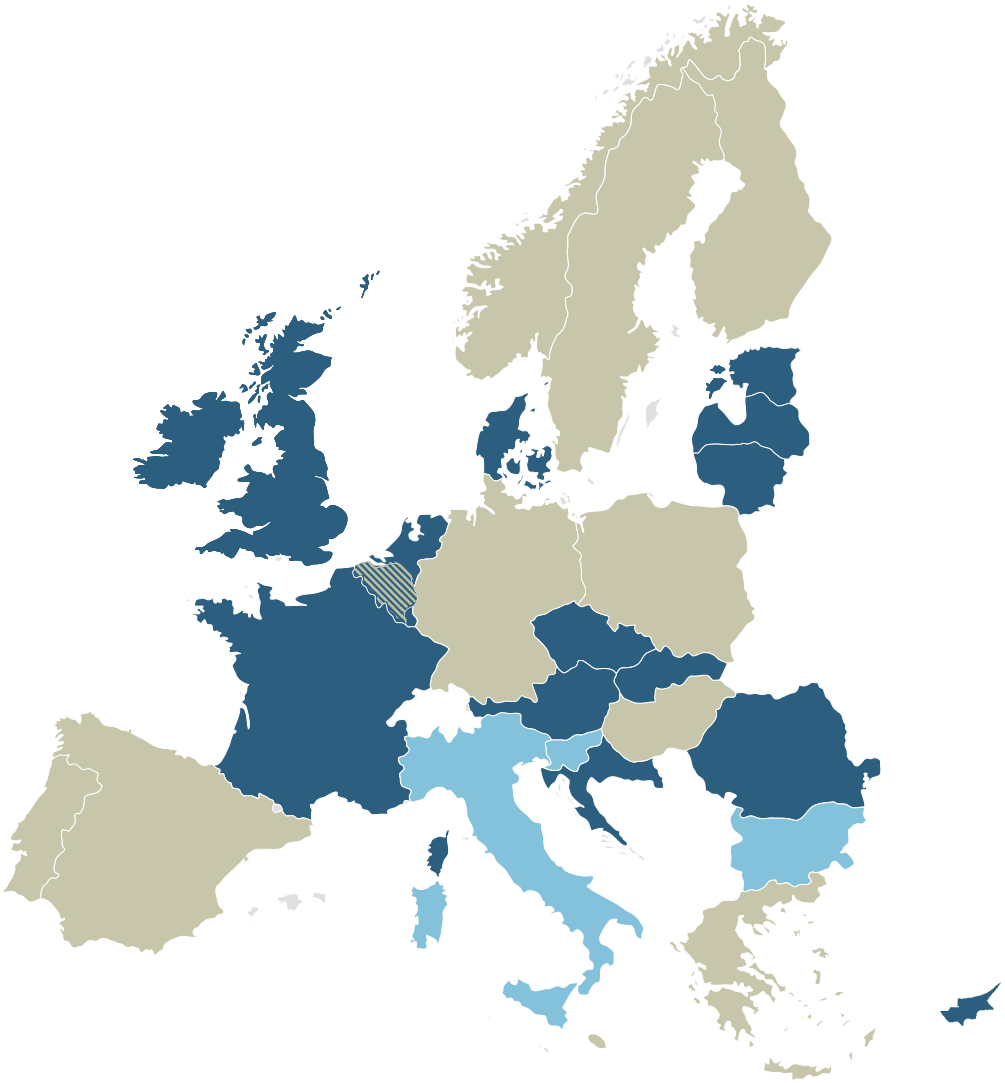
NEARLY ZERO ENERGY BUILDINGS DEFINITIONS ACROSS EUROPE

This factsheet summarises the current status (as of April 2015) of different approaches and indicators used by Member States (and Norway) for the nZEB definition of new and existing buildings. It highlights the link between the establishment of a definition and its gradual implementation and promotion on the market. The factsheet is to a large extent based on the findings of the EU-funded project EPISCOPE.

FACTSHEET



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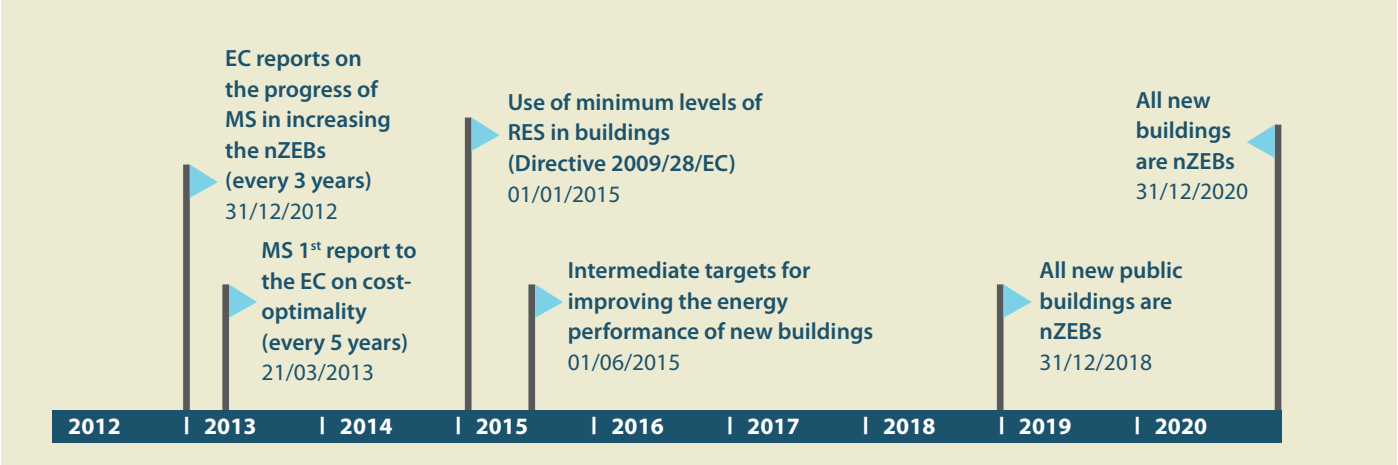
THE CONTEXT

Ambitious requirements for energy performance in buildings are an effective way to foster innovation and achieve a significant reduction of GHG emissions and energy use, contributing to the energy independence of the EU. In order to further stimulate an increased number of energy efficient buildings, the Energy Performance of Buildings Directive (EPBD, 2010/31/EC)[1] introduced the definition of nZEB as a building with very high energy performance where the nearly zero or very low amount of energy required should be extensively covered by renewable sources produced on-site or nearby. The EPBD foresees that after 31 December 2020, all new buildings will be nZEBs, while for public buildings the deadline is set for 31 December 2018[2].

Article 9 of the EPBD requires Member States (MS) not only to set a national nZEB definition, but also to actively promote higher market uptake of such buildings. MS shall prepare and submit to the European Commission the national plans with clear definitions and measures (e.g. policies and financial incentives) for the promotion of nZEBs. These national plans shall include, inter alia, intermediate targets to improve the energy performance of new buildings by 2015 and have to be updated every 3 years.

According to the same article (paragraph 5), the EC shall, by 31 December 2012 and every three years thereafter, evaluate the countries' progress in increasing the number of nZEBs and if necessary suggest measures towards this direction (Figure 1). In 2015 the evaluation will be conducted for the second time.

Figure 1 - Key years for nearly Zero-Energy Buildings (Directive 2010/31/EC) (Source: EPISCOPE[3])



In their national plans, most MS reported on intermediate targets to improve the energy performance of new buildings by 2015. Some countries went further and established measures to deliver a gradual transition towards nZEB levels:

1. In some countries, a progressive tightening of the requirements has been put in place. For instance, in Denmark and the Slovak Republic, the requirement for the energy performance indicator will be stricter after 2015 (Figure 2)

Figure 2 - Pathway to nZEBs for Denmark and the Slovak Republic: maximal primary energy consumption [kWh/m²y] for single family houses (Source: BPIE, 2014)

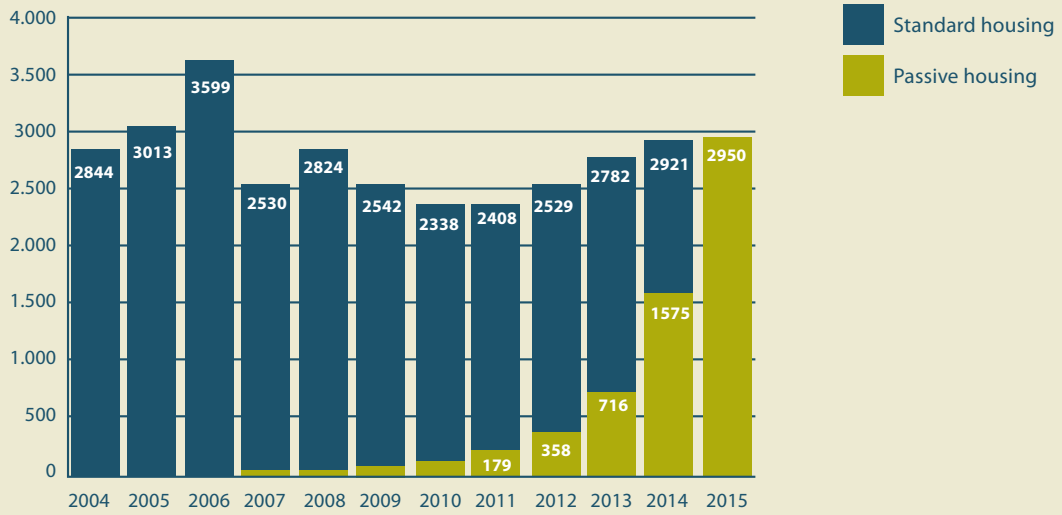
Maximum required primary energy consumption in new buildings [kWh/m²y]			
Country	**Before 2015**	**2015**	**2021**
Denmark	52,5 + 1650/ (heated gross floor area)	30 + 1000/ (heated gross floor area)	20 (nZEB)
Slovak Republic	109-216 (Energy Class B)	55-108 (Energy Class A1)	54 (nZEB, Energy Class A0)

[1] Directive 2010/31/EC (EPBD), of European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast).
[2] Following the Art 9.6 of the EPBD, Member States may decide not to apply the nZEB requirements. This can only be justified for specific cases where the cost-benefit analysis over the economic lifecycle of the building in question is negative.
[3] http://episcope.eu/fileadmin/episcope/public/docs/reports/EPISCOPE_SR1_NewBuildingsInTypologies.pdf

2. In some countries, a nZEB definition will be initially implemented for some types of buildings, such as in the Czech Republic (depending on the total energy reference area) and in the UK (for residential buildings).

3. Another example is the Brussels Capital Region, where nZEB requirements were officially defined in 2011 and enforced from 2015. In this case, the building sector has gradually adapted to them and today nZEB requirements are mandatory for all new buildings (Figure 3).

Figure 3 – Proportion of nZEB housing in the total construction of housing in Brussels (Source: Bruxelles Environnement)



Few Member States declared objectives which go beyond nZEB requirements, including zero energy buildings in the Netherlands, positive energy buildings in Denmark and France, climate neutral new buildings in Germany and zero carbon buildings in the United Kingdom.

SCOPE OF THE nZEB DEFINITION

The EPBD neither prescribes a common approach to implement nearly Zero-Energy Buildings nor describes the assessment categories in detail. Thus, MS and Belgian regions have established different parameters, both in terms of quantity and quality, in their nZEB definitions. Table 1 (pages 3, 4 and 5) presents a cross-country overview of the main aspects related to national nZEB definitions in EU28 (and Norway).

Table 1 – Cross-country overview of the main aspects related to national nZEB definitions in EU28 (and Norway)

LEGEND OF TABLE 1

✓ definition included in an official document ✗ no definition available **ND** - no data

Other indicators: CO_2 - Carbon emissions, **EP** - Envelope performance, **OH** - Overheating indicator, **TS** – Performance of technical systems

[1] For residential buildings, the EPBD takes into account the following energy services: heating, cooling, domestic hot water, air conditioning, and, for non-residential buildings, lighting is considered in addition
[2] Depending on the reference building
[3] Depending on the location
[4] Requirement depending on the RES measures adopted
[5] Maximum primary energy consumption defined as a percentage of the primary energy consumption (PE) of a reference building. In the Czech Republic, the non-renewable primary energy is considered instead of the primary energy
[6] No cooling for residential buildings
[7] Energy consumption of appliances is included in addition in the definition (both for residential and non-residential buildings)
[8] In the National nZEB Plan, BBC / "Bâtiments Basse Consommation" (buildings which comply with the Thermal Regulation 2012) are defined as buildings with an energy consumption close to zero, but it is foreseen that buildings will be positive energy buildings from 2020
[9] Apart from England, the targets for the other UK countries are different and expected to be reviewed. Northern Ireland is trying to promote the UK government's goal that all new homes should reach a zero carbon standard by 2016.

					nZEB definition for new buildings						nZEB definition for existing buildings		
Country	Status of the definition	Main reference(s)	Year of enforcement		EPBD scope of nZEB definition [1]	Numerical indicator	Maximum primary energy [kWh/m²y]		Share of renewable energy	Other indicators	Status of the definition	Maximum primary energy [kWh/m²y]	
			Public	Non-public			Residential buildings	Non-residential buildings				Residential buildings	Non-residential buildings
Austria	✓	OIB Guidelines 6	1/01/2019	1/01/2021	✓ [7]	✓	160	170 (from 2021)	Minimum share proposed in the draft of OIB guidelines for all buildings	EP, CO_2	✓	200	250 (from 2021)
Belgium - Brussels	✓	Amended Decree of 21/12/2007	1/01/2015	1/01/2015	✓	✓	45	~90 [2]	✓ Qualitative	EP, OH	✓	54	~ 108 [2]
Belgium - Flanders	✓	Regulation of 29/11/2013	1/01/2019	1/01/2021	✓	✓	30% PE [5]	40% PE [5]	✓ Quantitative [4]	EP, OH	Under development		
Belgium - Wallonia	Under development	Consolidated report to EC	1/01/2019	1/01/2019	✓	Under develop-ment			Quantitative	EP	Under development		
Bulgaria	Still to be approved	National nZEB Plan, BPIE study	1/01/2019	1/01/2021	✓	Still to be approved	~30-50	~40-60	Quantitative	EP	As for new buildings	~30-50	~40-60
							Included in the calculation; building needs to comply with class A					Included in the calculation; building needs to comply with class A	
Croatia	✓	Regulation OG 97/14, National nZEB Plan	1/01/2019	1/01/2021	✓	✓	33-41[3]	Under de-velopment	Minimum share in current requirements for all buildings	EP	ND		
Cyprus	✓	Decree 366/2014, Law 210(I)/2012	1/01/2019	1/01/2021	✓	✓	100	125	✓ Quantitative	EP	✓ As for new buildings	100	125
Czech Republic	✓	Regulation 78/2013 Coll.	2016-2018 depending on size	2018-2020 depending on size	✓	✓	75-80% [2,5]	90% [5]	✓ Quantitative	EP, TS	✓ As for new buildings	75-80% [2,5]	90% [5]
Denmark	✓	Building Regulations 2010	1/01/2019	1/01/2021	✓	✓	20	25	✓ Qualitative	EP, OH, TS	✓ As for new buildings	20	25
Estonia	✓	Regulation 68:2012	1/01/2019	1/01/2021	✓ [7]	✓	50-100 [2]	90-270 [2]	✓ Qualitative		✗		
Finland	Under development	Consolidated report to EC	1/01/2018	1/01/2021	✓ [7]	ND			ND		ND		
France	Definition of Positive Energy Buildings under development [8]	Thermal Regulation 2012, National nZEB Plan	28/10/2011	1/01/2013	✓	✓	40-65 [2,3]	70-110 [2,3]	✓ Quantitative [4]	EP, OH, TS	✓	80 [3]	60% PE [2]
Germany	Under development	KfW Efficiency House, National nZEB plan	1/01/2019	1/01/2021	✓	Under develop-ment	40% PE [5]		Minimum share in current requirements for all buildings	EP	Under development	55% PE [5]	
Greece	Under development	Law 4122/2013	1/01/2019	1/01/2021	ND	ND			Minimum share in current requirements for all buildings		Under development		
Hungary	Under development	Amended decree 7/2006, study by University of Debrecen	1/01/2019	1/01/2021	✓	Under develop-ment	50-72 [2]	60-115 [2]	✓ Quantitative	EP	Under development		
Ireland	✓	Draft definition in National nZEB Plan	1/01/2019	1/01/2021	✓	✓	45	~60% PE [5]	✓ Quantitative [4]	CO_2	Under development	75-150	

	nZEB definition for new buildings									nZEB definition for existing buildings		
Country	**Status of the definition**	**Main reference(s)**	**Year of enforcement**		**EPBD scope of nZEB definition [1]**	**Numerical indicator**	**Maximum primary energy [kWh/m²y]**		**Share of renewable energy**	**Other indicators**	**Status of the definition**	**Maximum primary energy [kWh/m²y]**	
			Public	**Non-public**			**Residential buildings**	**Non-residential buildings**				**Residential buildings**	**Non-residential buildings**
Italy	Still to be approved (under publication)	Draft of the new EPBD decree	1/01/2019	1/01/2021	✓	Still to be approved	Included in the upcoming updated version of the National nZEB Plan [2,3]		Quantitative	EP, TS	✓ As for new buildings	Included in the upcoming updated version of the National nZEB Plan [2,3]	
Latvia	✓	Regulation 383/2013	1/01/2019	1/01/2021	✓	✓	95	95	✓ Quantitative	EP	✓ As for new buildings	95	95
Lithuania	✓	Regulation STR 2.01.09 :2012	1/01/2019	1/01/2021	✓	✓	Included in the calculation; building needs to comply with class A++		✓ Quantitative	EP	✓ As for new buildings	Included in the calculation; building needs to comply with class A++	
Luxembourg	✓ Details to be fixed	National nZEB Plan	1/01/2019	1/01/2021	✗ [6]	✓	Included in the calculation; building needs to comply with class A-A-A		✓ Qualitative	EP, CO_2	ND		
Malta	Under development	National nZEB Plan	1/01/2019	1/01/2021	✓	Current values to be revised	40	60	Qualitative	EP	ND		
Netherlands	✓	National nZEB Plan	1/01/2019	1/01/2021	✓	✓	Included in the calculation; building needs to comply with energy performance coefficient = 0		✗	EP	ND		
Norway	Under development	Presentation by Research Centre on Zero Emission Buildings	1/01/2021	1/01/2021	✓	Under development			Minimum share in current requirements for all buildings	CO_2 (main indicator), EP, TS	ND		
Poland	Under development	Consolidated report to EC	1/01/2019	1/01/2021	✓	Under development	60-75 [2]	45-70 [2]	✗		ND		
Portugal	Under development	Law 118/2013	1/01/2019	1/01/2021	✓	In current requirements for buildings			✗		ND		
Romania	✓	National nZEB Plan	1/01/2019	1/01/2021	✓	✓	93-217 [2,3]	50-192 [2,3]	✓ Quantitative	CO_2	ND		
Slovakia	✓	Decree 364/2012	1/01/2019	1/01/2021	✗ [6]	✓	32-54 [2]	34-96 [2]	✓ Quantitative	EP	ND		
Slovenia	Still to be approved	Official Journal 17/14, National nZEB Plan	1/01/2019	1/01/2021	✓	Still to be approved	45-50 [2]	70	Under development	EP	Still to be approved	70-90 [2]	100
Spain	Under development	Decree 235/2013	1/01/2019	1/01/2021	✓	Under development	Included in the calculation; it is foreseen that buildings will need to comply with class A		Minimum share in current requirements for all buildings	CO_2 (main indicator)	Under development		
Sweden	Under development	National nZEB Plan	1/01/2019	1/01/2021	✓	Under development	30-75 [2,3]	30-105 [2,3]	✗		ND		
UK (England)	✓ Details to be fixed	National nZEB Plan, presentation by Zero Carbon Hub	1/01/2018 (from 2016 for residential buildings) [9]	1/01/2019 (from 2016 for residential buildings) [9]	✓	✓	~ 44 (2)	ND	✓ Qualitative	CO_2 (main indicator), EP, TS	ND		
							Included in the calculation; building will need to comply with carbon emissions ~ 0						

Energy performance indicator

In most countries, the nZEB definitions refer to maximum primary energy as one of the main indicators. In a few cases (e.g. the Netherlands and the Belgian Region of Flanders), the primary energy use of the building is assessed through a non-dimensional coefficient, comparing the buildings' primary energy use with a "reference" building with similar characteristics (e.g. building geometry). In several countries (e.g. the United Kingdom, Norway and Spain) carbon emissions are used as the main indicator, while in others (e.g. in Austria and Romania) carbon emissions are used as a complementary indicator to primary energy use.

For residential buildings, most jurisdictions aim to have a primary energy use not higher than 50 kWh/m^{2}y. Often, different requirements are established for single family houses as well as apartment buildings and higher values are established for regions with a colder climate (e.g. France and Romania).

For non-residential buildings, the requirements can have a broader range in the same country depending on the type of building. Some jurisdictions set a single target only for offices and schools (e.g. Brussels Capital Region) while others (e.g. Romania and Estonia) also include requirements for hospitals. Overall, due to the different calculation methodology, climate conditions and building typology, the maximal primary energy level for non-residential buildings in Europe ranges from 0 to 270 kWh/m^2/y.

Concerning the methodology to calculate the energy performance of buildings, the EPBD (Annex I) lists the main end-uses that should be included such as heating, domestic hot water, cooling, ventilation and (mainly in non-residential sector) lighting. In most jurisdictions, energy needs for cooling and ventilation are considered for residential buildings but only a few consider household appliances (e.g. Austria) or the energy consumption of lifts and escalators (e.g. for non-residential buildings in Italy).

Apart from the requirement for primary energy consumption, most countries also set separate requirements on final energy use, as suggested by the European Committee for Standardisation[4].

In most jurisdictions, these refer to the final energy required for space heating (e.g. in Cyprus, Latvia, Slovenia or Brussels Capital Region) or to the mean transmittance coefficient of the building (e.g. in the Czech Republic); in some cases (e.g. in Denmark and Brussels Capital Region), the evaluation of the building airtightness is also included. In a few cases (e.g. in France, Denmark, Brussels Capital Region and Flanders), additional requirements are established for the performance of the technical systems (e.g. heating and ventilation units) and to additionally reduce the building overheating risk.

Renewable Energy Sources (RES)

11 Member States plus Brussels Capital Region and Flanders set a definition that comprises both a numerical target for primary energy use (or final energy) and consider the share of renewables in a quantitative or qualitative way. In 8 of these jurisdictions (Cyprus, Lithuania, Latvia, Romania, Slovakia, Ireland, France, Region of Flanders), the share of primary energy consumption which has to be covered by renewable energy sources is explicitly stated, while in other jurisdictions (e.g. Czech Republic, Denmark, Estonia and Brussels Capital Region) renewable sources are considered indirectly.

In Denmark, while a minimum share of renewable sources has not been established, a gradual evolution of primary energy factors has been planned and an increase in the share of renewable energy above 50% is expected in 2020.[5]

[4] "Nearly Zero Energy Buildings (nZEB) in CEN draft standard"
[5] Progress by Member States towards nearly Zero-Energy Buildings (COM/2013/0483)

nZEB DEFINITIONS FOR EXISTING BUILDINGS

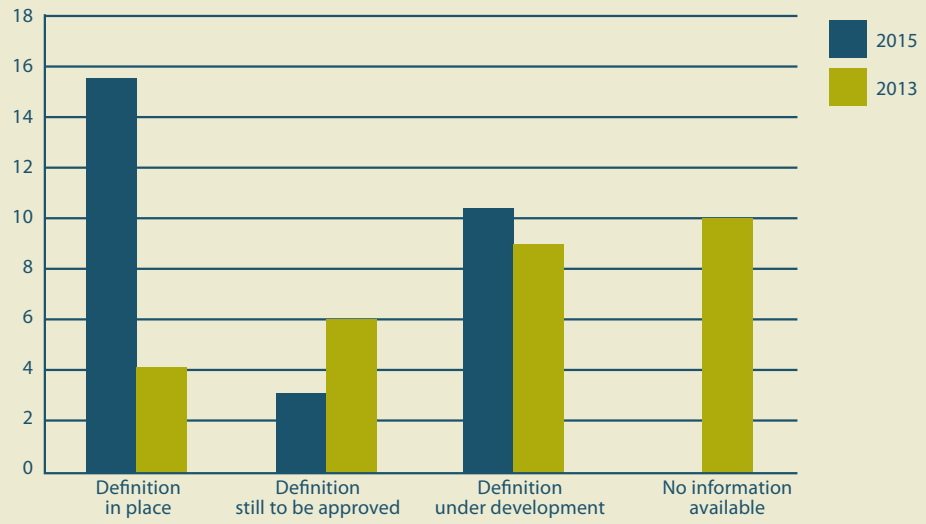
According to the EPBD (Article 9), MS should also develop policies in order to encourage the renovation of buildings to nZEB levels. So far the nZEB requirements established by the European Commission only address directly new buildings to be constructed from 2020 onwards. No mandatory requirements have been introduced for nZEB renovations.

Criteria for nZEB renovation of buildings have been identified in 13 jurisdictions, but definitions have so far only been set in 8 (Austria, Cyprus, the Czech Republic, Denmark, France, Latvia, Lithuania, Brussels Capital Region). Of these, Austria, France, and Brussels Capital Region have set primary energy use requirements for renovation at a less strict limit compared to new buildings. Germany, Ireland and Slovenia envisage doing likewise, though the renovation definitions for these countries have not yet been set. Denmark and Lithuania have the same nZEB definition for new and existing buildings, as do Bulgaria, Cyprus, Italy and Latvia, where the nZEB definition for new buildings is also applied for deep renovations. For more information on the nZEB requirements for existing buildings see Table 1.

CONCLUSIONS

Significant progress has been made since the first evaluation of the nZEB definitions status (based on the national report submitted to the European Commission in 2012)[6].

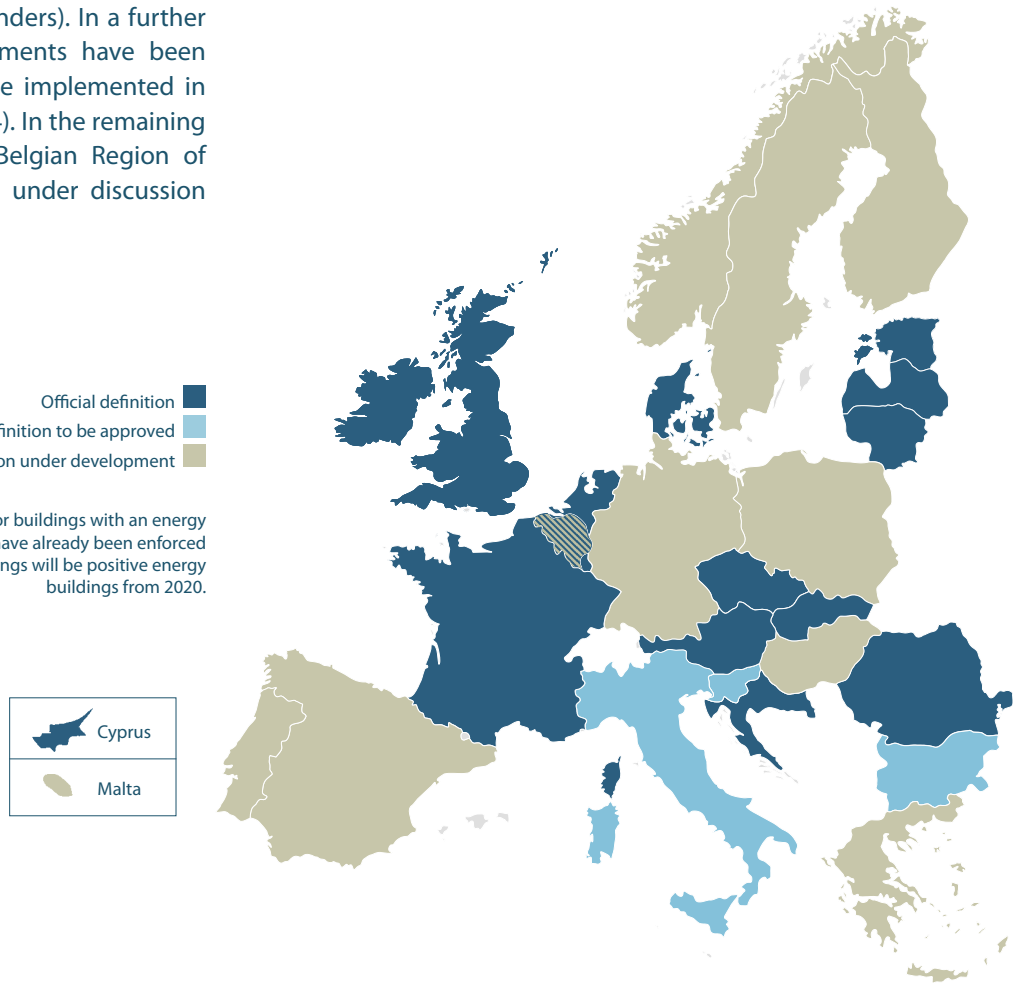
Figure 4 – Status of implementation of the nZEB definition in the MS and Norway. Each Belgian Region has been counted as one third of a country (Sources: Ecofys 2013, BPIE, 2015)



[6] Progress by Member States towards nearly Zero-Energy Buildings (COM/2013/0483)

To date, a definition is available in 15 countries (plus Brussels Capital Region and Flanders). In a further 3 countries, the nZEB requirements have been defined and are expected to be implemented in the national legislation (Figure 4). In the remaining 9 MS (plus Norway and the Belgian Region of Wallonia), the definition is still under discussion and has not been finalised yet.

Figure 5 - Status of nZEB definition for new buildings (Source: BPIE, 2015)



However, the values defined for maximum primary energy consumptions show a large variation of a factor 4 to 5.

To date, only 8 countries have formally established nZEB requirements for existing buildings. 5 jurisdictions have set the same requirements for new and existing buildings whereas in 3 cases (Austria, France and Brussels Capital Region) the requirements for major renovations of existing buildings are less strict than the ones defined for new buildings.

This research shows that all European Member States are working on the implementation of the EPBD nZEB requirements, though with different ambition levels. A clearer definition of the desired energy performance of a nearly Zero-Energy Building in the European legislation would support a more coherent approach by the national governments. In consequence, this would trigger more innovation in the field and support a technology leadership of Europe in the field. The question how "close to zero energy" the buildings will be in reality remains open and requires monitoring of existing and future nZEBs.

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