

General comments

REHVA welcomes the EPBD recast proposal and strongly supports an ambitious Directive to reach the objectives of the Renovation Wave strategy. We particularly support the requirement to safeguard healthy indoor climate and consider indoor air quality aspects when setting minimum energy performance requirements and calculating building performance to make sure that deep energy renovations are improving, and not deteriorating indoor climate quality. Therefore, REHVA strongly supports the requirements for the monitoring and control of indoor air quality and that the proposal specifies ventilation as the solution to ensure adequate indoor air quality and requires inspection regimes to be developed for standalone and combined ventilation systems beside heating and air conditioning.

REHVA fully supports the ambition to move towards zero-emission buildings through threshold values, further developing the cost-optimality methodology by moving towards hourly energy calculation methods, harmonizing the EPC scale and targeting the worst-performing building stock by defining MEPS with a clear transition timeline. However, it is crucial to recognize that to achieve this ambition, Member States must revise many of their national regulations and building codes, for which they need a new EPBD with clear technical terms and definitions that leave no room for ambiguity and create a more harmonized approach.

REHVA firmly considers this recast as a make-or-break moment to move towards a common European performance calculation methodology and requirements in line with the EPB standards developed under Mandate 480, otherwise we will fail to deliver on the European climate and energy goals in the building sector. We propose to include a mandate for DG Energy to develop a delegated act about a common European energy calculation methodology (similarly to what was previously done for the cost-optimal methodology) to help the further definition of the technical details.

REHVA is concerned about certain unclear technical terms and definitions in the recast proposal as these allow for divergence during the implementation at MS-level. We see a need for further clarifications on the definition and numeric values of *'zero-emission buildings'*, *'primary energy'*, the *'self-use'* of RES calculation with real uses or only EPB services, and the primary energy factors that are not reported under the ZEB numeric values. We propose multiple amendments on these in the next section.

Recommendations and amendments:

Amendment	Topic	Articles
1.	Zero-emission building (ZEB) definition & requirements	Article 2(2); Annex III(I); Annex V(1)
2.	Changing definition of 'self-used'	Article 2(53)
3.	Adding definition on 'net energy'	Article 2(57a)
4.	Adding mandate for delegated act on a common European methodology for the calculation of energy performance indicators	Article 4
5.	Strengthening IEQ-related requirements	Article 5(1); Annex V(1 + 2)

1. Zero-emission building (ZEB) definition & requirements

REHVA calls on the EU policymakers to ensure that the definition and requirements on zero-emission buildings are clear and *renewable* and *non-renewable* energy are not mixed with each other during the energy calculation. See detailed clarification for our proposed amendment below the table:

Article 2(2) CHANGE	'zero-emission building' means a building with a very high energy performance, as determined in accordance with Annex I, where the very low amounts of CO2 emission that still occurs due to energy use, still required is will be fully covered compensated, on an annual basis , by energy from renewable sources generated on-site, from a renewable energy community within the meaning of Directive (EU) 2018/2001 [amended RED] or from a district heating and cooling system or from the grid in accordance with the requirements set out in Annex III'.																				
Annex III(I) CHANGE	<p>The non-renewable total annual primary energy use of a new zero-emission building shall comply with the maximum thresholds indicated in the table below. If the national cost optimal level has a higher ambition than the national level shall apply.</p> <table border="1"> <thead> <tr> <th>EU climatic zone</th> <th>Single-family houses ** 1) Residential building</th> <th>Office building** 2)</th> <th>Other non-residential building*</th> </tr> </thead> <tbody> <tr> <td>Mediterranean</td> <td><15 60 kWh/(m2.y)</td> <td>< 26 70 kWh/(m2.y)</td> <td>< NZEB non-renewable total primary energy use defined at national level</td> </tr> <tr> <td>Oceanic</td> <td><25 60 kWh/(m2.y)</td> <td>< 48 85 kWh/(m2.y)</td> <td>< NZEB non-renewable total primary energy use defined at national level</td> </tr> <tr> <td>Continental</td> <td><30 65 kWh/(m2.y)</td> <td>< 48 85 kWh/(m2.y)</td> <td>< NZEB non-renewable total primary energy use defined at national level</td> </tr> <tr> <td>Nordic</td> <td><53 75 kWh/(m2.y)</td> <td>< 63 90 kWh/(m2.y)</td> <td>< NZEB non-renewable total primary energy use defined at national level</td> </tr> </tbody> </table>	EU climatic zone	Single-family houses ** 1) Residential building	Office building** 2)	Other non-residential building*	Mediterranean	<15 60 kWh/(m2.y)	< 26 70 kWh/(m2.y)	< NZEB non-renewable total primary energy use defined at national level	Oceanic	<25 60 kWh/(m2.y)	< 48 85 kWh/(m2.y)	< NZEB non-renewable total primary energy use defined at national level	Continental	<30 65 kWh/(m2.y)	< 48 85 kWh/(m2.y)	< NZEB non-renewable total primary energy use defined at national level	Nordic	<53 75 kWh/(m2.y)	< 63 90 kWh/(m2.y)	< NZEB non-renewable total primary energy use defined at national level
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¹⁾ Category of residential building that is targeted needs to be specified, single-family or apartment building.

²⁾ Values are for useful floor area. In case of other type of floor area, the values should be recalculated based on the average national ratio to useful floor area for each building category (e.g. 0.95 was used for ratio from useful to ALDREN gross internal floor area (GIA) for big office buildings).

Note: the threshold should be smaller than the threshold for **non-renewable total primary energy use established at the Member State level for nearly zero-energy non-residential buildings type other than offices.*

***Note: the threshold values apply for non-renewable primary energy calculation where exported energy is not accounted.*

To limit the primary energy use, an additional requirement related to the **building energy needs**, the first step in the calculation of the building energy performance, shall be added. The maximum thresholds are indicated in the table below. If the national cost optimal level has a higher ambition than the national level shall apply.

Table: Heating and cooling energy needs for different climate zones.

EU climatic zone	Single-family houses ¹⁾	Office buildings ¹⁾	Other non-residential building*
Mediterranean (Zone 1)	15 kWh/(m2.y)	40 kWh/(m2.y)	< NZEB building energy needs defined at national level
Oceanic (Zone 4)	20 kWh/(m2.y)	42 kWh/(m2.y)	< NZEB building energy needs defined at national level
Continental (Zone 3)	20 kWh/(m2.y)	42 kWh/(m2.y)	< NZEB building energy needs defined at national level
Nordic (Zone 5):	30 kWh/(m2.y)	44 kWh/(m2.y)	< NZEB building energy needs defined at national level

Note: the threshold should be smaller than the threshold for **total primary energy need use established at the Member State level for nearly zero-energy non-residential buildings type other than offices*

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The total annual **CO2 emission** ~~primary energy use~~ of a new or renovated zero-emission building shall be fully **compensated covered**, on a net annual basis – to be calculated on an hourly basis – by:

- energy from renewable sources generated on-site and fulfilling the criteria of Article 7 of Directive (EU) 2018/2001 [amended RED],
- renewable energy provided from a renewable energy community within the meaning of Article 22 of Directive (EU) 2018/2001 [amended RED], or
- renewable energy and waste heat from an efficient district heating and cooling system in accordance with Article (24(1) of Directive (EU) .../... [recast EED],-
- renewable energy from the grid.

~~A zero-emission building shall not cause any on-site carbon emissions from fossil fuels.~~

Only where, due to the nature of the building **site** or lack of access to renewable energy

	communities or eligible district heating and cooling systems, it is technically not feasible to fulfil the renewable energy requirements under the first paragraph, the total annual primary renewable energy use may also be covered by energy from the grid complying with criteria established at national level.
Annex V(1)	...
CHANGE	(b) the calculated annual non-renewable primary energy use in kWh/(m ² year); (c) the calculated annual non-renewable primary energy consumption in kWh or MWh; (d) the calculated annual final delivered energy use in kWh/(m ² year); (e) the calculated annual final delivered energy consumption in kWh or MWh; ...

Definition on 'zero-emission building'

To qualify as a **zero-emission building**, it should not be primary energy but CO₂ emission that is fully compensated by renewable energy. In its current phrasing, Art. 2(2) rather describes a zero-energy building as it excludes the renewable part of electricity coming from the grid, which is questionable. It is not justified why renewable energy generation by wind parks, hydro and other power plants can't be taken into account, as they contribute just as much to the decarbonisation of energy use in buildings. We recommend including these renewable sources in the definition.

Total primary energy vs. non-renewable primary energy

REHVA recommends changing the calculation based on *total primary energy* to *non-renewable primary energy* as we see a fundamental problem with the current wordings in the definition of zero-emission building in Art. 2(2) and Annex III. Total primary energy does not allow meaningful energy calculation as it does not distinguish between *renewable* and *non-renewable* energy:

- In the **EED recast Art. 2** the definition on 'primary energy consumption' is different from **total primary energy**, because EED defines primary energy as the gross available energy from which ambient heat is excluded.
- **RED II** defines that solar thermal, solar photovoltaic, geothermal energy and ambient energy are renewable energy and therefore are to be accounted in the total primary energy in the context of EPBD - making the total primary energy indicator vague because it mixes fossils and renewables.
- EED recast Art. 2(44) '**efficient individual heating and cooling**' uses non-renewable primary energy and we recommend using this consistently throughout EPBD to enable meaningful energy calculation.
- The Commission Recommendation (EU) 2016/1318 defines NZEB in **non-renewable primary energy**.

REHVA experts prepared a EPBD primary energy calculator to demonstrate that the total primary energy values do not enable meaningful energy calculation. This is illustrated by the case with a gas boiler in our calculation, which shows the lowest primary energy compared to a heat pump which show very high values due to the inclusion of heat extracted from ambient. In addition, this calculation example shows that the Annex III requirements in reality can't be met in the case of Nordic climatic conditions, if it's based on the total primary energy ([download the calculation in .xls format from here](#)).

Numerical ZEB thresholds

As REHVA recommends changing this requirement from *total* to the *non-renewable* primary energy use, there's also a need to define **new thresholds expressed in non-renewable primary energy use** in line with Commission Recommendation (EU) 2016/1318.

We compared the values of "net" primary energy use requirements developed under the [Horizon 2020 project ALDREN](#), which proposed an Energy Performance Certificate (EPC) for class A (NZEB) based on **non-renewable** primary energy use, with the requirements for Estonian NZEB residential buildings and [with a study made by Ecofys on NZEB \(2013\)](#), both expressed in **non-renewable** primary

energy use as well. This allowed for us to make an indicative proposal for ZEB thresholds ([download our detailed explanatory note for this comparison here in .docx format](#)).

Using the same thresholds for all residential buildings would be counterproductive, as it will lead to suboptimal targets either for small or large residential buildings. REHVA proposes to only specify numeric thresholds for one residential category, which is why we propose threshold values for a typical single-family house. It is sufficient to specify only one, while the other residential categories can be specified at national level, similar to the requirements for non-residential buildings. The differences between single-family houses and apartment buildings in terms of heat losses and opportunities for renewable energy generation are so significant that they will need different requirements (e.g. currently there are four separate residential building categories in Estonian regulation and five in the Finnish).

For the threshold values in the table to be transparent, the primary energy factors used to calculate these values have to be reported or make a reference to default primary energy factors in the European standard EN ISO 52000-1 if these values have been used. The threshold values calculated with indoor environmental parameters from EN 16798-1 would also need to be referenced.

Exported Energy

We have added a second note ** under the table specifying the threshold values for non-renewable primary energy calculation as there currently is no mention in the proposal on how to deal with **exported energy** which affects the calculation results of primary energy, including the Table values in Annex III(I). By this we mean that exported renewable energy shall only be considered *during the calculation of renewable energy* to compensate for non-renewable primary energy.

In the calculation of non-renewable primary energy, exported energy should by default not be taken into account as the dynamic primary energy factors are currently not yet commonly available and MS are not capable account for exported energy in a dynamic fashion. Many MS currently don't take into account exported energy in their energy calculation, as there is the option in EN ISO 52000-1 to account for exported energy or not (option $k_{exp}=0$ or 1).

Deletion of on-site carbon emission clause zero-emission building

Our proposed changes to the ZEB definition make the clause about on-site fossil fuels redundant as this is already covered by non-renewable primary energy. **We propose to delete this clause.**

Limit the clause on the derogation of "technically not feasible"

The current wording in the proposal makes it possible to side-pass the ZEB requirements. We **propose to limit this clause clearly to the renewable energy requirement** because an unfavourable building site will limit renewable energy generation and not the application of energy efficiency measures.

2. The definition of 'self-used' energy

Article 2(53) CHANGE	'self-used' means part of on-site or nearby produced renewable energy used by a technical systems for EPB services and by other appliances and lighting that represent the internal heat gains associated with the typical use of a building;
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We recommend to account for appliances and lighting electricity when calculating self-use to make the calculation correspond real life and allow for much larger PV systems to be cost-optimal. The proposal's definition of "self-use" limits the use of renewable energy and the sizing of cost-optimal renewable energy generation systems as only very small PV systems would be cost-optimal. This is especially the case for residential buildings with district heating or boilers where only the electricity of ventilation fans and heating circulation pumps can be termed as self-use. This definition contradicts with the real design of PV systems, as during the design all existing electricity uses are considered. Correct calculation, design and monitoring of self-use is important because this is the most valuable part of on-site generated renewable energy.

For example, self-use value of 55% used in [our REHVA EPBD primary energy calculator](#) will drop to about 20%. In addition, self-use of EPB services would be impossible to monitor because a common way to reduce exported electricity from PV generation with a smart meter is by providing the total self-use.

3. Adding a definition on ‘net energy’

Article 2(57a) ADD	57a ‘net energy’ means the delivered energy to the site minus the exported energy to the grid.
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Annex III mentions “net” annual basis while “net” is *not defined* in the EPBD recast proposal. We assume that “net” emphasizes the total annual amount of renewable energy and waste heat that also includes exported energy to the electricity grid and does not include non-renewable energy, therefore we recommend adding an explicit definition about this in Article 2.

4. Mandate about delegated act on a common European methodology for the calculation of energy performance indicators

Article 4 ADD	Member States shall apply a methodology for calculating the energy performance of buildings in accordance with the common general framework set out in Annex I. This is That is methodology shall be adopted at national or regional level. The Commission shall adopt delegated acts in accordance with Article 29 supplementing this Directive by establishing a common European methodology for the calculation of energy performance indicators.
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Setting threshold values in Annex III create a need for more detailed technical definitions to ensure that the requirements would be understood and implemented in a similar fashion in MS. REHVA firmly considers this recast as a make-or-break moment to move towards a common European performance calculation methodology and requirements in line with the EPB standards developed under Mandate 480, otherwise we will fail to deliver on the European climate and energy goals in the building sector. We propose to include a mandate for DG Energy to develop a delegated act about a common European calculation methodology of energy performance indicators (similarly to what was previously done for the cost-optimal methodology) to help the further definition of the technical details.

5. Strengthening IEQ-related requirements

Article 5(1,54) CHANGE	These is These is requirements Member States shall take account of general indoor climate conditions by setting up national minimum requirements for different building types (office, residential & other non-residential buildings) that are based upon on the parameters laid down in EN16798-1, in order to avoid possible negative effects such as inadequate ventilation, as well as local conditions and the designated function and the age of the building.
Annex V(1) CHANGE mandatory elements	... <i>Move to mandatory element from voluntary element:</i> (j) the presence of fixed sensors that monitor the levels of indoor air quality; (k) the presence of fixed controls that respond to the levels of indoor air quality; <i>Add as new mandatory element:</i> (l) information regarding ventilation rates in the most common room categories; (m) indicating winter and summer thermal comfort;

	(n) displaying the IEQ categories I-IV as defined by EN16798-1
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REHVA believes that the obligation on Member States to ensure healthy buildings with an adequate comfort level must be made more specific by setting up national minimum requirements on this for different building types. EN16798-1 provides clear parameters that can be used by MS to setup these requirements. It is not sufficient to have this standard only included in the methodology for calculating energy performance referred to in Article 4 and Annex I(1).

EPCs shall also display IEQ related data to inform building owners and consumers in a transparent and mandatory manner. Information related to ventilation rate, air quality monitoring and control, winter and summer thermal comfort. Therefore, REHVA proposes adding 3 new mandatory elements: information regarding ventilation rates in the most common room categories; winter and summer thermal comfort; and displaying the IEQ categories I-IV as defined by EN16798-1, as well as moving the 2 requirements on IAQ monitoring and control from the voluntary to the mandatory elements.