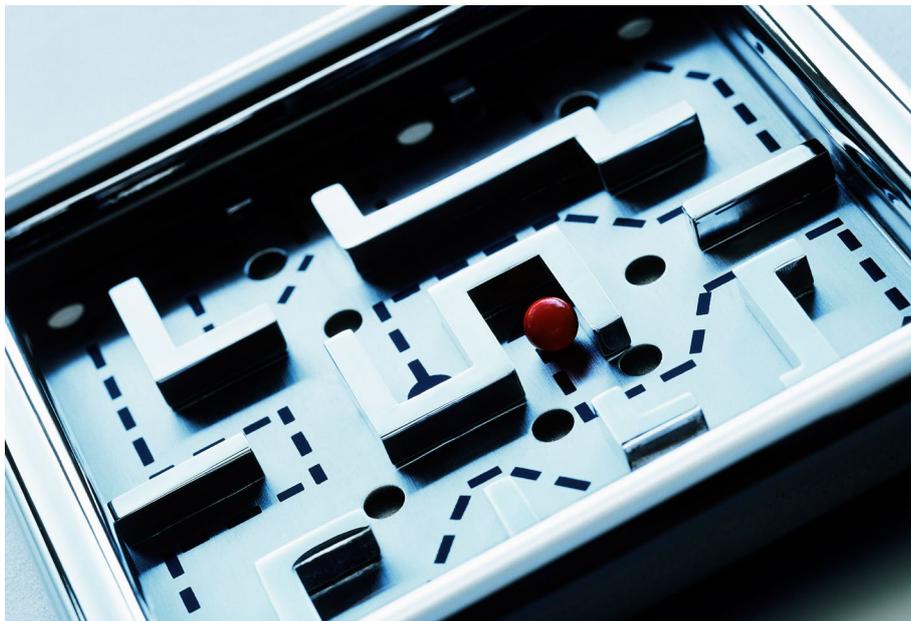




european
council for an
energy efficient
economy

Understanding (the very European concept of) Nearly Zero-Energy Buildings

**Steering through the maze #2 (revised):
A guide from the European Council for an
Energy Efficient Economy**



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This is a revised version of eceee:s maze guide #2 which deals with nearly-zero energy buildings.

11 April 2014

About the European Council for an Energy Efficient Economy (eceee)

eceee, the European Council for an Energy Efficient Economy, is the largest non-profit, membership-based energy efficiency NGO in Europe. The goal of eceee is to promote energy efficiency through co-operation and information exchange.

To facilitate this, eceee provides evidence-based knowledge, analysis and information. eceee provides an information service through its web site and news service, arranges conferences and workshops and takes active part in the European energy efficiency policy discussions.

One of eceee's principal events is the five-day Summer Study held in June every odd year which attracts more than 450 participants from governments, industry, research institutes and citizen organisations. Since 2012, eceee arranges a three-day Industrial Summer Study held in June every even year.

For more information about eceee, see www.eceee.org.



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Introduction

In 2010, the recast of the Energy Performance of Buildings Directive [Directive 2010/31/EU] introduced the concept of and obligation for nearly zero energy buildings (nZEB¹), particularly for new buildings. While (net) zero-energy building is a term familiar to buildings experts, the nZEB definition of EPBD (i.e. resulted from a political compromise acknowledging the variety of EU buildings traditions and the discrepancies between level of development of the EU MS) it was not widely understood and often raised confusion over what it really meant. The 2010 EPBD recast obliged all Member States to have all new public buildings built after December 31 2018 and all new buildings (residential and non-residential) built after December 31, 2020 to be nearly zero energy buildings. The concept was left intentionally vague to give Member States some room to figure out what was most appropriate within their own context.

There have been almost four years since the EPBD recast was approved and only six years until the full roll out of nearly zero energy buildings requirement. There is much to do to be fully prepared and it is felt that we are still in “early days” in terms of having working definitions and full strategies for the roll out.

This Maze guide follows a separate one that eceee published in February 2011 to explain how the concept had been defined and interpreted around the world up to that point. Now, Member States and the buildings sector as a whole must focus on the steps leading up to full implementation.

This Maze guide is designed to help the reader better understand the basic concept as it was conceived in the Directive, providing the key milestones for MS to meet. It reviews how MS are defining the concept and developing their strategies for roll out and discusses the next steps. It further intends to help the reader understand where MSs are in implementing the obligation.

The guide mainly focuses on new buildings but also includes existing buildings where possible.

The requirements in short

Article 2 of 2010 EPBD recast described nearly zero energy buildings as buildings that have a very high energy performance with the nearly zero or very low energy use, required to a very significant extent to be covered by energy from renewable sources including from renewable energy produced onsite and nearby.

Article 9 in the Directive states that Member States shall ensure that (a) by 31 December 2020, all new buildings are nearly zero-energy buildings; and (b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings.

‘Member States shall draw up national plans for increasing the number of nearly zero-energy buildings. These national plans may include targets differentiated according to the category of building.’ The national plans should include a practical application of what nZEB is supposed to consist in:

1. a numerical indicator in primary energy expressed in kWh/m²/year;
2. intermediate targets for 2015; and
3. policy, financial and any other type of measures that will support the implementation of nZEB and including national measures and requirements concerning the use of RES in new and existing buildings undergoing major renovation.

¹ This guide uses the acronym nZEB to define nearly zero energy buildings. This follows the approach by the BPIE that uses nZEB to distinguish from NZEB, a widely accepted and already in place as an acronym for net zero energy buildings. The EC continues to use NZEB for nearly zero energy buildings but increasingly nZEB is being used. Hopefully over time this confusion will diminish.

Thus, there are very ambitious targets for all new buildings in all sectors, whether they be residential or non-residential buildings. These official targets are considered the most ambitious globally.

The challenge is to set in motion the steps needed to meet the dates of 2018 and 2020 and this is the main focus of this Maze guide.

Getting back to basics: what does nZEB mean?

As stated above, 2010 EPBD recast introduced a new article on nearly zero energy buildings². Essentially, the recast sets out a general framework and gives considerable latitude to Member States to define it. Therefore, nZEB is a very flexible policy requirement with no single, harmonised nZEB definition throughout the EU.

Some of the expressions are intentionally vague and it is left to the Member States in their national plans to give some rigour to the definition within the context of their own national efforts.

Early attempts at explaining the concept

In 2011, eceee published its Steering through the Maze report on nearly zero energy buildings to essentially give an overview of the fairly new topic. The report had an annex on definitions and quoted one study in particular³:

Torcellini et al identified the following main definitions of zero energy buildings (ZEB):

Net Zero Site Energy: A site ZEB produces at least as much energy as it uses in a year, when accounted for at the site.

Net Zero Source Energy: A source ZEB produces at least as much energy as it uses in a year, when accounted for at the source. Source energy refers to the primary energy used to generate and deliver the energy to the site. (NB this is equivalent to the Industry Committee's definition.)

Net Zero Energy Costs: In a cost ZEB, the amount of money the utility pays the building owner for the energy the building exports to the grid is at least equal to the amount the owner pays the utility for the energy services and energy used over the year.

Net Zero Energy Emissions: A net-zero emissions building produces at least as much emissions-free renewable energy as it uses from emissions-producing energy sources. (In other words, a Zero Carbon Building.)

The 2011 Steering Through The Maze #2 added two more definitions:

*The U.S. Department of Energy (DOE) Building Technologies Program defines ZEB thus: "A net zero-energy building (ZEB) is a residential or commercial building with greatly reduced energy needs through efficiency gains such that the balance of energy needs can be supplied with renewable technologies." However they also point out that: "Despite the excitement over the phrase "zero energy," we lack a common definition, or even a common understanding, of what it means."*⁴

Laustsen, in the 2008 International Energy Agency report on buildings, gives the following definition⁵: Zero Net Energy Buildings are buildings that over a year are

² For more details on the EPBD recast, go to eceee's webpage: <http://www.eceee.org/policy-areas/Buildings>

³ Zero Energy Buildings: A Critical Look at the Definition P. Torcellini, S. Pless, and M. Deru National Renewable Energy Laboratory D. Crawley U.S. Department of Energy To be presented at ACEEE Summer Study Pacific Grove, California August 14–18, 2006 <http://www.nrel.gov/docs/fy06osti/39833.pdf>

⁴ "A literature review on ZEB definitions - Draft report for discussion" A. Marszal, P. Heiselberg; Aalborg University, Denmark 2009.

⁵ Laustsen, J. (2008). Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings. International Energy Agency (IEA) http://www.iea.org/g8/2008/Building_Codes.pdf

neutral, meaning that they deliver as much energy to the supply grids as they use from the grids.

The Buildings Performance Institute Europe (BPIE) provided some early analysis on helping member states develop a nZEB definition. The report, Principles for nearly Zero-Energy Buildings⁶, was designed to help reach a common understanding of nZEB by:

- Providing a starting point for a nZEB definition by analysing existing concepts and initiatives.
- Lining out main challenges and potential solutions for a nZEB definition.
- Compiling a possible set of principles for nZEBs.
- Applying such principles on reference buildings and assess related effects.
- Depicting related technological, financial and policy implications at EU level, and
- Giving an outlook on necessary further steps towards a successful implementation of nZEBs.

BPIE provides a very useful diagram to understand the principles in the broader policy context.

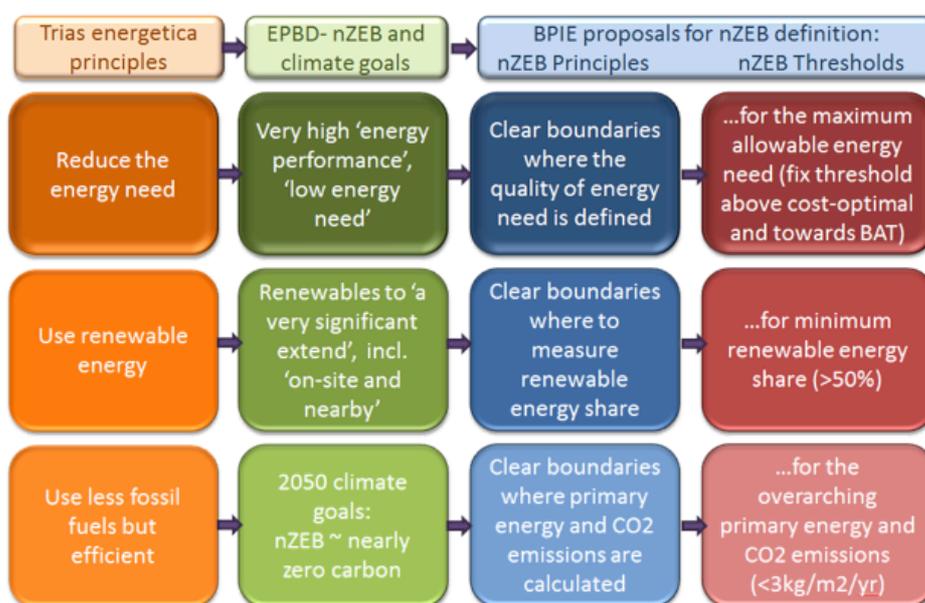


Figure 1: Principles for sustainable nZEB in the EU⁷

More details of the principles are available in the BPIE publication, available on the BPIE website⁸.

Further guidance in 2012 by the European Commission

During 2012, a consortium led by the consulting company Ecofys undertook a study for the Commission to provide more guidance to Member States and the Commission regarding the implementation of the requirements for nearly zero-energy buildings under the EPBD. The study built on the initial work undertaken by the BPIE. The study, finalised early in 2013, developed an analytical framework for evaluation the national plans (including a reporting template), identified benchmarks and investigated the

⁶ BPIE, *Principles for nearly Zero Energy Buildings*, BPIE, Brussels, November 2011

⁷ Source: B. Atanasiu, BPIE, Presentation at ecee 2013 Summer Study, June 2013

⁸ <http://www.bpie.eu/>

convergence between cost optimal levels and nearly zero-energy buildings. The report's objectives are:

- Give guidance to the MSs on how to interpret the requirements for nearly zero energy buildings as stated in article 2.2 of the recast;
- Develop a common reporting format on nearly zero energy buildings to be used by MS and evaluate the adequacy of measures and activities reported by MS in their national plans on nearly zero energy buildings; and
- Link cost optimality and the nearly zero energy buildings principle in a consistent way and facilitate their convergence until 2021.

The [Commission's report](#) is available on the DG Energy website.

Francesco Madonna and Franco Ravasio show the interaction between cost-optimality (required under EPBD) and nZEB in the following diagram that they presented at the 2013 eceee Summer Study. As they state, nZEB performance will be the minimum energy performance requirement for new buildings by the end of 2020.

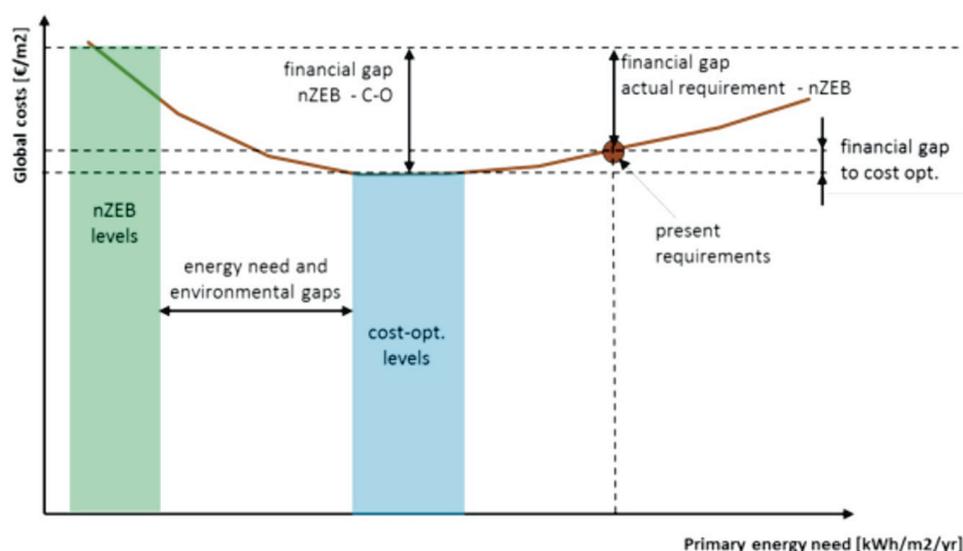


Figure 2: Example of financial, energy and environmental gaps between current and cost-optimal requirements and nZEB levels⁹

National plans, poor reporting on definitions

Using the analysis from the BPIE report and the Commission's study, under article 9 of the EPBD, MS were to draw up national plans for increasing the number of nearly zero-energy buildings. These plans shall include inter alia the detailed application in practice of the definition of nZEBs (including a numerical indicator of primary energy use expressed in kWh/m² per year), intermediate targets for improving the energy performance of new buildings by 2015, and information on the policies and financial or other measures aimed at promoting nZEBs. The Commission was to publish a report on the progress of MS in increasing the number of nearly zero-energy buildings by 31 December 2012 and every three years thereafter. As stated above, this report was sent to Council and the European Parliament in October 2013.

Annex 1 summarises the definitions provided to date in the national plans that were submitted to the Commission. Hungary has also provided its plan but it is only available

⁹ Source: BPIE, *Implementing the Cost-Optimal Methodology in EU Countries: Lessons Learned from Three Case Studies*, 2013, p. 16

in Hungarian on the DG Energy website¹⁰. There is no consensus on a definition and there has been very little on non-residential buildings. It is unfortunate that more MS have not reported so far. Readers of the individual national plans should notice the efforts made to solicit the views of a wide range of experts to establish either the definition or the process leading up to the definition.

In October 2013, the Commission produced a communication (not available on the Commission website) that reported on the progress of implementing nZEB. It included only eight MS that had submitted their national plans by November 2012. By the time of publishing the October report, a further six MS had submitted their plans. This report had originally been due at the end of 2012. According to the communication, “An analysis of the available information . . . shows that, although most Member States report progress in defining nZEBs, only 4 Member States (BE, CY, DK and LT) provided a definition that comprises both a numerical target and a share of renewable energy sources. In other Member States the work on the definition has reached different stages of development (see graph below).”¹¹

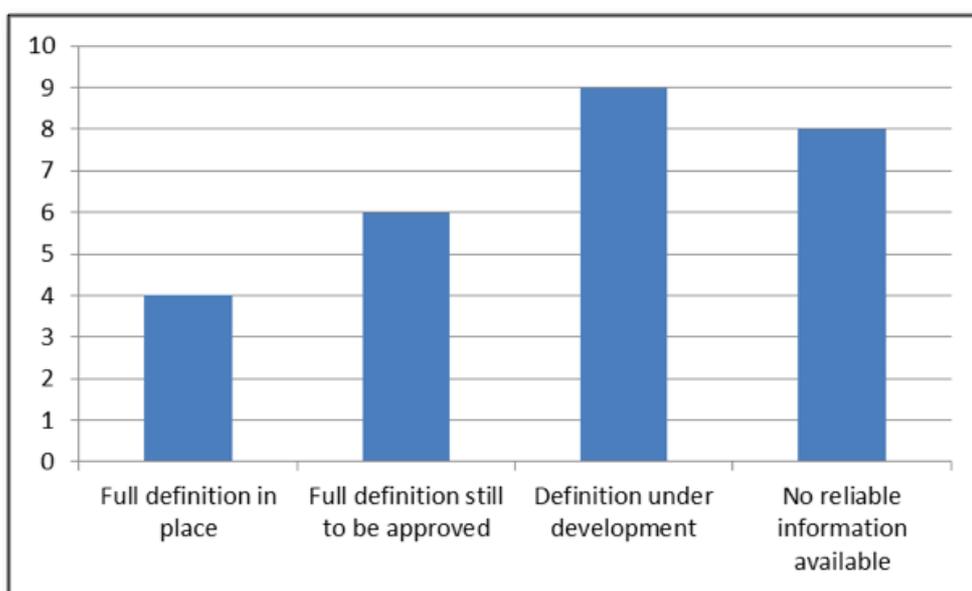


Figure 3: Status of development of the nZEB definition in Member States¹²

nZEB policy progress to date

Article 9 states that Member States shall ensure that:

- a. by 31 December 2020, all new buildings are nearly zero-energy buildings; and
- b. after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings.

The challenge is to set in motion the steps needed to meet the dates of 2018 and 2020.

Figure 4 shows the timeline that is to be followed.

¹⁰ http://ec.europa.eu/energy/efficiency/buildings/implementation_en.htm

¹¹ REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL *Progress by Member States towards Nearly Zero-Energy Buildings*, COM(2013) 483 final/2, p. 5.

¹² Source: Report from the Commission to the European Commission to the European Parliament and the Council, *Progress by Member States towards Nearly Zero-Energy Buildings*, COM(2013) 483 final/2, p. 5

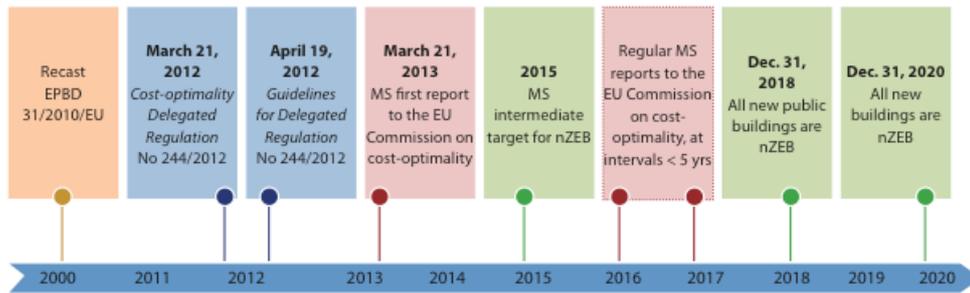


Figure 4: Implementation timeline for cost-optimality and nearly Zero-Energy Buildings' requirements of EPBD¹³

To ensure Member States develop a comprehensive, long-term approach to achieving those milestones, Article 9 also requires Member States to develop national strategies for the roll out of nearly zero energy buildings as stated above.

As shown below, 16 MS have now submitted their national plans on nZEB to the Commission¹⁴. The Commission followed up with its progress report to Council and the European Parliament in October 2013, well after the December 2012 deadline.

How are Member States implementing nZEB?

MS must submit their next National Energy Efficiency Action Plan (NEEAP) by June, 2014. For most MS the 2014 NEEAP will be the third NEEAP. While the NEEAP is a requirement under the Energy Efficiency Directive, the Guidance template provided by the Commission requires MS to also address requirements of the EPBD. Guidance 26 states that MS are recommended to include their National Plan for Nearly Zero-Energy Buildings as an Annex to their NEEAP. This is important since not all MS submitted their plans.

The plans that were submitted to the Commission give an indication of the work that is underway. The box on the following shows the strategy that Bulgaria is implementing. Indications of how effective Bulgaria or any other MS will be should be indicated in the upcoming NEEAPs.

It should also be noted that the BPIE has been providing support to Bulgaria, Poland and Romania. BPIE researched and developed ambitious roadmaps for Bulgaria, Poland and Romania which will help the countries progress towards the implementation of nearly Zero-Energy Buildings and dramatically reduce the national level of energy consumption and related carbon emissions. BPIE research recommends a holistic policy approach that can deliver on energy, climate and economic goals.

The individual country reports combine a technical and economic analysis, based on specific national building data, economic conditions and existing policies¹⁵. Different technological solutions – using variants of improved thermal insulation, energy efficient equipment for heating, cooling, ventilation and hot water and considering renewable energy generation – were simulated for improving the energy performance of offices, single-and multi-family houses. The costs were set in relation to the actual practice in

¹³ Source, BPIE, *Implementing the Cost-Optimal Methodology in EU Countries: Lessons Learned from Three Case Studies*, 2013, p. 9

¹⁴ Information on the individual MS is available in a project report funded by Intelligent Energy Europe. Please refer to http://www.cohereno.eu/fileadmin/media/Dateien/D2_1_BPIE_WP2_12092013_3_5_-final.pdf.

¹⁵ The reports are available on the BPIE website - http://www.bpie.eu/low_energy_buildings_east_eu.html#.UtAwPrw1dO0

construction in the country. Based on simulation results, BPIE proposed not only a concrete national definition for nZEB for the defined building categories but also policy implementation roadmaps towards 2020, when all new buildings need to be nearly zero-energy buildings. It will be important to follow the progress of those three countries give the support they have been given.

The Commission’s progress report provides its findings on the progress, even though very few MS had submitted plans. The Commission used some other sources to supplement what was submitted. The main findings are:

- National plans varied substantially reflecting different levels of development of national policies;
- A few MS mentioned objectives 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 standards in the UK;
- Where there were numerical indicators, they ranged from 0 kWh/m² to 220 kWh/m²;
- Only a few MS defined minimum requirements for renewable energy;
- No MS reported legislative regime for not applying the nZEB requirements in specific and justifiable cases where the cost benefit analysis over the economic life cycle of the building in question is negative
- Only 15 of 27 MS had intermediary goals;
- Only 3 MS set intermediate goals for refurbishment; and
- MS reported a wide range of policies and measures to support nZEB as shown in the following graph.

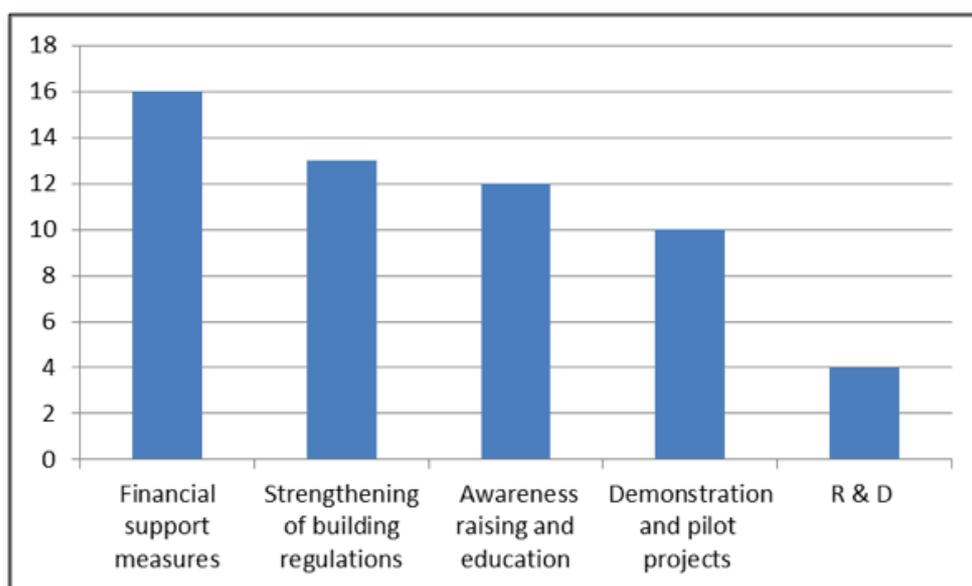


Figure 5: Main policies and measures in support of nZEBs in Member States¹⁶

¹⁶ Source: REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL *Progress by Member States towards Nearly Zero-Energy Buildings*, COM(2013) 483 final/2

Box: From Bulgaria's National Plan for Nearly Zero Energy Buildings

A Strategy to increase the number of these buildings in accordance with Directive 2010/31/EU has been proposed by:

- assisting the construction of new nearly zero-energy buildings and achievement of the same energy characteristics when existing buildings undergo major refurbishment;
- analysing and revising existing national legislation, documents and measures to support the implementation of Directive 2010/31/EU;
- analysing the state of the construction sector (growth of the construction process, business environment, financial and administrative obstacles, socio-economic conditions, market principles, etc.);
- regulating the introduction of renewables in the construction of new buildings or the reconstruction, major refurbishment, major repair or conversion of existing buildings;
- fine-tuning the powers and functions of the competent authorities arising from the implementation of the new requirements of Directive 2010/31/EU with regard to the building sector (public and residential buildings);
- planning measures for the period 2012—3 to assign and implement applied research tasks to determine national parameters and requirements for the energy performance of nearly zero- energy buildings; supplementing the national calculation methodology with new elements from the relevant European standards for designing sustainable and smart buildings, taking into account standards for passive buildings and the level of technologies for heating, cooling and ventilation systems using conventional or renewable energy; systematic analysis of data in the information system of the Sustainable Energy Development Agency (AUER) regarding the state of energy use in existing buildings; and preparing projects, approving and publishing legislation, by-laws and administrative regulations;
- planning measures in the period 2012—3; defining the national targets, implementation mechanisms, activities related to recording, documenting and reporting results; pilot projects for new public-sector nearly zero-energy buildings for 2011—3; an approximate definition of the provisional target for 2015 of 1—1.5 % of the total floor space of new buildings occupied by central or local government departments with an energy performance corresponding to nearly zero-energy use; drafting a National Plan to increase the number of nearly zero-energy buildings;
- adapting the National Programme for housing renovation in Bulgaria for 2006—20 in order to comply with the EU's harmonised energy efficiency policy and the government's new policy for large-scale renovation of multi-occupancy residential buildings;
- schemes to provide financial aid under the Operational Programme Regional Development (Supporting energy efficiency in multi-occupancy residential buildings);
- priority for the renovation of concrete panel and other multi-occupancy buildings, and linking this process with the necessary energy certification and energy surveying of buildings;
- drawing up a pilot programme for nearly zero-energy public buildings;
- harmonising a package of legislation and regulations in accordance with the 2010 Energy Performance of Buildings directive by supplementing national legislative requirements with regards to the thermal transmittance (U value, W/m²K) of walls and glazed apertures, and building features, taking into account developments in the manufacture of building materials and products (Regulation No 7 of 2004 on energy efficiency, thermal insulation and energy economy in buildings, as amended in 2010, and Regulation No RD-16-1058 of 2009 on energy use indicators and the energy performance of buildings; and Regulation No 15 on the

- technical rules and standards for the design, construction and operation of buildings and facilities for the production, transmission and distribution of heat energy);
- stimulating the establishment of owners' associations within the meaning of the Condominium Management Act (ZUES) and assistance with surveys of condominiums.

What are some of the concerns for implementation

While there is much discussion on nZEB, it is illustrative that so few MS sent in their national plans. It is certain that nZEBs have to be seen within the context of the implementation of the entire EPBD because all the pieces fit together. It is beyond the scope of this overview of nZEB to go into much depth.

There are some issues that should be brought out:

- Many MS have received infringement notices from the Commission for not meeting all the obligations under the Directive. This shows that there is a lag in implementation and it is not fully appreciated how serious this situation is for the effective implementation of the Directive and nZEBs.¹⁷
- The Commission published its report on the progress being made on nZEBs in October 2013 although it was not made available on its website. Unfortunately, it only covered the 8 MS that had submitted plans before November 2012.
- Work on existing buildings is still in early stages. While it is appreciated this is difficult, it is very important if Europe is to push for deep renovations which essentially mean nZEB buildings
- There is no consensus on the role and share of renewable energy¹⁸.

The Commission's progress report provides a worrying final conclusion:

...the conclusion has to be that too little progress has been made by the Member States in their preparations towards nZEBs by 2020.

This lack of proper and timely preparation increases the risk that Member States will not meet the deadlines for new buildings to be nZEBs. Moreover, the absence of clear definitions, interim targets and dedicated support measures means that the building sector faces uncertainty over the regulatory and policy framework for nZEBs, thus delaying the necessary investments in technology, processes and training, and reducing its competitiveness.

Next steps

In June 2014, MS will publish their third National Energy Efficiency Action Plans (NEEAPs) that should give a better indication on what progress has been made and if there will be any problems in meeting the 2019 and 2021 deadlines.

By the end of June 2014 the Commission will assess whether the EU's 2020 target is likely to be met (Article 3.2). If the Commission concludes that this is not the case, it will make further proposals to ensure the gap is closed (Article 24.7) and this could have an impact on the implementation of nZEBs.

ec3 will update this Maze guide once the NEEAPs are made available and there is a better indication on the progress made to implement nZEBs.

¹⁷ For the infringement notices, see the DG ENER website - http://ec.europa.eu/energy/infringements/proceedings/efficiency_en.htm

¹⁸ Article 2 on definitions states: “‘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. “ There is no consensus on what the “significant extent” should be.

What are the Commission and others doing to help in the implementation?

There are many initiatives to support the implementation of nZEBs within the context of the implementation of the EPBD.

Concerted Action EPBD

This is an EU-funded initiative that brings experts from MS together to discuss implementation issues and share best practice. Concerning nZEBs, Concerted Action states the following:¹⁹

The specific EPBD Concerted Action activities around “Towards 2020 - Nearly zero-energy buildings” will support the Member States by the exchange of experiences with already existing high performance buildings (ranging from low energy buildings to passive houses, zero-energy and zero-emission buildings, and even to energy surplus houses).

The discussion topics include the most common building and service system solutions, calculation methods, promotional means, available subsidies and other incentives, supporting documents (e.g. guidelines), etc., as well as study tours to interact with experts at national administrations and visits to relevant sites.

The different national applications of the definition of nearly zero-energy buildings are presented and compared: front-runner countries receive a feedback and other countries gather inspiration for their own application.

Through such information exchange, Member States participants furthermore support each other in the development of the national plans for increasing the number of nearly zero-energy buildings.

Intelligent Energy Europe (IEE)

IEE that terminated at the end of 2013 has been one of the EU’s main programmes to support energy efficiency and renewable energy policies. It has provided project funding for nZEB. Annex 3 lists the projects underway. It should be understood that some of these projects relate to nZEB for existing buildings. Most notable is the ENTRANZE (Policies to Enforce the Transition to Nearly Zero Energy Buildings in the EU-27) project. The objective of the ENTRANZE project is to actively support policy making by providing the required data, analysis and guidelines to achieve a fast and strong penetration of nZEB within the existing national building stocks. The project intends to connect building experts from European research and academia to national decision makers and key stakeholders with a view to build ambitious, but reality proof, policies and roadmaps. Information is available on its website.²⁰

IEE has now been replaced by Horizon 2020.²¹ There is currently a call for proposals for projects related to energy-efficient buildings that would include NZEB.

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eceee is also contributing to implementation, particularly through the papers presented at its bi-annual Summer Studies. Annex 2 lists the relevant papers from the 2013 Summer Study. Readers should also look at the eceee website to find copies of the Powerpoint presentations because they synthesise the papers in an excellent visual manner and highlight some of the main conclusions to help the reader.

¹⁹ <http://www.epbd-ca.eu/themes/nearly-zero-energy>

²⁰ <http://www.entranze.eu/>

²¹ <http://ec.europa.eu/programmes/horizon2020/>



BPIE

The BPIE has worked actively on the concept of nearly zero energy buildings. Because there was no detailed definition of nZEB, in 2011 BPIE published a report on the principles that should be included. Those are discussed elsewhere in this guide.

BPIE has also prepared the ground for implementing nearly zero energy buildings in Bulgaria, Poland and Romania. BPIE researched and developed ambitious roadmaps for Poland, Romania and Bulgaria that was designed to help the countries progress towards the implementation of nearly Zero-Energy Buildings. This resulted in individual reports for those countries.

BPIE is also a member of an Intelligent Energy Europe Project entitled Collaboration for housing nearly zero that will develop proposals and concepts for promising cross-sector and company business models for high efficiency refurbishment of single-family houses to nearly zero-energy housing.

Standards development

The implementation of the Directive is supported by a set of European standards, dealing with a wide range topics including calculation of delivered energy, energy needs and energy costs, inspections and definitions. Harmonised standards are important for implementing the Directive.

In 2010, the Commission issued a mandate to CEN, CENELEC and ETSI to review the previous standards and to undertake new work related to the recast Directive. The new standards would be easier for MS to use. For the most recent update of progress of standards development, please refer to a report by Jan Hogeling entitled, The future 2nd generation of EPB standards as a firm basis for the NZEB definition.

Conferences

Finally, there are many conferences related to nZEB, most notably by World Sustainable Energy Days, which had a conference on nZEB in late February 2014, following a similar one in 2013.²²

²² Information is available at <http://www.wsed.at/en/programme/nearly-zero-energy-buildings/>

Annex 1: Definitions of nZEBs as provided in national plans

Member State	Definition discussion from Strategy
Belgium	<p>There are separate definitions for the three regions: Brussels-Capital Region, Flemish Region, Walloon Region.</p> <p>Here, only the definition from the Brussels-Capital Region is provided as an example of the work undertaken already.</p> <p>In the Brussels-Capital Region, the Brussels Air, Climate and Energy Code (COBRACE) that will make the nearly zero energy buildings (nZEB) obligatory by 2021 (by 2019 for public buildings) passed second reading in July 2012 and is scheduled to come into force by the beginning of 2013.</p> <p>The definition written in the COBRACE uses the definition given by the Recast of the Energy Performance of Buildings Directive (2010/31/EU) i.e. “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”. The results of the study “Cost Optimum” that will be launched by the end of 2012 will be used to make this definition more specific.</p> <p>However, from 1st January 2015 onwards, all new buildings (housing, office or service buildings or schools) will have to be up to the Passive House standard that is to say the level of “nearly zero or very low energy consumption reached thanks to high energy performance” (nZEB definition). Its definition is the following (Government Decree of 5th May 2011 that passed first reading on 19th July 2012).</p>
Bulgaria	<p>The draft national definition of nearly zero-energy buildings in Bulgaria has been defined in accordance with the underlying principles of the correct formulation of the definition of nearly zero-energy buildings extrapolated at European level and takes into account its characteristics for Ministry of Regional Development and Public Works clearly defined targets and conditions, of technical and financial feasibility, flexibility and adaptability to local climatic conditions, of promoting innovative technologies, etc. (Principles for nearly Zero- Energy Buildings — published in 2011 by Buildings Performance Institute Europe).</p> <p>Bulgaria has definitions for three different buildings groups.</p>
Cyprus	<p>For Residential Buildings:</p> <p>Primary Energy Use: 180kWh/m²/yr</p> <p>The numerical indication above includes primary energy use for heating, cooling, lighting and domestic hot water.</p> <p>At least 25% of the 180kWh/m²/yr of the Primary Energy must be covered by RES</p>
Denmark	<p>Building Class 2020 has been prepared with the intention of being able to meet the Building Directive's requirements for nearly-zero energy buildings. Building Class 2020, which reduces the energy consumption of the building by 75 % in relation to the 2006 level, is introduced as a voluntary building class at a relatively early stage in the Building Regulations considering that the requirements for nearly</p>

	zero-energy buildings in the Building Directive with regard to publicly occupied and owned buildings and private buildings respectively, will not come into force until 31 December 2018 and 31 December 2020 respectively.
Finland	The aim of the structure of the new building regulations was that they make it possible to set a minimum level for renewable energy and to gradually shift towards nearly zero-energy construction.
France	Buildings of low consumption (BBC): New residential buildings are now designed and built to consume less than 50 kWh _{ep} / m ² / year considering the energy required for heating, cooling, domestic hot water, lighting and auxiliary systems. For renovated buildings: To be BBC, residential buildings undergoing a renovation should consume less than 80 kWh _{ep} / m ² / year considering the energy required for heating, cooling, domestic hot water, lighting and auxiliary systems.
Germany	The specific definition of the nearly zero-energy building standard is developed by the Federal Government with scientific support and having regard to economic considerations. In this regard, the focus is on the 'KfW efficiency houses' ³ , which are currently funded in Germany under the label of KfW Efficiency House 40, 55 and 70 (in the case of refurbishment, as KfW Efficiency House 55 and 70). The number indicates the amount of annual primary energy consumption (QP) in relation (%) to a comparable new building (reference building) according to the requirements of the Energy Conservation Regulation in force (EnEV2009). An Efficiency House 40, for example, does not use more than 40 % of the annual primary energy consumption (QP) of the corresponding reference building.
Ireland	It is an evolving definition. By 2020 all new dwellings in Ireland will have an Energy Performance Coefficient (EPC) and Carbon Performance Coefficient (CPC) of 0.302 and 0.305 in accordance with the common general framework set out in Annex I of Directive 2010/31/EU on the energy performance of buildings (recast). This takes account of the energy load for space heating, water heating, fixed lighting and ventilation. For a typical dwelling this will equate to 45 kWh/m ² /annum with a very significant proportion of which will be covered from renewable energy sources produced on-site or nearby.
Lithuania	Nearly zero-energy building means a building that has a very high energy performance established in accordance with the normative technical construction documents. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable resources, including energy from renewable sources produced on-site or nearby. In Lithuania, energy performance is unrelated to particular numerical value of energy consumption and is defined by the respective class of energy performance of the building. nearly zero-energy buildings are those that comply with the requirements of this Construction Technical Regulation for buildings of class A++ energy performance, i.e. buildings of very high energy performance with nearly zero-energy or very low energy consumption; most of the energy consumed is renewable energy, including renewable energy produced locally or nearby.



Netherlands	<p>In the Netherlands, the energy performance of a nearly zero-energy building is determined based on the NEN 7120 standard: Energy performance of buildings – Determination Method (EPB). The preliminary standard NVN 7125 District Energy Performance Measures (DEPM) may also be used.</p> <p>These determination methods have the following characteristics:</p> <ul style="list-style-type: none"> - Energy consumption is determined in standard utilisation and climate conditions; - Only building-specific energy consumption receives a specific value in the building's energy performance: district measures – if any – can be assessed using the EMG; - Energy generation may take place inside and outside the building; - Renewable energy sources are assessed; - Net energy consumption is determined over the course of a year.
Slovak Republic	<p>Act No 555/2012 provides a definition of nZEB, according to which they are buildings with very high energy performance. The almost zero or very small quantity of energy required in order to use these buildings must be secured with effective thermal protection and a high proportion of energy from RES in the buildings or their proximity.</p> <p>To achieve the nZEB parameters it is necessary to proceed from the acceptance and determination of three interrelated criteria:</p> <p>a) Reduction of specific heat demand for heating to a minimum. Such a criterion requires a quality design of the building's envelope construction and assumes the use of solar and internal gains.</p> <p>b) Reduction of primary energy consumption for heating, cooling, ventilation, domestic hot water and lighting. The criterion already requires the interconnection of construction and technology. It has an impact on the reduction of the expected consumption of fuels and other forms of energy and better describes the environmental impact of using the building.</p> <p>The expected reduction in primary energy demands of about 50 % has an impact on reduction of CO₂ and pollutant emissions.</p> <p>c) Significant coverage of the overall primary energy demands with renewable energy sources. Supply of energy from RES found in the building or its proximity should provide at least a 50 % reduction of primary energy.</p>
Sweden	<p>The Government's view: Given that the nearly zero-energy level will, from 2021, essentially be the legally binding level for energy economy requirements applied to all new buildings, a Swedish application of the term 'nearly zero-energy buildings' should include stricter requirements for energy economy in comparison with the requirements applying under current building regulations – in any case for most categories of buildings and climatic zones. There is not, at present, adequate information on which to base a quantified guideline for the extent of tightening-up that could be appropriate. Rather, this must be evaluated on a solid basis involving, amongst other things, an assessment of existing low-energy buildings, some demonstration projects for new energy-efficient buildings, economic analyses and so forth. Tightening-up must only take place when it is</p>

	<p>justified environmentally, socio-economically and from the point of view of real estate economics.</p>
<p>United Kingdom</p>	<p>UK application of the ‘nearly zero energy building’ definition:</p> <p>This definition does not mandate the inclusion of a very significant proportion of renewable energy. This is because the word “should” is used as a matter of Community legal practice, to signify an aspiration rather than an obligation.</p> <p>The UK Government already has a target for all new homes in England to be ‘zero carbon’ from 2016 and an ambition for all new non-domestic buildings in England to be zero carbon from 2019 (2018 for new public sector buildings).</p> <p>We consider that the approach we are adopting for zero carbon buildings will meet the definition of nearly zero energy buildings for the following reasons:</p> <ul style="list-style-type: none"> • although a range of low and zero carbon technologies will count towards meeting our zero carbon standard, we expect that in practice the policy will drive high levels of on-site renewables, for example heat pumps, photovoltaic panels etc; • similarly, we expect this to encourage the development of heat networks that, in the longer term, could be connected to renewable heat sources even if, in the short to medium term, gas combined heat and power is more prevalent; • we believe that low carbon technologies which are not classed as renewable still have a significant role to play in the aims of the Directive. Their use will significantly reduce the cost of building to high energy performance standards, while still achieving significant reductions in carbon emissions; • the building regulation standards for zero carbon buildings will take into account all of the energy uses covered by Annex I. This will be delivered through an energy efficiency standard covering space heating and cooling, with the remaining energy demand for fixed services being covered by the broader carbon emissions standards set in the regulations.

Annex 2: ecee 2013 summer study papers on nearly zero energy buildings

Paper No.	Authors	Title
5A-483-13	Professor Rajat Gupta, Matt Gregg and Rohini Cherian	Tackling the performance gap between design intent and actual outcomes of new low/zero carbon housing
5B-165-13	Hans Erhorn & Heike Erhorn-Kluttig	The age of positive energy buildings has come
5B-233-13	Bogdan Atanasiu et al	Nearly zero-energy buildings in Central and Eastern EU: Possible definitions and implementation roadmaps for Poland, Romania and Bulgaria
5B-315-13	Francesco Madonna and Franco Ravasio	Definition of nearly zero energy building and cost-optimal energy performance in 2020
5B-372-13	Klemens Leutgöb, Lorenzo Pagliano & Paolo Zangheri	Cost optimality – brake or accelerator on the way towards nearly zero energy buildings

Annex 3: Intelligent Energy Europe projects related to nZEB

Name ▼ ▲	Area ▼ ▲	End date ▼ ▲
"Energy Performance Indicator Tracking Schemes for the Continuous Optimisation of Refurbishment Processes in European Housing Stocks" (EPISCOPE)	EE + RES in Buildings	31/12/2013
"National Qualification Scheme for Construction Workers to Ensure High Performance Building Envelopes" (BUILD UP SKILLS QUALISHELL)	Build Up Skills	31/05/2015
"Nearly Zero-Energy Hotels" (NEZEH)	EE + RES in Buildings	31/12/2013
"PROMOTING RENOVATION OF SCHOOLS IN A MEDITERRANEAN CLIMATE UP TO NEARLY ZERO-ENERGY BUILDINGS" (ZEMEDS)	EE + RES in Buildings	31/12/2013
Affirmative Integrated Energy Design Action (AIDA)	EE + RES in Buildings	05/01/2015
Collaboration for Housing nearly zero-energy renovation (COHERENO)	EE + RES in Buildings	31/03/2016
Energy efficient and sustainable building in municipalities in European mountain (MOUNTEE)	EE + RES in Buildings	05/01/2015
Improve Skills and Qualifications in the Building Workforce in Cyprus (BUILD UP SKILLS WE-QUALIFY)	Build Up Skills	31/10/2016
NZB2021 'Doors Open Days' – sharing experiences from low energy buildings to meet nearly zero building standards by 2021 (NZB2021)	Buildings	31/03/2015
POWER HOUSE NEARLY ZERO CHALLENGE! (POWER HOUSE NZC)	EE + RES in Buildings	05/01/2015
Policies to enforce the transition to nearly zero energy buildings in the EU-27 (ENTRANZE)	EE + RES in Buildings	05/01/2015
Sustainable Energy for Rural Communities (SUSTAINCO)	EE + RES in Buildings	05/01/2015



References

BPIE, Implementing Nearly Zero Energy Buildings (nZEB) in Bulgaria, Towards a Definition and Roadmap, BPIE, August 2012

BPIE, Implementing Nearly Zero Energy Buildings (nZEB) in Poland, Towards a Definition and Roadmap, BPIE, August 2012

BPIE, Implementing Nearly Zero Energy Buildings (nZEB) in Romania, Towards a Definition and Roadmap, BPIE, August 2012

BPIE, Principles for nearly Zero Energy Buildings, BPIE, Brussels, November 2011

Laustsen, J. (2008). Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings. International Energy Agency (IEA)

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL Progress by Member States towards Nearly Zero-Energy Buildings, COM(2013) 483 final/2, October 2013

Ecofys, Politecnico di Milano and University of Wuppertal, Towards nearly zero-energy buildings, Definition of common principles under the EPBD, Final report, Report prepared for the European Commission, 2012