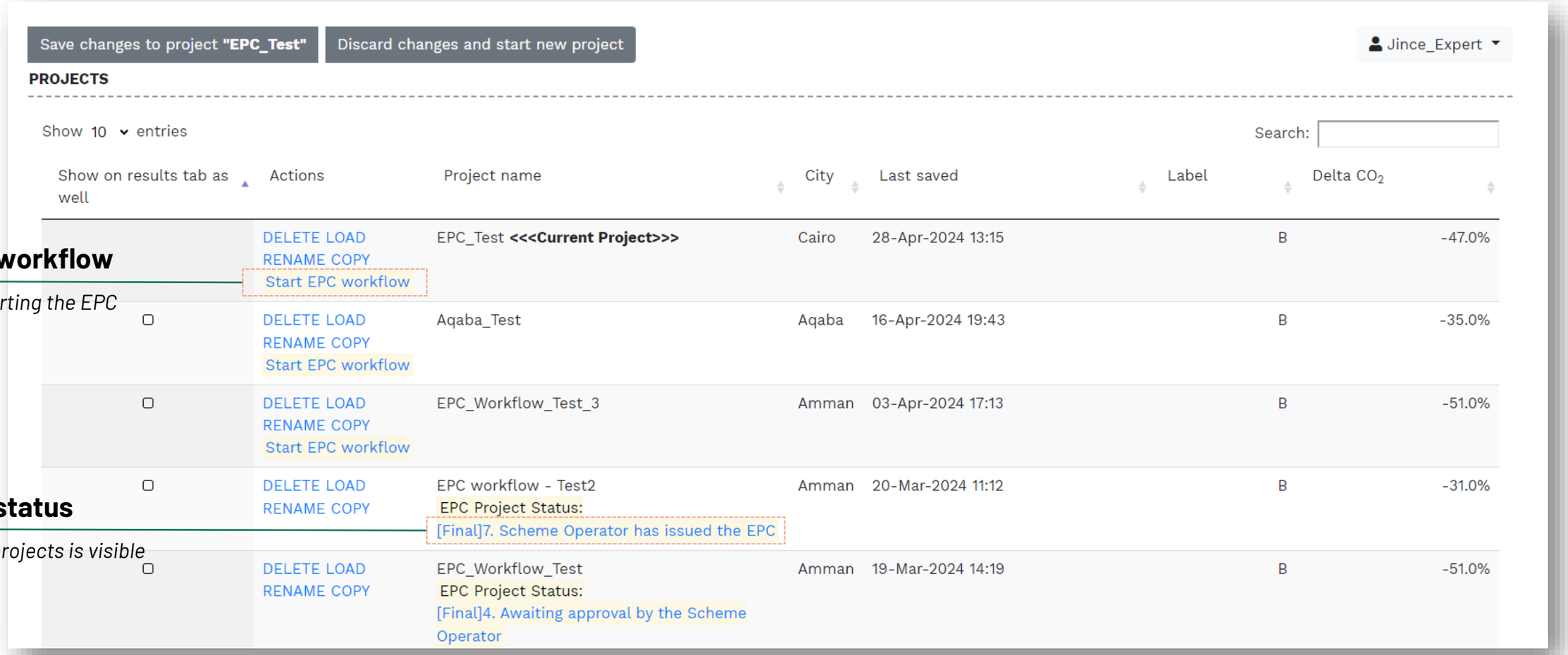
Workflow on the website

1| Start EPC workflow

EPC Expert is starting the EPC workflow

2| Project status

The status of projects is visible here



Automated EPC process through BEP 2.0 (Cont..)

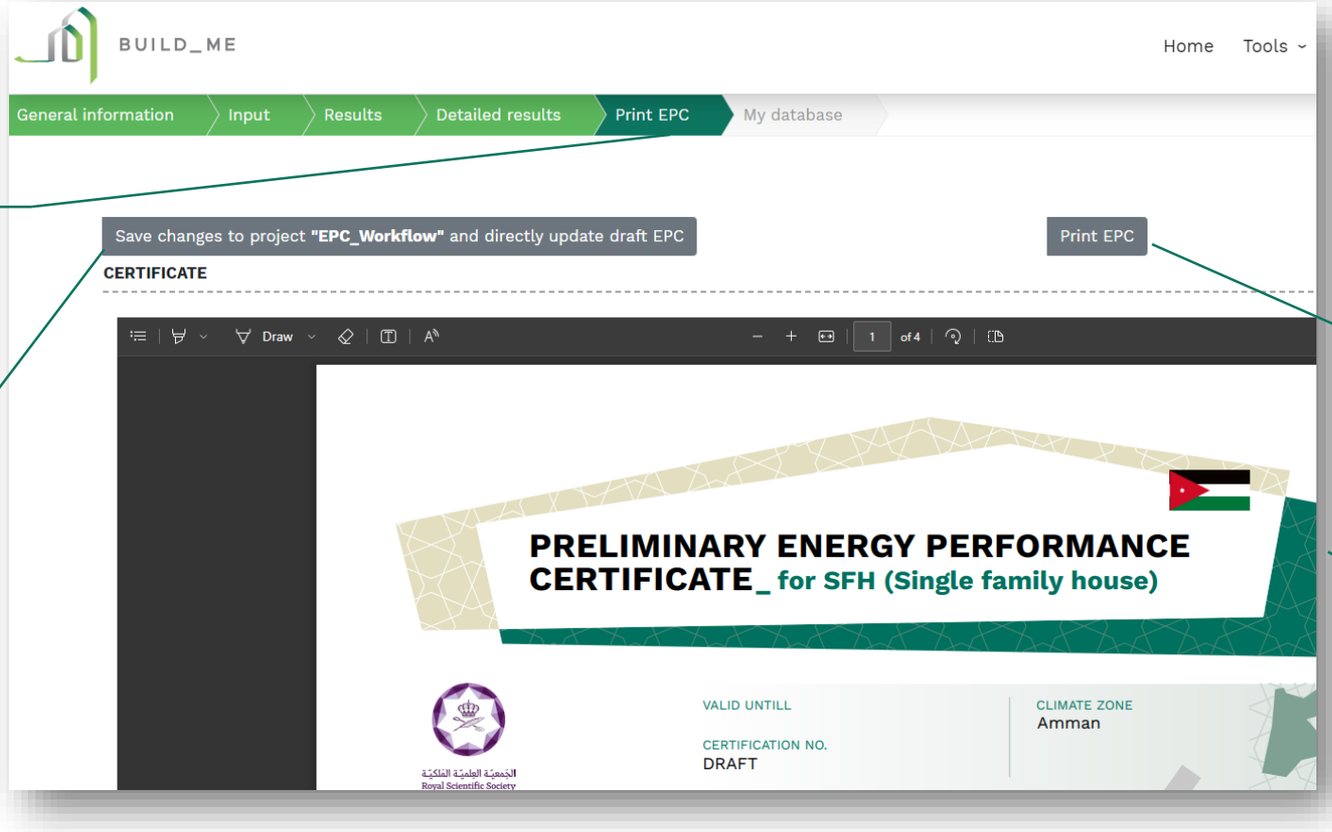
Print EPC tab

1| New tab "Print EPC"

View and download Draft, Preliminary, and Final EPC

2| Update the preview

Button to update the preview after changing the input



3| Print Button

Download/print directly from here

4| Preview

Preview of the EPC.

Walk through the website

30 minutes

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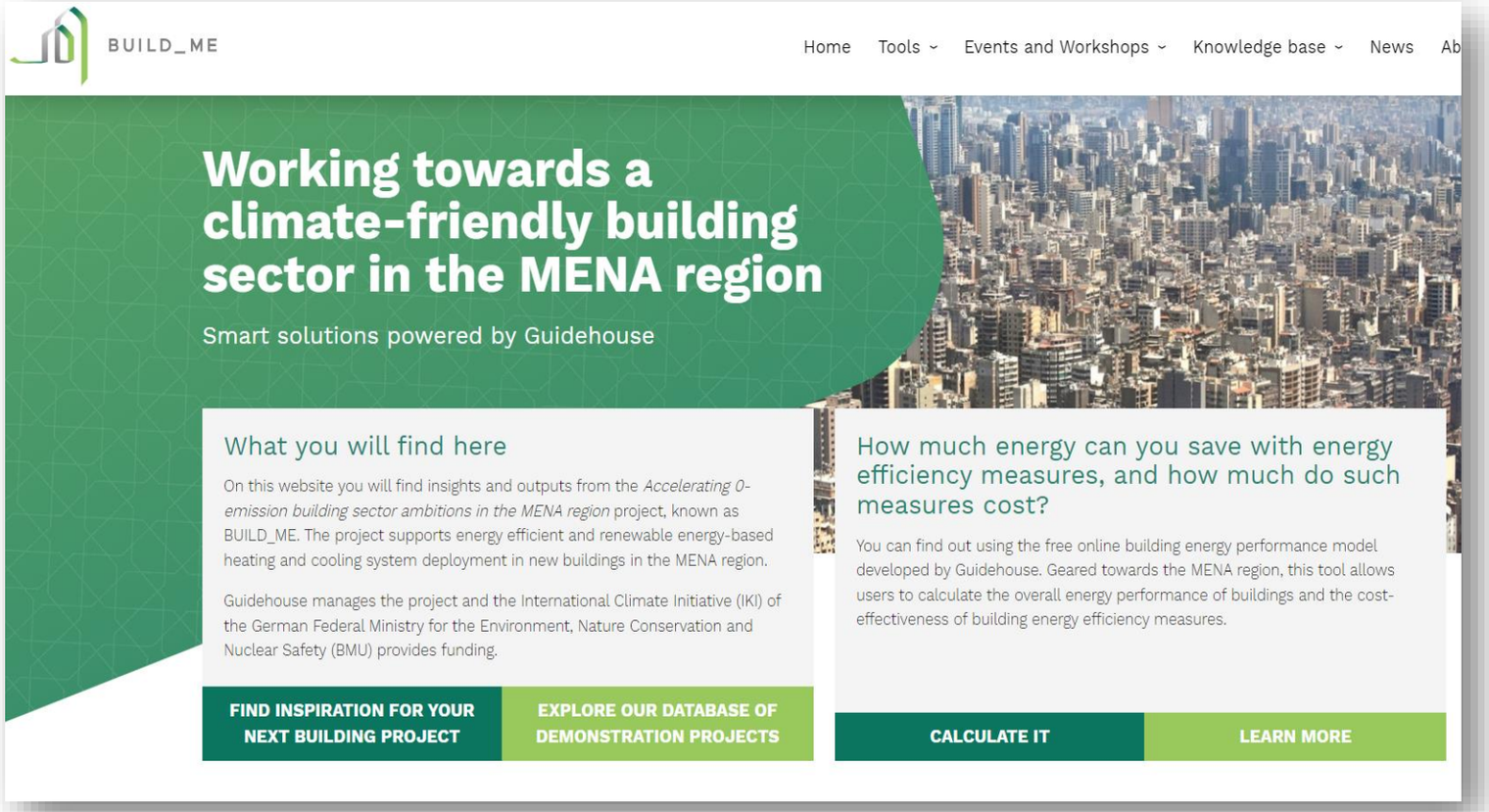
Walk through the website

www.buildings-mena.com

- [Towards a low-carbon building sector in the MENA region - BUILD_ME (buildings-mena.com)]



Case study and discussion

25 minutes

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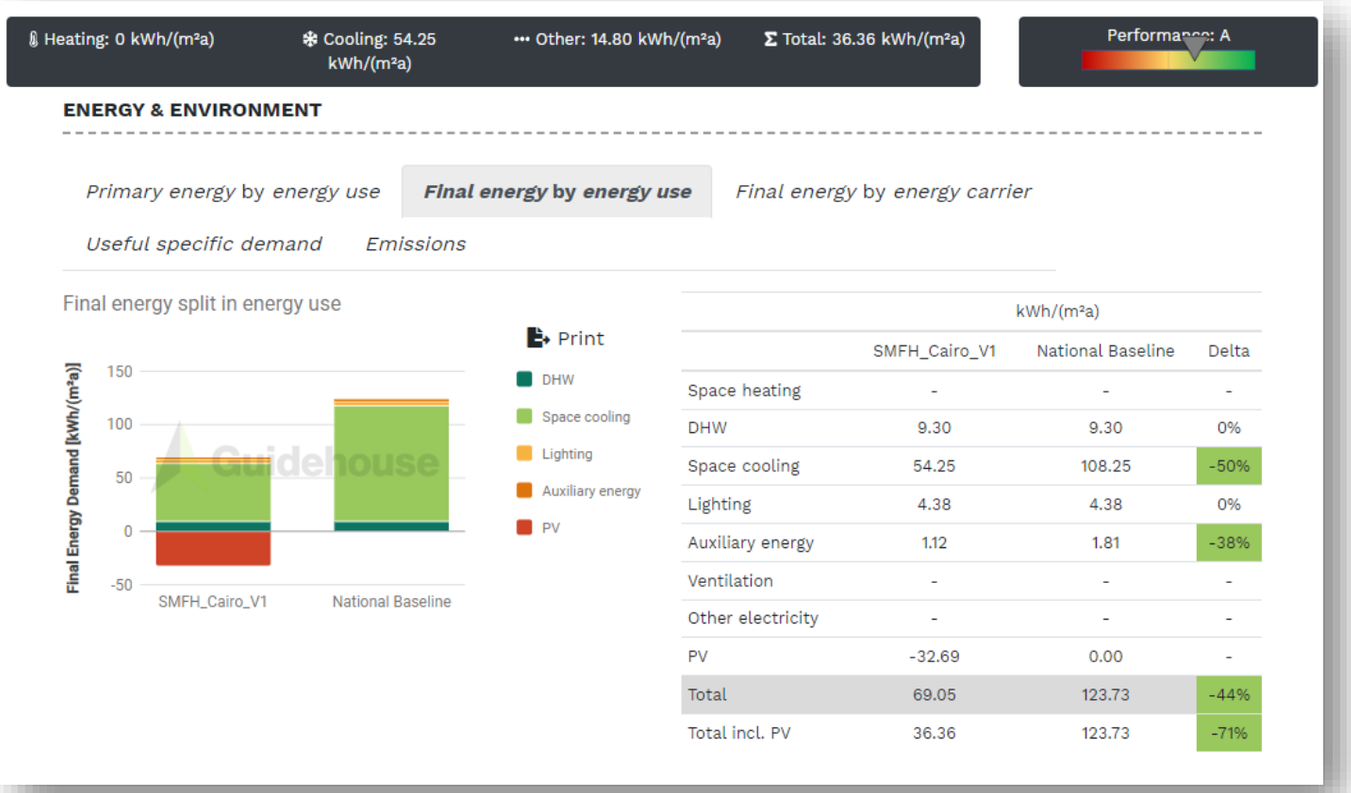
Case study

What does a building in class A look like? Variant-1

EBRD agreed to **finance** buildings with A certification

Building type	Small multi-family house	
Climate region	Cairo	
Measure	**Baseline situation**	**V1 – Envelope + HVAC + PV**
Roof	0.76 W/m²K	0.64 W/m²K
Wall	2.4 W/m²K	1.1 W/m²K
Windows	Single glass (U: 5.7 W/m²K / G: 0.85)	Double glass (U: 3.0 W/m²K / G: 0.7)
Cooling system	Mounted single-split or window AC (Low EER: 2.9 - 2.1)	Mounted single-split or window AC (Minimum req. EER: 3.9 - 3)
Renewable energy	No	PV, 20 kWp
Results		
Total final energy	124 kWh/m²a	36 kWh/m²a [-71%]
Global cost	224 €/m²	180 €/m² [-20%]
Final investment	406 €/m²	443 €/m² [+9%, PBP: 9 Years]

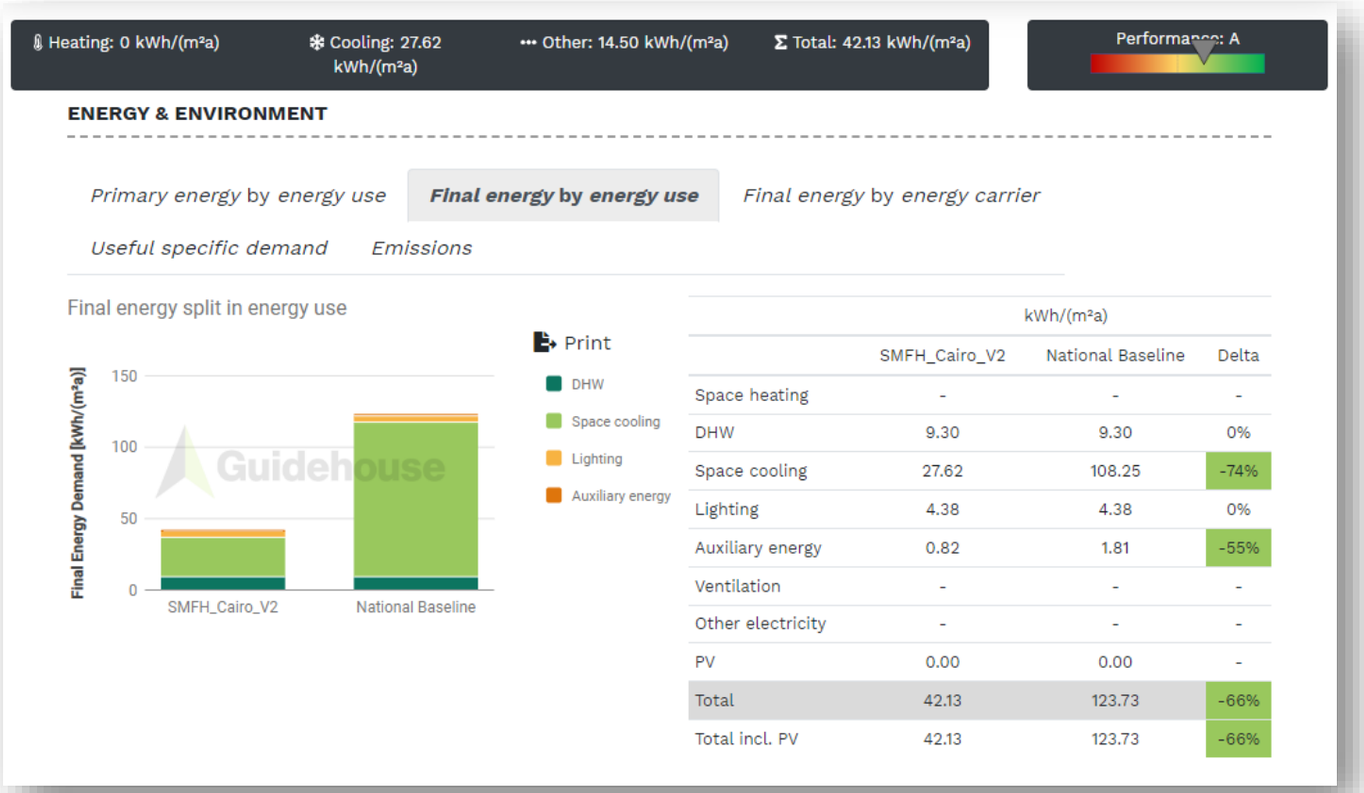


Case study

What does a building in class A look like? Variant-2

EBRD agreed to **finance** buildings with A certification

Building type	Small multi-family house	
Climate region	Cairo	
Measure	**Baseline situation**	**V2 – Envelope + HVAC**
Roof	0.76 W/m²K	0.43 W/m²K
Wall	2.4 W/m²K	0.73 W/m²K
Windows	Single glass (U: 5.7 W/m²K / G: 0.85)	Double glass (U: 1.2 W/m²K / G: 0.7)
Cooling system	Mounted single-split or window AC (Low EER: 2.9 - 2.1)	Mounted single-split or window AC (BAT, EER: > 5)
Renewable energy	No	No
Results		
Total final energy	124 kWh/m²a	42 kWh/m²a [-66%]
Global cost	223 €/m²	146 €/m² [-35%]
Final investment	406 €/m²	437 €/m² [+8%, PBP: 8 Years]



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Instructions

Case 1 – SFH

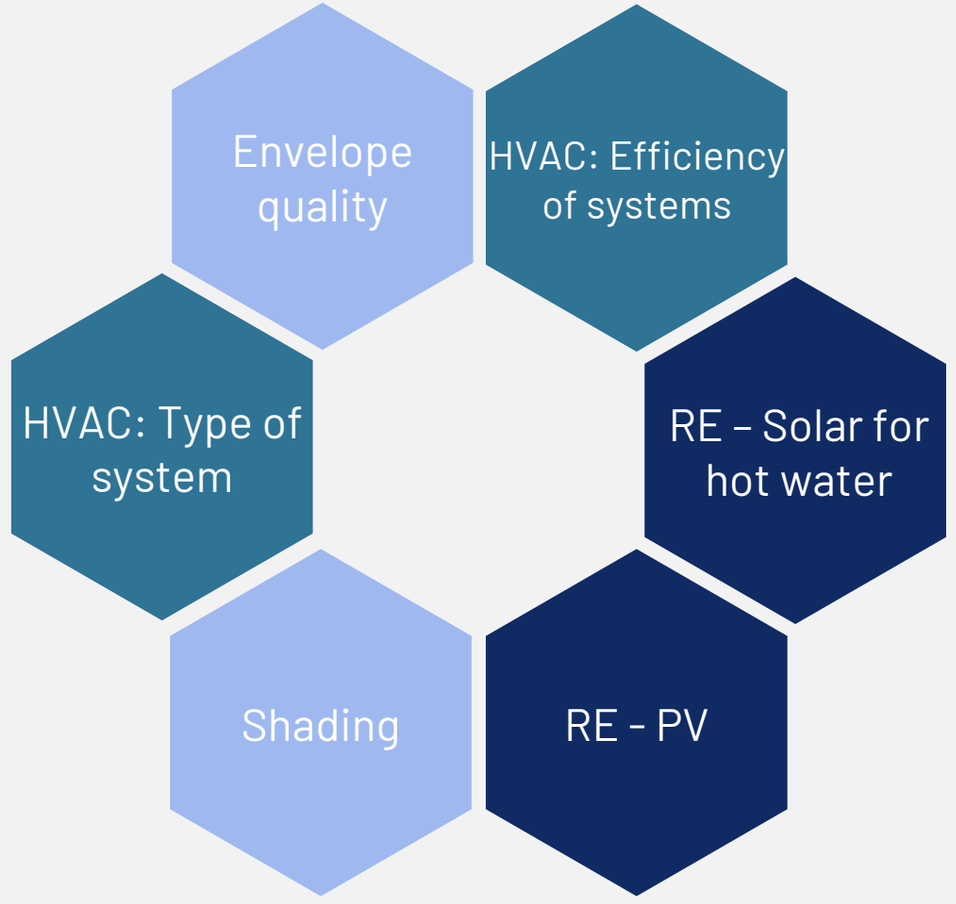
Objective
Find out a suitable combination of measures to reach the performance class A

Tools
Add/Change the all/any of the available measures (see the overview on the right)

Focus
Country: Egypt | Climate: Cairo | Building: SFH |
Age group: New construction

Time
10 min to work on the case

Measures available in the BEP Tool



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Discussion topics

First list of questions to be clarified

- The preliminary list of possible candidates attending the training for EPC experts or EPC auditors
- How can we co-operate to reach out to project developers?
- List of eligibility criteria of project developers?
- Financial offerings: Class A = 10% cash back, how will we deal with A+?

Training for TG1:
Financial institution: EBRD/GEFF

Survey

https://forms.office.com/Pages/ResponsePage.aspx?id=Q4_kTI3hSk-tVdCZCqxmDrudIATxHUtNtu91Z3nP615UMU40MVUyTVNBQlBNVFFPMDE4WjVUUk1MOS4u

Questions

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Federal Ministry for Economic Affairs and Climate Action

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on the basis of a decision by the German Bundestag