european
council for an
energy efficient
economy

Explanatory note from eceee regarding the EPBD draft Annex I[1] (Rev 1: 14 November 2017, rev 2: 1 December 2017)

Introduction

The revision of the Energy Performance of Buildings Directive (EPBD) entered a critical phase on 7th November 2017 when the first of two planned "trialogue" meetings took place. Those meetings (and technical meetings scheduled in between) are intended to lead to a final proposal for the revisions to the EPBD that will be accepted by all three parties to the negotiations (the European Council, the European Parliament and the European Commission).

The negotiations offer the opportunity to resolve and improve on any issues that are not fully resolved between the parties. For the **eceee**, one of those key issues is the revision of Annex I of the EPBD, which sets out the common general framework for the calculation of the energy performance of buildings. This note is based on analysis by researchers and academics from the eceee network and sets out the reasoning why the wording in Annex I is critical to the success of the EPBD.

Background

Let's start from the milestones and firm points of our reasoning:

1. Definitions – in EPBD Art 2

the energy performance of a building is defined as "the calculated or measured amount of *energy needed to meet the energy demand* associated with a typical use of the building, which includes, inter alia, *energy used for heating, cooling, ventilation, hot water and lighting;"*

and

"'nearly zero-energy building' means a building that has a very high energy performance, as determined in accordance with Annex I. *The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources,* including energy from renewable sources produced on-site or nearby;"

EPBD Art 2, which is not under review, thus clearly identifies the total (renewable and non renewable) energy required, asks to reduce its amount to nearly zero or very low, and finally to cover it largely with renewables. The logic is to avoid wasting precious energy, whatever its source.

2. Standard – standard EN-ISO 52000-1 (and the accompanying guidelines EN-ISO 52000_2) was adopted in July 2017

It is now the worldwide reference guide for the methodology to be used in the calculation of the energy performance of buildings and shows a *clear European leadership* in this area. It is to the merit of the EU, its Member States national standardisation bodies, CEN/CENELEC and the EU Commission to have contributed to build this standard via Mandate 480.

It is easy to notice how the wording used in the EN-ISO standard is essentially the same of the Directive that is now in force: "A NZEB should be a building that has a very low amount of energy required associated with a typical use of the building including energy used for heating, cooling, ventilation, hot water and lighting, ..." and "The very low amount of energy required by a nearly zero-energy building should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced *on-site* or *nearby*".

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[1] **Note:**
In this document, as suggested by the EPBD, we use terminology that is compliant with EN standards e.g. from EN ISO 52000-1:2017(E). The terms which have a specific definition in EN-ISO are in *italics underlined* in this text. The definitions of those terms and a graphical representation of the concepts presented, are included in an Annex to this note.

EN-ISO 52000 states explicitly that "the use of only one requirement, e.g. the numeric indicator of primary energy use, *is misleading"*. It recommends using as indicators the *energy needs* and *primary energy* (in its declinations *total primary use, non-renewable primary use without compensation*, and the option to also use *non-renewable primary energy with compensation)*.

The Standard include the principles that "...energy (even renewable) should not be wasted..." and that "separate accounting for *on-site*, *nearby* and *distant* renewable energy provides the RER [*Renewable Energy Ratio*] depending on the selected perimeter"[2]

Proposal

Some of the present proposals to update Annex I of the EPBD risk being so unclear that they will end up conflicting with the objectives and methodological principles set out above and with some of the advanced and good work undertaken by Member States (MS) in the past years with national implementation. We therefore see scope for cooperation, based on the productive work already undertaken by the Commission, the Council and the Parliament, towards a text which fine tunes Annex I, in the interest of an effective and easy use by stakeholders and MS.

In particular, points to be fine-tuned are the following:

- The 2010 version of Annex I referred to two indicators, while some of the present proposals propose to use only one, primary energy.
- All future buildings will be nZEB, defined by the indicators *energy needs* and *primary energy* in the new EN-ISO 52000 standard
- The texts put forward by the Commission and the Parliament propose to equally treat the renewable energy *on-site* and the renewable energy supplied through the energy carrier into, respectively, the *primary energy factors* or the "calculations";
  Those proposals appear not to be precise enough to provide clear guidance and entail the risk, especially if combined with the absence of the indicator *energy needs*, to produce buildings which are nominally nZEB because they compensate energy use with the importation of RES, but have high *energy needs* and hence unnecessarily waste RES. Furthermore, that renewable energy would be double counted: once in the certification of buildings (reducing the *non renewable primary energy* indicator) and once in the *primary energy factor* calculated at grid level.
  A third unwanted side effect would be a possible conflict with the Energy Market Directive and its guarantee for consumers to switch supplier within weeks or months, hence undermining the buildings' certification by introducing a factor (an energy supply contract) external to building features and that the Energy Market Directive incites to vary very frequently.

Renewables that might be delivered to the building via a district heating network are already considered in the standards (EN ISO 52000) by allowing "*nearby*" generation to comprise such local networks, so from this point of view there is no need to focus on "*distant*" renewables.

Put another way, district heating is proposed to be included in the "*nearby*" boundary by ISO EN 52000, so Member States can easily, if they so decide, include RES via district heating in the primary energy balance of the building, without any need to require equal treatment of "energy from renewable sources that is generated *on-site*" and "the energy from renewable energy sources supplied through the energy carrier".

The latter option creates an enormous problem since it seems to refer to both *nearby* and *distant* sources and in the present formulation is an incentive to waste RES through inefficient building

2 Source: PD CEN ISO/TR 52000-2:2017;

- Annex J, Calculation examples, page 126

- H.3 Second requirement: The total primary energy use, page 119

fabric while we dearly need every unit of RES energy to displace fossil fuels and their related CO_2 emissions.

Could some of the above be partly due to simple language misunderstandings as it appears e.g. in the guidelines on nZEB of August 2016 by the Commission? It emerges that in those guidelines, the term *energy needs* is sometimes used in a colloquial way which is in contrast with the EN standards commissioned by the Commission, and with the Cost-Optimal Regulation, where it's clear that *energy needs*, *energy use*, *delivered energy* and *primary energy* are different quantities, each with a specific meaning and definition. Furthermore, some of the texts proposed for Annex I include terms that are not defined either in the Directive or in the Standards (e.g. "supplied" or "supplied through the energy carrier" which seem to include both *nearby* and *distant* sources). Another term void of meaning is "energy needs for technical building systems" since the physical quantity *energy needs* is defined by the features of the building fabric and not by the building systems (see definitions and illustrations in the Annex to this text).

In order to go beyond these possible misunderstandings and to fine tune the Annex I, we call on the negotiators at the trialogue and technical meetings to take full account of the factors outlined in this note when debating the final wording to be used in the revised version of Annex.

Our review and analysis concludes that the most rational approach to the issues raised in this note is to explicitly maintain 2 indicators for describing the performance of buildings: *energy needs* and *primary energy*, and, at the same time, avoid the discounting of *distant* renewables.

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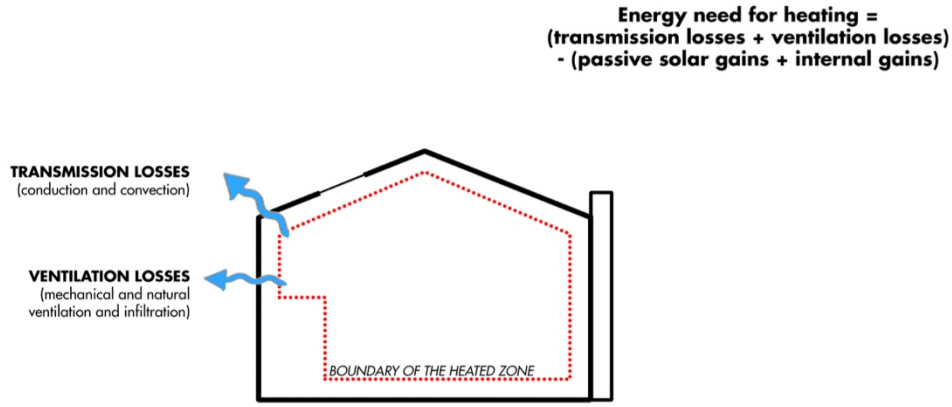
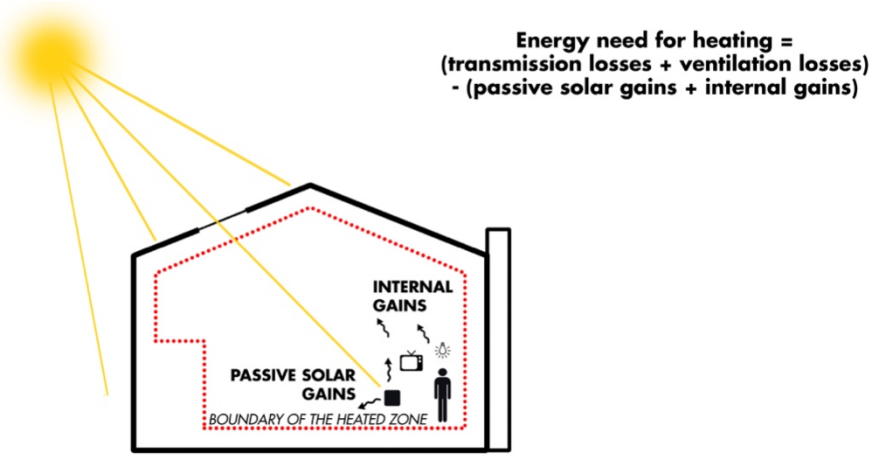
For a more complete technical briefing, please download from the eceee website's policy pages.

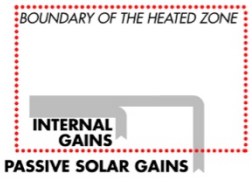
In this document, as suggested by the EPBD, we use terminology that is compliant with EN standards e.g. from EN-ISO 52000-1:2017(E)

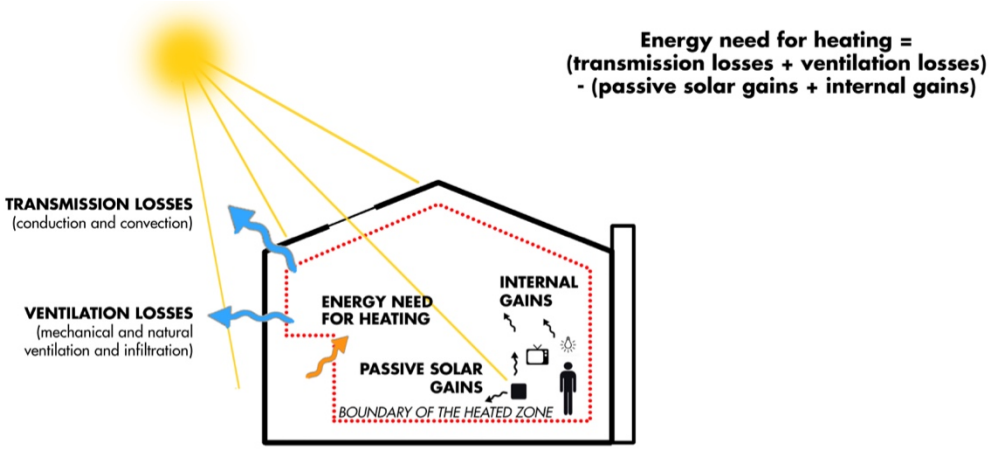
3.4.13 "energy need for heating or cooling" heat to be delivered to or extracted from a thermally conditioned space to maintain the intended space temperature conditions during a given period of time
3.4.12 "energy need for domestic hot water" heat to be delivered to the needed amount of domestic hot water to raise its temperature from the cold network temperature to the prefixed delivery temperature at the delivery point without the losses of the domestic hot water system
3.4.6 "delivered energy" energy, expressed per energy carrier, supplied to the technical building systems through the assessment boundary, to satisfy the uses taken into account or to produce the exported energy (Note that delivered energy can be calculated for defined energy uses or it can be measured.)
3.4.29 "primary energy" energy that has not been subjected to any conversion or transformation process
Note 1 to entry: Primary energy includes non-renewable energy and renewable energy. If both are taken into account it can be called total primary energy.
3.5.17 "non-renewable primary energy factor" non-renewable primary energy for a given energy carrier, including the delivered energy and the considered energy overheads of delivery to the points of use, divided by the delivered energy
3.5.21 "renewable primary energy factor" renewable primary energy for a given distant or nearby energy carrier, including the delivered energy and the considered energy overheads of delivery to the points of use, divided by the delivered energy
3.5.25 "total primary energy factor" sum of renewable and non-renewable primary energy factors for a given energy carrier
3.6.11 "useful heat gain" part of internal and solar heat gains that contribute to reducing the energy need for heating
3.4.24 "nearby" <the building site> on local or district level (e.g., district heating or cooling)
Note 1 to entry: Options are possible (see Annex A) and informative default options are provided (in Annex B).
3.4.27 "on-site" the premises and the parcel of land on which the building(s) is located and the building itself
Note 1 to entry: On-site defines a strong link between the energy source (localisation and interaction) and the building.
3.4.7 "distant" <to the building site> not on-site nor nearby

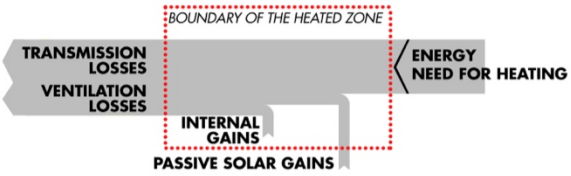
Explanatory illustrations of concepts discussed in this note (through an example limited to the end use of heating, for simplicity):

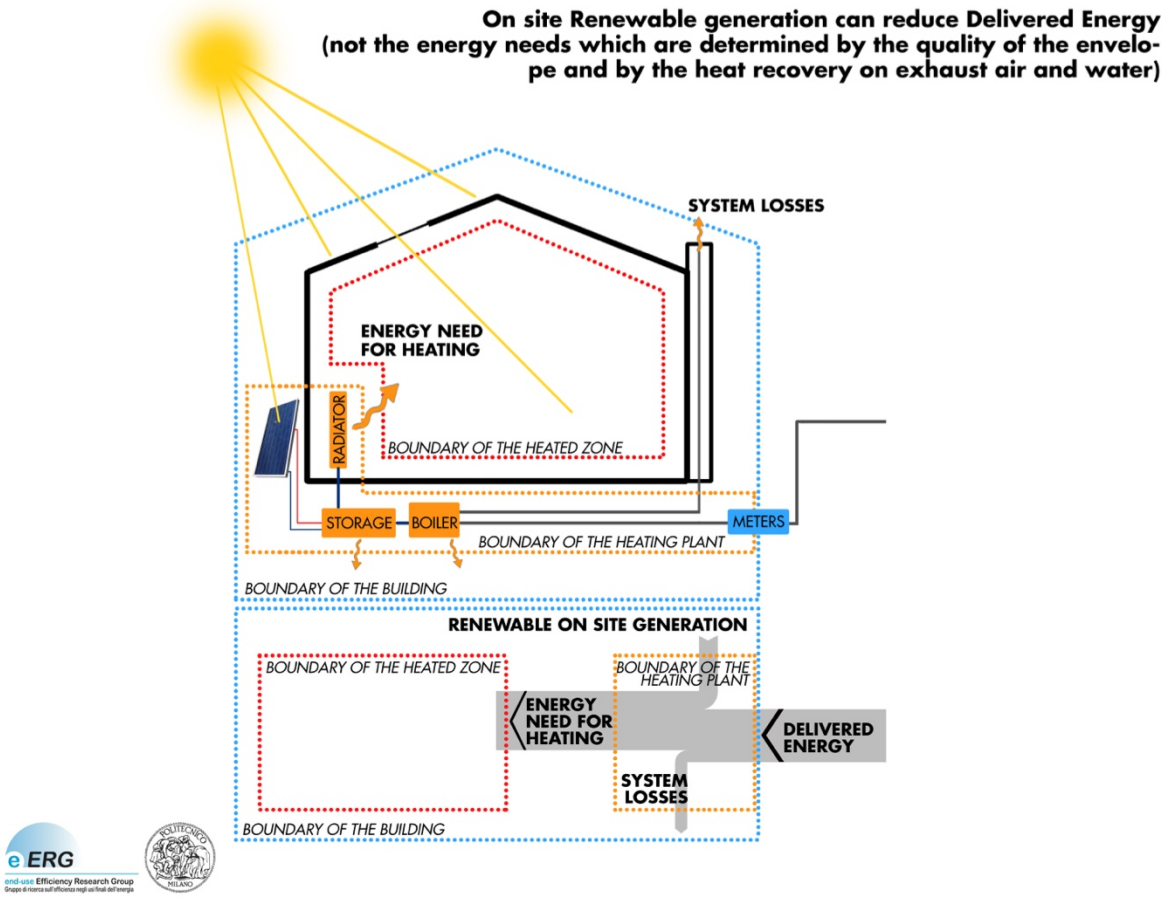


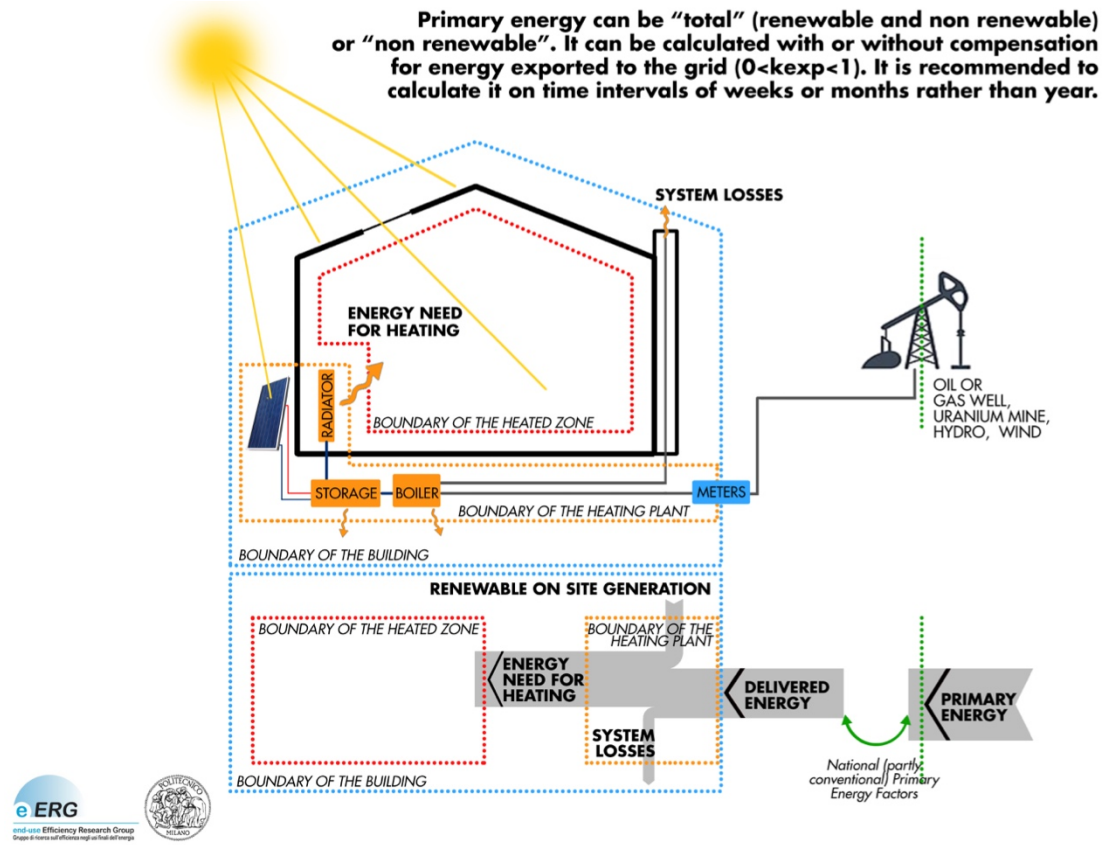

Energy need for heating =
(transmission losses + ventilation losses)
- (passive solar gains + internal gains)
INTERNAL GAINS
PASSIVE SOLAR GAINS
BOUNDARY OF THE HEATED ZONE


BOUNDARY OF THE HEATED ZONE
INTERNAL GAINS
PASSIVE SOLAR GAINS


Energy need for heating =
(transmission losses + ventilation losses)
- (passive solar gains + internal gains)
TRANSMISSION LOSSES
(conduction and convection)
VENTILATION LOSSES
(mechanical and natural ventilation and infiltration)
ENERGY NEED FOR HEATING
INTERNAL GAINS
PASSIVE SOLAR GAINS
BOUNDARY OF THE HEATED ZONE


BOUNDARY OF THE HEATED ZONE
TRANSMISSION LOSSES
VENTILATION LOSSES
ENERGY NEED FOR HEATING
INTERNAL GAINS
PASSIVE SOLAR GAINS


On site Renewable generation can reduce Delivered Energy
(not the energy needs which are determined by the quality of the envelope and by the heat recovery on exhaust air and water)
SYSTEM LOSSES
ENERGY NEED FOR HEATING
RADIATOR
BOUNDARY OF THE HEATED ZONE
STORAGE
BOILER
METERS
BOUNDARY OF THE HEATING PLANT
BOUNDARY OF THE BUILDING
RENEWABLE ON SITE GENERATION
BOUNDARY OF THE HEATED ZONE
BOUNDARY OF THE HEATING PLANT
ENERGY NEED FOR HEATING
DELIVERED ENERGY
SYSTEM LOSSES
BOUNDARY OF THE BUILDING
e ERG


Primary energy can be "total" (renewable and non renewable) or "non renewable". It can be calculated with or without compensation for energy exported to the grid (0<kexp<1). It is recommended to calculate it on time intervals of weeks or months rather than year.
SYSTEM LOSSES
ENERGY NEED FOR HEATING
RADIATOR
BOUNDARY OF THE HEATED ZONE
OIL OR GAS WELL, URANIUM MINE, HYDRO, WIND
STORAGE
BOILER
METERS
BOUNDARY OF THE HEATING PLANT
BOUNDARY OF THE BUILDING
RENEWABLE ON SITE GENERATION
BOUNDARY OF THE HEATED ZONE
BOUNDARY OF THE HEATING PLANT
ENERGY NEED FOR HEATING
DELIVERED ENERGY
PRIMARY ENERGY
SYSTEM LOSSES
BOUNDARY OF THE BUILDING
National (partly conventional) Primary Energy Factors
e ERG