

# Energy Performance of Buildings Directive (EPBD): overview

The Energy Performance of Buildings Directive (EPBD) stands as a cornerstone of European Union legislation aimed at promoting energy efficiency and sustainability in the built environment. Over the past two years, the EPBD has undergone substantial amendments due to the political discussion and compromise between the different institutions. Recognising the critical importance of this legislation, we have crafted a comprehensive summary article, encompassing Articles 1 to 22 of the directive, along with an overview of Annexes I, II, III, V, VII, VIII.

This summary serves as a valuable resource to support our members in comprehending and implementing the provisions outlined in the EPBD. It offers insights into various aspects of the directive, providing clarity on key topics essential for achieving energy efficiency and sustainability goals in our sector. The summary covers a wide array of topics, including:

- the common general framework for a methodology for calculating the integrated energy performance of buildings and building units.
- the application of minimum energy performance requirements to new buildings and new building units
- the application of minimum energy performance requirements to:
  - existing buildings and existing building units that are undergoing major renovation.
  - building elements that form part of the building envelope and that have a significant impact on the energy performance of the building envelope when they are retrofitted or replaced.
  - technical building systems where they are installed, replaced, or upgraded;
- (d) the application of minimum energy performance standards to existing buildings and existing building units, by Articles 3 and 9
- the calculation and disclosure of the life-cycle global warming potential of buildings
- solar energy in buildings
- renovation passports
- national building renovation plans
- sustainable mobility infrastructure in and adjacent to buildings
- smart buildings
- energy performance certification of buildings or building units.
- regular inspection of heating systems, ventilation systems and air-conditioning systems in buildings

- independent control systems for energy performance certificates, renovation passports, smart readiness indicators and inspection reports
- the indoor environmental quality performance of buildings

## Policy context

Under the Paris Agreement, nations worldwide committed to ambitious targets aimed at curbing global warming, including limiting the rise in the global average temperature to well below 2°C above pre-industrial levels, with efforts to cap it at 1.5°C. The EU has taken significant strides toward meeting these objectives, particularly through initiatives like the European Green Deal, unveiled in December 2019, which serves as a comprehensive roadmap for achieving climate neutrality and sustainability across various sectors.

A key component of the EU's efforts is the Renovation Wave strategy, announced in October 2020, which seeks to transform Europe's building stock into energy-efficient and sustainable structures. This strategy entails doubling the rate of energy renovations annually by 2030, aiming to renovate 35 million buildings by the same year and generating employment opportunities in the construction sector. To realize these goals, revisions to Directive 2010/31/EU are deemed essential, as they represent a pivotal mechanism for driving the Renovation Wave forward. Furthermore, these revisions align with other EU initiatives, such as the New European Bauhaus initiative and the mission on climate-neutral cities, which underscore the importance of integrating sustainability principles into urban development.

In tandem with these efforts, the Energy Performance of Buildings Directive (EPBD) enshrines the target of achieving climate neutrality by 2050 and sets a binding commitment to reduce net greenhouse gas emissions by at least 55% below 1990 levels by 2030. This regulation forms part of the broader "Fit for 55" legislative package, introduced in October 2020, which encompasses diverse policy areas, including energy efficiency, renewable energy, and emissions trading, among others. Additionally, the REPowerEU plan, outlined in May 2022, offers further measures to accelerate the transition to clean energy, emphasizing energy savings and the reduction of fossil fuel consumption.

## The Energy Performance of Building Directive

The comprehensive directive emphasizes the crucial role of buildings in greenhouse gas emissions throughout their lifecycle, highlighting the need for a holistic approach to their environmental impact. It underscores the transition toward zero-emission buildings, aiming for very low energy demand and minimal operational greenhouse gas emissions. The directive advocates for the consideration of whole lifecycle emissions, starting with new constructions and extending to renovations, promoting resource efficiency, circularity, and the reduction of global warming potential (GWP).

Furthermore, it addresses the significant contribution of buildings to air pollution and premature deaths, stressing the importance of improving energy performance to reduce pollutant emissions, in alignment with existing directives. The directive also emphasizes the importance of considering climatic conditions, adaptation to climate change, and indoor climate in energy performance improvement measures, while ensuring compliance with other building requirements.

In terms of energy performance standards, the directive outlines the need for minimum requirements for both residential and non-residential buildings, aiming to trigger large-scale renovations and phase out fossil fuels in heating and cooling systems. It encourages the deployment of renewable energy sources, such as solar technologies, and sets forth guidelines for their efficient implementation, including the concept of "solar-ready" buildings.

Moreover, the directive emphasizes the importance of financial support and technical assistance, especially for vulnerable households, to facilitate the adoption of energy-efficient measures. It also highlights the role of Member States in establishing national trajectories for building renovations, ensuring progress toward decarbonization targets.

To achieve the ambitious goals of a highly energy-efficient and decarbonized building stock, the directive calls for the establishment of national building renovation plans. These plans replace the long-term renovation strategies outlined in previous directives and serve as robust planning tools for Member States, aligning with the principle of "energy efficiency first." These plans are to include national building renovation targets, outline financing measures, investment needs, and administrative resources necessary for implementation, thereby providing a comprehensive framework for achieving sustainable building renovation goals.

Overall, the directive represents a comprehensive framework for promoting energy efficiency, reducing greenhouse gas emissions, and accelerating the transition to sustainable and zero-emission buildings, contributing to the broader goals of the European Green Deal and climate neutrality by 2050.

#### The Energy Performance of Building Directive and EU Taxonomy

The EU Taxonomy, established by Regulation (EU) 2020/852 of the European Parliament and of the Council, classifies environmentally sustainable economic activities across the economy, including for the building sector. Under Commission Delegated Regulation (EU) 2021/213916 (the 'EU Taxonomy Climate Delegated Act'), building renovation is considered to be a sustainable activity where it achieves at least 30 % energy savings, complies with minimum energy performance requirements for major renovation of existing buildings, or consists of individual measures related to the energy performance of buildings, such as the installation, maintenance or repair of energy efficiency equipment or of instruments and devices for measuring, regulating and controlling the energy performance of buildings, where such individual measures comply with the established criteria. Building renovation to comply with Union-wide minimum energy performance standards is typically in line with the EU Taxonomy criteria related to building renovation activities.

## Scope (Article 1)

The directive aims to enhance the energy efficiency of buildings and decrease greenhouse gas emissions across the Union, ultimately striving for a zero-emission building stock by 2050. It considers numerous factors including climate conditions, local circumstances, indoor environmental quality, and the role of buildings in energy system flexibility.

The directive specifies requirements such as establishing a methodology for calculating energy performance, setting minimum standards for new and existing buildings, addressing building elements' impact on energy performance, promoting renewable energy use, transitioning away from fossil fuels, introducing renovation passports and national renovation plans, integrating sustainable mobility infrastructure, encouraging smart buildings, and emphasizing nature-based solutions.

## Definitions (Article 2)

At its core, the directive establishes the overarching objective of transitioning towards a building stock that emits no net greenhouse gases. It provides definitions for key terms such as zero-emission building, nearly zero-energy building, and renovation passport to provide clarity and uniformity in understanding and implementation.

<b>Zero-emission building</b>	A building with very high energy performance, as determined in accordance with Annex I, requiring zero or a very low amount of energy, producing zero on-site carbon emissions from fossil fuels and producing zero or a very low amount of operational greenhouse gas emissions, in accordance with Article 11
<b>Nearly zero-energy building</b>	A building with a very high energy performance, as determined in accordance with Annex I, which is no worse than the 2023 cost-optimal level reported by Member States pursuant to Article 6(2) and where the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced onsite or energy from renewable sources produced nearby
<b>Minimum energy performance standards</b>	Rules that require existing buildings to meet an energy performance requirement as part of a wide renovation plan for a building stock or at a trigger point on the market (sale or rent), in a period or by a specific date, in line with the energy efficiency first principle, thereby triggering renovation of existing buildings
<b>Technical building system</b>	Technical equipment of a building or building unit for space heating, space cooling, ventilation, domestic hot water, built-in lighting, building automation and control, on-site renewable energy generation and energy storage, or a combination thereof, including those systems using energy from renewable sources
<b>Building automation and control system</b>	A system comprising all products, software and engineering services that can support energy-efficient, economical and safe operation of technical building systems through automatic controls and by facilitating the manual management of those technical building systems
<b>Renovation passport</b>	A tailored roadmap for the deep renovation of a specific building in a maximum number of steps that will significantly improve its energy performance

<b>Deep renovation</b>	<p>A renovation which is in line with the 'energy efficiency first' principle, which focuses on essential building elements, and which transforms a building or building unit:</p> <p>(a) before 1 January 2030, into a nearly zero-energy building.</p> <p>(b) from 1 January 2030, into a zero-emission building</p>
<b>Major renovation</b>	<p>The renovation of a building where:</p> <p>(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</p> <p>(b) more than 25 % of the surface of the building envelope undergoes renovation.</p> <p>Member States may choose to apply point (a) or (b)</p>
<b>Operational greenhouse gas emissions</b>	Greenhouse gas emissions associated with the energy consumption of the technical building systems during the use and operation of the building
<b>Whole life-cycle greenhouse gas emissions</b>	Greenhouse gas emissions that occur over the whole life cycle of a building, including the production and transport of construction products, construction-site activities, the use of energy in the building and replacement of construction products, as well as demolition, transport and management of waste materials and their reuse, recycling and final disposal
<b>Life-cycle global warming potential (GWP)</b>	An indicator which quantifies the global warming potential contributions of a building along its full life cycle
<b>Energy performance certificate</b>	A certificate, recognised by a Member State or by a legal person designated by it, which indicates the energy performance of a building or building unit, calculated in accordance with a methodology adopted pursuant to Article 4
<b>Cost-optimal level</b>	<p>The energy performance level which leads to the lowest cost during the estimated economic life cycle, where:</p> <p>(a) the lowest cost is determined taking into account:</p> <ul style="list-style-type: none"> <li>(i) the category and use of the building concerned.</li> <li>(ii) energy-related investment costs on the basis of official forecasts.</li> <li>(iii) maintenance and operating costs, including energy costs taking into account the cost of greenhouse gas allowances.</li> <li>(iv) environmental and health externalities of energy use.</li> <li>(v) earnings from energy produced on-site, where applicable.</li> <li>(vi) waste management costs, where applicable; and</li> </ul> <p>(b) the estimated economic life cycle is determined by each Member State and refers to the remaining estimated economic life cycle of a building where energy performance requirements are set for the building, or to the estimated economic life cycle of a building element where energy performance requirements are set for building elements.</p> <p>The cost-optimal level shall lie within the range of performance levels where the cost-benefit analysis calculated over the estimated economic life cycle is positive</p>
<b>Mortgage portfolio standards</b>	A mechanisms incentivising mortgage lenders to establish a path to increase the median energy performance of the portfolio of buildings covered by their mortgages towards 2030 and 2050, and to encourage potential clients to improve the energy performance of their property in line with the Union's decarbonisation ambition and relevant energy targets in the area of energy consumption in buildings, relying on the criteria for

	determining environmentally sustainable economic activities set out in Article 3 of Regulation (EU) 2020/852
<b>Digital building logbook</b>	A common repository for all relevant building data, including data related to energy performance such as energy performance certificates, renovation passports and smart readiness indicators, as well as data related to the life-cycle GWP, which facilitates informed decision making and information sharing within the construction sector, and among building owners and occupants, financial institutions and public bodies

### National Building Renovation Plans (Article 3)

The directive mandates the establishment of **national building renovation plans** by each Member State to transition their residential and non-residential building stock, both public and private, into highly energy-efficient and decarbonized structures by 2050, with the goal of achieving zero-emission targets.

These plans are tailored to address the unique characteristics and challenges of each country's residential and non-residential building sectors, encompassing public and private properties.

They should include strategies, targets, and timelines for improving energy performance, reducing emissions, addressing energy poverty, and facilitating the transition to sustainable building practices. Including:

- the thresholds for the operational greenhouse gas emissions and annual primary energy demand of a new or renovated zero-emission building,
- minimum energy performance standards for non-residential buildings based on maximum energy performance thresholds,
- national trajectory for the renovation of the residential building stock, including the 2030 and 2035 milestones for average primary energy use in kWh/ (m2.y).

Member States shall submit the first draft building renovation plan to the Commission by 31 December 2025 and draft plans every five years, involving regional and local authorities and conducting public consultations.

### Methodology and Minimum Energy Performance Requirements (Articles 4 & 5)

Member States shall adopt a methodology for calculating the energy performance of buildings based on the common framework outlined in Annex I. This methodology can be implemented at the national or regional level.

Member States shall establish minimum energy performance requirements for buildings or building units, aiming to achieve cost-optimal levels. These requirements should consider the impact of building elements on energy performance, differentiate between new and existing buildings, and ensure optimal indoor environmental quality. They must be reviewed every five years to incorporate technical advancements, cost-optimal calculations, and updated energy and climate goals.

### Exemptions:

- Member States can adjust requirements for buildings of special architectural or historical significance to preserve their character.
- Member States have the option to exempt certain categories of buildings from these requirements, including those used for national defence, religious activities, temporary structures, low-energy-demand industrial or agricultural buildings, seasonal residential buildings, and stand-alone buildings under 50 m<sup>2</sup>.

### Cost-optimal levels of minimum energy performance requirements (Article 6)

The Commission is authorized to adopt delegated acts to establish a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings. By June 30, 2025, the Commission must revise this framework for existing buildings undergoing major renovation and for individual building elements, aligning them with national pathways outlined in Member States' energy and climate plans.

Member States must use the comparative methodology framework to calculate cost-optimal levels, considering factors such as life-cycle global warming potential (GWP), climate conditions, and energy infrastructure accessibility. They should compare these calculations with existing minimum energy performance requirements (changes in energy prices, building materials, and labour costs should be considered).

If the comparison shows that existing requirements are more than 15% less energy efficient than cost-optimal levels, the Member State must adjust the requirements within 24 months of receiving the comparison results.

### Requirements for New Buildings (article 7)

The directive imposes stringent requirements on new buildings. From specified deadlines, all new buildings must meet zero-emission standards:

- a. From January 1, 2028, for new buildings occupied, operated, or owned by public authorities.
- b. From January 1, 2030, for all new buildings.

Member States shall address, in relation to new buildings, the issues of optimal indoor environmental quality, adaptation to climate change, fire safety, risks related to intense seismic activity and accessibility for persons with disabilities. Member States shall also address carbon removals associated to carbon storage in or on buildings.

#### Whole life Carbon provisions for new buildings:

- a. Member States must calculate and disclose the life-cycle global warming potential (GWP) of new buildings (with a useful floor area larger than 1000 m<sup>2</sup> starting from January 1, 2028, and January 1, 2030, for all new buildings, following Annex III.
- b. By December 31, 2025, the Commission is empowered to establish a harmonised EU framework for the national calculation of life cycle GWP to achieve climate neutrality.
- c. By 1 January 2027 Member States shall publish and notify to the Commission a roadmap detailing the introduction of limit values on the total cumulative life cycle GWP of all new buildings and set targets for new buildings from 2030, considering a progressive downward trend, as well as maximum limit values, detailed for different climatic zones and building typologies.

#### Requirements for Existing Buildings (article 8)

Member States must ensure that major renovation projects result in the upgraded energy performance of the building or renovated part to meet minimum energy performance requirements. These requirements should be applied to the renovated building as a whole or to individual renovated building elements, depending on feasibility.

When significant building envelope elements are retrofitted or replaced, Member States must ensure that the energy performance of these elements meets minimum requirements, if feasible.

Member States must encourage the deployment of high-efficiency alternative systems during major renovations, along with passive heating and cooling elements, indoor environmental quality standards, and measures to mitigate climate change impacts. Accessibility for persons with disabilities should also be ensured.

#### Minimum energy performance standards for non-residential buildings and trajectories for progressive renovation of the residential building stock (Article 9)

##### Non-residential Buildings

Member States are mandated to establish minimum energy performance standards for non-residential buildings, ensuring they do not exceed specified maximum energy performance thresholds. These thresholds, based on the non-residential building stock as of January 1, 2020, must be set such that 16% of the national non-residential building stock is above one threshold and 26% above another<sup>1</sup>. Compliance is

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<sup>1</sup> Each Member State shall set a maximum energy performance threshold to the effect that 16 % of its national non-residential building stock is above that threshold (the '16 % threshold'). Each Member State shall also set a maximum energy performance threshold to the effect that 26 % of its national non-residential building stock is above that threshold



to be verified through energy performance certificates or other means. The minimum energy performance standards shall ensure, at least, that all non-residential buildings are below:

- (a) the 16 % threshold from 2030; and
- (b) the 26 % threshold from 2033.

In their roadmap, Member States must outline timelines for achieving lower thresholds by 2040 and 2050, in line with the pathway for transforming the national building stock into zero-emission buildings.

Member States can establish criteria to exempt certain buildings based on expected future use, hardship, or cost-benefit assessment, ensuring fairness and reporting to the Commission. Equivalent energy performance improvements are required for exempted buildings, and where renovation costs are unfavourable, cost-effective measures must still be implemented.

### **Residential Buildings**

By 24 months from the date of entry into force of this Directive, each Member State shall establish a national trajectory for the progressive renovation of the residential building stock in line with the national roadmap and the 2030, 2040 and 2050 targets contained in the Member State's national building renovation plan and to transform the national building stock into a zero-emission building stock by 2050.

The national trajectory shall be expressed as a decrease in the average primary energy use in kWh/(m<sup>2</sup>.y) of the entire residential building stock over the period from 2020 to 2050, and shall identify the number of residential buildings and residential building units or floor area to be renovated annually, including the number or floor area of the 43 % worst performing residential buildings and residential building units.

Member States shall ensure that the average primary energy use in kWh/ (m<sup>2</sup>.y) of the entire residential building stock:

- (a) decreases by at least 16 % compared to 2020 by 2030.
- (b) decreases by at least 20-22 % compared to 2020 by 2035.
- (c) by 2040, and every 5 years thereafter, is equivalent to, or lower than the nationally determined value derived from a progressive decrease in the average primary energy use from 2030 to 2050, in line with the transformation of the residential building stock into a zero-emission building stock.

Member States must ensure that a sizeable portion (at least 55%) of the decrease in average primary energy use is attained through renovating the 43% worst-performing residential buildings. Additionally, they have the option to include energy reductions from buildings affected by natural disasters in this percentage.

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(the '26 % threshold'). Member States may set the maximum energy performance thresholds with reference to the national non-residential building stock as a whole or per building type or category of building.

To achieve the necessary decrease in energy use across the entire residential building stock, Member States are required to implement measures such as minimum energy performance standards, technical assistance, and financial support. It is important that in their renovation efforts, Member States avoid disproportionately exempting rental residential buildings or units to maintain fairness and equity across all sectors.

Member States are required to include in their national building renovation plans the methodology and data used to estimate values related to energy performance standards. The Commission will monitor the achievement of these values, particularly focusing on the renovation of the 43% worst-performing residential buildings, and provide recommendations, if necessary, which may involve the increased use of minimum energy performance standards.

The national trajectory for the progressive renovation of residential buildings should be based on data from the national residential building stock, using statistical sampling and energy performance certificates where appropriate. If the average fossil share of energy use in residential buildings is below 15%, Member States have the option to adjust energy use targets to ensure that by 2030, and every five years thereafter, the average primary energy use of the entire residential building stock aligns with a nationally determined value derived from a linear decrease from 2020 to 2050, in line with transitioning to a zero-emission building stock.

**Additional provisions:**

- Member States have the option to introduce additional indicators of non-renewable and renewable primary energy use, as well as operational greenhouse gas emissions. Minimum energy performance standards must consider these factors to ensure a reduction in operational greenhouse gas emissions, aligning with the objectives outlined in Directive (EU) 2018/2001.
- Member States are mandated to support compliance with minimum energy performance standards through various measures. These include providing financial assistance, especially targeting vulnerable households and those affected by energy poverty, offering technical assistance such as one-stop shops focusing on vulnerable groups, designing integrated financing schemes to incentivize deep renovations, removing non-economic barriers like split incentives, and monitoring social impacts, particularly on the most vulnerable households.
- Whenever a building undergoes renovation to meet minimum energy performance standards, Member States must ensure that the building elements also comply with minimum energy performance requirements as outlined in Article 5. In the case of a major renovation, existing buildings must adhere to additional minimum energy performance requirements.
- Member States have the discretion to exempt certain categories of buildings from the application of minimum energy performance standards. These include buildings of significant cultural or historical importance, places of worship, temporary structures, low-energy-demand industrial and agricultural buildings, certain residential buildings with limited use, small standalone structures, and buildings serving national defence purposes.

- Member States are required to take necessary measures to enforce the implementation of minimum energy performance standards, including establishing monitoring mechanisms and penalties in line with Article 34. These penalties should consider the financial circumstances and access to support of homeowners, particularly focusing on vulnerable households.
- By March 31, 2025, the Commission will present an analysis focusing on the effectiveness and appropriateness of financing instruments utilized to improve the energy performance of buildings, especially those identified as worst-performing. This analysis will evaluate the utilization of structural funds, Union framework programs, funds from public finance institutions, and coordination efforts between Union and national funding, aiming to optimize funding for achieving Union objectives. A report on these findings will be submitted to the European Parliament and the Council.

### Solar Energy in Buildings (Article 10)

Member States shall ensure that all new buildings are designed to optimise their solar energy generation potential based on the solar irradiance of the site, facilitating the subsequent cost-effective installation of solar technologies.

Member States shall promote the deployment of suitable solar energy installations:

- (a) by 31 December 2026, on all new public and non-residential buildings with useful floor area larger than 250 m<sup>2</sup>
- (b) on all existing public buildings with useful floor area larger than:
  - i. 2 000 m<sup>2</sup>, by 31 December 2027
  - ii. 750 m<sup>2</sup>, by 31 December 2028
  - iii. 250 m<sup>2</sup>, by 31 December 2030
- (c) by 31 December 2027, on existing non-residential buildings with useful floor area larger than 500 m<sup>2</sup>, where the building undergoes a major renovation or an action that requires an administrative permit for building renovations, works on the roof or the installation of a technical building system.
- (d) by 31 December 2029, on all new residential buildings; and
- (e) by 31 December 2029, on all new roofed car parks physically adjacent to buildings.

Policies and measures about the deployment of suitable solar energy installations on all buildings shall be included by Member States in the National Building Renovation plans.

Member States are tasked with establishing and publicly sharing criteria at the national level for implementing the obligations. These criteria should also cover exemptions for specific building types, considering technological neutrality for emissions-free technologies. Additionally, Member States must consider factors like structural integrity, green roofs, and insulation when applying these obligations. To ensure effectiveness and address electricity network stability concerns, relevant stakeholders must be involved in developing

these criteria. Member States have the option to measure buildings' ground floor area instead of useful floor area, provided it leads to an equivalent capacity of suitable solar energy installations.

Member States are required to create a comprehensive framework encompassing administrative, technical, and financial measures to facilitate the adoption of solar energy in buildings. This framework should support the integration of solar energy with technical building systems and efficient district heating systems, contributing to the broader deployment of solar energy infrastructure.

### Zero-emission buildings (Article 11)

The directive sets out comprehensive guidelines for the development of zero-emission buildings, emphasizing their pivotal role in mitigating carbon emissions. These buildings are mandated to eliminate on-site carbon emissions from fossil fuels and possess the capability to adapt energy usage in response to external signals, where feasible.

Member States are tasked with ensuring that the energy demand of zero-emission buildings adheres to a maximum threshold, determined based on cost-optimal levels outlined in national reports. This threshold must be set at least 10% lower than that established for nearly zero-energy buildings at the Member State level. Additionally, Member States have the flexibility to adjust these thresholds for renovated zero-emission buildings, provided they maintain compliance with cost optimality requirements and operational greenhouse gas emissions thresholds as specified in national building renovation plans.

Furthermore, Member States are required to notify the Commission about their maximum energy demand thresholds and provide detailed information regarding the calculation methodology per building type and climate designation.

In terms of energy sourcing, the directive mandates that the total annual primary energy use of new or renovated zero-emission buildings be covered by:

- (a) energy from renewable sources generated on-site or nearby.
- (b) energy from renewable sources provided from a renewable energy community.
- (c) energy from an efficient district heating and cooling system
- (d) energy from carbon-free sources.

In cases where meeting these requirements proves unfeasible, other grid energy may be used, provided it meets national criteria.

### Renovation Passport (Article 12)

Within 24 months of the directive's entry into force, Member States must establish a scheme for renovation passports based on a common framework outlined in Annex VIII of the Directive.

Participation in this scheme is voluntary for building owners unless made mandatory by the Member State. Measures must be taken to ensure affordability and financial support may be considered for vulnerable households undertaking renovations. Renovation passports may be issued jointly with energy performance certificates and must be in a digital format suitable for printing, prepared by a qualified expert after an on-site visit. Building owners are encouraged to discuss the passport's contents with the expert to plan steps towards achieving zero-emission status by 2050.

Member States should provide digital tools for preparing and updating passports and ensure integration with national energy performance databases and digital building logbooks where available.

### Technical building systems (Article 13)

The directive outlines comprehensive measures for optimizing the energy performance and environmental quality of buildings across Member States.

Firstly, it mandates Member States to establish system requirements for technical building systems, encompassing aspects such as energy performance, installation, dimensioning, and control. These requirements should align with design conditions and typical operating conditions. Member States may also introduce requirements related to greenhouse gas emissions and renewable energy usage, ensuring they are economically feasible.

Moreover, Member States are empowered to set specific system requirements to facilitate the installation and operation of low-temperature heating systems in new or renovated buildings.

The following provisions are outlined:

- Indoor climate regulation is addressed through requirements for the installation of self-regulating devices in new buildings and during major renovations of existing buildings. These devices, along with hydronic balancing, ensure efficient temperature control.
- Ensuring healthy indoor environments is another key aspect, with Member States mandated to establish requirements to maintain adequate indoor environmental quality standards.
- Non-residential zero-emission buildings must be equipped with monitoring and control devices for indoor air quality, promoting healthier work environments.
- The directive emphasizes the assessment and optimization of energy performance in technical building systems. This includes documentation of energy performance assessments for verification purposes.
- Promotion of energy storage and renewable energy sources is encouraged, along with incentives for transitioning away from fossil-fuel-based heating and cooling systems.

- Efforts to phase out fossil fuel boilers in existing buildings are also outlined, with guidance provided by the Commission on defining fossil fuel boilers.
- Requirements for building automation and control systems in non-residential buildings are specified based on heating system output, ensuring continuous monitoring, benchmarking, and interoperability.
- Residential buildings are not left out, with requirements for electronic monitoring, effective control functionalities, and the capacity to adjust energy consumption in response to external signals.
- Automatic lighting controls are mandated for non-residential buildings above certain heating system outputs, promoting energy efficiency in lighting systems.

### Infrastructure for Sustainable Mobility (Article 14)

In alignment with broader sustainability objectives, provisions are made for integrating sustainable mobility infrastructure into building projects:

**For new non-residential buildings and those undergoing major renovation** with more than five parking spaces, Member States must ensure:

- Installation of at least one recharging point for every five parking spaces.
- Installation of pre-cabling for at least 50% of car parking spaces and ducting for the remaining car parking spaces to enable future installation of recharging points for electric vehicles, electrically power-assisted cycles, and other L-category vehicle types.
- Provision of bicycle parking spaces representing at least 15% of average or 10% of total user capacity of non-residential buildings, considering space for bicycles with larger dimensions.

These requirements apply when the car park is located inside the building or physically adjacent to it, and renovation measures include the car park or its electrical infrastructure. Member States shall ensure the pre-cabling and ducting are dimensioned to enable simultaneous and efficient use of the required recharging points and support load or recharging management systems, where feasible and justifiable. For new or renovated office buildings with more than five parking spaces, Member States shall install at least one recharging point for every two parking spaces.

**For all non-residential buildings with more than 20 car parking spaces**, Member States shall, by 1 January 2027, ensure:

- Installation of at least one recharging point for every 10-car parking spaces or ducting for at least 50% of the car parking spaces to enable future installation of recharging points for electric vehicles.
- Provision of bicycle parking spaces representing at least 15% of average or 10% of total user capacity of the building, accommodating bicycles with larger dimensions than standard bicycles.

For buildings owned or occupied by public bodies, Member States shall ensure installation of pre-cabling for at least 50% of car parking spaces by January 1, 2033. Member States may delay implementation until January 1, 2029, for non-residential buildings renovated within two years before the Directive entered into force to comply with national requirements.

Member States may adjust requirements for the number of bicycle parking spaces by paragraphs 1 and 2 for specific categories of non-residential buildings that are not typically accessed by bicycles.

**For new residential buildings or those undergoing major renovation** with more than three parking spaces, Member States must ensure:

- (a) Installation of pre-cabling for at least 50 % of car parking spaces and ducting, namely conduits for electric cables, for the remaining car parking spaces to enable the installation, at a later stage, of recharging points for electric vehicles, electrically power-assisted cycles, and other L-category vehicle types.
- (b) the provision of at least two bicycle parking spaces for every residential building unit.

**For new residential buildings with more than three car parking spaces**, Member States shall also ensure the installation of at least one recharging point.

- (a) the car park is located inside the building, and, for major renovations, renovation measures include the car park or the electric infrastructure of the building; or
- (b) the car park is physically adjacent to the building, and, for major renovations, renovation measures include the car park or the electrical infrastructure of the car park.

Member States must implement measures to simplify and speed up installing recharging points in both new and existing residential and non-residential buildings, especially for co-owners' associations.

Policies for buildings, mobility, climate, energy, biodiversity, and urban planning must be coherent. Member States should support local authorities in developing sustainable urban mobility plans integrating housing policies with sustainable mobility and urban planning.

### Smart Readiness of Buildings (Article 15)

The directive mandates the European Commission to introduce measures to establish a common Union scheme for assessing the smart readiness of buildings through delegated acts and implementing acts. This scheme aims to evaluate a building's capability to adjust its operations according to occupants' needs, focusing on factors like indoor environmental quality, energy efficiency, and grid interaction.

By June 30, 2026, the Commission will submit a report to the European Parliament and Council on the testing and implementation of this smart readiness indicator. Following stakeholder consultations, a delegated act will be adopted by June 30, 2027, mandating the application of the smart readiness rating to non-residential buildings with specific heating, air-conditioning, or ventilation systems.

Additionally, implementing acts will be introduced to outline technical arrangements for the effective implementation of the scheme. These acts will detail aspects such as a national test phase timeline and its relationship with energy performance certificates. Once the delegated act for non-residential buildings is established, technical arrangements for its application will be detailed in another implementing act, all adopted through an examination procedure.

### Data exchange (Article 16)

Member States must ensure that building owners, tenants, and managers have direct access to their building systems' data, including energy performance metrics, automation systems, and e-mobility infrastructure. They should facilitate interoperability and data exchange within the EU.

Rules on data management and exchange should comply with international standards and not create barriers or discrimination against third-party access. No extra costs should burden building stakeholders for data access or sharing. Member States will determine charges for access by financial institutions, energy suppliers, and other relevant parties, ensuring they are reasonable and justified.

Data access and storage rules must adhere to EU law, including data protection regulations. By December 31, 2025, the Commission will establish implementing acts outlining interoperability requirements and transparent access procedures, following consultation with stakeholders.

### Financial incentives, skills, and market barriers (Article 17)

Member States are mandated to facilitate the transition of building stock into zero-emission buildings by 2050 through financial incentives, support measures, and other instruments aimed at addressing market barriers. These measures include streamlining access to public financing for building renovation, assessing, and tackling upfront renovation costs, and considering revenue-based parameters in financial support schemes. National energy efficiency funds can be utilized to finance dedicated renovation programs, while regulatory measures should eliminate non-economic barriers to renovation, including those within co-ownership structures.

To ensure a skilled workforce in the building sector, especially among SMEs, Member States are required to implement measures promoting education and training. Additionally, the Commission may provide assistance to Member States in setting up financial support programs for building energy performance improvements.



In addressing market barriers, financial incentives for stand-alone boilers powered by fossil fuels must cease from January 2025. Priority should be given to deep renovation initiatives, with increased support for sizable programs targeting the worst-performing buildings. Member States should also mitigate eviction risks for vulnerable households resulting from rent increases post-energy renovations.

Financial incentives should prioritize vulnerable households, those affected by energy poverty, and individuals in social housing. Furthermore, financial incentives for rented buildings should benefit both owners and tenants, with effective safeguards in place for vulnerable households. Overall, these measures aim to incentivize building renovation and ensure a sustainable transition towards zero-emission buildings.

### One-stop shops for the energy performance of buildings (Article 18)

Member States, in collaboration with competent authorities and private stakeholders, are mandated to establish technical assistance facilities, including inclusive one-stop shops, for enhancing the energy performance of buildings. These facilities are intended to cater to various stakeholders involved in building renovations, such as homeowners and SMEs. Member States must ensure the availability of these facilities across their territories, with specific criteria for their establishment, including population density, regional distribution, building stock age, and accessibility. The Commission will provide guidelines for establishing these one-stop shops.

The technical assistance facilities are tasked with providing comprehensive information on technical and financial options and solutions to households, SMEs, and public bodies. They should offer holistic support tailored to different housing types and geographic areas, with a focus on households affected by energy poverty and underperforming buildings. This support should cover all stages of the retrofit project.

One-stop shops are expected to offer independent advice on building energy performance and may also assist with integrated district renovation programs. Additionally, they should provide specialized services for vulnerable households, those affected by energy poverty, and individuals in low-income households.

### Energy performance certificates (Article 19)

Member States are required to implement measures to establish a certification system for the energy performance of buildings. This system will issue an energy performance certificate containing information such as the building's energy performance expressed numerically as primary energy use per square meter per year (kWh/m<sup>2</sup>. y). Additionally, the certificate will include reference values like minimum energy performance requirements, nearly zero-energy building requirements, and zero-emission building requirements. These details aim to facilitate comparisons and assessments of energy performance for building owners or tenants.

Within 24 months of this Directive coming into force, energy performance certificates must adhere to the template outlined in Annex V. These certificates will indicate the energy performance class of a building on a scale from A to G, with A representing zero-emission buildings and G representing the least energy-efficient buildings in the national stock at the time of implementation. Member States already using 'A0' to designate zero-emission buildings may continue to do so. The remaining classes (B to F, or A to F if A0 is used) must have an appropriate distribution of energy performance indicators.

- Member States have the option to introduce an A+ energy performance class for buildings with energy demands at least 20% lower than zero-emission buildings and with on-site renewable energy generation exceeding total annual primary energy demand. For existing buildings renovated to A+ class, Member States must estimate and disclose the life-cycle global warming potential in the energy performance certificate.
- Member States that rescaled their energy performance classes between January 1, 2019, and the entry into force of this Directive may postpone rescaling until December 31, 2029.

Member States are required to ensure a standardized visual identity for energy performance certificates within their territories.

Member States must guarantee the quality, reliability, and affordability of energy performance certificates. They should consider providing financial support for vulnerable households to ensure affordability. These certificates must be issued by independent experts following an on-site visit, or by virtual means with visual checks if appropriate. They should be clear, easily legible, available in a machine-readable format, and follow the template in Annex V.

Energy performance certificates must include recommendations for cost-effective improvements in energy performance, reduction of operational greenhouse gas emissions, and enhancement of indoor environmental quality unless the building already achieves at least energy performance class A. These recommendations should cover measures related to major renovations as well as individual building elements.

When Member States implement a renovation passport jointly with the energy performance certificate, the recommendations in the passport supersede those in the energy performance certificate.

Recommendations in the energy performance certificate must be technically feasible, providing estimates for energy savings, reduction of greenhouse gas emissions, and payback periods or costs and benefits. They should also include information on available financial incentives and assistance. The recommendations should assess whether heating, ventilation, air-conditioning, and hot-water systems can be adapted for more efficient operation.

Remaining lifespan assessments of heating and air-conditioning systems should be included, along with alternatives for replacement in line with climate targets.

The certificate should indicate where building owners or tenants can access more detailed information, including cost-effectiveness evaluations, steps for implementation, contact information for relevant services, and available financial support options.

- Certification for building units may be based on the entire building or on representative units with similar energy characteristics.
- For single-family houses, certification may be based on similar representative buildings if guaranteed by the certifying expert.

The validity of energy performance certificates should not exceed 10 years. Building owners receiving certificates below level C should be offered renovation advice either immediately after expiration or five years after issuance.

Simplified procedures for updating certificates should be available for individual element upgrades or implementation of measures identified in a renovation passport, or when using certified methods or tools to determine energy performance.

#### Issue of energy performance certificates (Article 20) <sup>2</sup>

Member States are mandated to issue digital energy performance certificates for buildings or building units under specific circumstances, including construction, major renovation, sale, rental to a new tenant, or renewal of a rental contract. This requirement extends to existing buildings owned or occupied by public bodies unless a valid certificate is already available. Upon request, Member States must also provide a paper version of the energy performance certificate.

Furthermore, Member States must ensure that the energy performance certificate is presented to prospective tenants or buyers and handed over to them when buildings or building units undergo construction, major renovation, sale, rental, or renewal of rental contracts.

In cases where a building is sold or rented out before construction or major renovation, Member States may require the seller to provide an assessment of its future energy performance, with the energy performance certificate issued once the building is constructed or renovated.

Member States are also required to ensure that buildings or building units offered for sale or rent display the energy performance indicator and class of the energy performance certificate in both online and offline advertisements. Compliance with these requirements must be monitored through sample checks or other controls, implemented in accordance with national rules on joint ownership or common property.

Additionally, Member States have the option to exclude certain categories of buildings from the application of these requirements. This includes residential buildings with limited use or expected energy consumption,

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<sup>2</sup> The provisions of this article should align with national rules on joint ownership or common property.

subject to specific criteria. Lastly, Member States must ensure that all energy performance certificates issued are uploaded to the database for the energy performance of buildings, containing all necessary data for calculating the building's energy performance.

### Display of energy performance certificates (Article 18)

Member States must ensure that energy performance certificates issued for buildings occupied by public bodies and frequently visited by the public are prominently displayed in a clearly visible location. Similarly, in non-residential buildings, the energy performance certificate must be prominently displayed.

However, these requirements do not extend to displaying the recommendations included in the energy performance certificate.

### Databases for energy performance of buildings (Article 22)

Each Member State is mandated to establish a national database for the energy performance of buildings, facilitating the collection of data on individual buildings as well as the overall energy performance of the national building stock. These databases may be interconnected and must gather data from various sources, including energy performance certificates, inspections, renovation passports, and smart readiness indicators. Additionally, data on both operational and embodied emissions, as well as life-cycle Global Warming Potential (GWP), may be collected.

The aggregated and anonymized data from the building stock must be made publicly available, ensuring compliance with Union and national data protection regulations. Access to the full energy performance certificate should be provided free of charge to building owners, tenants, managers, and financial institutions, while prospective tenants or buyers authorized by the owner should also have access for buildings offered for rent or sale.

Member States must grant local authorities access to relevant building energy performance data to aid in drafting heating and cooling plans. Publicly available information should include details on the share of buildings covered by energy performance certificates, along with aggregated or anonymized data on energy performance and consumption, updated at least twice annually. Anonymized or aggregated information should also be available to public and research institutions upon request.

To ensure consistency, Member States must make their national databases interoperable and integrated with other administrative databases containing building information, such as national building cadastres or land registries, and digital building logbooks. The Commission will establish common templates for transferring information to the EU Building Stock Observatory through implementing acts, with the first act expected by June 30, 2025.

## Overview Annexes

### ANNEX I - COMMON GENERAL FRAMEWORK FOR THE CALCULATION OF ENERGY PERFORMANCE OF BUILDINGS (referred to in Article 4)

1. In assessing the energy performance of buildings, whether for certification purposes or to ensure compliance with minimum standards, a comprehensive evaluation of energy usage is imperative. This evaluation hinges on either calculated or metered energy consumption, considering critical factors like space heating, cooling, domestic hot water, ventilation, lighting, and technical systems. Member States play a pivotal role in ensuring that typical energy use reflects real-world operational conditions and user behaviour, drawing insights from national statistics, building codes, and metered data. Metered energy consumption, particularly when utilized as the basis for energy performance calculations, requires meticulous diligence. It necessitates regular readings, typically monthly, and a nuanced understanding of different energy carriers to capture variations in occupants' behaviour and the influence of local climate factors. Furthermore, a standardized numeric indicator expressing primary energy use per unit of floor area per year serves as the cornerstone for energy performance assessments. This transparent calculation methodology, open to innovation and adaptation, ensures consistency while accommodating advancements in energy efficiency practices. Additionally, recognition of benefits from district heating or cooling systems, particularly their renewable energy components, underscores the need for an inclusive approach to energy performance evaluation.
2. Calculating energy needs for buildings demands a granular approach that accounts for fluctuating conditions impacting system operation and indoor comfort levels. This involves meticulous time intervals, including monthly, hourly, or even sub-hourly assessments, to capture the dynamic nature of energy usage. Leveraging product-specific regulations for energy-related products under Directive 2009/125/EC streamlines the calculation process by providing standardized information without necessitating additional data. Moreover, the determination of primary energy factors considers a multitude of factors, ranging from non-renewable to renewable energy sources, in alignment with national energy and climate plans. Member States play a pivotal role in defining these factors, ensuring transparency and accountability in the calculation process. The flexibility to opt for an average Union primary energy factor for electricity, as opposed to reflecting the national electricity mix, further streamlines the calculation methodology, enhancing its adaptability to diverse contexts.
3. In addition to primary energy use indicators, Member States define supplementary metrics to provide a comprehensive overview of a building's energy performance. These indicators encompass total, non-renewable, and renewable primary energy use, as well as operational greenhouse gas emissions per unit of floor area per year. By incorporating these additional metrics, the assessment framework becomes more nuanced, enabling stakeholders to gauge not only overall energy consumption but also the environmental impact of building operations. This holistic approach ensures that energy performance evaluations consider both energy efficiency and environmental

sustainability, aligning with broader goals of mitigating climate change and reducing greenhouse gas emissions.

4. The methodology for assessing energy performance considers various critical aspects that influence a building's energy consumption and efficiency. It encompasses an array of factors, including thermal characteristics, heating systems, renewable energy capacity, ventilation, lighting, and building design. Moreover, it considers indoor climate conditions, internal loads, building automation, solar exposure, and energy storage systems, reflecting the multifaceted nature of energy usage in buildings. By incorporating these factors into the assessment framework, the methodology provides a comprehensive understanding of a building's energy performance, enabling stakeholders to identify opportunities for improvement and optimization.
5. In assessing energy performance, the methodology acknowledges and accounts for factors that positively influence a building's energy efficiency and sustainability. These factors include local solar exposure conditions, active solar systems, cogeneration, district heating and cooling systems, natural lighting, and energy storage systems. By recognizing the beneficial impact of these elements, the assessment framework encourages the integration of renewable energy sources and energy-efficient technologies into building design and operation. This proactive approach not only enhances energy performance but also contributes to environmental conservation and mitigates climate change by reducing greenhouse gas emissions.
6. To facilitate energy performance assessments, buildings are classified into distinct categories based on their usage and characteristics. These categories include single-family houses, apartment blocks, offices, educational buildings, hospitals, hotels, sports facilities, and other energy-consuming structures. By categorizing buildings according to their specific typologies, the assessment framework can account for variations in energy usage patterns and efficiency measures tailored to different building types. This classification system ensures that energy performance assessments are accurate, relevant, and reflective of the diverse landscape of building stock.

## ANNEX II - TEMPLATE FOR THE NATIONAL BUILDING RENOVATION PLANS (referred to in Article 3)

Annex II gives an overview on the template for the national building renovation plans referred to in Article 3 with the list of the Mandatory and Optional Indicators for the following categories:

- (a) Overview of the national building stock
- (b) Roadmap for 2030, 2040, 2050
- (c) Overview of implemented and planned policies and measures
- (d) Detailed roadmap of the investment needs, budgetary sources, and administrative resources
- (e) Thresholds of new and renovated zero-emission buildings, referred to in Article 11
- (f) Minimum energy performance standards for non-residential buildings

(g) National trajectory for the progressive renovation of the residential building stock

This Directive Article 3	Mandatory indicators	Optional indicators
(a) Overview of the national building stock	<b>Number of buildings and total floor area (m<sup>2</sup>):</b> <ul style="list-style-type: none"> <li>- per building type (including public buildings and social housing)</li> <li>- per energy performance class</li> <li>- nearly zero-energy buildings</li> <li>- worst-performing buildings (including a definition)</li> <li>- the 43 % worst-performing residential buildings</li> <li>- estimation of the share of buildings exempted pursuant to Article 9(6), point (b)</li> </ul>	<b>Number of buildings and total floor area (m<sup>2</sup>):</b> <ul style="list-style-type: none"> <li>- per building age</li> <li>- per building size</li> <li>- per climatic zone</li> <li>- demolition (number and total floor area (m<sup>2</sup>))</li> </ul>
	<b>Number of energy performance certificates:</b> <ul style="list-style-type: none"> <li>- per building type (including public buildings)</li> <li>- per energy performance class</li> </ul>	<b>Number of energy performance certificates:</b> <ul style="list-style-type: none"> <li>- per construction period</li> </ul>

*Template for the national building renovation plans in Annex II*

### ANNEX III - REQUIREMENTS FOR NEW AND RENOVATED ZERO-EMISSION BUILDINGS AND CALCULATION OF LIFE-CYCLE GWP (referred to in Article 7)

For the calculation of the life cycle GWP of new buildings under Article 7(2), the total life cycle GWP is communicated as a numeric indicator for each life-cycle stage expressed as kgCO<sub>2</sub>eq/(m<sup>2</sup>) (of useful floor area) calculated over a reference study period of 50 years. The data selection, scenario definition and calculations shall be conducted by EN 15978 (EN 15978:2011 Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method) and considering any subsequent standard relating to the sustainability of construction works and the calculation method for the assessment of environmental performance of buildings. The scope of building elements and technical equipment is as defined in the Level(s) common EU framework for indicator 1.2. Where a national calculation tool or method exists or is required for making disclosures or for obtaining building permits, that tool or method may be used to provide the required disclosure. Other calculation tools or methods may be used if they fulfil the minimum criteria established by the Level(s) common EU framework. Data regarding specific construction products calculated by Regulation (EU) No 305/2011 of the European Parliament and of the Council<sup>1</sup> shall be used when available.

## ANNEX V - TEMPLATE FOR ENERGY PERFORMANCE CERTIFICATES (referred to in Article 16)

Annex V lays down the template for energy performance certificates. On its front page, the energy performance certificate shall display at least the following elements:

- (a) the energy performance class.
- (b) the calculated annual primary energy use in kWh/ (m<sup>2</sup>.y).
- (c) the calculated annual final energy use in kWh/ (m<sup>2</sup>.y).
- (d) renewable energy produced on-site in % of energy use.
- (e) operational greenhouse gas emissions (kgCO<sub>2</sub>/ (m<sup>2</sup>.y)), and the value of the life cycle GWP, if available.

The energy performance certificate shall also display the following elements:

- (a) the calculated annual primary and final energy consumption in kWh or MWh.
- (b) renewable energy production in kWh or MWh; main energy carrier and type of
- (c) renewable energy source.
- (d) the calculated energy needs in kWh/ (m<sup>2</sup>.y).
- (e) a yes/no indication whether the building has a capacity to react to external signals and adjust the energy consumption.
- (f) a yes/no indication whether the heat distribution system inside the building is capable to work at low or more efficient temperature levels, where applicable.
- (g) the contact information of the relevant one-stop shops for renovation advice.

2. In addition, the energy performance certificate shall include the following indicators:

- (a) energy use, peak load, size of generator or system, main energy carrier and main type of element for each of the uses: heating, cooling, domestic hot water, ventilation, and in-built lighting
- (b) the greenhouse gas emission class (if applicable).
- (c) information on carbon removals associated to the temporary storage of carbon in or on buildings.
- (d) a yes/no indication whether a renovation passport is available for the building.
- (e) the average U-value for the opaque elements of the building envelope.
- (f) the average U-value for the transparent elements of the building envelope.
- (g) type of most common transparent element (e.g. double-glazed window).
- (h) results of the analysis on overheating risk (if available).
- (i) the presence of fixed sensors that monitor the indoor environmental quality.
- (j) the presence of fixed controls that respond to the levels of indoor environmental quality.
- (k) number and type of recharging points for electric vehicles.
- (l) presence, type, and size of energy storage systems.



- (m) expected remaining lifespan of the heating or air-conditioning systems and appliances, where applicable.
- (n) feasibility of adapting the heating system to operate at more efficient temperature settings.
- (o) feasibility of adapting the domestic hot-water system to operate at more efficient temperature settings.
- (p) feasibility of adapting the air-conditioning system to operate at more efficient temperature settings.
- (q) metered energy consumption.
- (r) whether there is a connection to a district heating and cooling network, and, if available, information about a potential connection to an efficient district heating and cooling system.
- (s) local primary energy factors and related carbon emission factors of the connected local district heating and cooling network.
- (t) operational fine particulate matter (PM2.5) emissions.

The energy performance certificate may include the following links with other initiatives if these apply in the relevant Member State:

- (a) a yes/no indication whether a smart readiness assessment has been carried out for the building.
- (b) where available, the value of the smart readiness assessment.
- (c) a yes/no indication whether a Digital Building Logbook is available for the building.

Persons with disabilities shall have equal access to the information in energy performance certificates.

## ANNEX VII - Comparative methodology framework to identify cost-optimal levels of energy performance requirements for buildings and building elements.

The comparative methodology framework shall enable Member States to determine the energy and emission performance of buildings and building elements and the economic aspects of measures relating to the energy and emission performance, and to link them with a view to identifying the cost-optimal level to achieve the 2030 emission reduction and climate neutrality goals, as well as a zero-emission building stock by 2050 at the latest.

The comparative methodology framework shall be accompanied by guidelines outlining how to apply that framework in the calculation of cost-optimal performance levels.

The comparative methodology framework shall allow for taking into account use patterns, outdoor climate conditions and their future changes according to best available climate projections, including heat and cold waves, investment costs, building category, maintenance and operating costs (including energy costs and savings), earnings from energy produced, where applicable, environmental and health externalities of energy

use, waste management costs, where applicable, and technological developments. It should be based on relevant European standards relating to this Directive.

The Commission shall also provide:

- guidelines to accompany the comparative methodology framework; those guidelines will serve to enable the Member States to undertake the steps listed below.
- information on estimated long-term energy price developments.

For the application of the comparative methodology framework by Member States, general conditions, expressed by parameters, shall be laid down at Member State level. The Commission shall issue recommendations to Member States regarding their cost optimality levels, where relevant.

The comparative methodology framework shall require Member States to:

- define reference buildings that are characterised by and representative of their functionality and geographic location, including indoor and outdoor climate conditions. The reference buildings shall cover residential and non-residential buildings, both new and existing ones.
- define energy efficiency measures to be assessed for the reference buildings. Those may be measures for individual buildings as a whole, for individual building elements, or for a combination of building elements.
- assess the final and primary energy need and resulting emissions of the reference buildings with the defined energy efficiency measures applied.
- calculate the costs (i.e. the net present value) of the energy efficiency measures (as referred to in the second indent) during the expected economic life cycle applied to the reference buildings (as referred to in the first indent) by applying the comparative methodology framework principles.

By calculating the costs of the energy efficiency measures during the expected economic life cycle, the cost-effectiveness of various levels of minimum energy performance requirements is assessed by the Member States. That will allow the determination of cost-optimal levels of energy performance requirements.

#### ANNEX VIII - Requirements for renovation passports.

The Directive lays down the formation that the renovation passport shall include:

- (a) information on the current energy performance of the building.
- (b) a graphical representation or graphical representations of the roadmap and its steps for a staged deep renovation.
- (c) information on relevant national requirements such as minimum energy performance requirements for buildings, minimum energy performance standards and rules in the Member State on the phasing out of fossil-fuel used in buildings for heating and cooling, including application dates.
- (d) a succinct explanation on the optimal sequencing of steps.

(e) information about each step, including:

- i. the name and description of the renovation measures for the step, including relevant options for the technologies, techniques, and materials to be used.
- ii. (The estimated energy savings in primary and final energy consumption, in kWh and in percentage improvement compared to the energy consumption prior to the step.
- iii. the estimated reduction of operational greenhouse gas emissions.
- iv. (The estimated savings on the energy bill, clearly indicating the assumptions on energy costs used for the calculation.
- v. the estimated energy performance class of the energy performance certificate to be achieved following completion of the step.

(f) information about a potential connection to an efficient district heating and cooling system.

(g) the share of individual or collective generation and self-consumption of renewable energy estimated to be achieved after the renovation.

(h) general information on available options for improving construction products' circularity and for reducing their whole life cycle greenhouse gas emissions, as well as wider benefits related to health and comfort, indoor environmental quality, and the improved adaptive capacity of the building to climate change.

(i) information on available funding and links to the relevant webpages indicating the sources of such funding.

(j) information on technical advice and advisory services, including contact details and links to the webpages of one-stop shops.

**The renovation passport may include:**

(a) an indicative timing of the steps.

(b) for each step:

- i. (i) a detailed description of the technologies, techniques, and materials to be used, their advantages, disadvantages, and costs.
- ii. (ii) how the energy performance of the building would compare to minimum energy performance requirements for buildings undergoing major renovation, nearly zero-energy building and zero-emission building requirements after completion of the step and how the energy performance of the building elements replaced would compare to minimum energy performance requirements for single building elements, where these exist.
- iii. the estimated costs for conducting the step.
- iv. the estimated payback period for the step, with and without any available financial support
- v. the estimated time needed to carry out the step.

- vi. where available, the reference values on the life-cycle greenhouse gas emissions for the materials and equipment and links to the relevant webpages where they can be found.
  - vii. the estimated lifetime of measures and the estimated maintenance costs.
- (c) independent modules on:
- i. the typical trades necessary or recommended for conducting energy renovations (architects, advisors, contractors, suppliers, and installer, etc.) or links to the relevant webpages.
  - ii. (a list of relevant architects, advisors, contractors, suppliers, or installers in the area, which may include only those fulfilling certain conditions such as matching higher qualification or certification labels or conditions, or links to the relevant webpages.
  - iii. (The technical conditions needed for an optimal roll-out of low temperature heating.
  - iv. how the renovation steps and additional measures could improve the smart readiness of a building.
  - v. technical and safety requirements for materials and works.
  - vi. the underlying assumptions behind the calculations provided or links to the relevant webpage where they can be found.
- (d) information on how to access a digital version of the renovation passport.
- (e) any major renovations made to the building or building unit, as referred to in Article 8(1), and any retrofitting or replacement of a building element that forms part of the building envelope and which has a significant impact on the energy performance of the building envelope, as referred to in Article 8(2), where such information is made available to the expert carrying out the renovation passport;
- (f) (Information related to seismic safety, where such information relevant to the building is made available to the expert.
- (g) upon request of and on the basis of information made available by the current building owner, an attachment containing additional information, such as the adaptability of spaces to evolving needs and any planned renovations.