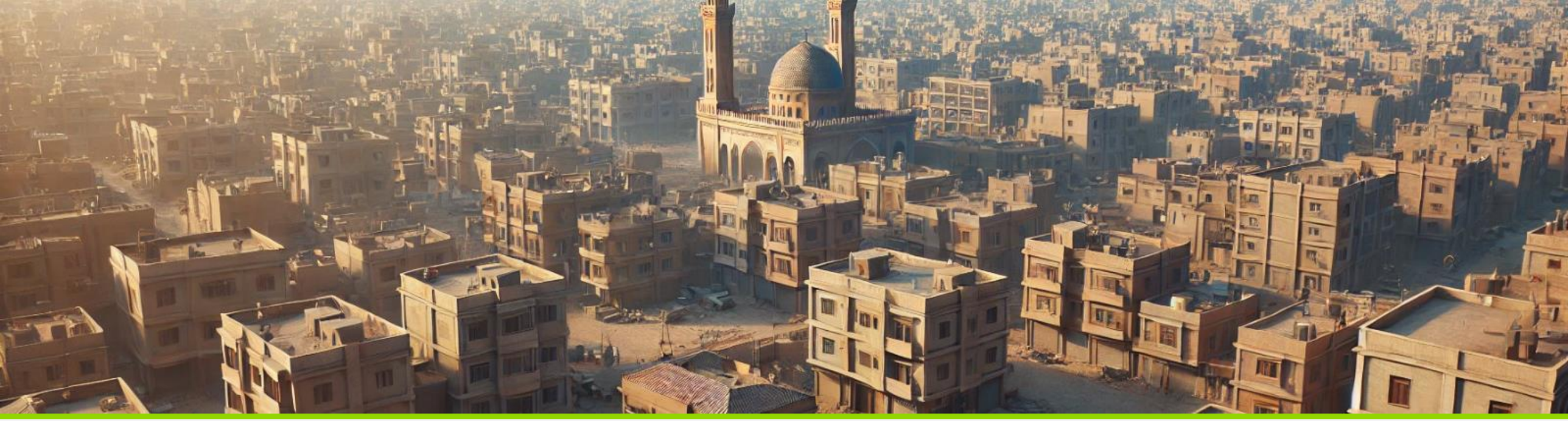
Defining the Zero Emission Buildings Standard for the MENA region

IKI Project: Accelerating 0-emission building sector ambitions in the MENA region (BUILD_ME)

September 2024



Contents

Introduction to the BUILD_ME 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
2023-2025

Support the Roll-Out

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

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Objectives of current third phase of BUILD_ME

March 2023 – March 2025

Technical

More robust tools, allowing for stronger support

- Further develop the BEP tool
- Roll out energy performance certificate EPC scheme with the national agencies
- Trainings

Financial

Green financial products for buildings

- Matchmaking between financial institutions and pilot project developers interested in receiving green finance.
- Facilitating green finance for buildings projects.

Policy

EE of buildings Contributing to national policies

- National energy efficiency Strategies
- Simplification and updates of EEBC.
- Demand Driven

Relevance of our today´s topic to the third phase of BUILD_ME

March 2023 – March 2025

Technical

More robust tools, allowing for stronger support

- Further develop the BEP tool
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Introduction to today´s webinar topic

Defining the Zero Emission Buildings (ZEB) Standard for the MENA region

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Zero Emission Buildings

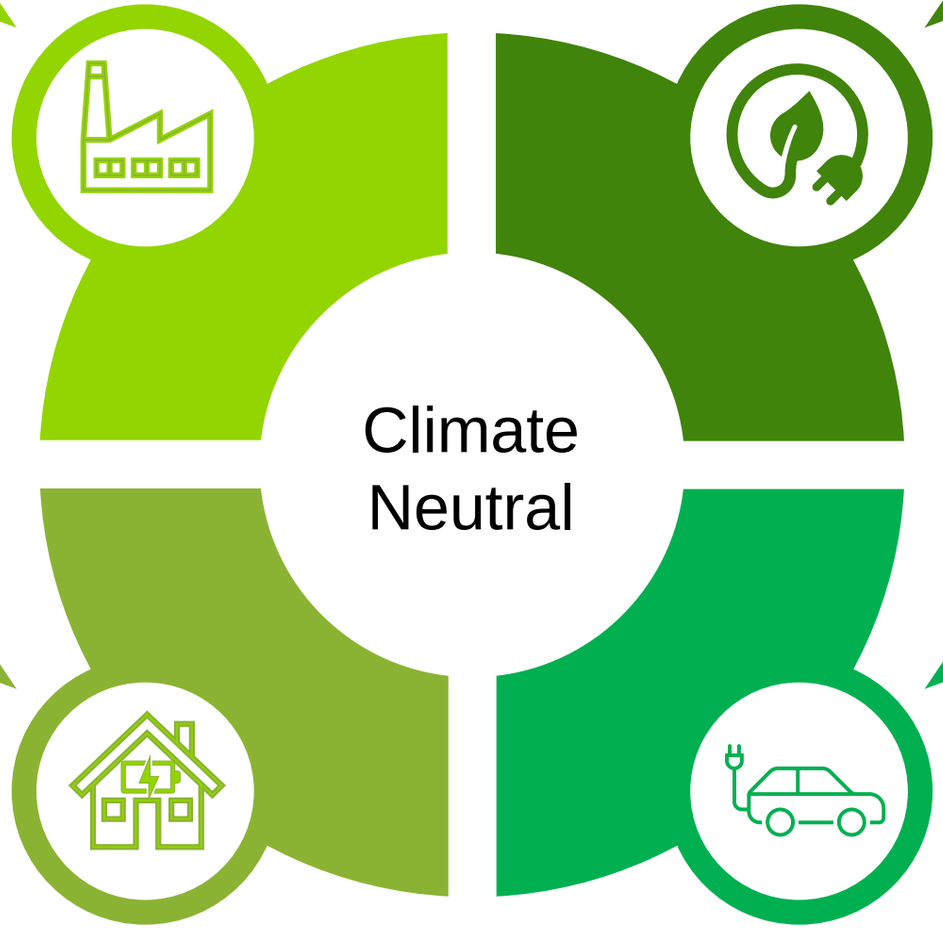
a Crucial Element of a Climate Neutral Energy System

Decarbonized Industry

High efficiency, onsite PV and storage

Renewable Energy Grid

PV, Wind, Large energy storage



Zero Emission Buildings

High efficiency, onsite PV and storage

Electric Transportation

Of persons and goods

Transition to Zero Emission Energy Systems in MENA

Lack of an Overarching Strategy

High Risk of Lock-In Effects

- **Low-efficient buildings** causing a **high energy demands** which require **extremely high efforts for a renewable energy supply**
- **Risk of failure of the transition.**

Key Question:
What is the **most cost-effective** solution for balancing investments in:

- **Energy efficiency improvements?**
- **Renewable energies?**
- **Energy storage systems?**

Challenges of the Uptake of ZEBs in the MENA Region

Financial Focus on Investment Costs

- **Economical crises and high inflation rates**
  limit the available investment capital an access financing.

- **Low subsidized energy prices**
  increase or prevent payback.

Awareness and Experience

- Low relevance of climate change topic
  due to a variety of other **more concretely issues**.
- **Lack of experience** with sustainable and efficient constructions and technologies
- **Weak building policies**
  low ambitious regulations, poor compliance, to little additional initiatives

Proposed Methodology

Defining the Zero Emission Buildings Standard for the MENA region

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International Definitions of Zero Emission/Energy Buildings

Overview of some selected definitions on ZEBs

EPBD

EPBD (European Performance of Buildings Directive)

- **2010/31 Directive**: Nearly Zero-Energy Buildings (NZEB), Energy performance requirements determined by cost-optimality calculations.
- **2024/1275 Update**: Zero-Emission Buildings (ZEB), No on-site fossil fuel emissions, adaptable to external signals, and capable of managing energy use, generation, or storage.

IEA

IEA (International Energy Agency)

- **Zero Carbon Ready Buildings:** Highly energy-efficient, utilizing renewable energy or connected to a fully decarbonized energy supply by 2050.

WGBC

WGBC (World Green Building Council)

- **Net-Zero Carbon Buildings:** 100% of energy demand met through on-site renewable energy.
- **Net Zero Whole Life Carbon:** Embodied carbon is minimized and fully offset across the building's lifecycle.

Balanced approach to identify ZEBs for the MENA region

Aim: Define ZEB requirements for MENA that are financially feasible, and future-proof (climate-neutral).

1. What is financially acceptable? => Identify cost optimal building specifications
2. What is the optimal balance between Energy Efficiency and Renewable Energies? => Identify cost optimal ZEB-configuration
3. Derive financially acceptable and futureproof requirements => **ZERB**

Step 1: Determine financially acceptable cost range

Identification of cost optimal building specifications

Define Boundary Conditions:

- Reference climate
- Reference buildings
- Investment costs of measures
- Energy costs and trends
- Net metering subsidies
- Interest rates, …

Perform Calculations

For various building configurations (incl. PV) determine:

- Energy Demand
- Global Costs
  (OPEX+ CAPEX over 20 years)

BEP-tool

Identify Cost Optimal Configuration

Identify the configurations with:

- Lowest Global Costs
- Specify an Acceptable Cost Range (e.g. +1 %)

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Step 2: Determine the right balance between EE and RE

Identification of cost optimal ZEB-configuration

Precondition:

- Building-related energy demand (electricity) must be fully met by appropriately sized PV and battery-storage systems.

=> **Final energy demand = 0**

Perform Calculations:

- Determine global costs of different ZEB configurations.

Low Efficiency => Large PV+BAT

High Efficiency => Small PV+BAT

Identify Cost-Optimal ZEB-Configuration:

- Configuration with the lowest global costs

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Step 3: Define Cost-Effective & Future-Ready Requirements

The Zero Emission Ready Building (**ZERB**)

Define Energy Efficiency Requirements:

- Ensure the efficiency of the cost-optimal ZEB is **within the acceptable cost range** of the step 1-cost-opt calculations.

Define PV and Battery Requirements:

- Baseline: step 1-cost-optimum
- Consider **acceptable cost range and roof size limitations**

Avoid Lock-in Effect:

- If PV and/or batteries are not financially feasible, ensure **at least preparations are made for future installation.**

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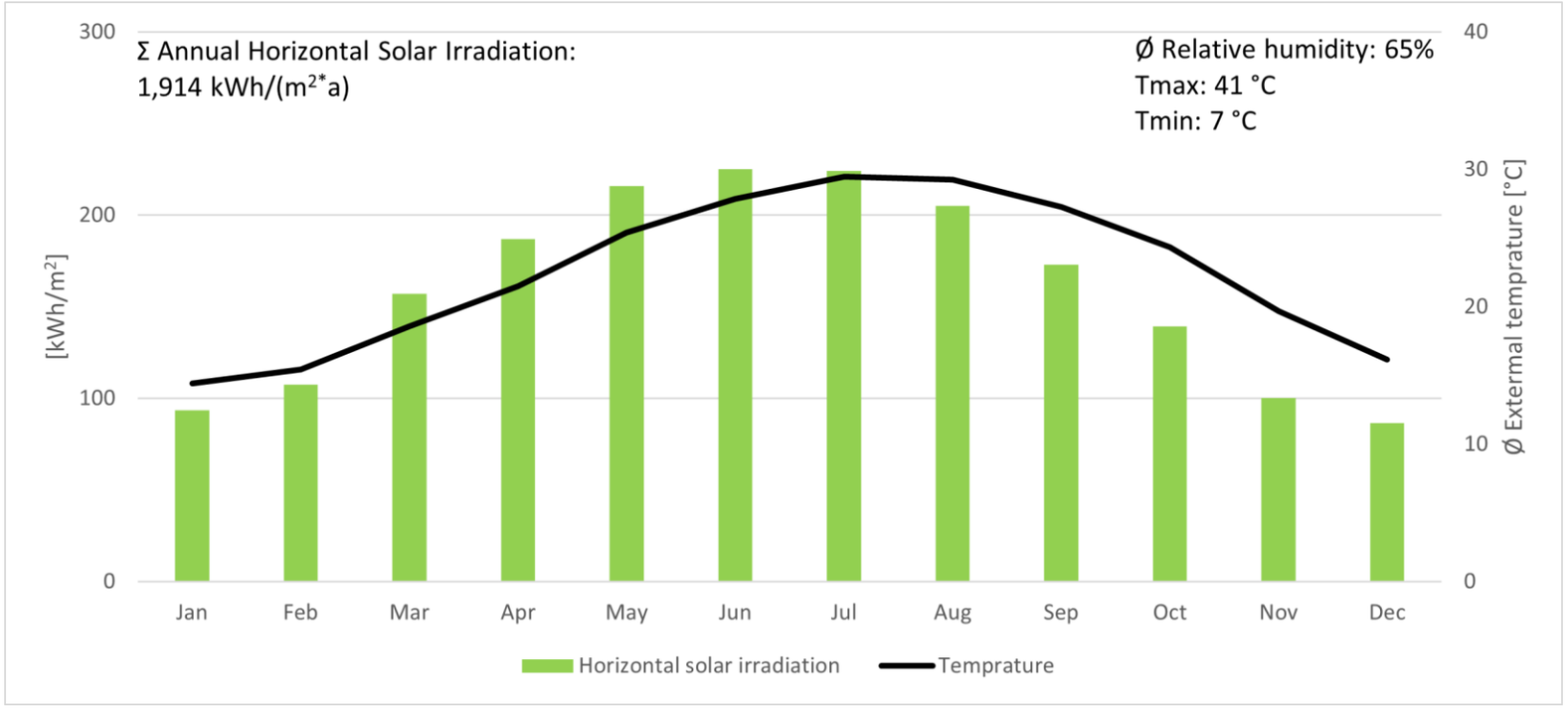
Example Egypt

Identify ZERB-Specifications for a Large Multifamily House

Step 1: Identify Cost Optimum for a Large Multifamily House

1a: General Boundary Conditions

Climate: Cario



Reference building

Multi-Family House Specifications

- Net floor area: 2,604 m²
- Roof area: 576 m²
- Opaque wall area: 1,878 m²
- Window area: 470 m²
- Ground floor area: 576 m²
- AC System: Single-split units
- DHW System: Dedicated electric heater
- Lighting system: LED
- Internal loads (average): 3.5 W/m²

Step 1: Identify Cost Optimum for a Large Multifamily House

1b) Specify Variants for the Calculations

BUILDING ENVELOPE

WALL
X 32

ROOF
X 29

FLOOR
X 3

WINDOW
X 5

HVAC SYSTEM

COOLING
X 4

HEATING
X 4

VENTILATION
X 3

HOT WATER
Electric

RENEWABLES

PV
X 100

SOLAR THERMAL
N/A

BATTERY
X 88

248

Variants of packages (incl. EE+RE measures) have been considered to determine the cost optimal range

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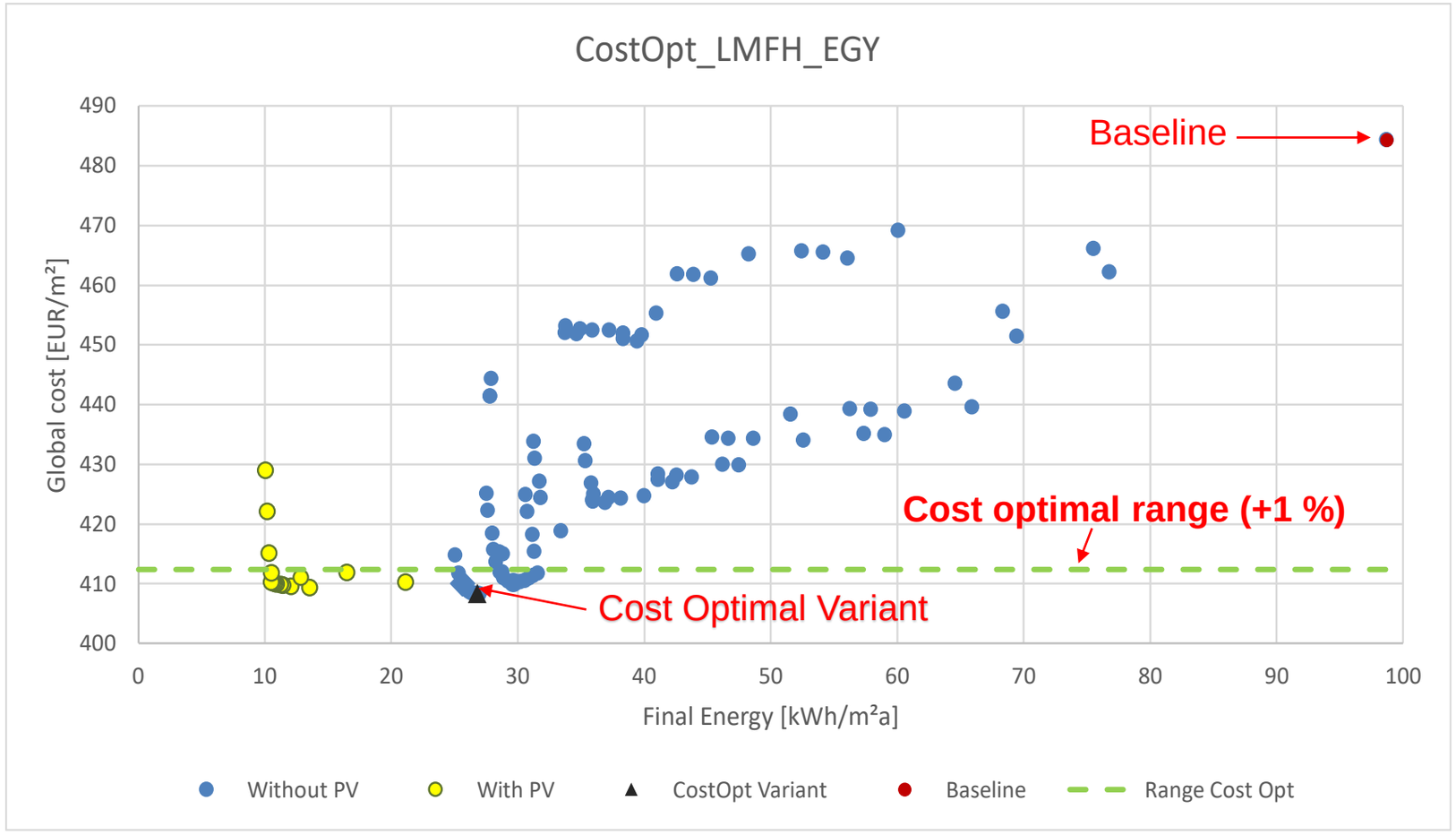
Step 1: Identify Cost Optimum for a Large Multifamily House

1c: Results

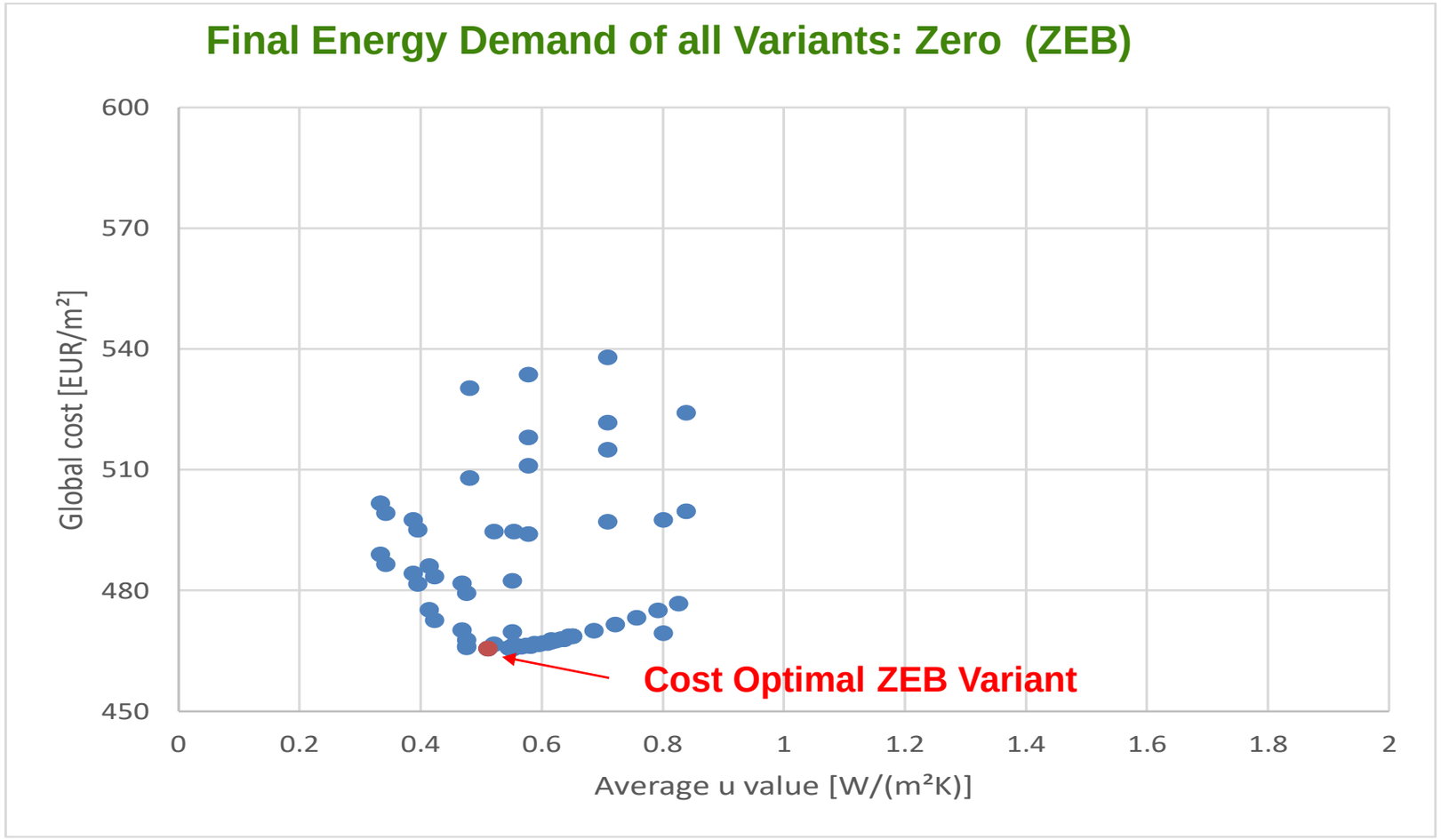


The key specifications of the identified cost-optimal variant:

Roof and walls: u=0.48 W/m²K (=> 6 cm insulation)
Ground floor: **u=0.60 W/m²K** (=> 4 cm insulation)
Windows: **double glazed with solar coating** (u=1.5 W/m²K; SHCG=0.3)
AC: **high efficiency split units** (EER=5.6)
Shading: **Fixed shading elements**
PV: **No**

Step 2: Balance Energy Efficiency & Renewable Energy

Results



The key specifications of the identified cost-optimal ZEB variant:

Roof and walls: u=0.30 W/m²K (=> 10 cm insulation)
Ground floor: **u=0.60 W/m²K** (=> 4 cm insulation)
Windows: **double glazed with solar coating** (u=1.5 W/m²K; SHCG=0.3)
AC: **high efficiency split units** (EER=5.6)
Shading: **Fixed shading elements**
PV: **20 W/m²net floor area**
Battery : **36 Wh/m²net floor area**

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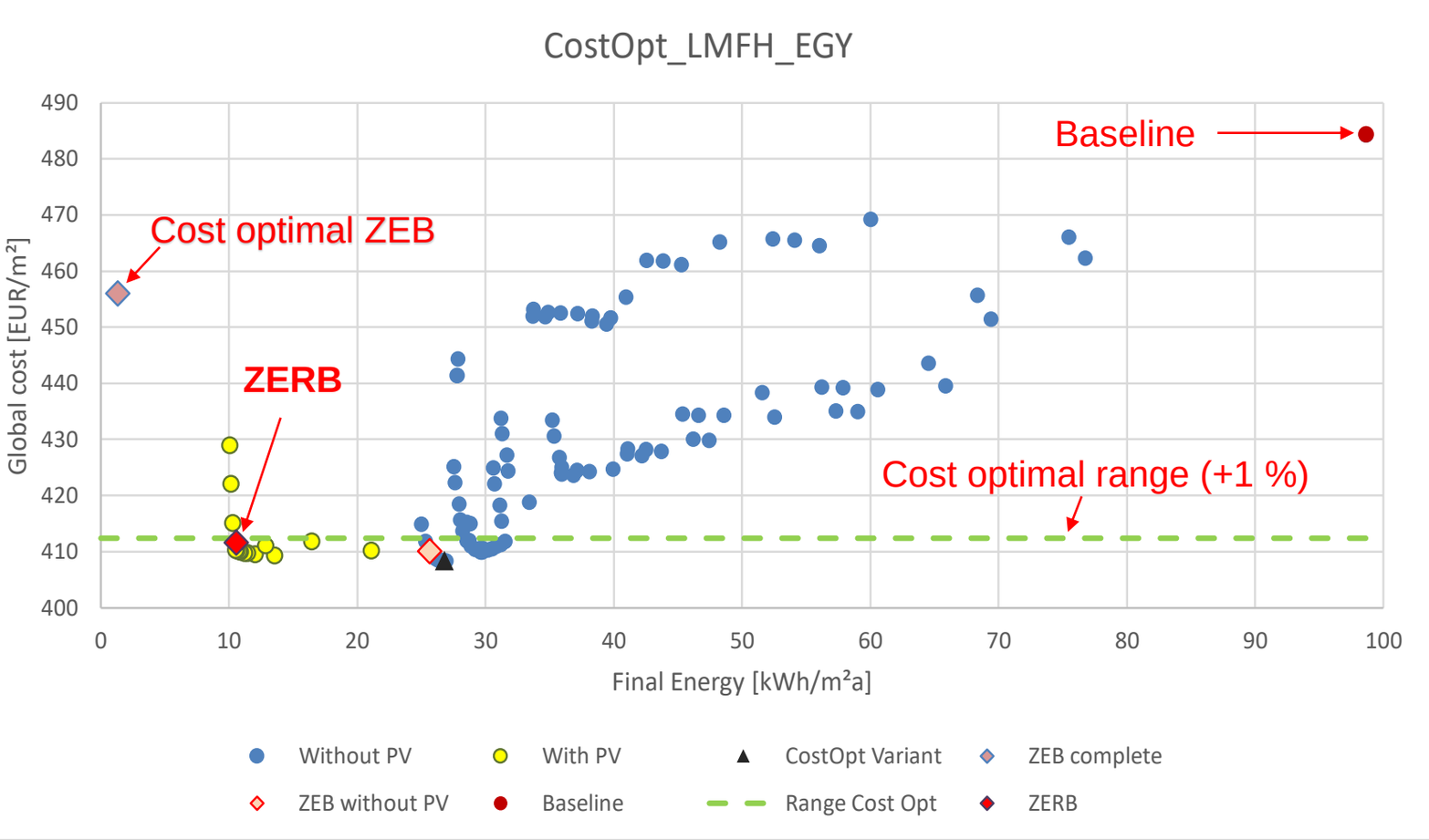
Step 3: Derive Cost-Effective & Future-Proof Requirements

Results



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AC: high efficiency split units (EER=5.6)
Shading: Fixed shading elements
PV: 20 W/m²net floor area

Summary

Defining the Zero Emission Buildings standard for the MENA region

ZEB ready (ZERB) methodology

universally suitable for

Warm & Hot Climates

Diverse Building Types

Country Specific Financial & Technical Boundary Conditions

Benefits of (ZERBs) compared to Common Building Practices

Based on calculations for Egypt, Jordan, and Lebanon

- **70% to 90% Reduction in Final Energy Demand**

Significant energy savings lead to lower utility costs and improved environmental sustainability.

- **15% to 30% Lower Global Costs**

Long-term financial savings due to energy efficiency and reduced operational expenses.

- **Short Payback Periods (typically around 3 years)**

of the additionally required investment costs (usually around 5 %)

Overarching characteristics of the ZERBs

Key Features

- **Thermal Insulation**

Insulated roofs and walls (in some cases also floor insulation).

- **Double Glazing**

Partly solar-coated or triple glazing in some cases.

- **Effective Shading**
- **High-Efficient Technical Building Systems**

Specifically, AC systems.

- **Photovoltaic Systems (PV)**

In areas with net metering subsidies.

- **Use of Sustainable Materials**

Where possible without significant increase of overall investment costs.

Zero Emission Buildings are Feasible and Ready to be Implemented in the MENA region

Let’s act now!

Q&A

Survey

https://forms.office.com/r/LEHvvBWxwY

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IKI INTERNATIONAL CLIMATE INITIATIVE

on the basis of a decision by the German Bundestag