**Guidance document on the revised Annex I EPBD**

**Common general framework for the calculation of energy performance of buildings**

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# INTRODUCTION

**Directive 2010/31/EU[[1]](#footnote-1) on the Energy Performance of Buildings as amended by Directive (EU) 2018/844[[2]](#footnote-2)** (hereafter "the revised EPBD") requires Member States to lay down cost-optimal minimum energy performance requirements and to establish certification schemes for the issuance of Energy Performance Certificates. In order for these requirements to be achieved a methodology to calculate the energy performance of buildings is necessary. Annex I provides the general framework for the calculation of the energy performance of buildings.

The amending Directive (EU) 2018/844 introduced several changes, covering also points of Annex I, in order to clarify the way in which the energy performance of buildings is calculated. It is expected that the revised Annex I will result in a more concrete setting of minimum energy performance requirements, in improved quality of Energy Performance Certificates, and in ensuring that indoor environment quality is adequately considered. The amendments could also affect current practices in positive ways, including more comparability across the EU.

The aim of this guidance document is to clarify the purpose of the revised provisions in Annex I and support the correct transposition and implementation of these amendments at the national/regional regulatory framework level. The note states the views of the Commission services, does not alter the legal effects of the Directive and is without prejudice to the binding interpretation of Annex I as provided by the Court of Justice.

# SCOPE

Article 3 of the EPBD requires Member States to adopt a methodology for the calculation of the energy performance of buildings. This can be adopted at national or regional level. Although Article 3 and the provisions related to the calculation of cost-optimal levels (Articles 4 and 5) have not been changed, the common general framework for the calculation of energy performance of buildings described in Annex I and Annex III is revised in order to **improve the transparency and consistency** of the existing 35 different regional and national energy performance calculation methodologies.

In particular, point (1) of Annex I has been revised in order to better address how the energy performance of buildings has to be determined and expressed, while emphasizing the obligation of Member States to describe their national calculation methodologies taking into consideration the energy performance of buildings standards (EPB standards).

Likewise, point (2) of Annex I has been revised, so as to reflect the energy needs associated with the typical use of a building in the light of developments in the construction sector. In addition, the revised point (2) emphasizes the role of Primary Energy Factors (PEFs) in the calculation of primary energy taking into account renewable energy sources through the energy carrier and renewable energy sources that are generated and used on-site.

A new point (2a) is inserted providing the possibility for additional options to express the energy performance of buildings.

Points 3, 4 and 5 of Annex I remain almost unchanged. However, in paragraph 4, a change was made in the introductory sentence: "*The positive influence of the following aspects shall, where relevant in the calculation, be taken into account*". The phrase "*where relevant in the calculation*" has been deleted, with the result that it is no longer optional to take into account the positive influence of several factors (i.e. local solar conditions, electricity produced by cogeneration, district heating and cooling systems, natural lighting) in the calculation of energy performance calculations.

This guidance document is structured to cover the revised provisions of Annex I in the following way:

* Calculation of the energy performance of buildings, covering the first two paragraphs of the revised point (1), the first paragraph of point (2) and the new point (2a);
* The use of energy performance of buildings standards, based on the third paragraph of the revised point (1);
* The role of PEFs, on the basis of the three last paragraphs of point (2).

# CALCULATION OF THE ENERGY PERFORMANCE OF BUILDINGS

As mentioned, the revised provisions of Annex I mainly aim to improve the transparency, robustness, quality and comprehensiveness of the existing regional and national energy performance calculation methodologies. This is achieved through the following elements:

## Determination of the energy performance of a building (point 1, paragraph 1)

This paragraph explains that the energy performance of a building must be determined on the basis of the **calculated or the actual energy use** of the building and that it has to reflect all its typical energy uses.

This provision is not new, as Annex I of the EPBD had already introduced that the energy performance has to be determined on the basis of the calculated or actual annual energy consumed to meet the different needs associated with its typical energy use. The word "annual" is deleted in line with the definition of energy performance in Article 2 of the EPBD, making the obligation more flexible.

* *In their transposition measures, Member States must in any case explicitly which method they use (calculated or actual energy use) to determine the energy performance of buildings.*

The provision was revised in order to make clear the typical energy uses as reflected in the revised definition of technical building systems (Article 2, paragraph 3). In particular, the typical energy uses of a building include, inter alia, energy used for **space heating, space cooling, domestic hot water, ventilation, built-in lighting and potentially other technical building systems**. It has to be noted that the revised definition of technical building systems is broader and covers new areas, such as lifts, building automation and control, on-site electricity generation and energy from renewable sources, which might be easy to be reflected in the calculation of energy performance (e.g. by a simple factor and a monthly method) however it is more complicated to correctly reflect the real impact of these systems on the energy use.

* *Member States must mention the energy uses applied for the calculation of energy performance in the respective transposition measures.*

## Expression of the energy performance of a building (point 1, paragraph 2 & new point 2a)

The revised second paragraph of point 1 intends to make clear that the common **numeric indicator** to express the energy performance of a building is based on **primary energy use and is expressed in kWh/(m².y)**. The primary energy use is not further specified, but the third paragraph makes a reference to overarching standards which provide further guidance how to account non-renewable, renewable and total primary energy. This makes the obligation more flexible, for instance Member States may use common non-renewable energy accounting (default option in the overarching standard and required for the cost-optimal evaluation) for most of energy carriers but may consider total primary energy for biofuels, which present difficulty, because very small non-renewable primary energy factor of biofuels may lead to wasteful use of a limited recourses. The new point 2a allows **additional indicators to be considered**. Using additional indicators to describe the energy performance of a building could provide a more precise picture of the impact of various measures on energy performance. These indicators, are already in place in many Member States and might refer to greenhouse gas emissions produced (and could be expressed in kgCO2eq /(m².y)), to the share of renewable primary energy use, etc.

It also has to be noted that according to Article 11 of the EPBD, the Energy Performance Certificate has to include the energy performance of a building and may also include additional information, such as the annual energy consumption or the percentage of energy from renewable sources in the total energy consumption. The revised second paragraph of point 1 of Annex I takes note of that by requiring that the energy performance of a building, including the calculation methodology and the numeric indicators refer to **both Energy Performance Certificates and compliance with minimum energy performance requirements**.

* *Member States must ensure that the energy performance is expressed in primary energy use in kWh/(m².y) for the purpose of both energy performance certification and compliance with minimum energy performance requirements.*
* *Member States may also explore additional indicators to express the energy performance of a building.*

Another point that is worth mentioning is that the methodology applied for the determination of the energy performance of a building must be **transparent and open to innovations**. These requirements should be applied for all the elements that form part of the calculation of energy performance, such as:

* the energy needs of the building for space heating, space cooling, ventilation, domestic hot water and lighting systems, which the calculation of energy performance takes as the starting point,
* the method used for determining the Primary Energy Factors (PEF),
* the resulting total primary energy demand from the breakdown of energy needed to cover the uses through national PEFs,
* the renewable energy produced on-site, if any, which is deducted from the total primary energy demand,
* the treatment of renewable energy produced off-site,
* the use of energy performance of buildings standards,
* the best combination of energy efficiency and renewable measures, which are at the core of the EPBD,
* the consideration of the national indoor air quality and comfort levels in the calculation of energy performance for different buildings types.

In addition, the calculation exercise, in accordance with the guidelines accompanying Commission Delegated Regulation (EU) No 244/2012[[3]](#footnote-3), will have to cover new technologies, such as decentralised supply, cogeneration, district heating and cooling and heat pump and include measures based on renewable energy sources.

# THE USE OF ENERGY PERFORMANCE OF BUILDINGS STANDARDS

The use of the Energy Performance of Buildings standards (EPB standards) is up to Member States decision, even though as stated in Recital 40 of the amending Directive (EU) 2018/844, "*the recognition and promotion of them would have a positive impact on the implementation of the revised EPBD*". However, the revised EPBD introduces a new requirement for Member States to describe their national calculation methodology following the national annexes of the overarching standards, namely ISO 52000-1, 52003-1, 52010-1, 52016-1, and 52018-1, developed under mandate M/480 given to the European Committee for Standardisation (CEN). A short description of the standards is presented in Annex A of this guidance document.

The third paragraph of point 1 of the revised EPBD aims to **improve transparency, consistency, quality and comprehensiveness in the way energy performance is determined at national or regional level their EPB assessment methods**.

## Legal codification of the standards

It has to be clarified that this provision is **not an obligation on Member States to comply with the EPB standards**. Recital 40 of the amending Directive (EU) 2018/844, by stating "*without prejudice to the Member States' choice to apply the set of standards*" makes it clear that **the standards are voluntary** and that there is no requirement to change the national calculation methodologies. Consequently, Member States keep the same flexibility as before to adapt their national or regional calculation methodologies in accordance with their local and climatic conditions and ensure a minimum level of quality as described in the set of EPB Standards.

By filling in the national annexes (annexes A) of the overarching standards, Member States will not be deemed to have implicitly or explicitly agreed with the calculation methodology proposed by the standards. The annexes A are considered a useful tool for Member States to use for the purpose of describing their national calculation methodologies. However, this does not in any way imply that standards will become mandatory in that Member State.

## Describing the calculation methodology according to EPB standards

The revised EPBD only requires Member States to **report and explain the calculation methods following the template provided for in annexes A of the overarching standards**. Member States are not obliged to follow any M/480 standards, but only to use the annexes A as a template to explain their national calculation methodologies, which already provide a template for specifying the choices and the required input data.

Each standard has an “Annex A” - a template providing choices between specific methods (e.g. simple or more detailed) and choices of (technical, policy or climate related) input data. The choices according to the Annex A template, made by the Member States and/or National Standardization Bodies are to be laid down in National datasheets or National Annexes to these standards.

* *According to the revised Annex 1, Member States must describe their national calculation methodology following the national annexes of the overarching standards. In practice the easiest way to do this would be for Member States to fill in the annexes A of the overarching standards.*
* *According to Article 3 of the revised EPBD, Member States must communicate to the Commission how they have transposed or implemented new obligations imposed by the revised EPBD by the transposition deadline (20 months after the date of entry into force, namely by 10 March 2020). As part of this communication Member States will have to show that they fully comply with the obligation to describe their calculation methodologies according to the standards.*
* *The revised EPBD allows flexibility to Member States on how to notify compliance to this obligation. One obvious option could therefore be to notify the filled-in Annexes of the overarching standards as part of the official communication to the Commission of the provisions of national law which Member States adopt to transpose / implement the revised EPBD (Article 3 of the revised EPBD).*
* *In order to facilitate transparency Member States may consider making the description of their calculation methodologies according to Annexes A of the overarching standards publicly available, for example by uploading the filled-in templates to a website, annexing the filled-in templates as part of their building codes, etc. Making the calculation methodology publicly available will also help Member States fulfil the requirement in the third paragraph of point 1 of Annex 1, that “The methodology applied for the determination of the energy performance of a building shall be transparent…”. In that case, Member States could notify to the Commission the appropriate public available source to prove that the obligation is fulfilled.*
* *Member States will have to meet this requirement at the latest by the transposition deadline, namely by 10 March 2020.*

*DG-ENER is putting together (approximately September 2018) a tender to provide support to Member States in the use of the EPB standards. This should include case studies or pilot cases to show the possible use of the EPB standards and the development of some tools (e.g. spreadsheets) to facilitate their use as well as guidance documents on the practical use of the standards. Most relevant for the EPBD Committee and the work of the Member States, the tender should provide direct advice and consultation to the ministries, agencies or designated standardisation bodies.*

# THE ROLE OF THE PRIMARY ENERGY FACTORS (PEFS)

The energy performance of a building has to be expressed by a numeric indicator of primary energy use, which is the energy needed to deliver to the building the energy used (also called “expenditure factor” in the EPB standards). Delivered energy includes for example electric energy drawn from the grid, gas from the network, oil or pellets (all with their respective primary energy conversion factors) transported to the building for feeding the buildings technical system. Primary energy is calculated from the delivered and exported amounts of energy carriers, using primary energy conversion factors (PEFs) or weighting factors.

The calculation of PEFs is a demanding process, but it has to be pointed out that it is the responsibility of Member States to define them in a transparent manner. Even with a common set of conventions, the appropriate values for different Member States may well differ. Experience has shown that the figures reported and published by Member States differ significantly but the procedures used are usually not transparent.

The intention of the revised point 2 of Annex I is not to interfere with the Member States competence to define the PEFs and weighting factors, but only to improve transparency by setting the basis for the calculations of PEFs and addressing the role of on-site and off-site renewable energy sources.

## The energy needs to be considered (point 2, paragraph 1)

The revised EPBD aims to determine the energy needs of the building, meaning the amount of energy that must be consumed in order to provide the adequate comfort and health conditions inside the building. Within the revised EPBD the energy uses resulting from the energy needs must cover at least the broader revised definition of technical building systems (Article 2, paragraph 3), which includes energy uses for **space heating, space cooling, domestic hot water, ventilation, lighting and potentially other** areas, such us building automation and control, on-site electricity generation, energy from renewable sources. As mentioned before, these needs might not all be applicable in the calculation of energy performance.

* *Member States must mention the energy needs reflected in their calculation of energy performance.*

This revised provision highlights the fact that the calculation of energy needs must be aimed at **optimising health, indoor air quality and comfort levels** as defined by Member States at national or regional level, in the calculation of energy needs. These elements are crucial, as buildings are defined in the EPBD as constructions for which energy is used to condition the indoor climate. Moreover, better performing buildings provide higher comfort levels and wellbeing for their occupants and improve healthy indoor climate conditions as well as productivity and learning performance in working environments. Therefore, the consideration of the national indoor air quality and comfort levels in the calculation of energy performance for different buildings types is very important. Minimum ventilation rates, temperature limit values and some other parameters are necessary to achieve good indoor air quality and comfort levels that are described in EN 16798-1 (and ISO 17772-1) developed under mandate M/480.

These requirements are not totally new, as the EPBD already sets out that Member States must ensure appropriate general indoor conditions and that that these conditions must be taken into account for the improvement of the energy performance of buildings, when defining the minimum requirements and for calculating the energy performance of buildings. The comparative methodology framework to identify cost-optimal levels of energy performance requirements also requires Member States to define reference buildings that are characterised by and are representative of their functionality, including indoor climate conditions.

* *The cost-optimal calculation exercise has to be designed in such a way that differences in air quality and comfort are made transparent. In case of a serious violation of indoor air quality or other aspects, a measure might also be excluded from the national calculation exercise and requirement setting.*
* *The calculation methodology should be designed in such a way that it includes for every measure the risk of overheating and the need for an active cooling system.*
* *The selected energy efficiency measures as part of the cost-optimal exercise should also be compatible with air quality and indoor comfort levels according to CEN standard 15251 on indoor air quality or equivalent national standards. In cases where measures produce different comfort levels, this must be made transparent in the calculations.*

Technical guidelines could be provided by Member States at national or regional level on how to improve the indoor quality of buildings, on issues such as the following:

- How to avoid thermal bridges, inadequate insulation and unplanned air pathways that can result in surface temperatures below the dew point of the air and in dampness.

- How all relevant elements and technical systems in a building, should be considered, such as passive elements that participate in passive techniques aiming to reduce the energy needs for heating or cooling, the energy use for lighting and for ventilation and hence improve thermal and visual comfort as well as active elements such as dynamic solar shading strategies with the same afore mentioned aims.

- How to ensure ventilation airflow rates in different rooms, how to filtrate pollen and other particulate matter from outdoor air and how to implement heat recovery so that contaminants from extract air (for instance from cooker hoods, wet rooms etc) will not deteriorate supply air quality.

More examples from the JRC report [To be included in a later stage].

## Calculation of PEFs (point 2, paragraph 2)

The revised EPBD clarifies that the PEFs or weighting factors per energy carrier may be based on **national regional or local annual, and possibly also seasonal, monthly or hourly**, weighted averages or on more specific information made available for individual district systems.

This provision aims at providing more flexibility to Member States when defining the PEFs, as seasonal and local weighted averages can help better describe the PEFs. For example; the treatment of electricity (and to some extent district heating) networks presents difficulties as the usual convention of using a single annual average value can be misleading; or the photovoltaics component of generation, which is clearly seasonal.

## Pursuing the optimal energy performance of the building envelope (point 2, paragraph 3)

A specific requirement is added in paragraph 3 of point 2 that requires Member States to ensure that in the application of primary energy and weighting factors, **the optimal energy performance of the building envelope is pursued**. This provision underpins the fact that reducing the overall energy demand is an effective strategy to use when optimising the energy performance of a building. It could also be mentioned that technical building systems and building automation and control systems (BACS) are most easily optimised within a highly-energy performing building. The revised provision intends to ensure that in any case the consideration of the envelope is not underestimated by switching the energy supply of a building.

In addition to primary energy factors this point introduces weighting factors with the aim to make it more flexible for Member States to set factors which will lead to **the optimal energy performance of the building envelope,** i.e. to optimal heating and cooling energy needs. For example; the treatment of biofuels presents difficulties as low values of non-renewable primary energy factor may lead to less insulated building envelopes and excessive heating needs which is clearly not optimal energy performance of the building envelope. The use of weighting factor provides an opportunity to take into account the resource availability as well as cost issues as biofuels are typically a limited recourse which cost does not necessarily correlate with non-renewable primary energy factor.

* *Member States within the framework of determining their national calculation methodology, should try to always pursue the principles of best combining energy efficiency and renewable measures.*

## On-site and off-site renewable energy sources (point 2, paragraph 4)

The revised EPBD requires Member States to take into account the renewable energy sources (RES) supplied through the energy carrier and RES that are generated and used on-site. The energy produced on-building reduces the energy uses (and delivered energy) and it is not accounted as delivered/supplied energy to the building. In this way, the EPBD provides that on-site renewables are always part of the calculation of the energy performance of the building.

The provision does not specify the treatment of on-site / off-site renewables, but it allows Member States to consider renewable energy according to the local or national conditions. The treatment of RES, whether on-site or off-site, must be accounted for on a **non-discriminatory basis in the chosen calculation methodology**, meaning that the quantity of RES consumed by the building increases the energy performance of the building.

With regards to the cost-optimal calculation methodology, the revised provisions do not affect the way costs are calculated, i.e. the energy costs, operation costs and maintenance costs. They do not change how the investment costs on energy efficiency and renewable energy would be calculated either. Regarding the calculation of primary energy for the determination of the cost-optimal levels, it is already mentioned in the accompanying guidelines (page 115/3[[4]](#footnote-4)) that for the purpose of the cost-optimal evaluation the non-renewable part of primary energy should be considered.

* *The calculation methodology should start by calculating the energy needs of the building and should always consider reducing the energy demand.*
* *Then it would consider how those needs are fulfilled through energy supply and what proportion of the supply arises from RES (on-site or off-site). Then the result can be translated into a primary energy use expressed in kWh/m²/year, by applying the correct PEF to each and every source of energy supplying the building.*
* *The use of on-site RES should be encouraged to reduce the demand of a building, but this should always be in conjunction with seeking energy savings from the building envelope and its technical building systems. This approach is in line with the definition of a nearly zero-energy building (NZEB).*

It has to be noted that all the multiple benefits of improved energy performance cannot be achieved by applying the energy supply of a building to RES. The right balance should be sought in accordance with the definition of NZEB.

Technical guidelines could be provided by Member States to building designers on how to choose the right balance between energy efficiency and renewable energy measures.

# Annex A - The overarching energy performance of buildings standards

Concerning the list of overarching standards, these are the key standards:

* EN ISO 52000-1, Energy performance of buildings — Overarching EPB assessment – Part 1: General framework and procedures
* EN ISO 52003-1, Energy performance of buildings – Indicators, requirements, ratings and certificates – Part 1: General aspects and application to the overall energy performance
* EN ISO 52010-1, Energy performance of buildings - External climatic conditions - Part 1: Conversion of climatic data for energy calculations
* EN ISO 52016-1, Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures
* EN ISO 52018-1, Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features — Part 1: Overview of options

1. Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings. [↑](#footnote-ref-1)
2. Directive (EU) 2018/844 of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. [↑](#footnote-ref-2)
3. Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements (2012/C 115/01). [↑](#footnote-ref-3)
4. Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements (2012/C 115/01). [↑](#footnote-ref-4)