

# A GUIDEBOOK TO EUROPEAN BUILDING POLICY KEY LEGISLATION AND INITIATIVES



### **Authors**

Mariangiola Fabbri  
Jessica Glicker  
Senta Schmatzberger  
Arianna Vitali Roscini

### **BPIE review and editing team**

Roberta D'Angiolella  
Caroline Milne  
Barney Jeffries

### **External reviewers**

Paula Rey Garcia, Deputy Head of Unit, European Commission, Directorate-General for Energy, Energy Efficiency: buildings and products  
Dimitrios Athanasiou, Policy Officer, European Commission, Directorate-General for Energy, Energy Efficiency: buildings and products

### **Designer**

Ine Baillieul

Published in August 2020 by the Buildings Performance Institute Europe (BPIE).

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### **Supported by:**



Federal Ministry  
for the Environment, Nature Conservation  
and Nuclear Safety

of the Federal Republic of Germany

This publication was produced with the financial support of the European Union's Partnership Instrument and the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) in the context of the International Climate Initiative (IKI). The contents of this publication are the sole responsibility of Buildings Performance Institute Europe (BPIE) and do not necessarily reflect the views of the funders.

# CONTENTS

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<b>LIST OF ABBREVIATIONS</b>	<b>4</b>
<b>EXECUTIVE SUMMARY</b>	<b>5</b>
<b>INTRODUCTION</b>	<b>7</b>
<b>CLEAN ENERGY PACKAGE FOR ALL EUROPEANS</b>	<b>9</b>
Energy Efficiency Directive (EED)	10
Renewable Energy Directive (RED)	14
Governance Regulation (GR)	15
<b>THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD)</b>	<b>18</b>
Key principles for improving the energy performance of buildings in the EU (2002-2018)	18
Building renovation and decarbonisation of building stocks by 2050	25
Building modernisation	32
<b>EXISTING DATABASES ON EU BUILDING STOCK</b>	<b>35</b>
Building Stock Observatory (BSO)	35
National EPC databases	35
De-risking Energy Efficiency Investment Platform (DEEP)	37
Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU	37
<b>HAS THE EU LEGISLATION ON BUILDINGS ACHIEVED THE EXPECTED RESULTS?</b>	<b>39</b>
Bringing innovation to the market	40
Tools developed for EU stakeholders	41
Lessons learnt and best practices	42
Barriers and how to overcome them	44
<b>CIRCULAR ECONOMY FOR BUILDINGS</b>	<b>46</b>
Circular Economy Action Plan	46
Waste framework directive	48
<b>PRODUCT POLICY</b>	<b>49</b>
Energy labelling	49
Ecodesign Directive	51
<b>CONCLUSIONS</b>	<b>52</b>
<b>REFERENCES</b>	<b>53</b>
<b>AVAILABLE GUIDING DOCUMENTS</b>	<b>55</b>

# LIST OF ABBREVIATIONS

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BACS	Building automation and control systems
BSO	Building Stock Observatory
E1st	Efficiency First
EE	Energy efficiency
EED	Energy Efficiency Directive
EEO	Energy Efficiency Obligation
EIB	European Investment Bank
EPBD	Energy Performance of Buildings Directive
EPC	Energy performance certificate
GHG	Greenhouse gas
GR	Governance Regulation
IEA	International Energy Agency
LTS	Long-term strategy
LTRS	Long-term renovation strategy
NECP	National Energy and Climate Plan
PV	Photovoltaic
RED	Renewable Energy Directive
TBS	Technical building systems

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# EXECUTIVE SUMMARY

This document is intended to give the reader a sound overview of the key elements of European legislation with regards to building policy.

European building policy has been under development since the 1990s. Under the leadership of the European Commission building standards and policies have gradually improved, taking into account issues such as financing solutions, renewable energies, indoor environmental quality, and the alleviation of energy poverty. The guide focuses on the key EU legislation aimed at transforming and decarbonising the European building stock. This includes:

- The Clean Energy Package for all Europeans – a comprehensive set of legislation that defines European climate and energy policy beyond 2020. The Energy Performance of Buildings Directive (EPBD), the Energy Efficiency Directive (EED) and the Renewable Energy Directive (RED) cover the main issues regarding building policies on a European level.
- A new Circular Economy Action Plan (CEAP) was adopted in March 2020. It includes measures that will help stimulate Europe's transition towards a circular economy and encompasses the entire life cycle of products and key value chains, including construction and buildings.
- EU energy product policy. Since 1994 the EU has been working on making products more energy-efficient and environmentally friendly. The Energy Labelling Directive aims at providing a clear and simple indication of the energy efficiency of products at the point of purchase. The Eco-Design Directive complements this by improving the environmental performance of products by setting mandatory energy efficiency standards and eliminating the least strongly performing products from the market.

The EU has set itself the goal of improving energy efficiency by 32.5% by 2030 and reaching a decarbonised building stock by 2050. This can only be done by setting milestones underpinned by targeted measures, and providing dedicated funding streams that help to achieve the specific policy targets. The National Energy and Climate Plans (NECP), which are closely interlinked with national long-term renovation strategies (LTRS), must provide this information and outline how Member States plan to reach their climate and energy targets.

The European legislation covers and connects a range of topics to support high performance and decarbonisation of the building stock. These include the calculation of the energy performance of buildings, energy performance certificates, metering of energy consumption and building automation, but also the split-incentive dilemma and the alleviation of energy poverty, which have a clear social impact.

Financing for building renovations has been gaining increasing interest from Member States, the European Commission and financial institutions, as appropriate financing streams and well-tailored financing mechanisms are essential to speed up the rate of deep renovations, therefore contributing to the achievement of the 2030 and 2050 targets. The European Commission has launched a number of financing initiatives like Smart Finance for Smart Buildings (SFSB), and has introduced requirements to increasingly tie financial support to energy performance achievements.

In addition to legislation, the EU has also adopted a series of initiatives to support Member States, increase knowledge about EU building stock, and monitor its progress over time: the Building Stock Observatory (BSO) collects data on all building typologies across the EU; while national databases on energy performance

certificates are meant to provide up-to-date information on the performance of buildings sold, rented or which have undergone major renovations. LTRS and NECP also provide data on national building stock. This can help to assess the achievement of goals, compare different countries and building types, and monitor the effectiveness of policies and financial instruments.

At the end of 2019, the European Commission presented the European Green Deal with the goal of “putting the EU on a pathway towards climate neutrality by 2050 and to address environmental related challenges, while transforming the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy” [3]. In this framework, building renovations are seen as a key tool to reduce emissions and provide a healthy and affordable living and working environment for all. As a follow-up to the Green Deal, the European Commission is expected to publish the Renovation Wave, a strategic communication, in the third quarter of 2020 with the aim of boosting the rate of building renovation in the EU.

In May 2020, as a response to the Covid-19 pandemic and with the aim of helping the EU economic recovery, the European Commission presented a recovery plan for Europe which will provide an additional €750 billion from 2021 to 2024 and is intended to support the green transition to a climate-neutral economy. The combination of policies and financing instruments in the European Green Deal, the Renovation Wave and the recovery plan are a chance for governments, companies and citizens to transform Europe’s buildings into a clean, healthy and affordable stock by 2050.

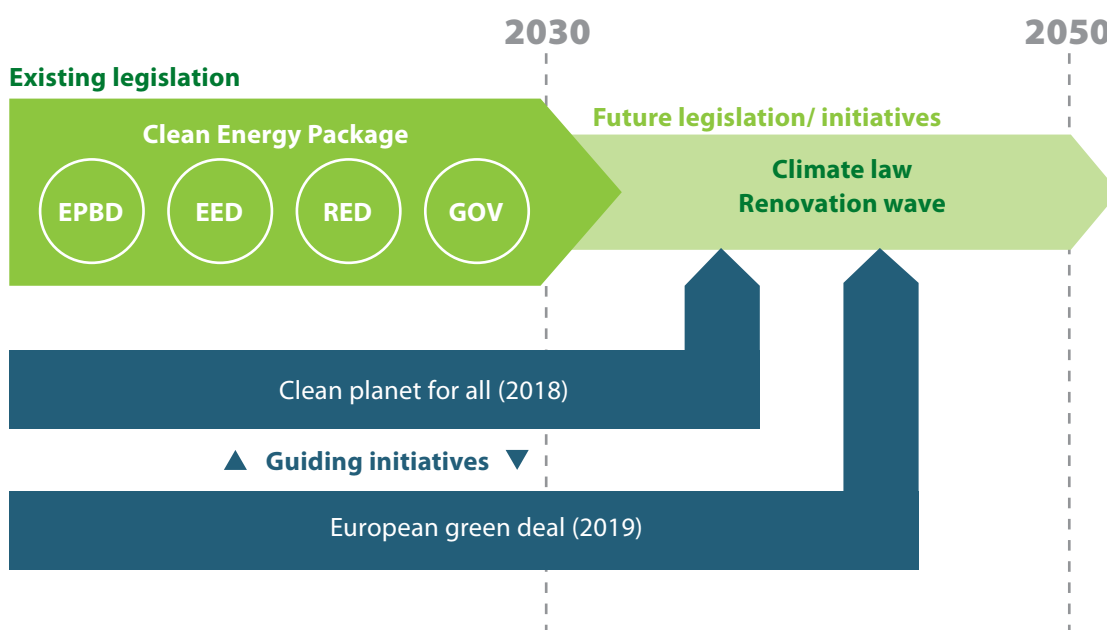
# INTRODUCTION

Buildings are responsible for approximately 40% of the energy consumption and 36% of the CO<sub>2</sub> emissions of the EU. On average Europeans spend 90% of their time indoors, and the quality of the indoor environment affects health and wellbeing. Two-thirds (65%) of Europe's building stock was built before 1980: about 97% of the EU's buildings must be upgraded to achieve the 2050 decarbonisation goal [1], but only around 1% are renovated each year. Buildings have the potential to drive flexibility in the energy system, through energy production, control, storage and demand response, as well as green charging stations for electric vehicles; but this can only happen if a systemic upgrade of the building stock is achieved. A highly efficient, technically equipped and smarter building stock could be the cornerstone of a decarbonised energy system. EU legislation provides a clear framework for Member States to support the implementation of this interconnected system.

The Directive on Energy Performance of Buildings (EPBD) is the cornerstone of European legislation for transforming the building sector. The EPBD was adopted in 2002, recast in 2010, and amended in 2018 (2018/844/EU). The recent amendments to the EPBD, which are part of the Clean Energy Package for All Europeans<sup>1</sup>, set a clear direction for the full decarbonisation of Europe's building stock by 2050. It provides a clear goal for EU Member States as well as the tools to achieve it.

Together with the EPBD, the Clean Energy Package addresses some of the existing regulatory gaps in building legislation and tries to create a supporting framework for decarbonising the EU building sector by mid-century. It also contributes to achieving the EU's commitments under the 2015 Paris Agreement on climate change.

**Figure 1 - European Climate and Energy Legislation and Initiatives** (Source: BPIE)



<sup>1</sup> <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans>

In March 2020 the European Commission published a proposal for Europe's first Climate Law [2], which was announced along with the European Green Deal. With specific regard to buildings, the European Green Deal [3] announces a Renovation Wave of the building stock to improve energy efficiency while ensuring affordability for EU citizens. Several associated impacts of such an initiative – which are highlighted in the communication – are to lower energy bills, reduce energy poverty, boost the construction sector and support local jobs. The publication of the Renovation Wave communication strategy is expected in September 2020.

Two decades of EU policy experience in the building sector, and the diverse policy approaches taken by EU Member States to implement European legislation, result in a wide array of experiences and policy innovations: lessons learnt in the EU can inform policy-making in most G20 countries independently from their building stock growth, renovation rate and climatic conditions.

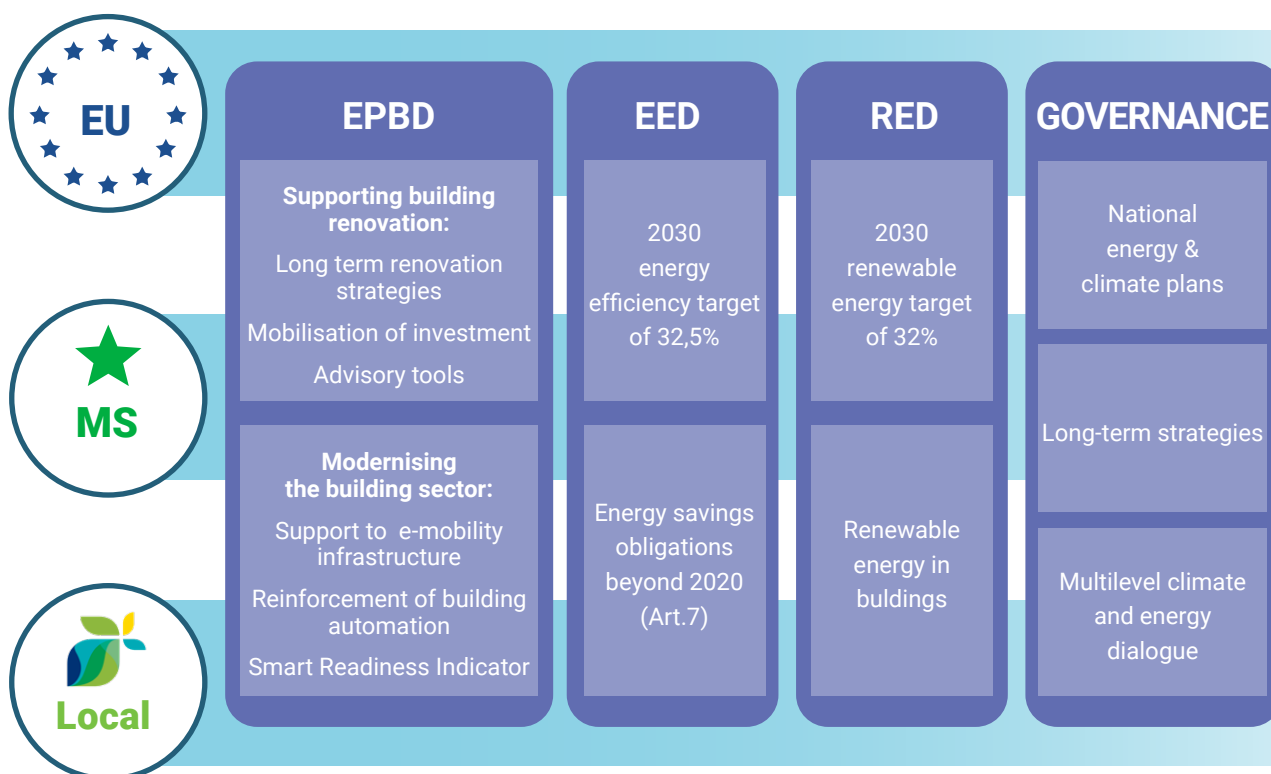
This guide provides an overview of EU building policies, with a focus on the Energy Performance of Buildings Directive (EPBD) and Clean Energy Package for all Europeans.



# CLEAN ENERGY PACKAGE FOR ALL EUROPEANS

The Clean Energy Package for all Europeans is a comprehensive set of legislation that defines European climate and energy policy beyond 2020. It is composed of eight regulatory initiatives aimed at accelerating the energy transition in Europe, including the EPBD<sup>2</sup>. Its implementation will affect many areas, including national long-term planning, reducing greenhouse gas emissions, electromobility, consumers' rights, and producing renewable energy on-site.

**Figure 2 - Clean Energy Package elements related to buildings** (Source: BPIE)



The Clean Energy Package addresses some of the existing regulatory gaps in building legislation and tries to create a supporting framework for decarbonising the building sector in the EU by mid-century. It also contributes to achieving the EU's commitments under the 2015 Paris Agreement on climate change. This section analyses some of the most important changes brought by current legislation that will influence building renovation policy in the coming decades. It will focus on three core components beyond the EPBD, which will be explained in more detail in the next chapter.

<sup>2</sup> The Clean Energy Package addresses energy performance of buildings, energy efficiency, renewable energy, the design of the electricity market (including electricity regulation, amendments to the Electricity directive, risk preparedness, a regulation outlining a stronger role for the Agency for the Cooperation of Energy Regulators) and governance rules for the Energy Union. See: <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans>

## ENERGY EFFICIENCY DIRECTIVE (EED)

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The Energy Efficiency Directive (EED)<sup>3</sup> sets the overarching legal framework for energy efficiency policy in the EU. It came into force in 2012, establishing measures to achieve a 20% energy efficiency target by 2020. Its 2018 revision sets a 32.5% energy efficiency target for 2030 and extends the lifespan of one of its core provisions, the ‘energy savings obligation’, beyond 2020. The EED also includes an important provision targeting government buildings: Member States are required to renovate 3% of the total floor area of heated and/or cooled buildings owned or occupied by central governments each year, in line with at least minimum energy performance requirements.

Both the overall 2030 energy efficiency target and the annual energy savings objective of the energy savings obligation will also be achieved through energy savings in the buildings sector.

### *An EU-wide objective to save energy by 2030*

The EED establishes a headline energy efficiency target of at least 32.5%, to be achieved collectively across the EU. The 32.5% is a reduction in primary and/or final energy consumption compared to energy projections, and means that the EU should not consume more than 1,273 Mtoe of primary energy and/or no more than 956 Mtoe of final energy in 2030 [4].

The European Commission maintains the ability to revise this target upwards in 2023 to achieve the EU’s decarbonisation commitments or in case of significant cost reductions resulting from technological development. The 2030 efficiency target is non-binding and its achievement relies strongly on the savings resulting from the implementation of EU legislation, including the EPBD, and national measures.

To achieve the EU target, Member States must establish their national energy efficiency contribution (i.e. their share of the EU headline target) and communicate this to the European Commission within their National Energy and Climate Plans. When establishing their contributions, Member States can focus national actions on the sectors with the highest energy savings potential, including the buildings sector.

After an initial steady decrease in final energy consumption between 2007 and 2014 (which was partly due to the economic recession), energy consumption in the EU started increasing again, largely due to low oil prices and cold winters. In 2017 primary energy consumption was 5.3% above the 2020 target. The European Commission set up a task force in 2018 to suggest measures which could help meet the goal for 2020. This task force has been closely monitoring the progress made by Member States and has made suggestions for measures on national levels [5].

The ambition of the overall EU energy efficiency target and of the national contributions have a direct impact on the ambition of national renovation policy: the higher the targets, the more stringent the measures Member States must adopt to reduce energy consumption in the buildings sector. Given that buildings account for 40% of energy consumption and 75% of them are inefficient, there is significant potential<sup>4</sup>.

### *Energy savings obligation*

The energy savings obligation (EED Article 7) is one of the cornerstones of EU energy efficiency policy. It requires Member States to save a certain amount of energy annually by establishing an energy efficiency

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<sup>3</sup> Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2018.328.01.0210.01.ENG&toc=OJ.L:2018:328:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0210.01.ENG&toc=OJ.L:2018:328:TOC)

<sup>4</sup> [https://ec.europa.eu/energy/sites/ener/files/documents/buildings\\_performance\\_factsheet.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/buildings_performance_factsheet.pdf)

obligation scheme or by adopting alternative measures that achieve the same effect. If Member States choose the first option, the obligated parties under the scheme (for example energy companies) will need to achieve the required savings by implementing energy efficiency measures mainly on their customers' premises, for example through building renovations or switching to more efficient lighting. If Member States choose the second option, they must put in place measures – such as financing schemes, fiscal incentives and energy or carbon taxes – to achieve the required amount of savings. A combination of the two options is also possible.<sup>5</sup>

With the revised EED, this crucial provision has been extended beyond 2020, as the original Article 7 stipulated that the measure would be in force only for the period 2014-2020. In addition, it sets a new annual energy savings target of 0.8% new savings per year for the 2021-2030 period, calculated on annual final energy consumption. In the period 2014-2020 this target was set at 1.5% per year, but the delivered savings amount to only about half the target as several exemptions were allowed. Therefore, the targets of the two periods are comparable in terms of savings to be achieved.<sup>6</sup>

If well implemented, energy saving obligations can contribute substantially to improving energy efficiency in the EU building stock. To ensure building renovations are incentivised, the energy savings obligation scheme and alternative measures can be designed to favour energy savings from measures with a long lifetime.<sup>7</sup>

The directive also clarifies which savings from buildings can be counted: Annex V states that savings related to the renovation of existing buildings can be claimed as long as it can be demonstrated that they are the result of a specific direct action of a recognised actor, such as a public implementing authority<sup>8</sup>. This clarification aims at encouraging building renovations and accounting for measures which deliver additional renovations, both in terms of numbers and savings achieved (rate and depth of renovation). Savings resulting from the construction of new buildings cannot be claimed for the post-2020 period.

### ***Tackling energy poverty***

The amended EED also requires Member States to implement measures addressing vulnerable households, including those affected by energy poverty, and where appropriate social housing<sup>9</sup>. Prioritising energy efficiency renovations in those households would ensure that the energy savings obligations also contribute to improving the living conditions of EU citizens.

### ***Split-incentive dilemma***

One major barrier to implementing renovation measures in rented buildings is the split-incentive dilemma. This means that the one who is responsible for implementing and paying for efficiency measures is not always the one who benefits from them. For example, tenants benefit from lower energy costs and higher comfort after a refurbishment, but they are normally not the ones who have to pay for it.

This dilemma has to be addressed in long-term renovation strategies by outlining measurable, targeted

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<sup>5</sup> According to the European Commission staff working document evaluating the implementation of EED Article 7, four Member States are using the energy efficiency obligation only, 12 Member States have chosen to implement alternative measures and 12 Member States use a combination of both. See for more details [https://ec.europa.eu/energy/sites/ener/files/documents/3\\_en\\_autre\\_document\\_travail\\_service\\_part1\\_v3.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/3_en_autre_document_travail_service_part1_v3.pdf)

<sup>6</sup> For more detailed information about the changes brought by the Revised EED to Article 7, see the Coalition for Energy Savings publication: [http://energycoalition.eu/sites/default/files/20190222\\_TheCoalitionForEnergySavings\\_EED\\_Article\\_7\\_New\\_period\\_new\\_savings.pdf](http://energycoalition.eu/sites/default/files/20190222_TheCoalitionForEnergySavings_EED_Article_7_New_period_new_savings.pdf)

<sup>7</sup> According to analysis performed in 2016, energy savings in the buildings sector were likely to account for 42% of the expected savings under Article 7 [46].

<sup>8</sup> European Commission, 'ANNEX to Commission Recommendation on transposing the energy savings obligations under the Energy Efficiency Directive', C(2019) 6621 final, 2019. [Online]. Available: [https://ec.europa.eu/energy/sites/ener/files/documents/c\\_2019\\_6621\\_-\\_annex\\_com\\_recom\\_energy\\_savings.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/c_2019_6621_-_annex_com_recom_energy_savings.pdf)

<sup>9</sup> Social housing: Houses and flats that are owned by local governments or by other non-profit organizations, and that are rented to people who have a low income.

and affordable actions, such as rules for dividing or recovering some of the costs or making sure these groups have access to financing instruments. Minimum energy performance standards for rental properties could be a solution to this dilemma, and Member States should consider introducing them in order to spur the renovation of buildings.

### ***Metering and billing***

Metering and billing have been identified as key issues for improving efficiency in buildings and involving consumers and tenants in the energy savings process. The EED requires Member States to adopt transparent, publicly available national rules on the allocation of the costs accumulated in multifamily buildings (previously it was only a suggestion). The EED also contains clearer requirements for more useful and complete billing information based on climate-corrected consumption data. This encompasses information on the related energy mix and greenhouse gas emissions, as well as on available complaints procedures or dispute resolution mechanisms in the country.

The EED introduces the remote reading of water meters, heat meters and heat cost allocators as the new standard for new buildings. From 2027, this will apply to all existing devices. By then, all meters must be replaced or retrofitted. Following the implementation of this provision, users in buildings with such infrastructure can request quarterly information on their consumption.

When transposing the rules on metering and billing, Member States can take into account their national circumstances, such as climatic conditions, tenancy and property ownership, and building stock [6].

### ***Energy audits***

Energy audits can serve as a tool to assess the current energy consumption of a building and provide a list of measures to reduce it. They should provide concrete proposals for management, public authorities and homeowners on which measures to implement for reaching a certain amount of energy savings. For large companies they have to be conducted every four years. This can be a useful tool to overcome barriers to energy saving measures.

Member States are required to establish clear and transparent criteria for energy audits and energy auditors and promote the availability of these to all final energy consumers. National programmes should be put in place, in order to raise awareness in households as to which benefits energy audits and energy savings have.

For the building sector, the EPBD requires financial support to be linked to targeted or achieved energy savings; those savings can be documented by different tools, including with an energy audit.

### ***Procurement of public buildings***

The public sector has an important role in providing leadership on energy efficiency in the EU. The EED provisions on public procurement note that governments are required to purchase the most energy-efficient products, services and buildings in line with other EU legislation such as the Energy Labelling Directive and the Eco Design Directive. Member States' governments should use new business models and technologies in order to promote and facilitate the uptake of energy efficiency measures, including innovative energy services for large and small customers.

### ***Energy performance contracting***

Energy performance contracts are one of the main mechanisms to deliver energy savings with third-

party financing, and are therefore considered an essential instrument in the energy transition. An energy performance contract is a contractual agreement between an end-user and an energy service provider with an agreed financing term and repayment agreement and energy savings guarantee. Energy performance contracts can cover a wide range of energy saving measures, including (but not limited to) boiler and chiller systems, lighting, HVAC, roofing, insulation, windows and building management systems.

Energy service companies (ESCOs) design, install, and in some cases finance energy efficiency projects through a contractual agreement with the energy-using customer, usually using an energy performance contract. In 2017 the terms under which the loan for an EnPC are accounted for were clarified by the European Commission in a Eurostat guidance note [7]. Previously when a public authority entered into an energy performance contract, the energy efficiency investment was counted on their balance sheet; this was problematic because it raised their debt and created a liability. The new Eurostat rules now allow public authorities to count energy performance contracts off their balance sheet; this change makes it easier for public authorities to renovate their buildings using energy performance contracts.

## RENEWABLE ENERGY DIRECTIVE (RED)

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The Renewable Energy Directive (RED)<sup>10</sup> covers the overall policy for the production and promotion of energy from renewable sources in the EU to achieve its 2030 renewable energy target. Reduction of energy consumption through energy efficiency measures and renewable energy production are mutually supportive. One of the aims of the Clean Energy Package is to establish a combination of energy efficiency measures and renewable solutions to reduce energy consumption, increase energy efficiency and increase renewable energy penetration (therefore also reducing GHG emissions). Reducing energy consumption facilitates the increase of the renewable share in the energy mix as a smaller amount of energy is needed to cover the overall demand.

### *A 2030 renewable energy target of 32%*

In 2009, the Renewable Energy Directive (RED) established a binding EU target of 20% renewable energy in final energy consumption for 2020, with national binding targets for EU Member States. The target was revised in 2018: RED now includes a binding EU 2030 target of at least 32%, giving the Member States the freedom to set their own national targets, which will be reported in the NECPs. The risk with this is that depending on the targets reported by each Member State it is not certain that an overall 32% reduction will be achieved, and therefore some Member States will have to increase their ambition. To this end, the Governance Regulation (GR) foresees a “gap filler” mechanism: Member States that don’t reach their reference points for their renewable share have to cover the gap through measures at national level. For the efficiency target the measures will be implemented at the EU level. The target must be calculated on gross final energy consumption, covering renewables in all sectors from industry to households, and delivered by different carriers.

As with the EED, the European Commission maintains the right to revise this target upwards in 2023 in case of significant cost reductions resulting from technological development, to achieve the EU’s decarbonisation commitments, or in case of a significant decrease in energy consumption. This last point clearly shows the interactions between the energy efficiency and renewable energy targets: the successful implementation of energy consumption reduction measures (via the EED and EPBD) could lead to an achievement of the renewables target with little additional renewables deployment. It would require an increase of the renewables target to steer additional action and achieve decarbonisation through increased renewable supplies across the EU.

### *Renewable energy in buildings*

Integrating renewable energy solutions in buildings – such as solar water heaters, heat pumps or renewables-based district heating and cooling – is essential for reducing the sector’s greenhouse gas emissions, and is best done when planned in conjunction with building renovations. There are several provisions in the RED that aim to strengthen these synergies or that will have a clear effect on building renovation policy. These include the following:

- Member States must ensure that qualified authorities at national, regional and local levels include measures facilitating the deployment of renewables when carrying out spatial planning and when building or renovating urban infrastructure and commercial or residential areas.
- Member States must introduce appropriate measures in their building regulations and codes to

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<sup>10</sup> Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources

increase the share of renewable energy in the building sector. For example, they must introduce a minimum level of energy from renewable sources in both new buildings and buildings undergoing major renovations in their building regulations and codes.

- Member States should aim to increase the share of renewable energy in heating and cooling by an indicative 1.3% per year between 2020 and 2030. This could have a positive effect on accelerating building renovations as increasing penetration of renewable energy sources through district heating or heat pumps requires very low energy buildings and a joint planning approach between supply side and demand side measures.

### **Renewable energy communities**

The RED has brought some legal clarity and enforcement for citizens' energy projects which are involved in producing, storing or consuming renewable energy. Member States need to ensure that citizens (through renewable energy communities) can participate in support schemes and that they enjoy a level playing field with other energy actors. To that end, Member States should be allowed to take measures such as providing information, technical and financial support, reducing administrative requirements, including community-focused bidding criteria, creating tailored bidding windows for renewable energy communities, or allowing renewable energy communities to be remunerated through direct support where they comply with requirements of small installations. Moreover, Member States are invited to establish targets for self-consumed energy generation, providing a basis for more extensive citizen energy projects within energy communities.

## **GOVERNANCE REGULATION (GR)**

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The Governance Regulation (GR)<sup>11</sup>, first established in 2018, sets the framework for cooperation between the EU and its Member States on climate and energy policy. The overall aim is to facilitate the achievement of EU objectives, the 2030 climate and energy targets, and the obligations under the UN Framework Convention on Climate Change and the Paris Agreement.

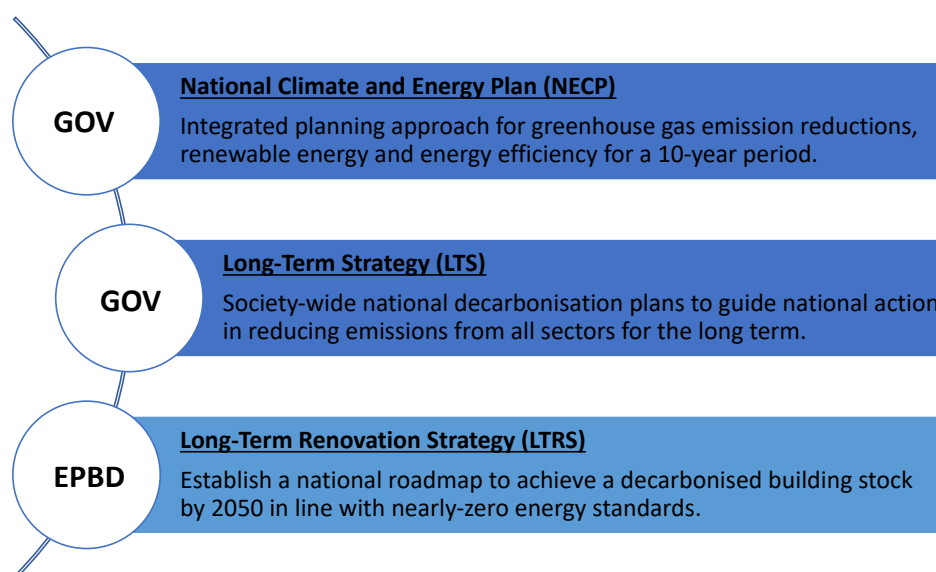
### **Governance system**

The GR introduces a new transparent and dynamic process to help deliver the objectives of the Energy Union, including the 2030 climate and energy targets, in an efficient and coherent manner. Under this new governance system, EU Member States are required to develop integrated NECPs for the period 2021-2030 and create national long-term strategies to decarbonise their economies by 2050 (those were due on 1 January 2020).

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<sup>11</sup> Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

**Figure 3 - EU Member State reporting obligations under the Clean Energy Package** (Source: BPIE)



### ***National Energy and Climate Plans (NECPs)***

NECPs are based on an integrated planning approach for greenhouse gas emission reduction, renewable energy and energy efficiency for a 10-year period.

The first NECPs cover the period from 2021 to 2030, and the GR establishes a binding template that Member States must follow when preparing their plans. Member States had to submit their final plans by 31 December 2019, following a public consultation and the submission of a first draft to the European Commission.

The NECP template covers the five dimensions of the Energy Union: decarbonisation, energy efficiency, energy security, internal market, and research & innovation and competitiveness. Buildings policy is a key component of the NECP, particularly of its energy efficiency dimension. When setting their national objectives and targets for energy efficiency in their NECPs, Member States must outline the indicative milestones, evidence-based estimates of the expected energy savings and wider benefits in line with the requirements of the LTRS under the EPBD. The LTRS is part of the NECPs but for its first version there was a derogation allowing Member States to submit their LTRS at a later date (10 March 2020). They also must include the total floor area to be renovated (or equivalent savings) in line with the obligation under the Energy Efficiency Directive to renovate 3% of the total floor area of heated and cooled buildings owned and occupied by the central government every year.

### ***National long-term strategies***

The GR also required Member States to develop a long-term strategy (LTS) by 1 January 2020. This strategy is a society-wide national decarbonisation plan to guide national action in reducing emissions from all sectors for the long term (covering a period of at least 30 years). The LTS must show how Member States plan to cut their greenhouse gas emissions to contribute to the objectives of the Paris Agreement and to a highly energy-efficient and highly renewables-based energy system in the EU.



With buildings-related emissions accounting for more than a third of the EU total, Member States must address both reductions in heating and cooling and in the buildings sector (residential and tertiary) in their strategies. They must consider the links with other national long-term objectives and planning.<sup>12</sup>

The European Commission has since proposed that the EU should achieve net-zero emissions by 2050 in its proposal for a Climate Law. If this is adopted through ordinary legislative procedure, this objective will need to be reflected in the updated LTS in 2025.

**Figure 4 - Summary of the respective timelines** (Source: BPIE, adapted from BuildUpon<sup>3</sup>)

	NECP	LTS	LTRS
Directive/ Regulation	GR	GR	EPBD
Focus	Integrated planning approach for greenhouse gas emission reductions, renewable energy and energy efficiency for a 10-year period – INCLUDES LTRS.	<b>Society-wide national decarbonisation plans to guide national action in reducing emissions from all sectors for the long term by 2050.</b>	<b>Establish a national roadmap to achieve a decarbonised building stock by 2050 in line with nearly-zero energy standards.</b>
Due	31 December 2019	<b>1 January 2020</b>	<b>10 March 2020</b>
Update	30 June 2024	<b>1 January 2025</b>	<b>30 June 2024</b>
New	1 January 2029	1 January 2029	1 January 2029

### **The Energy Efficiency First principle**

Energy Efficiency First (E1st) principle establishes that Member States should consider, before taking into account energy planning, policy and investment decisions, whether cost-efficient, technically, economically and environmentally sound alternative energy efficiency measures could replace policy and investment measures while still achieving the objectives of the respective decisions<sup>13</sup>.

The definition of the principle is included in article 2 of the Governance Regulation, and Member States are required to take it into account when designing their NECPs.

### **Multilevel climate and energy dialogue**

In addition to the public consultation requirements, the GR also recognises the importance of a constant dialogue with different stakeholders on climate and energy policies to increase their public acceptance. Member States must set up a multilevel climate and energy dialogue with relevant stakeholders to discuss different scenarios for climate and energy policies, including long-term aspects. Local authorities, civil society organisations, the business community, investors and the general public are explicitly mentioned as actors to be involved in this dialogue.

<sup>12</sup> When developing their LTS, Member States must follow the requirements of Article 15 and Annex IV of the GR; Annex IV, unlike Annex I for NECPs, is not a binding template.

<sup>13</sup> Art 2(18) Governance Regulation

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# THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD)

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The EPBD serves as the primary legislation guiding building construction and renovation in the EU to enhance building performance and efficiency in order to achieve the 2030 and 2050 energy targets. The directive was adopted in 2002, recast in 2010, and amended in 2018. The latest amendments to the directive set a clear direction for the full decarbonisation of EU building stock by 2050, with an increased emphasis on building renovation and modernisation. This goal, accompanied by a roadmap and suggested measures to achieve that vision with national long-term renovation strategies, should be the driver for increased renovation activities in the EU. The revision processes introduced changes and updates to several key topics, which are the focus of this chapter.

## KEY PRINCIPLES FOR IMPROVING THE ENERGY PERFORMANCE OF BUILDINGS IN THE EU (2002-2018)

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This chapter provides an overview of the key principles established over time – e.g. energy performance certificates (EPCs), a highly efficient and decarbonised building stock, and cost-benefit analyses. Examples of how Member States implemented them – with cases from Belgium, Italy, Poland, Denmark, France, Lithuania and Ireland – are included for clarification.

### *Energy performance certificate (2002) informing citizens and businesses*

Introduced in 2002, EPCs are now commonly used across Europe. Under the EPBD, Member States must establish the necessary measures to create a system of certification of the energy performance of buildings. EPCs are a useful information tool for citizens, the real estate market and for policymaking. They must be issued by independent energy experts.

An EPC must include the energy performance of a building and reference values such as minimum energy performance requirements in order to make it possible for owners or tenants of the building or building unit to compare and assess energy performance. They also include information on how to improve the performance of the building. EPCs may include additional information such as the annual energy consumption and the percentage of energy from renewable sources in the building's total energy consumption. EPCs have proven to be a useful market tool, but their usability should be increased, for example by determining a link with financial measures for renovation proposed by Member States, as established by the directive's revised Article 10 on financial incentives and market barriers.

### ***Obligation to issue and display EPC when rented or sold***

Member States shall ensure that an EPC is issued for:

- a. Buildings or building units which are constructed, sold or rented out to a new tenant; and
- b. Buildings where a total useful floor area over 250 m<sup>2</sup> is occupied by a public authority and frequently visited by the public.

The directive also established the obligation to display the energy performance indicator of the EPC in advertisements.

The recent amendment to the EPBD established that:

- Member States should provide information to owners and tenants on the purpose and objectives of EPCs, energy efficiency measures and supporting financial instruments through accessible and transparent advisory tools such as direct advice and one-stop-shops.
- Databases should assemble information on energy consumption of buildings from EPCs, at least from public buildings that have one. This data (when aggregated and anonymised) should be made available for statistical and research purposes and to the building owner. While it is not compulsory to set up a database for registering EPCs, 24 Member States have set up a system to collect EPC data voluntarily and two others have a database under development<sup>14</sup>. EPC databases could be further developed and used as a source for data collection on buildings which could feed into existing European databases.
- The European Commission will assess the feasibility of introducing an optional building renovation passport<sup>15</sup>. Following this, introduction of such schemes could be required or encouraged, but there is no legal expectation.

### ***Examples from EU Member States***

#### ***Portugal***

In Portugal the EPC is a document presenting the energy efficiency of buildings on a scale of A+ to G, where A+ corresponds to the most efficient performance and G to the worst. All homes bought, sold or rented in Portugal require an EPC. The main body of EPCs for residential buildings provides the following elements:

- Size of the building
- The quality of the envelope components based on a simple grading system, showing the score for thermal insulation for walls, roofs, floors and windows
- An illustration of the building's heat losses
- A list of recommendations of potential measures selected by the energy expert from a predefined list and supplemented with open text. The EPC can display up to 10 potential measures with detailed information on the technical description, the necessary investment and the benefits coming from the implementation of each measure
- Comparison of the building's performance with the market average.

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<sup>14</sup> For examples, please see sub chapter 'National EPC databases' p. 28.

<sup>15</sup> Definition: "an optional building renovation passport that is complementary to the energy performance certificates, in order to provide a long-term, step-by-step renovation roadmap for a specific building based on quality criteria, following an energy audit, and outlining relevant measures and renovations that could improve the energy performance." (EPBD Directive 2018/844/EU Article 19a)

Figure 5 Snapshot of Portuguese EPC (Source: iBROAD Factsheet Portugal [3])



The random compliance checks of the EPC consist of two approaches: basic and more detailed. The basic approach includes an automatic check of the data inserted in the EPC registry, followed by a simple verification of the basic methodologies. The more detailed check comprises a full-data review of calculations and an on-site visit, to test compliance with requirements and methodologies. The compliance checks are performed on a random sample of EPCs.

Public and private software tools – which must follow the national algorithm and technical standards – are available for energy performance calculations. Nevertheless, the most common tools are Excel spreadsheets [8].

### Nearly zero-energy buildings (nZEBs) definition and timing of implementation (2010)

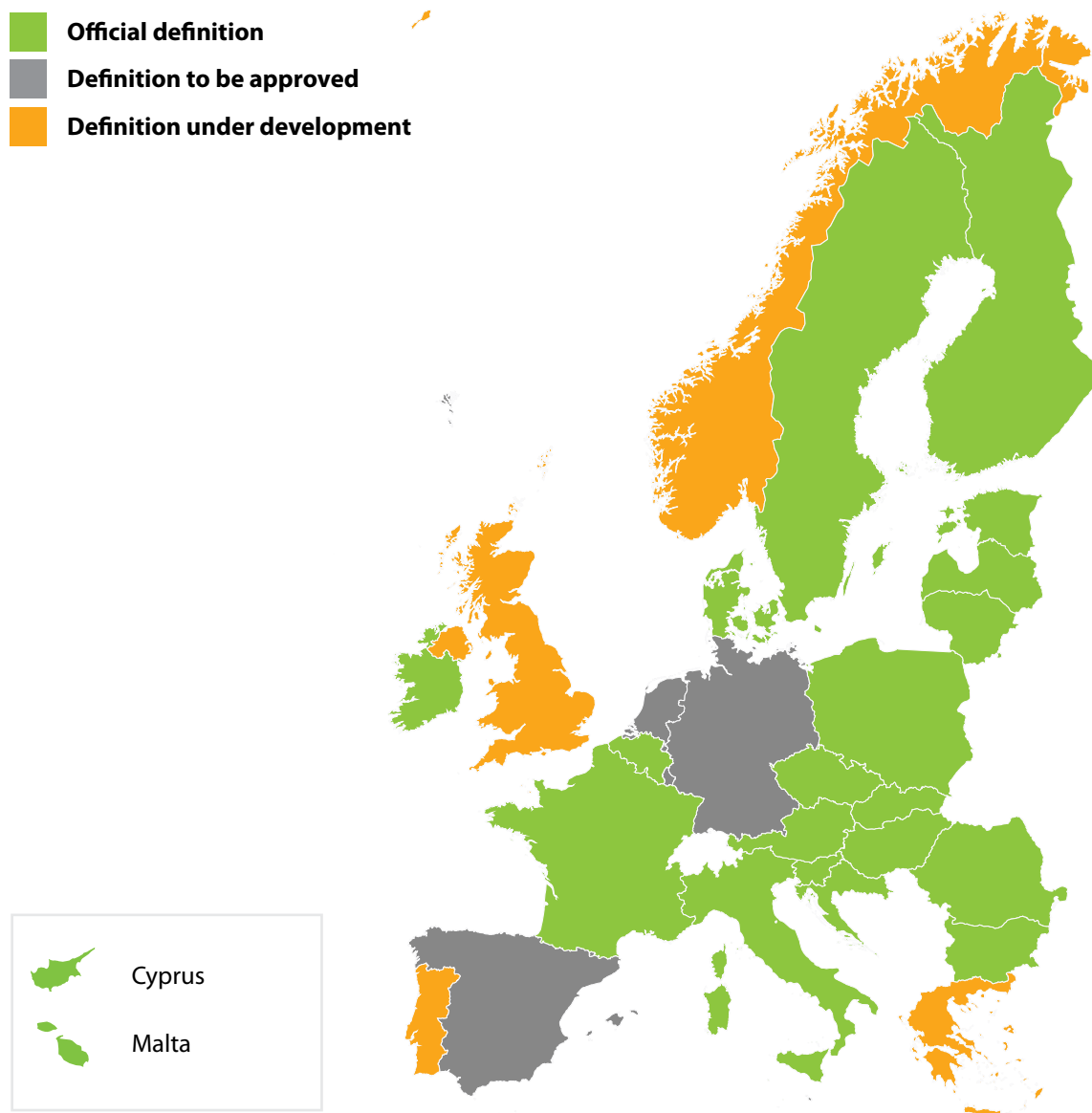
A nearly zero-energy building (nZEB) is a building that has a very high energy performance, as determined in accordance with Annex I of the EPBD (which outlines a common general framework for the calculation of energy performance of buildings). The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced not only on-building but also nearby.

The EPBD requires Member States to ensure that:

- a. All new buildings must be nZEBs from **31 December 2020**; and
- b. After **31 December 2018**, new buildings occupied and owned by public authorities are nZEBs.

Acknowledging the variety in building types and climate throughout the EU, the EPBD does not prescribe a detailed EU-wide definition of nZEB, but leaves Member States free to adopt the detailed application of the nZEB definition. The EPBD requires Member States to draw up specifically designed national plans for increasing the number of nZEBs reflecting national, regional or local conditions. The national plans include practical and applicable measures to steadily increase the number of nZEBs.

**Figure 6 - nZEB definitions by country** (Source: CA EPBD nZEB Factsheet)



The implementation of nZEBs as the current building standard for new public buildings, and from the end of 2020 for all new buildings, represents one of the biggest opportunities to maximise energy savings and minimise greenhouse gas emissions for new buildings. It could also help to accelerate the deployment of nZEB-ready technologies in the renovation of existing buildings.

In order to ensure successful implementation of the nZEB standard across Europe, a proper monitoring mechanism needs to be implemented by Member States in combination with sanctions for buildings not meeting the new standards. This – in combination with support mechanisms and clear-cut data provision on how nZEB standards help to reduce the share of emissions caused by buildings – should lead to a successful implementation [9]. Figure 6 shows the current implementation status of nZEBs in Europe [10].

### **Definition of major renovation (2010)**

Major renovation of a building is where:

- a. The total cost of the renovation relating to the building envelope or the technical building systems is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated; or
- b. More than 25 % of the surface of the building envelope undergoes renovation.

Member States can choose to apply option (a) or (b).

For new buildings and buildings undergoing major renovations, Member States should encourage highly efficient alternative systems, if technically, functionally and economically feasible, while also addressing the issues of healthy indoor climate, fire safety and risks related to intense seismic activity, in accordance with national safety regulations.

Member States shall take the necessary measures to ensure that when buildings undergo major renovation, the energy performance of the building or the renovated part thereof is upgraded in order to meet minimum energy performance requirements set in the directive.

### **Minimum energy performance standards based on a cost-optimal methodology (2010)**

Member States must set energy performance requirements for new buildings, for existing buildings undergoing major renovation, and for the replacement or retrofit of building elements like heating and cooling systems, roofs and walls. These standards are not harmonised across Member States and therefore differ largely.

The EPBD required, for the first time, that energy performance requirements should consider the life cycle costs of buildings. This means not only looking at the investment costs but also taking account of the operational, maintenance, disposal and energy costs of buildings and building elements.

The cost-optimal level is used to help Member States to set their minimum energy performance requirements and is defined as “the energy performance level which leads to the lowest cost during the estimated economic lifecycle.” Member States will determine this level by taking into account a range of costs including investments, maintenance, operating costs and energy savings<sup>16</sup>. The EPBD requires MS to report on the comparison between their minimum energy performance requirements and the calculated cost-optimal levels using the comparative methodology framework provided by the European Commission.

The comparative methodology framework requires Member States to:

- Define reference buildings that are characterized by and representative of their functionality and climate conditions. The reference buildings must cover residential and non-residential buildings, both new and existing ones;
- Define energy-efficiency measures that are assessed for the reference buildings. These may be measures for buildings as a whole, for building elements or for a combination of building elements;
- Assess the final and primary energy need of the reference buildings by calculating the impact of different packages of measures; and
- Calculate the costs (i.e. the net present value) of the energy efficiency measures during the

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<sup>16</sup> The economic lifecycle is defined in the Cost-Optimal Delegated Regulation of the Commission: Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements.

expected economic life cycle applied to the reference buildings, taking into account investment costs, maintenance and operating costs, as well as earnings from produced energy.

In the event that the cost-optimal comparative analysis shows that the national requirements in force are much less ambitious than the cost-optimal level (i.e. if the energy requirements in force are more than 15% above the cost-optimal level), Member States need to justify this gap to the Commission. If the gap cannot be justified, a plan should be developed to outline steps on how to reduce the gap significantly [11].

### **Calculating energy performance of buildings (2010-2018)**

The EPBD provides the methodology to assess and describe the energy performance of buildings, including how to count the use of renewable energy sources. It takes into account existing EU standards and can be applied to different building elements. Indoor environmental quality (IEQ) is also included: the directive states that the energy needs “shall be calculated in order to optimise health, indoor air quality and comfort levels”<sup>17</sup>.

#### **EPBD: ANNEX I**

1. The energy performance of a building shall be determined on the basis of calculated or actual energy use and shall reflect typical energy use for space heating, space cooling, domestic hot water, ventilation, built-in lighting and other technical building systems.

The energy performance of a building shall be expressed by a numeric indicator of primary energy use in kWh/(m<sup>2</sup>.y) for the purpose of both energy performance certification and compliance with minimum energy performance requirements. The methodology applied for the determination of the energy performance of a building shall be transparent and open to innovation.

Member States shall describe their national calculation methodology following the national annexes of the overarching standards, namely ISO 52000-1, 52003-1, 52010-1, 52016-1, and 52018-1, developed under mandate M/480 given to the European Committee for Standardisation (CEN). This provision shall not constitute a legal codification of those standards.

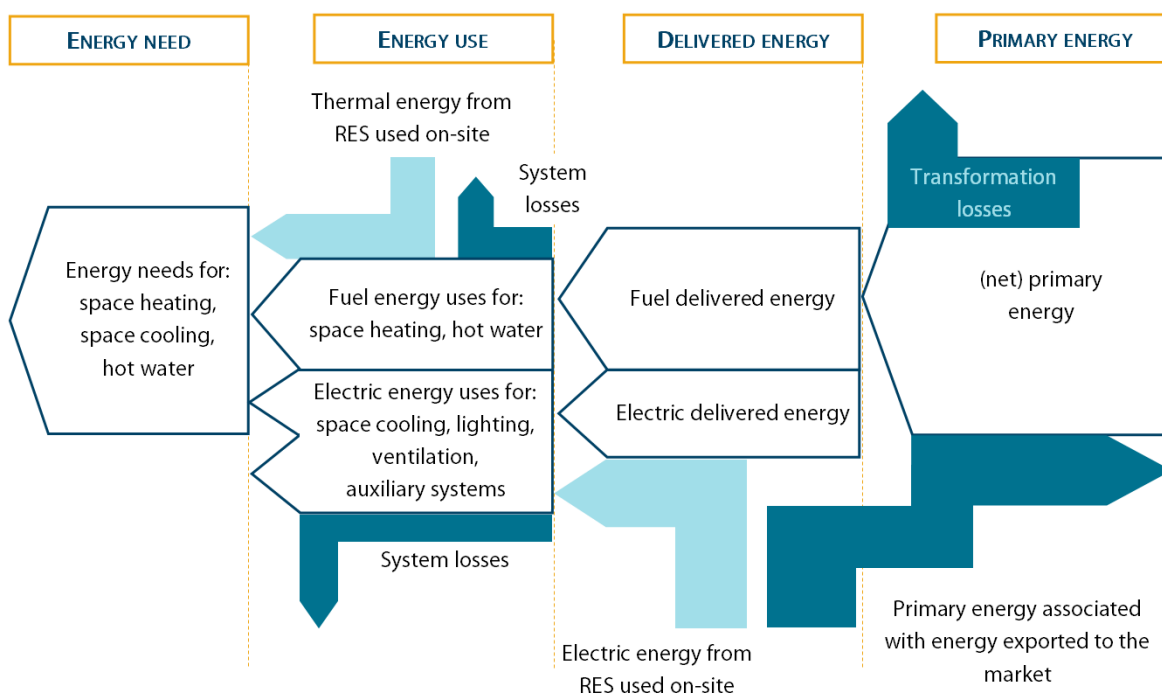
<sup>17</sup> Annex 1, EPBD 2018.

According to the directive, Member States must ensure that energy performance is expressed in primary energy use in kWh/(m<sup>2</sup>·y) for the purpose of both energy performance certification and compliance with minimum energy performance requirements. Primary energy is calculated from the amounts of energy flows delivered, using primary energy conversion factors (PEFs)<sup>18</sup>. Figure 7 shows a schematic overview of the current calculation method [12]. Under the EPBD, Member States are responsible for calculating PEFs for different energy carriers used in buildings. The calculation may be affected by national circumstances, different electricity mixes, the efficiency of the power plants, the share of renewable energy, and different calculation methodologies.

Member States may also explore additional indicators to express the energy performance of a building. This approach offers increased transparency between and within methodologies and allows a certain degree of flexibility to Member States.

Using multiple indicators to describe the energy performance of a building is necessary to avoid providing a misleading picture of the impact of various measures. One shortcoming of relying solely on a single primary energy indicator is that a better energy performance could be achieved by simply switching the energy supply of a building to renewable energy. However, doing so undermines the real benefits of improving the fabric of the building. This is particularly the case for thermal comfort, which is best achieved by improving the quality of the building envelope (more uniform surface temperatures, no cold drafts, better availability of daylighting, etc.). Relying on indicators of the energy needs for heating and cooling as well as total primary energy avoids wasteful use of energy, even from renewable sources, and realises the full multiple benefits of a more thermally-efficient building fabric.

**Figure 7 - Schematic illustration of the calculation scheme** (Source: Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements)



<sup>18</sup> ANNEX to the COMMISSION RECOMMENDATION on building modernisation (2019)



## BUILDING RENOVATION AND DECARBONISATION OF BUILDING STOCKS BY 2050

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### *Long-term renovation strategies (2018)*

The requirement to produce national renovation strategies was first introduced in 2012 in the EED. It was moved from the EED to the EPBD in 2018 in order to ensure greater alignment with other aspects of the energy performance of buildings.

Each Member State shall establish a national long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, into a highly energy efficient and decarbonised building stock by 2050, facilitating the cost-effective transformation of existing buildings into nZEBs.

Member States were required to provide a new comprehensive LTRS by 10 March 2020 that includes:

- Milestones (indicative) for 2030, 2040 and 2050
- Explanation of the contribution to the overall EU energy efficiency target for 2030
- Overview of the national building stock
- Expected share of renovated buildings in 2020
- Approaches to renovation relevant to the building type and climatic zone, including potentially relevant trigger points
- Policies and actions to stimulate cost-effective deep renovation of buildings, including staged deep renovation, for example by introducing an optional scheme for building renovation passports
- Policies and actions to target the worst-performing segments of the national building stock, split-incentive dilemmas and market failures
- Actions that contribute to the alleviation of energy poverty
- Policies and actions to target all public buildings
- Initiatives to promote smart technologies and well-connected buildings and communities
- Initiatives to promote skills and education in the construction and energy efficiency sectors
- An estimate of expected energy savings and wider benefits, such as those related to health, safety and air quality.

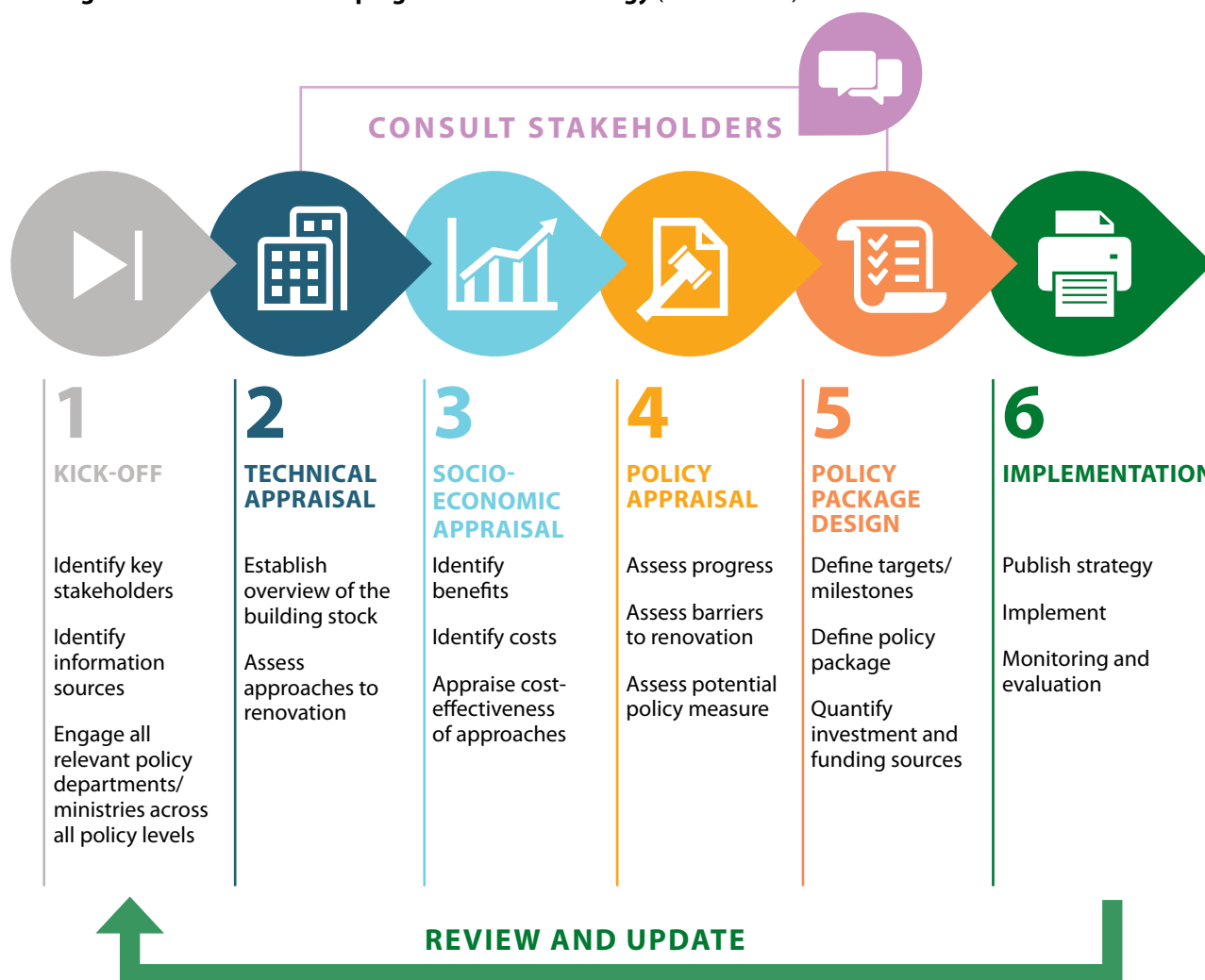
Member States must also carry out a public consultation on the strategy, include a summary of the results of the consultation as an annex to the strategy, and continue inclusive consultations during implementation.

The LTRS should also include details on progress with implementation of the current strategy, submitted to the European Commission in 2017. Member States will need to update their strategy by June 2024 as part of their NECP under the Governance Regulation [13] and supply a further new and updated version by January 2029 as part of the second NECP [14].

The EPBD also says that Member States may use LTRS to address fire safety and risks related to intense seismic activity that affect energy efficiency renovations, indicating another way in which non-energy-related renovation can be combined with energy efficiency upgrades.

To develop and deliver a renovation strategy Member States should complete all the sections and follow a series of key steps, divided into six phases (kick-off, technical appraisal, socio-economic appraisal, policy appraisal, policy package design and implementation). The steps also include a stakeholder consultation throughout the process and a feedback loop to review and regularly update the strategy (Figure 8).

**Figure 8 - Phases in developing a renovation strategy** (Source: BPIE)



Three key new elements were introduced for the LTRS in 2018:

#### *Wider benefits*

The concept of wider benefits (sometimes also referred to as multiple benefits) in relation to energy efficiency means that energy efficiency has other/additional benefits as well as energy savings. These include environmental, social and economic benefits (such as improved health, safety, and air quality). This approach seeks to expand the perspective of energy efficiency beyond traditional measures of reduced energy demand and lower greenhouse gas emissions by identifying and measuring its impacts across different spheres.

The monetary value of the wider benefits that arise in addition to the energy cost savings is often overlooked. The cost of a public subsidy provided to stimulate deep renovation may be more than offset by the benefits that result from it. Energy efficiency improvements can ease pressure on public finances (i.e. the budgets of public authorities), by generating increased tax revenues through increased economic activity and by reducing expenditure on energy and unemployment benefits. Improvements in energy efficiency can also lead to improved indoor air quality and thermal comfort, which have knock-on productivity benefits [15] –

these result from fewer days of work missed, shorter hospital stays and improved educational performance. There is a clear correlation between the quality of a building (office, school, factory etc.) and the number of sick days (absenteeism) reported. Studies report that a better building can result in 0.4-1.5 fewer sick days per employee per year [16], while another study concluded that every €1 invested in insulation results in €0.78 benefit in reduced sick days [17]. A better building can also improve performance by 11-16% in offices and 13-20% in schools due to better air quality, thermal comfort, light (electric and natural), acoustics and control [18]. Promoting the environmental benefits of energy efficiency improvements, in terms of reduced carbon emissions and energy use, can enhance public relations with an improved organisational reputation [19].

The notion of wider benefits is introduced in the revised EPBD; specifically, Member States must include an evidence-based estimate of wider benefits such as health, safety and air quality in their LTRS (this list is non-exhaustive). Among the type of wider benefits that LTRSs should evaluate, the European Commission in its recommendations suggests healthy indoor environments, occupants' and workers' health, healthcare costs, greater labour productivity and reduced emissions in the entire life cycle, as well as material recycling and buildings' capacity to adapt to climate change [20]. The goal of this provision is to enable an integrated approach, creating new synergies across policy areas and among different government departments (e.g. health, finance, environment, infrastructure, urban and special planning).

### *Trigger points*

Trigger points are key moments in the life of a building (e.g. rental, sale, change of use, extension, repair or maintenance work) when carrying out energy renovations would be less disruptive and more economically advantageous than at other moments, since a renovation or a building intervention would happen regardless, making it an ideal time to execute energy performance upgrades as well [21].

The EPBD refers to a trigger point as “an opportune moment in the life-cycle of a building, for example from a cost-effectiveness or disruption perspective, for carrying out energy efficiency renovations”, and states that Member States shall identify cost-effective approaches to renovation considering potential relevant trigger points in the life-cycle of a building.

Taking advantage of these occasions would facilitate investment decisions to undertake energy renovation works. They can be prompted by practical opportunities (e.g. a need for repairs or maintenance, or building an extension), personal circumstances (e.g. a new-born in the family, retirement or children moving out), or change of ownership (e.g. new tenants, new owners, putting a property on sale), as well as unexpected events like a fire, earthquake or flood.

Including energy efficient renovations at trigger points provides the chance of making the entire process of upgrading a building more cost-effective, limiting the risk of missing opportunities to renovate and increase possible synergies with other actions (i.e. avoiding lock-in effects) as well as delivering additional benefits such as improved indoor air quality, with a positive impact for comfort, health and productivity.

To guarantee the expected results, policies identifying trigger points could be tailored to the building type (e.g. single-family buildings vs. multi-family buildings, schools and kindergartens vs. office buildings, etc.), accompanied by additional targeted measures promoting deep renovation (such as building renovation passports and minimum energy performance requirements for specific building types, like commercial and public buildings), and properly integrated into medium- and long-term planning.

## Examples from EU Member States

### *Italy: Mandatory requirements in case of building extensions*

In the autonomous province of Bolzano, from 2019, owners of buildings have been allowed to expand the surface of their dwelling by up to 20%, or up to 200 m<sup>2</sup>, but only if the refurbished building achieves an energy need for heating below 70kWh/m<sup>2</sup>/year.

### *Poland: Improvement of energy performance in case of other works*

In Poland, in case of building renovation, the reconstructed elements must meet the existing levels of thermal insulation for new buildings. For example, if an external wall is rebuilt it must be insulated respecting current U-value requirements.

### *France: Mandatory renovation within a specific timeframe*

In France, the energy transition law<sup>19</sup> for green growth foresees a renovation obligation for private residential buildings whose primary energy consumption exceeds 330 kWh/m<sup>2</sup>. This affects all buildings with an energy performance rating in either of the two lowest bands, F or G. These buildings, both rented and owner-occupied, must be renovated as follows:

- By 2025, all class F and G buildings must be renovated. Improvements should be close to the performance of a new building.
- By 2050, all buildings must be in class A or B (based on the French EPC), reaching BBC<sup>20</sup> levels or equivalent.

## Measures to tackle energy poverty

While there is not an established EU definition of energy poverty, the term refers to a lack of adequate essential services such as warmth, cooling, lighting and power. This can be caused by low income, high energy expenditure and high energy use (especially caused by inefficient building components or appliances), or a combination of all of these. Inefficient buildings, with low insulation and poor-quality walls and roofs, can exacerbate the inability to maintain minimum levels of comfort and cover energy costs.

Effective action to alleviate energy poverty should therefore include energy efficiency measures alongside social policy measures. While several Member States already addressed energy poverty in their national renovation strategies, the EPBD now requires Member States to outline “relevant national actions that contribute to the alleviation of energy poverty” [20].

The EED includes a provision to target energy efficiency measures for consumers affected by energy poverty, and the Governance Regulation requires Member States to identify energy poverty levels and outline solutions to tackle it. This is in line with the provisions mentioned above. So far incentives are first and foremost financial ones for low income households, as well as awareness raising and advice [16]. Policies for fighting energy poverty are closely linked to other policy areas such as social policy and need to address the issue in a coherent way.

National programmes renovating low-income and energy-poor homes can be highly cost-effective considering the wider health, societal and economic benefits of renovation [22][23][23][22][21][21][20][20][20][19][2][18]. Shifting public budgets from energy subsidies for the energy-poor to energy renovation programmes can mobilise investment in renovation, which is a key aim of the LTRS. Member

<sup>19</sup> Loi n° 2015-992 du 17 août 2015 relative à la transition énergétique pour la croissance verte.

<sup>20</sup> BBC = bâtiment à basse consommation, or low-energy building

States can use EU funds, such as Structural and Cohesion funds that aim to improve the welfare of EU countries, as sources of funding for programmes to renovate the homes of the energy poor.

The EU Energy Poverty Observatory<sup>21</sup>, supported by the European Commission, aims to help Member States to combat energy poverty. It exists to improve the measuring, monitoring and sharing of best practice examples and experience of policies and programmes tackling energy poverty.

### **Examples from EU Member States**

#### *Lithuania: Grants for low-income families*

In 2009, the Lithuanian government and the European Investment Bank (EIB) established the Lithuanian JESSICA Holding Fund for multi-family building renovation, with an initial investment of €227 million – €127 million from the European Regional Development Fund and €100 million in national funding. The Fund offers long-term loans with a fixed interest rate (3%) for the improvement of energy efficiency in multi-family buildings, and for low-income families the loan can be converted into a grant. Up to 2015, renovation of some 1,055 buildings had been financed under the JESSICA Holding Fund, totalling around 29,500 apartments. Since May 2015 the JESSICA II fund<sup>22</sup> has been providing funding for around 1,100 buildings to undergo renovation by the end of 2020.

#### *Ireland: Energy-poor targeted advice and fund*

The Irish Warmer Homes Scheme targets vulnerable and energy-poor homes providing advice and funds for energy efficiency measures. From 2000 to 2013 over €82 million was distributed through the scheme and more than 95,000 homes were supported. The energy efficiency interventions include measures such as attic insulation, draught proofing, efficient lighting and cavity wall insulation. In 2010, the implemented measures saved 25 GWh and many beneficiaries were lifted out of energy poverty. The number of beneficiaries who found it difficult or impossible to pay utility bills on time decreased from 48% to 28%. The number of families with children that could keep a comfortable temperature at home increased considerably from only 27% to 71%. The number of beneficiaries who suffered from long-term illness or disorders decreased by a massive 88%. Recipients showed significant improvements in other health problems including heart attacks, high blood pressure/hypertension, circulatory problems, problems with joints/arthritis, headaches, and physical and mental disability [22].

#### *Austria: Bonus for savings in low-income households*

Within the Austrian energy efficiency obligation (EEO) scheme, savings achieved in low-income households will be weighted 0.5% higher. Moreover, the energy suppliers, which are also the target group of the EEO, must establish information centres to provide support on energy poverty.

Austria additionally has a number of local initiatives for fighting energy poverty in low-income households in cities such as Vienna, Linz and Freistadt, which mainly cover advice on how to save electricity [20].

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<sup>21</sup> <https://www.energy-poverty.eu>

<sup>22</sup> <https://www.eib.org/en/products/blending/jessica/index.htm>

### ***Mobilising investment in renovation (2018)***

Facilitating financing and mobilising investment in building renovation is a core component of achieving long-term decarbonisation objectives. The EPBD lays out several focus areas to address and facilitate financing for building renovation. Specifically, these include project aggregation, addressing risk, leveraging public funds, investment in the public building stock and the creation of advisory tools.

The Energy Efficiency Financial Institutions Group reported in 2015 that investments of €60-100 billion will be required annually by 2020 to improve the energy performance of buildings in Europe, while the International Energy Agency (IEA) in its 2°C (450ppm) scenario estimates a requirement of US\$1.3 trillion in the period 2014-2035 [24].

The EPBD 2018 introduced new requirements related to financing as part of the LTRS. The aim is to mobilise investment in renovation of national stocks of residential and non-residential buildings – both publicly and privately owned. The main requirements are that Member States shall facilitate access to appropriate mechanisms for:

- Aggregating projects, including by investment platforms or groups, and by consortia of small and medium-sized enterprises, to enable investor access as well as packaged solutions for potential clients
- Reducing the perceived risk of energy efficiency operations for investors and the private sector
- Using public funding to leverage private-sector investment
- Guiding investments into an energy-efficient public building stock, for example through public private partnerships or optional energy performance contracts, in line with the Eurostat guidance<sup>23</sup>
- Accessible and transparent advisory tools, such as one-stop-shops for consumers and energy advisory services, on relevant energy efficiency renovations and financing instruments

Member States are also expected to link financial measures for energy efficiency improvements in the renovation of buildings to the targeted or achieved energy savings. Potential methods include installer certification or qualification, comparison of EPCs before and after renovation, energy audits or other comparable methods that could show the energy performance improvement.

### ***Advisory tools and building renovation passports (2018)***

A building renovation passport is an optional document complementary to the EPC which provides a long-term, step-by-step renovation roadmap for a specific building based on quality criteria, following an energy audit, outlining measures and renovations to improve energy performance.

Under Article 19a of the amended EPBD, the European Commission was tasked with assessing how EPCs could be improved, as well as exploring the concept of building renovation passports by 2020. This means that although the passports are not required at national level, the European Commission conducted research to assess whether such schemes (including as an optional provision) could be feasible. This, depending on the assessed feasibility, could later result in a legal provision to require them nationally.

To take this forward, the European Commission has undertaken the following actions<sup>24</sup>:

1. Review of existing building renovation passports and related schemes and initiatives in the EU and globally at national and regional level – this should develop an understanding of the characteristics and pros/cons of the various schemes and initiatives.
2. Analysis of the possible scope for new EU measures including non-legislative ones (e.g. supporting

<sup>23</sup> [https://ec.europa.eu/eurostat/documents/1015035/8885635/guide\\_to\\_statistical\\_treatment\\_of\\_epcs\\_en.pdf/f74b474b-8778-41a9-9978-8f4fe8548ab1](https://ec.europa.eu/eurostat/documents/1015035/8885635/guide_to_statistical_treatment_of_epcs_en.pdf/f74b474b-8778-41a9-9978-8f4fe8548ab1)

<sup>24</sup> The results of the study are available at: <https://renovation.epbd19a.eu/>

the exchange of best practices, promoting standards, etc.), legislative ones (inclusion of dedicated provisions under the EPBD), and a combination of both – highlighting their possible advantages and drawbacks including costs of implementation.

3. Establish policy options for the possible introduction of additional (non-legislative and legislative) measures at EU level to support building renovation passports, including the introduction of an optional building renovation passport scheme under the EPBD and, for each option, an assessment of potential impacts. These may include possible extensions of EPCs and the introduction of optional standalone building renovation passport schemes. Interactions with other provisions such as the smart readiness indicator have also been considered.

The experiences in Germany and Belgium offer valuable lessons on the route that leads to successful development and implementation of building renovation passports.

### **Examples from EU Member States**

#### *Individueller Sanierungsfahrplan, Germany*

Germany's Sanierungsfahrplan (SFP) was first launched in the federal state of Baden-Württemberg in 2015 and a newly developed Individueller Sanierungsfahrplan (iSFP) was launched at the national level in 2017. In Germany, EPCs are not considered reliable enough to stimulate renovation and are often viewed as an administrative obligation. On the other hand, there is a strong culture of on-site energy auditing, but the very detailed reports delivered to building owners (up to 150 pages) are often left unread and do not promote renovations. The iSFP has been designed as a user-friendly tool that includes both short- and long-term measures and suggests ways to avoid lock-in effects. As about 85% of the energy renovation measures funded in Germany concern only one building component, iSFP puts a strong focus on staged renovation and the interdependences between the stages. The idea is that building owners must be given the appropriate means to turn renovation from "a nuisance that I have to endure" (I have to renovate) into "an opportunity to improve my house and my living environment" (I want to renovate).

In Germany, the building owner is put at the very centre of the process, and the individual approach, including in-depth dialogues between the building owner and the energy auditors, is considered key for the instrument.

#### *Woningpas, Flanders, Belgium*

The Flemish Energy Agency (VEA), in cooperation with a wide network of stakeholders, has implemented the Renovation Pact (2014-2018), designed to lead to a thorough improvement of the energy performance of the region's building stock. Flanders established that by 2050 the existing building stock should become as energy-efficient as the current requirements for new buildings.

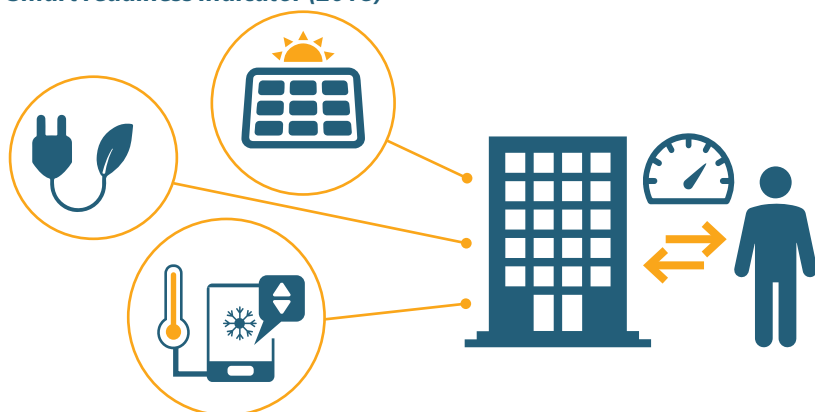
One of the main actions foreseen in the Renovation Pact is to develop the Woningpas (a logbook) and the EPC+ (a more user-friendly version of the EPC, including a clear overview of measures, ordered by priority, needed to reach the 2050 objective). The two instruments aim to provide building owners with useful, easy-to-understand information and long-term guidance.

The Woningpas is a unique integral digital file of each individual building. The file can be retrieved by the building owner and by individuals who have been authorised access. The logbook features energy performance, renovation advice, the housing quality (such as stability, humidity, safety), data on the environment and, in the future, other building aspects such as durability, water, installations and building permits. The Woningpas, launched in December 2018, makes it possible to track the evolution of each individual building.

## BUILDING MODERNISATION

To maximise energy performance of buildings, there is a clear need to not only look at the building envelope and the energy source, but also at modernising the building stock by fully exploiting the potential of technical building systems, digitalisation, self-regulating devices and building automation. Putting a focus on building modernisation can help lift efficiency potentials, integrate new components such as charging infrastructure for e-vehicles, and provide buildings which are more adaptable to the occupants' needs.

### *Smart readiness indicator (2018)*



Buildings are moving from being highly energy-demanding and unresponsive elements of the energy system to becoming highly efficient micro-energy hubs consuming, producing, storing and supplying energy, making the system more flexible and efficient. The EPBD recognises this transition and required the Commission to develop an optional common EU scheme for rating the smart readiness of a building by 31 December 2019, which is still in the process of being defined. This includes both a definition and a methodology on which the calculations will be based. According to the EPBD, the rating of a smart building will “be based on an assessment of the capabilities of a building or building unit to adapt its operation to the needs of the occupant and the grid and to improve its energy efficiency and overall performance.”

The proposal for a smart readiness indicator (SRI) indicates the potential smartness of a property by evaluating the “functionality level” of various services of a building. These services are grouped into 10 categories: (i) heating, (ii) domestic hot water, (iii) cooling, (iv) mechanical ventilation, (v) lighting, (vi) dynamic building envelope, (vii) energy generation, (viii) demand side management, (ix) electric vehicle charging, and (x) monitoring and control. A higher functionality level is assumed to provide more beneficial impacts to the users of the building and/or the connected grid compared to a lower level. The smarter the services, the higher the SRI score [25]. The delegated and implementing acts from the European Commission are expected to be published in 2020.

The SRI should enable the end-user (building owner, occupant or investor) to understand what services the building can deliver and should contribute to the integration of the buildings sector into electricity systems and markets. It is intended to raise awareness of smart technologies in buildings, motivate consumers to invest in their buildings and support the uptake of technological innovation in the building sector [26]. This is relevant for building occupants in the residential sector, but even more so for occupants and investors dealing with commercial buildings.

Smart technologies in buildings are crucial for an effective decarbonisation of the building and energy



sectors. Buildings can function as highly efficient micro-energy hubs that consume, produce, store and supply energy, making the system more flexible and efficient [27]. This will enable them to help balance the future energy system, characterised by a large share of variable renewables, through storage and demand responses. In order to achieve this, there is a need to boost building renovation investments and leverage smart, energy-efficient technologies. Smart buildings enable and ensure a healthy and comfortable living and working environment for the occupants [28].

### ***Charging infrastructure for e-mobility (2018)***

In accordance with the changing infrastructural needs of new transportation technology, the amended EPBD includes charging infrastructure for e-mobility in buildings. Member States should provide for measures to simplify the deployment of recharging infrastructure with a view to addressing barriers such as split incentives and administrative complications which individual owners encounter when trying to install a recharging point on their parking space.

The new regulation sets out the following requirements:

- By 2025, Member States must set requirements for a minimum number of charging points in all non-residential buildings with more than 20 parking spaces
- A simplification of the deployment of recharging points (including permitting procedures)
- A requirement for the installation of ducting infrastructure in new buildings and those undergoing major renovation, with more than 10 parking spaces
- A requirement for the installation of at least one charging point in new buildings and those undergoing major renovation, with more than 10 parking spaces

Ducting infrastructure provides the right conditions for the rapid deployment of recharging points if and where they are needed. Member States should ensure the development of e-mobility in a balanced and cost-effective way. Where a major renovation related to electrical infrastructure takes place, the pertinent installation of ducting infrastructure should follow. In the implementation of the requirements for e-mobility in national legislation, Member States should duly consider potential diverse conditions such as ownership of buildings and the adjacent parking lots, public parking lots operated by private entities, and buildings that have both a residential and a non-residential function.

When applying the requirements for e-mobility infrastructure Member States should consider the need for holistic and coherent urban planning as well as the promotion of alternative, safe and sustainable modes of transport and their supporting infrastructure, for example through dedicated parking infrastructure for electric bicycles and for the vehicles of people with reduced mobility.

### ***Technical building systems (2010-2018) and inspections***

Technical building systems (TBS) are at the very heart of the building, their main purpose being to optimise its energy performance. They have been part of European legislation since 2010, but their definition was extended and technical equipment for building automation and control as well as technical equipment for on-site electricity generation were added in 2018. The EPBD defines TBS as “technical equipment for space heating, space cooling, ventilation, domestic hot water, built-in lighting, building automation and control, on-site electricity generation or a combination thereof, including those systems using energy from renewable sources, of a building or building unit”<sup>25</sup>.

Member States must set system requirements for the overall energy performance, proper installation and appropriate dimensioning of these systems. The requirements are valid for all buildings which are new or have

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<sup>25</sup> EPBD, Art 2(3)

their technical building system replaced or upgraded. Thus they are not restricted to major renovations and could be used as trigger points for further renovation measures [29].

The EPBD foresees that whenever a TBS is installed, replaced or upgraded, a new assessment of its overall energy performance is made and handed over to the building owner. It is furthermore required to install, where technically and economically feasible, self-regulating devices to adjust the room temperature levels. This is applicable to all new buildings and when the heating system is replaced in existing buildings.

A key aspect of TBS are the inspections. They ensure that the performance is efficient, up to date, tracked and documented. Regular inspections of the accessible parts of heating systems and combined heating and ventilation systems, with an effective rated output of over 70kW, need to be undertaken. This inspection includes an assessment of the efficiency and sizing of the heat generator compared with the heating requirements of the building. Member States can choose not to require another inspection of the heat generator sizing, if no significant changes to the heating system or the building's heating requirements have been made in the meantime.

The information derived from inspections is important for building owners, residents and policymakers to ensure that the promised results are achieved, and goals are met in an efficient and cost-effective manner.

The main changes in inspection requirements introduced under the EPBD in 2018 are: thresholds for inspections have been increased, inspections of ventilation systems for combined heating (air-conditioning) and ventilation systems were introduced, a greater focus was put on normal operating conditions, and a greater role was given to building automation and control systems (BACS) and electronic monitoring and control systems. As an alternative to inspections, the possibility for Member States to choose alternative measures that would ensure that users receive advice was introduced, if it can be proven that the impact is the same [30]. Under a newly introduced provision, buildings that are equipped with BACS or continuous electronic monitoring are exempt from inspection requirements.

### ***Building automation and controls***

TBS as well as BACS play an important role in increasing the energy efficiency of buildings continuously, while providing them with more flexibility within the energy system and adding to the well-being of Europeans. There is consensus that a large untapped cost-effective savings potential lies within the optimisation of TBS, which needs to be tackled.

The text on technical building systems and inspections was expanded in 2018 to include a requirement to install BACS in all non-residential buildings over a certain effective rated output of heating, ventilation and air-conditioning systems (more than 290 kW). The directive defines BACS as a system comprising all products, software and engineering services which can support the energy-efficient, economical and safe operation of TBS. This is done through automatic controls and by facilitating the manual management of TBS. BACS can lead to significant energy savings and improve the management of the indoor environment – and, as such, are beneficial to both building owners and users, in particular in large non-residential buildings.

Building automation and electronic monitoring of TBS have proven to be an effective replacement for inspections, in particular for large systems. They have some potential for cost and energy savings in larger buildings or building complexes.

It is important that all measures concerning building modernisation are implemented in an efficient and effective way, taking into account new technological requirements and the energy system as a whole. User needs and energy savings should be at the centre of all legislation.

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# EXISTING DATABASES ON EU BUILDING STOCK

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The main tool for providing an overview of EU building stock, its renovation rate and fulfilment of EU-wide goals is a good database. The European Commission has been working towards an all-encompassing database for some years. Some specifications for including data from NECPs, LTRs and EPC databases could also pave the way toward better data availability.

## BUILDING STOCK OBSERVATORY (BSO)

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The EU Building Stock Observatory (BSO)<sup>26</sup> was established in 2016 and aims to provide the European Commission, policymakers, investors, stakeholders, local and national authorities and researchers with comprehensive knowledge on Europe's building stock.

The observatory contains a database, a data mapper and factsheets for monitoring and statistics on the energy performance of buildings across Europe. It also assesses energy efficiency improvements of buildings and their impact on the actual energy consumption of the buildings sector.

The BSO provides data and tracks developments on the following topics:

- Energy efficiency levels in buildings in EU countries and the EU as a whole
- Different certification schemes and how they are implemented
- Available investments for renovating buildings
- Energy poverty levels across the EU.

## NATIONAL EPC DATABASES

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The amended EPBD guidance specifies that databases should assemble information on energy consumption of buildings from EPCs, at least from public buildings that have one. This data (when aggregated and anonymised) should be made available for statistical and research purposes and to the building owner. There are already 24 countries which have national EPC databases which can be accessed by different groups of people involved in EPC management or even the public (in the latter case the information is mostly limited).

Data protection is a vital consideration, and alignment with data protection regulations must be ensured. However, in Member States like Portugal, the Netherlands, Sweden, Denmark, Ireland and Belgium selected data is available for supporting policymaking and to a certain extent for private actors.

<sup>26</sup> The BSO is currently undergoing maintenance but the data can be accessed from the EC website: <https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-performance-of-buildings/eu-bso>

Different levels of accessibility for different actors should be considered, since data can be used for research purposes, by policymakers when developing policies for the building stock, or by private actors developing business models (targeting a specific type of building). EPC data can also be used to increase interest in energy renovations by enabling owners to see what their neighbours did, including how much energy they saved and even the effects on the house price.

### *Examples from EU Member States*

The following examples demonstrate how databases have been set up, what benefits they have and how available data is used.

#### *Portugal*

In Portugal, the Portuguese Energy Agency ADENE designed, implemented and is currently managing the registry and database gathering the EPCs, which are available on a public [website](#)<sup>27</sup>. Basic data (energy class, year, district and building type) is publicly available from around 1.3 million EPCs. An average of about 11,000 EPCs are registered every month. The EPC database is a useful tool to map and monitor the national building stock and to explore relevant information [8].

#### *Sweden*

In Sweden, all EPCs are accessible by address on a public [website](#)<sup>28</sup>. The information that can be obtained online is the (i) identification number of the EPC, (ii) date of issue, and (iii) energy performance rating (given as a single value of specific energy in kWh/m<sup>2</sup>/year and energy class). Boverket, the National Board of Housing, Building and Planning in Sweden, is responsible for checking the validity of the EPCs. Input data is automatically controlled by software [31].

In contrast to other Member States, the Swedish EPCs are (partly) based on the measured energy use of the building, which is used as the input data for issuing the EPC for new buildings. Energy use has to be measured during a period of 12 consecutive months and entered into the database by an independent certified energy expert. The energy use is then corrected for the climate variability by using a reference year. The energy use is also 'normalised', correcting for user-influence on energy consumption – for example, if the indoor temperature is different from the average indoor temperature of 22°C, or occupants use more domestic hot water than expected. The corrected value determines the energy class level of the EPC.

#### *Belgium*

In Flanders, the EPC was made available for the sale of residential units on 1 November 2008 and for rental housing units on 1 January 2009. The most relevant feature on the Flemish EPC is the energy score that reflects the calculated energy consumption in kWh/m<sup>2</sup>/year of usable floor area. EPCs are stored in a database, managed by the Flemish Energy Agency (VEA) [32]. The data is being used to evaluate the building stock, the default values in the EPC and the impact of the regulation and subsidy programmes.

#### *Denmark*

In Denmark, detailed building data is publicly available on the [website](#)<sup>29</sup> of the Danish Energy Agency. Based on the address, people can retrieve a detailed EPC (10-20 pages) for the specific building, comprising building data, heating source, details of the energy expert, picture of the building and recommendations. The information includes detailed recommendations on energy measures and savings and illustrates the potential improvement.

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<sup>27</sup> [www.sce.pt](http://www.sce.pt)

<sup>28</sup> [www.boverket.se](http://www.boverket.se)

<sup>29</sup> [www.sparenergi.dk/forbruger/vaerktoejer/find-dit-energimaerke](http://www.sparenergi.dk/forbruger/vaerktoejer/find-dit-energimaerke)

## DE-RISKING ENERGY EFFICIENCY INVESTMENT PLATFORM (DEEP)

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The De-risking Energy Efficiency Platform (DEEP)<sup>30</sup> is a pan-EU open-source database containing detailed information and analysis of more than 10,000 industrial and buildings-related energy efficiency projects. It builds performance track records and helps project developers, financiers and investors to better assess the risks and benefits of energy efficiency investments across Europe. Member States should encourage all market players to support this initiative by sharing available data and performance track records, thereby enhancing the robustness of the platform and increasing the knowledge base.

## COMPREHENSIVE STUDY OF BUILDING ENERGY RENOVATION ACTIVITIES AND THE UPTAKE OF NEARLY ZERO-ENERGY BUILDINGS IN THE EU<sup>31</sup>

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Applying indicators from the BSO, the European Commission conducted a study on building energy renovation activities and the uptake of nZEBs in the EU. The goal was to deliver a comprehensive analysis of the renovation activities and nZEB uptake in the EU from 2012 to 2016.

The study, which was conducted through desk research and surveys across the 28 Member States, provides insights into the following topics:

- Precise definitions in the context of energy renovation of buildings
- EU28 building stock inventory and new construction data
- Renovation rates and investment costs; split into energy renovation, non-energy renovation, residential and non-residential buildings, and renovation depths
- Related primary energy savings; split into residential and non-residential buildings, and different renovation depths
- Avoided greenhouse gas emissions through energy renovation; split into residential and non-residential buildings
- Impact on employment rate of overall building renovation
- Rates for the uptake of nZEB; split into new construction and renovation
- Information on triggers, drivers, barriers and incentives

The following renovation depths were identified in line with the definitions of the BSO:

- Below threshold ( $x < 3\%$  savings)
- Light renovations ( $3\% \leq x \leq 30\%$  savings)
- Medium renovations ( $30\% < x \leq 60\%$  savings)
- Deep renovations ( $x > 60\%$  savings)

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<sup>30</sup> <https://deep.eefig.eu/>

<sup>31</sup> [https://ec.europa.eu/energy/sites/ener/files/documents/1.final\\_report.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/1.final_report.pdf)

The study concluded that approximately 12% of residential floor area and 9.5% of non-residential floor area is estimated to be affected by an energy renovation each year. Only 0.2-0.3% of renovations are deep renovations and the overall renovation rate is only at 1%, which is far from the 3% needed to decarbonise the building stock by 2050. Currently, 80% to 90% of renovations are only light or medium. The study identified the need to move from a majority of light renovations to more medium renovations. This shift needs to be accompanied by a step-by-step renovation process, which has the nearly-zero-energy standard as its ultimate goal. Currently the low hanging fruits of a building's renovation potential are accessed as a priority too often, without planning for deeper renovations as the next step.

The study identifies a need for a tripling of investments to accompany the tripling of the renovation rate. To achieve the necessary investments of €800 billion annually, new innovative financing schemes as well as an increase in private funding should be put in place.

Problems which were identified in the study include that even when step-by-step renovations are done, they mostly focus on smaller renovations and do not lead to long-term deep renovations. Also, a large number of renovations have a positive cost-benefit ratio but these are mostly light renovations and often cause deeper more expensive renovations to be put off indefinitely.

The study identifies maintenance works on the building, budget becoming available and health improvements as the main triggers for renovation. Lack of knowledge, limited information on EPCs and difficulty in accessing financing are identified as the main barriers to renovation [33].

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# HAS THE EU LEGISLATION ON BUILDINGS ACHIEVED THE EXPECTED RESULTS?

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Over the last years the EU has introduced key legislation for overcoming the lack of building renovation with the goal of reaching a decarbonised building stock by 2050. Due to the governance structure of the EU, which builds on the subsidiarity principle<sup>32</sup> [34] and includes a shared competence between EU countries and the EU bodies in energy matters<sup>33</sup>, building-related legislation is the result of a negotiation between the European Commission, the European Parliament and the Council of the EU (representing the Member States). Transposition into national law and implementation are the responsibility of each Member State, while the European Commission ensures monitoring and enforcement. This ensures that national, regional and local circumstances such as climatic, economic, building and energy related conditions are considered when implementing EU legislation. While this allows Member States to tailor requirements to national situations, it has led to a discrepancy on the ambition of the measures adopted and to a lack of harmonisation among Member States (e.g. nZEB definition, EPC schemes, minimum energy performance requirements).

This section provides an overview of successes and shortcomings of the existing buildings policy in the EU. Regarding the EPBD, its key provisions and how they steer energy performance of buildings have been elaborated above. From 2007 to 2014 around 48.9 Mtoe of additional final energy savings in buildings were achieved through the implementation of the EPBD [35]. Nevertheless, there are still shortcomings which need to be addressed by Member States when transposing the directive into national law and enforcing legislation.

Overall renovation rates in EU Member States are still too low to reach the goal of decarbonising the building stock by 2050. The annual share of deep renovations is at only 0.2-0.3% across the EU, and the renovation rate decreases along with the depth of renovation. The current overall weighted renovation rate in the EU residential building sector is only 1% [33]. Most of the energy-related renovations are undertaken in combination with other non-energy renovations; showing that, for building owners and investors, energy efficiency alone is not a trigger to invest.

There are many reasons why investments in energy-saving measures in buildings are often overlooked, rejected, or only partially realised. The main barrier categories identified for building investments are financial, institutional and administrative, awareness/information, and split incentives [36]. This is where

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<sup>32</sup> In the EU, the principle of subsidiarity regulates the exercise of the EU's non-exclusive competences (such as energy) and rules out EU intervention when an issue can be dealt with effectively by Member States at the central, regional or local level. In this framework, the EU can exercise its powers only when Member States are unable to achieve the objectives of a proposed action satisfactorily and added value can be provided if the action is carried out at EU level (like adopting GHG reduction targets to tackle a global issue such as climate change, or tackling energy security across the EU).

<sup>33</sup> Article 194 of the Treaty on the Functioning of the European Union (TFEU) states that energy is a shared competence between EU countries and the EU. However, each EU country maintains its right to "determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply." The main aims of EU energy policy are to: ensure the functioning of the energy market; ensure security of energy supply; promote energy efficiency and energy saving and the development of new and renewable forms of energy; promote the interconnection of energy networks.

the new amendments of the EPBD and suggestions for implementation are trying to step in and improve the quality and depth of renovations across Europe by introducing new instruments such as the building renovation passport or targeted financing mechanisms.

The EPBD introduced important requirements, such as for certification, inspections, training or renovation, which are now enforced in Member States and which would probably not have been implemented across the EU otherwise. Nevertheless, there are still elements which need to be addressed and solved, in particular a limited access to finance for building renovations, a lack of substantial and systematic data collection, as well as the need to better monitor enforcement. These three factors are closely linked as they are necessary to reach the EU goal of decarbonising the building stock by 2050.

The cost-benefit analysis is an important tool in the EPBD and national strategies and has proven to be important for investors and homeowners when deciding to renovate as well as for Member States when defining an nZEB standard. However, when renovations are performed and funded based on cost-benefit analysis, shallow renovations<sup>34</sup> quickly increase compared to deeper renovations, due to the better cost-benefit ratio and the shorter payback period they provide. Additionally, the current cost-benefit methodology focuses on the key aspects and overlooks many of the societal gains of getting healthier nZEBs. Integrating such societal gains could boost the renovation rate and promote the move toward healthy, comfortable and nearly zero-energy buildings. Therefore, a cost-benefit analysis would benefit from the use of common standards which include all costs and benefits (including non-energy benefits) on a building level and a macroeconomic level.

## BRINGING INNOVATION TO THE MARKET

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The EPBD introduces interesting new concepts which bring innovation to the market (e.g. trigger points, Smart Readiness Indicators, e-mobility). These can help overcome the barriers if Member States implement the legislation using best practice examples from other countries and monitoring their results.

The Clean Energy Package creates significant potential for bringing innovations to the market, thereby making them deployable at a larger scale. Among these are progressive prosumer laws which promote on-site renewable generation and – combined with digitalisation, e-mobility and charging points as well as the smart readiness indicator and the inclusion of multiple benefits at different stages of the policy process – open the way for a systemic change, aiming at the decarbonisation of the built environment, energy grids and mobility.

The results and impacts of these new aspects remain to be seen during the implementation process, which is still on-going. The fact that the Clean Energy Package has linked digitalisation of the building sector and smart buildings to smart cities will be important for digitalisation efforts in the coming years. Implementing support measures that will encourage innovation and scaling up deep energy renovation is a ‘win-win-win’ scenario for the economy (competitiveness and jobs), society (better and smarter homes) and the environment (more renewables and less greenhouse gases).

As a supporting tool of new technologies and innovations the European Commission has funded many research projects through Horizon 2020<sup>35</sup>. The results of this research, for example on smart buildings, prosumer topics or the building logbook are now being brought to policymakers on all levels, giving them the right tools to implement EU policies and providing them with good practice examples.

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<sup>34</sup> Shallow or light renovations are determined as achieving up to 30% of primary energy savings, while deep renovations achieve at least 60% of primary energy savings [33].

<sup>35</sup> <https://ec.europa.eu/programmes/horizon2020/en>



While public authorities have a key role to play, transformative innovations will only take off if they are supported by challenge-driven innovation ecosystems comprising both public and private actors. From a governance perspective, this means that regulations at all levels need to be aligned, and private actors must be involved in the policy development if innovation is to be scaled up [37].

## TOOLS DEVELOPED FOR EU STAKEHOLDERS

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Launched in 2009, Build-Up<sup>36</sup> is a European Commission initiative aiming to reduce the energy consumption of buildings across Europe. Build-Up promotes the effective implementation of energy-saving measures in buildings and offers free access to a wide range of information on best practices, technologies and applicable legislation for energy reduction. Via the interactive BUILD UP web portal, building professionals, public authorities and building occupants across Europe can easily share experiences, knowledge and best practices.

The RenoWiki<sup>37</sup> is a collaborative tool for the national renovation strategy community, to help tracking of and coordinating all the important initiatives related to building renovations. RenoWiki provides information on national strategies, policies and initiatives grouped by topic (such as awareness raising, skills and capacity, financing and economic, policy and regulation as well as organisational and administrative). It receives input from national experts working together and providing information on their national situation for free. In return they can find information on other countries' best practices and policies.

As a result, from the Clean Energy Package, the European Commission has created a new financial initiative, the Smart Finance for Smart Buildings (SFSB) initiative<sup>38</sup>. The aim is to make investments in energy efficiency projects in buildings more attractive to private investors, through the intelligent use of EU funds. Its core steps are making more effective use of public funds, assisting and aggregating project development (e.g. through one-stop-shops) and de-risking energy efficiency investments. The SFSB aims at unlocking €10 billion of private and public funds and creating up to 220,000 jobs. In the long run this should have a significant impact on the renovation rate, job creation and the alleviation of energy poverty. SFSB helps to de-risk investments in the building sector, giving investors a clearer picture of the risks but also the benefits of energy efficiency investments.

The SFSB initiative also supports the use of Energy Performance Contracts (EPCs) in the public sector. These are a practical way of making public buildings and other public infrastructures more energy efficient: the initial investment is covered by a private partner and repaid by guaranteed energy savings.

Another investment tool, the European Energy Efficiency Fund (eeef)<sup>39</sup> has been created by the European Commission and the EIB as a public-private-partnership and has been provided with approximately €146 million. The aim of this fund is to invest in energy savings and the reduction of greenhouse gas emissions as well as increasing the use of renewable energy. The fund offers investments in the public sector, in order to overcome budget restrictions and encourage more efficient allocation of funds.

The Covenant of Mayors<sup>40</sup> was launched in 2008 with the ambition to gather local governments voluntarily committed to achieving and exceeding the EU climate and energy targets. Signatory cities pledge action to support implementation of the EU 40% greenhouse gas-reduction target by 2030 and the adoption

<sup>36</sup> [www.buildup.eu](http://www.buildup.eu)

<sup>37</sup> <http://buildupon.eu/initiatives/>

<sup>38</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1575045684774&uri=CELEX:52016DC0860#document2>

<sup>39</sup> [www.eeef.eu](http://www.eeef.eu)

<sup>40</sup> <https://www.covenantofmayors.eu>

of a joint approach to tackling mitigation and adaptation to climate change. Part of this is developing a Sustainable Energy and Climate Action Plan (SECAP). A focus of the Covenant of Mayors is building renovation, as this is a major way of reducing greenhouse gas emissions and energy consumption in cities.

## LESSONS LEARNT AND BEST PRACTICES

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The EPBD requirements give quite some room for interpretation and leeway for implementation. In the past, Member States have taken very different pathways in implementing the legislation and transferring it into national law.

All Member States had to deliver a national renovation strategy by 2014 and 2017 and should have delivered their LTRS by March 2020. The change of renovation strategies to long-term strategies is a key factor, as a long-term vision has been missing from most strategies so far. Developed at national level, the LTRS must be put at the heart of building policies and should be the basis for developing new policy initiatives, such as those of the European Green Deal with its Renovation Wave, announced for the second half of 2020.

The most successful policy design is one which focuses on a mix of policies and enabling conditions. This is done through implementing regulation, incentives, training, communication and financial support while monitoring the success of the policies.

While the EPBD provides some guidelines on how LTRS should be drafted, the choice of specific policies and measures to achieve the 2050 goal is left to Member States. The inclusion of regulatory policies and measures addressing some of the areas suggested below would affect the quality and effectiveness of LTRS:

- Removing or implementing measures to overcome restrictive tenancy laws which disincentivise or otherwise inhibit energy performance improvement
- Mandate improvement of the least-efficient stock to higher energy performance levels, e.g. through restrictions on sale or rental of buildings in the lowest energy performance categories
- Developing renovation standards that are progressively and regularly strengthened in response to experience and new technological solutions
- Analysing the potential for district heating systems to provide efficient, low carbon energy, aligned with planning for building renovation
- Ensuring proper monitoring and enforcement of compliance with building codes as well as quality standards/certification systems

Financial policies which can increase the renovation rate and have been identified as best practice include:

- Funding vehicles, tailored to specific market segments, that provide a simple ('one-stop-shop') and commercially attractive source of finance for deep renovation
- Mechanisms to encourage deep renovation via third-party financing (e.g. ESCOs, EPCs)
- Energy/carbon pricing mechanisms to provide the right economic signals, removing fossil fuel subsidies and introducing 'bonus-malus' mechanisms, e.g. property taxation systems (which reward high energy performing buildings while penalising poorly performing ones) and energy pricing

Apart from legal and fiscal incentives and regulations it is very important that knowledge is shared and that there is ongoing communication on all issues regarding renovation in order to make sure that targets are met, and financial incentives are used.

Some examples for better communication on the renovation needs are easily available; comparisons of good practices and communication with the target groups include:

- Establishing publicly accessible databases demonstrating energy performance of renovated buildings and information on how to undertake deep renovation
- Gearing up skills and training programmes covering the key professions and disciplines
- Establishing knowledge and experience-sharing networks across regions/Member States
- Encouraging development of local supply chain industries for maximising macro-economic benefits and minimising embedded CO<sub>2</sub> emissions
- Developing promotional and dissemination activities that sensitise building owners to opportunities for deep renovation and that provide stepwise support throughout the renovation process
- More generally communicating regularly and publicly on progress with the renovation strategy

Not all policies are applicable in all Member States, and they will all need tailoring to the specific national and market circumstances. Some topics such as energy poverty, the split-incentive dilemma or lack of knowledge on renovation necessities still need to be fully tackled through Member States' policies. A thorough implementation of the EPBD as well as specific measures which could be introduced within the Renovation Wave can improve these.

Successful implementation of some of these factors has already happened in several EU countries. For example, the Czech Republic, France, Greece, Hungary, Ireland, Lithuania, Romania, Slovenia and Spain all have high standard building renovation strategies which include good building performance standards, financial incentives, information campaigns and long-term planning for the residential and non-residential sectors [13].

Denmark, as one of the frontrunner countries in the EU, has implemented a strategy which involves strong energy performance requirements, a strong timeline for implementation and specific strategies for different target groups such as multi-family buildings, single-family buildings, public buildings and commercial buildings.

Regarding financial incentives, all countries offer them but few have elaborated long-time systems of funding. Austria for example has longstanding experience with public subsidies for efficiency measures for existing and new residential buildings (since 1982) and has continuously tightened the requirements. Germany has a long successful tradition with grants and loans through its KfW scheme<sup>41</sup>, which provide support for renovations achieving various performance levels; the most ambitious one being the KfW Efficiency House 55 representing 55% of the maximum primary energy requirement set for a new building [38].

Information campaigns and awareness raising are necessary to round off the national strategies. In this regard EU Member States have adopted many different approaches, from providing easy-to-read EPCs, to providing information and advice through subsidised energy advisors, to widespread public information campaigns. These are pivotal for raising the awareness of the public, building owners, policymakers and investors, and work best when combined with the measures described above regarding regulation, financial incentives and monitoring of results through data management.

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<sup>41</sup> <https://www.kfw.de/inlandsfoerderung/Privatpersonen/index-3.html>

The Concerted Action EPBD (CA EPBD)<sup>42</sup> is a joint initiative between the European Commission and Member States. It is a platform to improve the sharing of experience on the EPBD through sharing best practices and information in order to facilitate national implementation. CA EPBD meets several times per year and national ministries and their affiliated institutions, such as energy agencies from all EU Member States and Norway, participate in this exchange. External guests (e.g. researchers, thinktanks, experts) can be invited to present on specific topics and introduce new case studies.

## BARRIERS AND HOW TO OVERCOME THEM

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New buildings are increasingly constructed to demanding energy performance levels, and the path has been laid within EU legislation for all new buildings to have nearly zero energy requirements by 2021. Yet more than 40% of our residential buildings have been constructed before the 1960s when energy building regulations were very limited, and 75% before 1990 when the first EU building standard was introduced [36][1]. At current rates of renovation, the full potential for cost-effective improvement will not be achieved before the end of the century. The most pressing issues currently are low renovation rate (rate and depth), very low levels of deep renovation, limited data availability, lack of accountability of governments for reaching the targets and reliable long-term financing options.

There are a number of issues linked to the low renovation rate which need to be overcome:

**The energy efficiency goal not being binding**, energy savings under the Energy Efficiency Directive can still be accomplished through other measures than Energy Savings Obligations (i.e. Member States may adopt alternative measures that achieve the same effect). This may result in countries favouring measures which are difficult to distinguish from business-as-usual policies and therefore difficult to monitor.

While the Clean Energy Package addresses issues of multiple benefits and requires Member States to take them into account when developing their LTRS, there is a clear **lack of quantification and monetisation of the multiple benefits of renovation** (health, comfort, wellbeing, productivity). This makes it difficult to include them in cost-benefit analyses or EPCs, which thereby acts as a barrier. Only a few Member States have tried to include multiple benefits in their renovation strategies or EPCs so far.

Finally, there is a clear lack of strategy and concrete action plans at Member State level to **address decarbonisation of heating and cooling and integrate** this into the larger picture of national strategic goals to reach the decarbonisation of the building sector. This should include integration of urban planning and urban regeneration in renovation strategies as well as social policies which can absorb the high costs of renovation.

**Long-term goals coupled with clear milestones and strategies which provide security for investors and the construction sector are necessary.** The long-term renovation strategies coupled with the impetus of the Renovation Wave will provide a good step in this direction.

A consistent and effective renovation policy at national level needs **strong and lasting cooperation among different levels of governance**. However, the competences of local authorities vary substantially among different EU countries. Local and regional authorities need to be included in the policy process in order to make sure that implementation of the policies is taken care of. Currently the implementation of the renovation policies differs largely between countries but also among local and regional authorities within many countries.

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<sup>42</sup> <https://epbd-ca.eu>

In order to increase the renovation rate to the necessary 3% per year, there is a clear need for additional financing (€800 billion). This has also been identified as a main barrier which prevents homeowners from renovating, as they lack financing or the information on how to access grants and loans. Therefore, **an emphasis has to be put on new and innovative financing schemes which reach homeowners, and which target not only light renovations but deep renovation, either holistic or through a step-by-step renovation process.** For this an integrated approach is needed, which includes all costs and benefits and links these to existing instruments such as EPCs.

Renovating a building is, in most cases, a very individual process which needs to be tailored specifically to the building, its use and occupants. **Qualified and skilled planners, installers and construction workers are needed.** Currently one of the barriers to increasing the renovation rate is that these are not always readily available. An increase of the annual renovation rate to 3% requires scaling up a skilled workforce to meet the demand. More funds for research on new construction and renovation processes to incentivise industrialisation (e.g. prefabrication, 3D printing) plus financing for training and upskilling are needed to secure high quality in building renovation.

Finally, LTRS should provide a long-term outlook on how regulation will need to change over the next 10 years and provide guidance on removing administrative barriers hampering renovation.

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# CIRCULAR ECONOMY FOR BUILDINGS

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The construction sector has considerable potential for introducing circular economy principles given the scale of material use, the value contained in buildings, its labour intensiveness, and the long-term effect of its measures. It is one of the most resource consuming sectors in Europe, accounting for approximately half of all extracted materials, half of total energy consumption and one third of water consumption. Construction and demolition waste (CDW) accounts for approximately 25-30% of all waste generated in the EU with very significant life cycle impacts, particularly associated with extraction and processing stages. The level of recycling and material recovery of CDW varies greatly (between less than 10% and over 90%) between EU Member States. The overall objective for circular buildings is to reduce the life cycle impact at the same time as providing healthy and comfortable spaces. This should lead to reduced whole life carbon consumption, increase of reused and recycled content, and sustainable handling of CDW. Circularity and sustainability need to be assessed over the whole life cycle of the building to optimise reduction of carbon emissions and material flows. One example is the embodied carbon burden of installing triple glazing rather than double, which can be greater than the resulting operational benefit. To get a true picture of a building's energy, material and carbon emissions impact, it is necessary to understand not only operational and embodied emissions on their own, but also the interrelationship between them [39].

## CIRCULAR ECONOMY ACTION PLAN

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As one of the pillars of the Green Deal the European Commission adopted a new Circular Economy Action Plan (CEAP)<sup>43</sup> in March 2020. It includes measures that will help stimulate Europe's transition towards a circular economy and encompasses the entire life cycle of products<sup>44</sup>. The CEAP covers all products and production chains, identifying key value chains of which construction and building is one. With regards to buildings, the main output will be a Strategy for a Sustainable Built Environment. The Strategy will aim at ensuring circularity principles throughout the life cycle of buildings and is supposed to include measures to increase the sustainability performance of construction products (possibly including recycled content requirements), actions to increase the durability and adaptability of buildings including the development of digital logbooks, a further usage of the Level(s) initiative for public procurement and the EU sustainable finance framework, and support for initiatives which reduce soil sealing [40].

The CEAP also refers to the Renovation Wave, promising that it will implement circular economy principles throughout the construction and building sector.

The CEAP was first introduced in 2015 and established a series of actions, with measures covering the whole cycle from production and consumption to construction and demolition. Moreover, it covered

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<sup>43</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>

<sup>44</sup> <https://ec.europa.eu/environment/circular-economy/>

waste management and the market for secondary raw materials as well as a revised legislative proposal on waste, the Waste Framework Directive which was adopted in 2018<sup>45</sup>. The action plan includes a balanced mix of voluntary initiatives and regulatory actions for production, consumption, waste management and secondary raw materials. It also identifies five priority sectors: plastics, food waste, biomass and bio-based products, critical raw materials, and construction and demolition.

The action on green public procurement enhances integration of circular economy requirements, supporting a higher uptake of green public procurement, including through training schemes, reinforcing its use in procurement policies of the European Commission and EU funds. Revised EU green public procurement criteria integrating circular economy requirements include among others construction and maintenance, and office building design. To support the uptake of green public procurement, the Commission published a handbook, 'Buying green'<sup>46</sup> and a brochure on 'Public Procurement for a Circular Economy'<sup>47</sup>.

Construction and demolition are a major part of the CEAP. Three documents have been published on this: The Guidelines for the waste audits before demolition and renovation works of buildings<sup>48</sup>, the voluntary industry-wide recycling protocol for construction and demolition waste<sup>49</sup>, and the core indicators for the assessment of the life cycle environmental performance of a building and incentives for their use<sup>50</sup>. On the basis of the last guideline, Level(s), the European reporting framework for sustainable buildings with its indicators and life cycle tools, has been developed with stakeholders. It includes both resource use indicators and indicators linked to the quality and the value of buildings.

### **Level(s)**

The European Commission, in collaboration with a number of building professionals, has developed a tool to assess and report on sustainability aspects throughout the lifetime of buildings.<sup>51</sup> The tool is called Level(s). The objective is to provide a common language on sustainability and circularity for buildings targeting the mainstream market. It should be an easy entry point to sustainability assessment, which includes the building projects which currently consider such an assessment as being too complex. Level(s) will increase knowledge across the market and will gradually allow standard building projects to improve building performance in a cost-efficient way and enable comparability, exchange of good practice and benchmarking. The outputs are meant to be used in different initiatives for circular buildings, such as green public procurement, building passport concepts and market initiatives.

Long-term thinking is important in regards to circular buildings, especially regarding maintenance, durability and lifespan, deconstruction, recycling and adaptability of building components. Taking all this into account could lead to better and higher reuse rates of construction products. Market incentives promoting sustainability are important in this sector, as payback times for investments in circularity typically are linked to the building performance over the full lifetime, which is quite long for buildings and investors.

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<sup>45</sup> Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste

<sup>46</sup> <http://ec.europa.eu/environment/gpp/pdf/Buying-Green-Handbook-3rd-Edition.pdf>

<sup>47</sup> [https://ec.europa.eu/environment/gpp/pdf/cp\\_european\\_commission\\_brochure\\_en.pdf](https://ec.europa.eu/environment/gpp/pdf/cp_european_commission_brochure_en.pdf)

<sup>48</sup> <https://ec.europa.eu/docsroom/documents/31521/attachments/1/translations/en/renditions/native>

<sup>49</sup> <https://ec.europa.eu/docsroom/documents/24563/attachments/1/translations/en/renditions/native>

<sup>50</sup> [https://susproc.jrc.ec.europa.eu/Efficient\\_Buildings/docs/Efficient%20Buildings%20project%20overview.pdf](https://susproc.jrc.ec.europa.eu/Efficient_Buildings/docs/Efficient%20Buildings%20project%20overview.pdf)

<sup>51</sup> <http://ec.europa.eu/environment/eussd/buildings.htm>

## WASTE FRAMEWORK DIRECTIVE

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The Waste Framework Directive (2008/98/EC)<sup>52</sup> aims to achieve a 70% recovery target for construction and demolition waste by 2020, and suggests increasing the life span of buildings first and then increasing the reuse and recycling of materials.

Nevertheless, only about 50% CDW is currently being recycled in the EU. There are some good practices which achieve higher rates and some EU countries, such as the Netherlands, Sweden and Austria, have implemented legislation which could lead to 90% recycling rates [41].

However, one of the common hurdles to recycling and reusing CDW in the EU is the lack of confidence in the quality of C&D recycled materials. There is also uncertainty about the potential health risk for workers using recycled C&D materials. This lack of confidence reduces and restricts the demand for C&D recycled materials, which inhibits the development of C&D waste management and recycling infrastructures in the EU.

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<sup>52</sup> <https://ec.europa.eu/environment/waste/framework/>



# PRODUCT POLICY

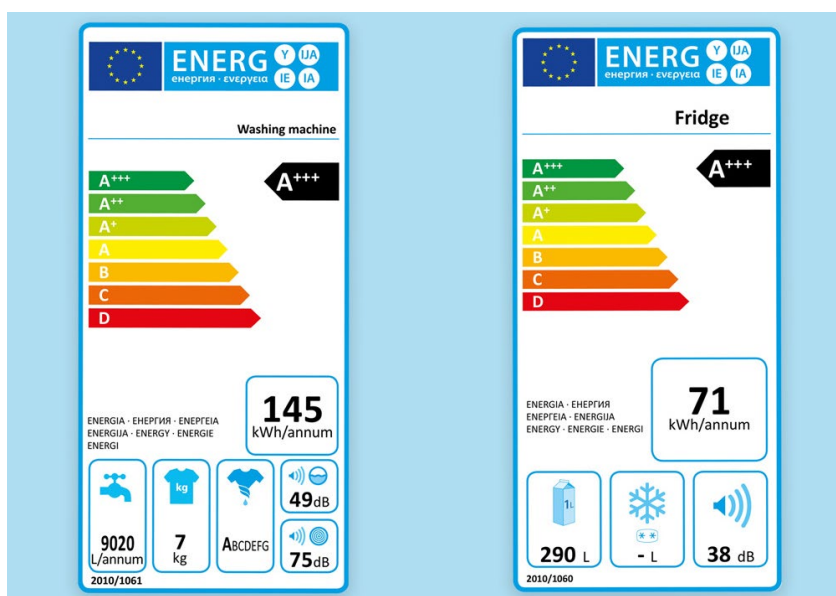
The products used in a building for heating and cooling, as well as electric products, have a major influence on the building's overall energy consumption. Therefore, it is important to ensure that these products meet high efficiency standards, are properly maintained and replaced regularly, and that building owners and tenants have a clear picture of their energy consumption.

The EU energy efficiency product policy is based on two main directives: the energy labelling directive, which aims at providing a clear and simple indication of the energy efficiency of products at the point of purchase; and the Eco-Design, which improves the environmental performance of products by setting mandatory minimum standards for their energy efficiency and eliminating the least performing products from the market.

## ENERGY LABELLING

EU energy labelling<sup>53</sup> was originally introduced in 1994, offering consumers a guideline for purchasing energy-efficient household appliances through a simple coloured scale reaching from A (most efficient) to G (least efficient). Due to the success of the label and the progress in products' efficiency, the scale was gradually extended to A+ - A+++ (Figure 9). In addition to information about a product's energy consumption, today the label can also provide specific data about other relevant features of usage such as the product's noise emissions or water consumption<sup>54</sup>. A survey carried out by the European Commission in 2019 showed that the energy label is widely accepted by European consumers, with 97% stating that they recognise the label and 73% that they take it into consideration when buying appliances [42].

**Figure 9 - Current EU energy label** (Source: European Commission)

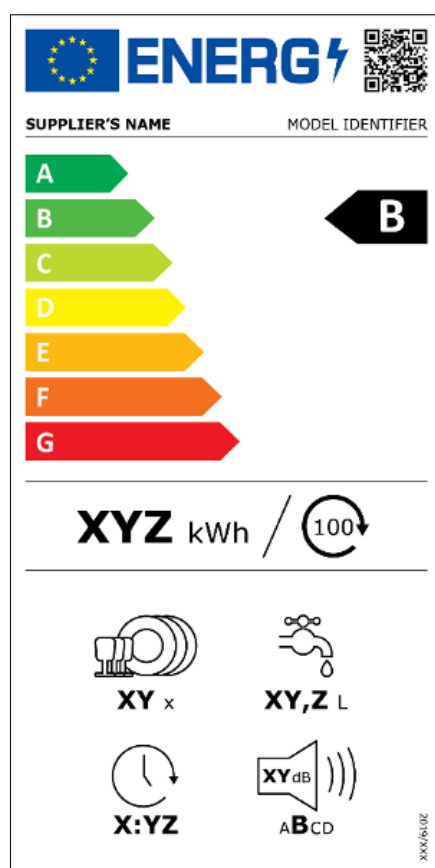


<sup>53</sup> [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L\\_2017.198.01.0001.01.ENG](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_2017.198.01.0001.01.ENG)

<sup>54</sup> [https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign\\_en](https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign_en)

As a result of the development of more and more energy-efficient products, and because the difference between A++ and A+++ is less obvious to the consumer, the categories will be gradually adjusted to reintroduce the simpler A to G scale. The rescaling of the five product categories will take place in 2021<sup>55</sup> and the highest class A will initially be empty to leave room for more efficient products in the future. Depending on the product, the energy labels will display not only electricity consumption, but also other energy and non-energy information, with intuitive pictograms, to compare products and offer a better informed purchase choice: information about water used per washing cycle, storing capacity, noise emitted, etc. Another new element in the label is a QR code with which consumers will be able to get additional information by scanning the code with a smartphone.

**Figure 10 - New labels, visible for European consumers in physical stores and online as of 1 March 2021** (Source: European Commission)



From 1 January 2019, suppliers (manufacturers, importers or authorised representatives) have had to upload information about their products into the European product database for energy labelling (EPREL)<sup>56</sup> before placing these products on the European market. It is planned that consumers will be able to search the database for efficient products from 2020 onwards.

In 2015 the energy labelling of local space heaters was introduced in regulation 2015/1186<sup>57</sup>. This covers all new space heaters with a nominal heat output of 50 kW or less, and those older than 15 years which are still in use. This label is currently being implemented in two steps, with all heaters having to provide a label by 1 January 2022.

<sup>55</sup> Fridges, dishwashers, washing machines, electronic displays including televisions and lamps

<sup>56</sup> [https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/product-database\\_en](https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/product-database_en)

<sup>57</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R1186>

## ECODESIGN DIRECTIVE

The directive for the setting of ecodesign requirements for energy-related products (Ecodesign)<sup>58</sup> goes hand in hand with energy labelling. Adopted in 2005 and recast in 2009, the directive on ecodesign sets mandatory minimum standards for product efficiency, thereby ensuring that the most inefficient products are gradually phased out of the European market and that highly inefficient products are not allowed to reach the stores. By introducing minimum energy requirements for a large group of products (e.g. from white appliances to TVs, ovens, heating and cooling equipment, pumps and electric motors) the directive has eliminated the most poorly performing products from the market, significantly contributing to the EU's energy efficiency objective. In 2019 new measures were adopted for certain product categories, such as light sources, external power supplies and washing machines. These include better reparability and recyclability, the availability of spare parts and access to repair and maintenance information, an important step on the way to a circular economy approach for products.

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<sup>58</sup> <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ%3AL%3A2009%3A285%3A0010%3A0035%3Aen%3APDF>

# CONCLUSIONS

In the last 20 years, the European Union has progressively adopted climate and energy goals and introduced legislation to achieve them. Buildings and construction are key sectors for the 2050 decarbonisation and climate goals. The Clean Energy Package managed to strengthen relevant European legislation and accelerate the energy transition in Europe. The introduction of the national objective of achieving a highly efficient and decarbonised building stock by 2050 in the LTRS is a recognition of the central role that the built environment has in decarbonising the energy system and achieving EU climate targets.

Nevertheless, the renovation rate in Europe is still very low, and because buildings in the EU have a renovation cycle of about 20 to 30 years, it is very important that action is taken now to apply the newest standards for new buildings and to incentivise the quality of renovation of existing buildings to a highly efficient standard.

The new elements introduced in the Clean Energy Package address some of the shortcomings which have been identified, but they lack harmonisation among Member States and mild implementation persists. Overall EU Member States could be more ambitious and develop and implement a more visionary perspective for 2050, while the European Commission must ensure monitoring and enforcement of existing legislation.

A future-proof building stock that contributes to climate neutrality by 2050 also needs to seriously tackle issues of embodied carbon and the reduction and proper disposal of construction and demolition waste. A thorough life cycle assessment needs to be incorporated into all strategies concerning new and existing buildings and building materials.

Finally, the European Commission has taken steps to promote continuous stakeholder engagement in Member States. This is crucial not only for securing public acceptance but also to make sure that policies are reaching the right people and targeting the necessary respondents. Strong networks with key players in the region accelerate the development of new policies. Building public trust is key, and can be achieved through increasing transparency, accountability and citizen participation and engagement. [43].

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## AVAILABLE GUIDING DOCUMENTS

- European Commission – Guidelines for the promotion of nearly zero-energy buildings and best practices [9]
- Buildings Performance Institute Europe (BPIE) – Factsheet: nZEB definitions in the EU Member States [44]
- Buildings Performance Institute Europe (BPIE) – Principles for nearly zero-energy buildings [45]
- European Commission – Guidelines for the promotion of nearly zero-energy buildings and best practices
- Buildings Performance Institute Europe (BPIE) – Implementing the Cost-Optimal Methodology in EU countries: lessons learned from three case studies
- Commission guidance on how to implement revised Energy Performance of Buildings Directive provisions on building renovation
- European Commission – Guidelines on establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements



Buildings Performance Institute Europe (BPIE)

Rue de la Science 23

1040 Brussels

Belgium

[www.bpie.eu](http://www.bpie.eu)

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