Measured Energy Performance Indicator (MEPI) for next-generation Energy Performance Certificates

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Introduction

The European Union (EU) aims at net-zero greenhouse gas emissions by 2050. For the built environment, as part of the European Green Deal, the EU has initiated the **renovation wave strategy** in 2020 with the ambition to at least double the annual renovation rate and to foster deep renovation. EPCs play a key role in the strategy for improving the energy performance of the EU building stock. The EPC was already introduced in the Energy Performance of Buildings Directive (EPBD) in 2002 (2002/91/EC) and is a specific focus of the proposal of the recast EPBD in which also energy performance requirements linked to EPCs for existing buildings are foreseen.
Currently, EPCs are mostly based on calculated energy performance or asset rating. Despite challenges such as correction for actual occupant behaviour and weather conditions, the inclusion of measured data of building energy use may lead to additional benefits, improve the quality, reliability and usability of next-generation EPCs. Such benefits are important for augmenting user acceptance and increasing trust in the market, which in turn may lever renovation rates.
In the X-tendo project a Measured Energy Performance Indicator (MEPI) was developed for inclusion in EPC schemes in EU member states.

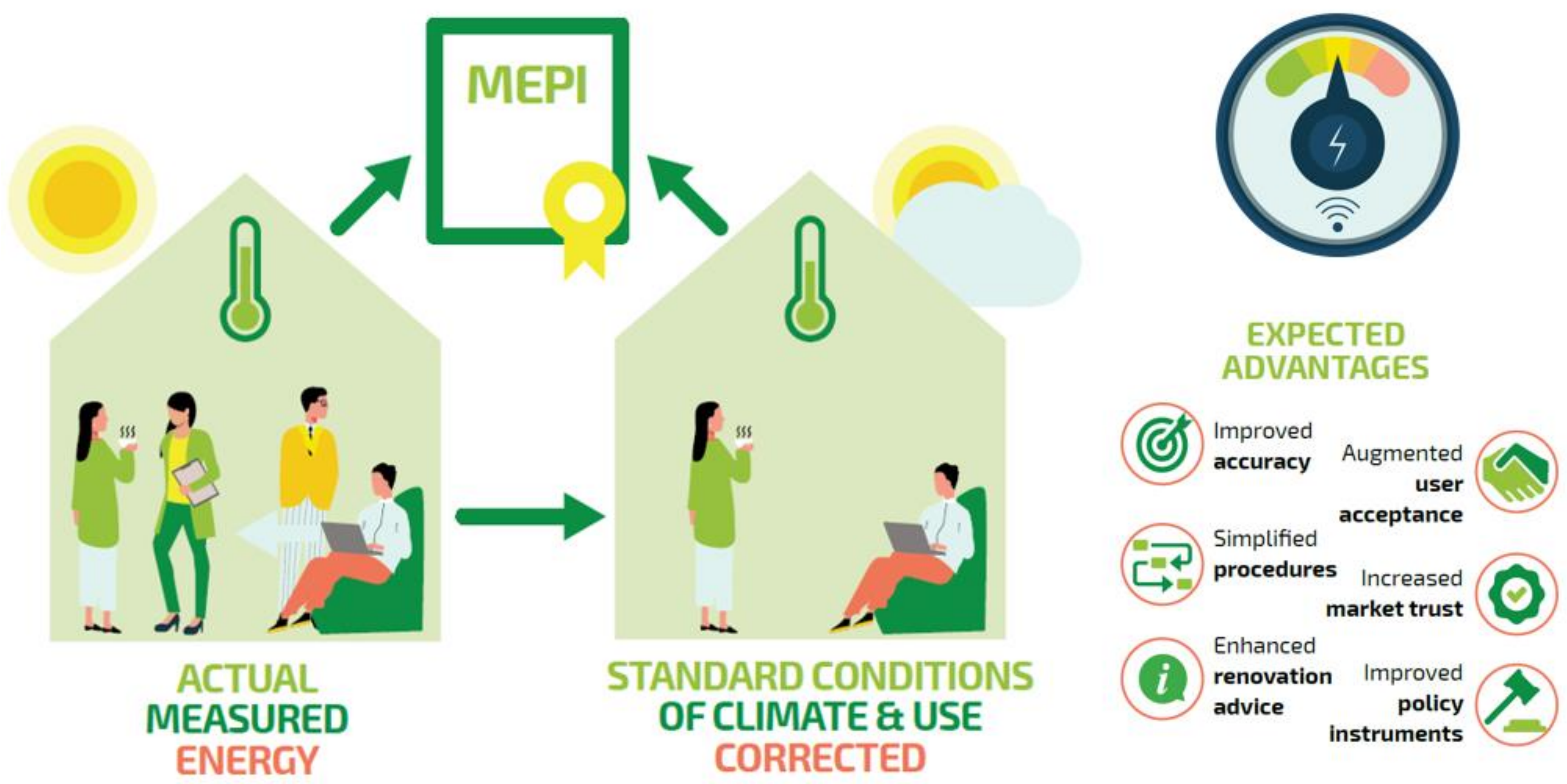

Figure 1: Concept of MEPI and expected advantages

MEPI Calculation method

The MEPI determination method follows the general principles as described in the overarching EPBD standard EN 52000-1 series [CEN; 2017] and is inspired by other methods, for energy performance determination based on metered energy use.

The main input consists of **measurement data of energy delivered to and exported from the building unit per energy carrier and per application**. The method requires monitoring infrastructure with submetering depending on the system and building architectural configuration.

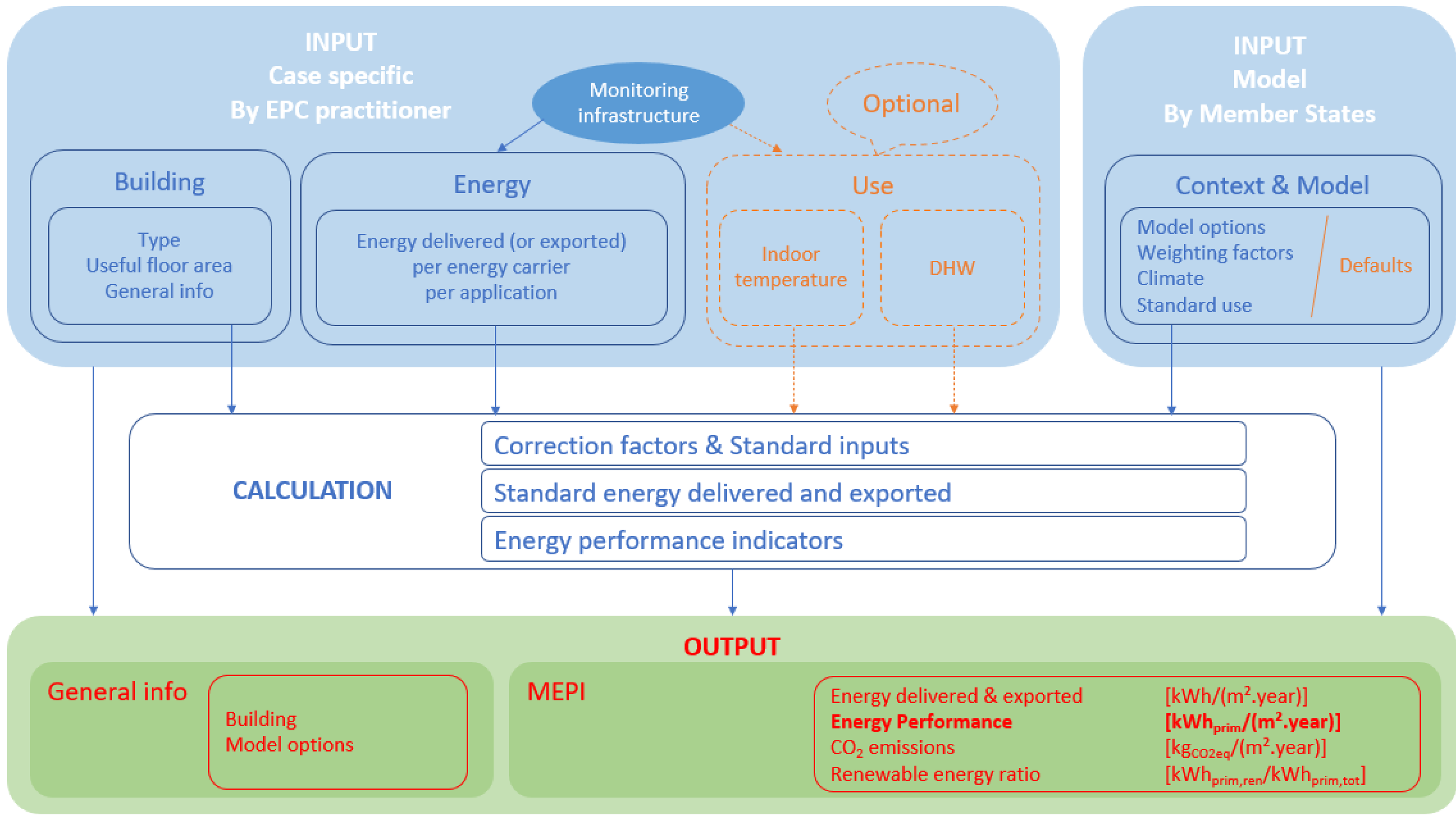

Figure 2: MEPI calculation procedure

The data input structure of **the MEPI calculation tool is** established in a **generic** manner, allowing as much as reasonable the input of the variety of buildings and system architectures as they can be encountered in the EU building stock. At the same time the input matrix is limited to what is minimally needed to do the most essential corrections to enable inter-building comparison and comparison over time.

Corrections are applied to the space heating and cooling energy delivered to the building unit for external climatic conditions by means of heating degree-days and cooling degree-days method. Correction methods for solar irradiation, for domestic hot water energy and for indoor temperature are included optionally, with the default choice to also implement these corrections.

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Measured Energy Performance Indicator

MEPI is an EPC indicator that reflects **the actual energy performance of the building at standard conditions of climate and use**. The calculation starts from metered energy data to which several essential corrections are applied to allow for inter-building comparison and comparison over time.

The MEPI methodology is conceptualised in a **flexible** manner - with several methodological options and a broad set of output parameters to select from - to give Member States room to adapt and adjust it in concordance with the provisions of the Energy Performance of Buildings Directive and in line with the national context and EPC practice.

It is except to industrial buildings. The MEPI can be used for certification **applicable to most types of buildings** n potentially replacing existing energy performance indicators or it may solely serve informative purposes for instance for use in addition to existing EPC indicators currently applied in practice.

Development process towards implementation

After a preliminary **scoping analysis** [Sheikh Z. et al.; 2020], an assessment of **current practices within European EPC frameworks** [Volt J. et al.; 2020] and **survey based analysis of end-user needs and expectations** [Smatzberger S., Sheikh Z.; 2020], a definition of the envisioned methodology for the inclusion of an EPC indicator based on metered energy data in next-generation EPC schemes was formulated.

For **quality safeguarding** throughout the development process, the MEPI tool was evaluated on criteria of quality and reliability, user-friendliness, economic feasibility and consistency with international standards and regular consultancy was foreseen by experts and implementation agencies representatives.

Technical specifications and functionalities were analysed and **verification calculations** were done on theoretical reference buildings taking into account the variety in terms of location and climatic conditions in Europe.

The MEPI tool was successfully **tested in 4 EU countries – Austria, Estonia, Italy and Romania - in a total of 17 buildings**.

The excel calculation spreadsheet and accompanying guidelines of MEPI were further improved based on several internal reviews, expert exchange meetings, findings from the verification analysis and the in-building testing [Hummel M. et al.; 2022] and published after a final external review on the X-tendo website.

Implementation guidelines are available with an estimate of the replication potential for deployment in EU member states [Taranu V. et al.; 2022].

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Tools, concepts, guidelines, background materials for Measured Energy Performance Indicator ([Toolbox – area per each feature])

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