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REPORT

EPBD implementation and enforcement in CEE and SEE countries

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Content

Introduction

The 2015 Paris Agreement on climate change boosts the European Union's efforts to decarbonize its building stock. Given that buildings account for 40% of the EU's final energy consumption, the decarbonization of the building stock through energy renovations is a clear priority of the Commission and the Renovation Wave is a flagship initiative under the EU Green Deal. The new Renovation Wave strategy, published in October 2020, aims to double the rate of building renovation and spur deep renovations over the next decade.

An ambitious Energy Performance of Buildings Directive (EPBD) is crucial to achieve a climate neutral building sector, without which the 2050 carbon neutrality is unattainable. The EPBD has been amended several times in the past, in order to reflect the more and more stringent goals towards a low-energy building stock. The Fit for 55 proposal package, adjusting requirements for the 55% greenhouse gas reduction target, greatly affects the building sector, of which the most directly related element is the EPBD recast.

While it is of key importance, concerning the achievability of climate neutrality, what the final version of the directive will contain after the legislative procedure, the level of implementation and practice of the current EPBD is still a question in some Member States. The success and achievements of the revised EPBD will highly depend on the commitment of the Member States.

In a study made for the European Commission in 2015 on the compliance of EPBD (ICF, 2015, EPBD Compliance Study) it is acknowledged that **compliance rates are being significantly affected by the nature of compliance checking and enforcement activities**, particularly in relation to the use of penalties and sanctions. The EU's efforts to impose increasingly strict building energy performance requirements seem to work mostly on regulatory level, and compliance rates across EU Member States greatly differ.

The practical application of the EPBD requirements 'on the ground' has not yet been investigated in detail and there is a need for a greater understanding of the mechanisms for regulatory enforcement. By examining the operationalization of the present EPBD in the target MSs through this assessment, the level of enforcement can be evaluated, and the success of the revised EPBD could be projected.

Objective and scope

The assessment targets the implementation and enforcement of the EPBD in 6 Member States, in CEE and SEE countries. Input for the present study was provided by expert building organisations from each country, namely (with the participating organizations in brackets): Czechia (Chance for Buildings - Šance pro budovy), Hungary (MEHI Hungarian Energy Efficiency Institute), Poland (NAPE National Energy Conservation Agency), Slovakia (Buildings for Future – Budovy pre Buducnost), Romania (Technical University of Cluj-Napoca) and Bulgaria (Center for Energy Efficiency EnEffect). The aggregation of the templates and the compilation of the summary on the key findings was performed by MEHI Hungarian Energy Efficiency Institute.

The mechanisms for regulatory enforcement have a great impact on compliance. The aim of this work was to investigate the enforcement of the EPBD in the 6 countries: what mechanisms of execution and control are applied, how effective its implementation is, and whether it serves its goal to significantly improve energy performance of the building stock and to exploit its energy saving potential.

The study focuses on 3 major themes:

1. The scope and application of **minimum energy performance requirements** (MEPR) regarding (a) retrofitted building elements, (b) existing buildings undergoing a major renovation, (c) new buildings.

2. The role and application of **Energy Performance Certificates** (EPC) in meeting the requirements.

3. **Policy support** for the successful implementation of the MEPRs and EPCs: level of ambition, framework conditions, financial and technical support systems.

The following table summarizes the specific articles of the EPBD, the provisions of which fall within the scope of assessment of this study:

	Requirement under EPBD
Art. 4.	**Setting of minimum energy performance requirements**: minimum energy performance requirements for buildings or building units are set with a view to achieving cost-optimal levels
Art. 6.	**New buildings**: new buildings meet the minimum energy performance requirements
Art. 7.	**Existing buildings**: 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 accordance with Article 4. When a building element that forms part of the

	building envelope and has a significant impact on the energy performance of the building envelope, is retrofitted or replaced, the energy performance of the building element meets minimum energy performance requirements
Art. 9. para 1.	**Nearly zero-energy buildings**: by 31 December 2020, all new buildings are nearly zero-energy buildings
Art. 10. para 1.	**Financial incentives and market barriers:** In view of the importance of providing appropriate financing and other instruments to catalyse the energy performance of buildings and the transition to nearly zero-energy buildings, Member States shall take appropriate steps to consider the most relevant such instruments in the light of national circumstances
Art. 11.	**Energy Performance Certificates**: The energy performance certificate shall include the energy performance of a building and reference values such as minimum energy performance requirements. The energy performance certificate shall include recommendations for the cost-optimal or cost-effective improvement of the energy performance of a building or building unit.
Art. 12.	**Issue of energy performance certificates**: an energy performance certificate is issued for buildings or building units which are constructed, sold or rented out to a new tenant.
Art. 18.	**Independent control system**: independent control systems for energy performance certificates are established.

Table 1. Overview of the components of the EPBD within the scope of the study

The assessment primarily targets residential buildings (with an outlook to public or other buildings at certain points), and addresses each of the above topic on three levels:

(1) the description of the current status in each MS,

(2) an evaluation from the aspect whether it serves the objective of reaching a high energy performance of, and aims to exploit the energy saving potential and the upscale of the rate of renovation of the countries' residential building stock,

(3) the major scope of the assessment is the enforcement of regulations: operationalization of requirements, administration, procedures, institutional background, control mechanisms, sanctions and penalties, financial and technical support systems.

Methodology

The study employed a mixed-methods approach to data collection and analysis.

Questionnaire template

The three major topics were specified in more details and organized into a structured template. The templates were filled out by each organisation, based on the data collected through the tools below. The aggregated filled out templates are in the Annex.

National legislation and literature review

Enforcement of EPBD in each country was analysed by investigating the national legislation related to the subject, and the literature review of available national and international papers, background documents and data.

Own experience

The organizations involved in the project are dedicated to promote and improve energy efficiency of buildings in their respected countries, working with policy and legislation, and have great experience regarding the state of energy efficiency. This was also used in the analyses. Not referenced information included in the filled templates partly originate from the previous work of the organizations, mainly through stakeholder consultations, workshops and other professional events.

Interviews with stakeholders

A limited number of anonymous interviews were performed with stakeholders in order to gather the perspectives of secondary sources. Not referenced information included in the filled templates partly originate from the results of the interviews.

Key findings

This chapter summarizes the main outcomes of the investigation. Although it is difficult to generalize, as the specific conditions differ from country to country, there are a number of findings and conclusions that can be drawn from the assessment. Within this summary only the most common findings are highlighted, specific details of each country can be found in the country templates in the Annex.

Minimum Energy Performance Requirements

MEPR values

- MEPR values are legally determined in most countries, corresponding to building elements, major renovation of existing buildings and new buildings.
- MEPRs have been generally reviewed a few times in the last ten years, but values do not always aim at reaching the best energy performance.
- Stringent enough MEPRs are the prerequisites to exploit the full energy savings potential of the residential building stock (deep analyses of the ambitions of the applied MEPR values was not within the scope of this study).

Existing buildings, cost-optimality, major renovation

There is a general lack of enforcement in the examined countries regarding the application of MEPRs related to building elements and major renovation.

- In countries where no permit is needed for partial or major energy renovation, compliance with MEPRs is not checked at all. In such cases it is similarly difficult to even assign a responsible party along the renovation process, as in many cases only the homeowner and the installer are involved (not to mention DIY solutions, where the owner of the building carries out the retrofit); and the players generally knowing about the legal requirements (designers, architects, engineers, energy experts, technical inspectors) are not engaged in the process.
- In countries where a building permit is needed for major renovation there is some kind of control system. However, even in these cases there are deficiencies. Major renovations are not always notified, even if permit is needed, so the authorities are not informed about the construction and cannot check the documents. They usually do not have the capacities to make on-site investigations, therefore such activities remain hidden from the authorities.

- Where control of MEPRs takes place to a certain extent, the responsible party for compliance is usually either the architect/technical designer or the energy auditor. During the control process the compliance is checked by the presence of EPC or other design document related to the renovation process, which includes data on energy performance, but it is usually not examined if the content is valid.

- Control mostly happens in the process of applying for a building permit, before the instalment; post-retrofit energy performance is usually not checked, neither by documents, nor by on-site visits. Sanctions for non-compliance therefore are usually only applied after the design phase, related to the building permit process, and they principally mean not-issuing the building permit until the design meets the energy requirements. Sanctions on not meeting the energy performance requirements after renovation are typically not applied.

- Lack of compliance control in the examined countries is most severe in the case of single-family houses, being usually the cases where a building permit is not needed or not applied for. In case of multi-apartment buildings permit is usually needed, mainly because of the size of the building, and designers/architects are generally more involved in the renovation process because of the size of the project (DIY solutions are not applied in such cases).

- The only exception regarding compliance is when a state subsidy/funding program is provided for energy efficiency retrofits. Subsidies for renovation are usually linked to the MEPS, as compliance is proven by the EPC or energy audit done before the actual renovation. Furthermore, in some countries support schemes incentivise going beyond the minimum requirements linking the level of support to the level of renovation. **Compliance control mechanisms linked to support programs are usually more functional** than general compliance checking procedures, mainly because of the financial involvement. There is still room for development in checking compliance through financial programs, but clearly there is an incentive for Member States here as well to achieve higher energy savings through financial schemes involving state support.

- The major bottleneck of the compliance checking is the **low institutional capacity of the building authorities**. Even if mandatory permit was required and performed in all cases of major renovations, the number of trained energy experts to make energy plans would not be sufficient to plan the energy renovation for the homeowner and for the authority to check the calculations of the designed energy performance as well as that of constructed status.

- In the context of renovation, the term 'technically and economically feasible' ensures that the requirements outlined in the EPBD are not excessive and that they only apply when cost-effective. However, the interpretation of the term is left to the owner or the system installer, and this could lead to inconsistency in application: the design will be approved in case the designer justifies that only a worse level of performance can be achieved than required, referring to non-feasibility.

Conclusions, recommendations

- As long as the compliance check of MEPRs related to major renovation of residential buildings is not fulfilled in much higher rates, there is a high risk that the requirements will not be met. Given that the majority of buildings that exist presently will still stand and be used in 2050, great emphasis should be put on the enforcement to comply with major renovation requirements.

- Uncontrolled home energy renovations are exposed to the risk of the so-called lock-in effect. When MEPRs are not met during renovations, the building will be locked into a less energy-efficient state for decades, by choosing a sub-optimal (not the best available) technical solution for an investment. It is therefore important to shift the demand for renovation in a direction where the associated energy savings potential can be maximised. For this, **mandatory check-points** need to be introduced within the renovation process to ensure the application of the minimum energy performance requirements.

- The most beneficial solution could be **to establish a strong authorization process** (both in the design and in the post-construction phase), where a certain level of control takes place in all the cases of major renovations (not limited by size or type), with proper sanctions applied in case of non-compliance. This would be the most reliable solution, ensuring the application the MEPRs. However, this would require a large administrative as well as energy expert capacity within the building authorities, which is noted as one of the most considerable bottlenecks of compliance control.

- An alternative approach can be the **availability of funding for renovations**. This is the process where the examined countries reported a better functioning control mechanism. The role of state involvement with a valid and long-term support program, besides providing additional financing, is to bring renovators into a system where compliance check could take place. The criterium of being eligible for funding is the proven compliance with the energy performance requirements both in the design and in the execution phase. The availability of support programs thus provides multiple benefits: they incentivise major renovation, require planning by energy experts, fulfil the energy requirements and thus deliver real energy savings, which can be tracked (monitored), and reported (helping to meet EU targets).

- Since in countries where control takes place the major tool and reference of compliance checking is the EPC, the **control of the validity of EPCs** (input data as well as calculations) should require improvement. Checking should happen **in greater proportions in EPCs related to renovation projects** (rather than checking the validity of the EPCs randomly, like those where only a transaction of the building – sale or rent – happened).

- The term "technically and economically feasible" must be tackled by the countries' public authorities to detail the cases for which feasibility cannot be ensured; feasibility must be assessed under clear guidelines and established procedures.

New buildings, NZEB

Compliance control mechanisms in the case of new residential buildings are generally more developed than at major renovations. As construction of new buildings in all countries require some kind of permit/notification, the request for permit contains design documents and/or EPCs, where evaluation of the energy performance is included.

- The NZEB definition has been in place in all of the countries for years. However, it has not been introduced in the national legislation in Bulgaria, and entering into force was postponed in Hungary with one and half years to 1 July 2022.

- Compliance check of meeting the NZEB requirements at the construction of new buildings usually happens at both the design phase (related to issuing the building permit) and after construction (related to issuing the occupancy permit), but it is generally based only on the submitted documentation to the building authority. Validity of the content of the document is not checked by the building authority.

- Building authorities do not have the capacity or often the competence to assess the validity of the information on the energy performance (within the EPCs or technical design documentations) of the constructed building. Validity check of EPCs is carried out along a separate process by other authorities, and it is not connected to the licensing process performed by the building authorities.

- There is a general lack of trained energy specialists in the examined countries, but the need for their work has greatly increased, being an essential criterium to fulfil and guarantee the application of energy performance requirements

Conclusions, recommendations

- Applying proper NZEB values is a prerequisite to a high energy performance building stock by 2050.

- Just like it was emphasized in the case of major renovations, the control of the validity of EPCs (input data as well as calculations) should require improvement. **The two parallel processes (building licensing and quality control of EPCs) should be interlinked, and checking should happen in greater proportions in EPCs related to construction projects** (rather than checking the validity of the EPCs randomly, also of those where only a transaction of the building – sale or rent – happened).

- Compliance control need to happen both in the design phase and after implementation, to ensure the fulfilment of the application of MEPRs already in the design phase, and verifying proper implementation after construction.

- Capacity and competence of building authorities should be increased in all of the examined countries for ensuring proper enforcement of MEPRs.

Energy Performance Certificates

- Regarding the quality of energy performance certificates (EPCs) and energy audits, the limits of the current control procedure are noted, especially regarding the quality control of the performed energy calculations. Verification of input data as well as the calculation results is challenging and rare, the precariousness of the evaluation method in the case of existing buildings is noticed.

- EPC checking is generally carried out by random sampling on statistically significant proportion of produced EPCs. However, the term "statistically significant" is not defined in most of the countries, and there is a general lack of data on how many EPCs are evaluated a year.

- In each examined country there is an independent control system on EPCs, which are reported mostly to be in line with the provisions of Annex II of the current EPBD. In all the countries there is a designated body performing the inspections, which are also responsible for issuing sanctions if needed.

Conclusions, recommendations

- Energy Performance Certificates are the most commonly used tool to verify whether energy performance requirements in a building have been met, and they serve as the basis for checking compliance. It is important to recognise that this is one of the central roles of EPCs, besides informing building owners and users of the energy performance of the building, and their significance must be treated accordingly.

- Compliance control of fulfilling the energy requirements at major renovations or constructions of new buildings, and compliance control of EPCs are two separate processes currently in the examined countries, with no interlinkages. While the former is generally performed by a building authority with no special expertise in energy performance of buildings, the latter is performed by another inspection body, having expertise in energy certification but no connection to renovation or construction projects. During the building licensing process, validity checks of EPCs do not happen, despite that it could be the most important tool for verifying compliance of MEPRs. On the other hand, during compliance check of EPCs, the project itself, under which the EPC was developed (major renovation or construction) is not assessed at all. This means that if incorrect values or calculations are found within the EPC, it will not relate to the renovation or construction project, there is no feedback to the building authorities. **The present study proposes to consider linking the two processes by legislation**, so that it best serves the aim to achieve real energy savings through renovations or new constructions by fulfilling MEPRs.

- Building on the previous proposal, the selection of EPCs for compliance control should not happen randomly. Presently the majority of EPCs are produced when a property is sold or rented. Although it is important for information and educational purposes to have valid EPCs in these cases as well, it is equally if not more important to have valid EPCs in case of projects related to energy saving measures. Therefore, more emphasis and resources should be put on the validity check of EPCs prepared for such purposes. Instead of a random selection of the total number of EPCs produced per year, a larger sample size should be investigated among those EPCs which were prepared along major renovations or constructions of new buildings.

Implications to the EPBD recast under the "Fit for 55" proposal package

The "Fit for 55" proposal package, adjusting requirements for the 55% GHG reduction target, greatly affects the building sector, of which the most directly related element is the EPBD recast. While it is of key importance concerning the achievability of climate neutrality what the final version of the directive will contain after the legislative procedure, the level of implementation and practice of the current EPBD is still a question in some Member States. **The success and achievements of the revised EPBD will highly depend on the commitment of the Member States**.

This is one of the key findings and main messages of this current assessment: **Although national legislations mostly comply with the current EPBD, there is a general lack of enforcement in the examined countries regarding the application of MEPRs.**

Achieving minimum energy performance standards for the very worst-performing buildings, zero-emission buildings becoming the new standard for new buildings, Member States' obligations to support compliance with minimum energy performance standards with an enabling framework including financing support: just a few new elements of the EPBD recast, which will mean a huge challenge for these countries, as they even struggle with the proper implementation and enforcement of current requirements. This must not be ignored, when the new provisions of the EPBD are formulated.

The text of the explanatory memorandum of the EPBD recast says:

"The resulting proposal leaves a large margin for manoeuvre to Member States to adapt their buildings regulatory and financing policies to national and local circumstances with a view to meet a common overall ambition. The contribution of the EPBD revision to the overall "Fit for 55" package is not diminished but the key responsibility for its realisation falls more upon Member States than originally envisaged, with due respect for the principle of subsidiarity."

The results of this analyses indicate that leaving a large room for manoeuvre to Member States as regards to implementation might not result in the desired outcomes. Based on the findings of the present study we propose for consideration that certain provisions be included in a regulation

instead of a directive. An ambitious legislation on the building sector is crucial to achieve the 55% greenhouse gas reduction target, the sector representing one of the largest potentials, without which the 2050 carbon neutrality is unattainable.

The EPBD recast proposal contains new provisions on financing. One of the findings of the present assessment is that support programs are not only a good way to incentivise energy efficiency renovations, but they are effective means of ensuring that minimum energy requirements are met as a condition for receiving support; in fact, even stricter conditions may be demanded. Compliance control mechanisms linked to support programs are usually more functional than general compliance checking procedures, mainly because of the financial involvement. This implies the proposal that **at least financial support programs using EU funding** (and aiming at residential building renovation) **could entail compliance with MEPRs as an eligibility criterium in the financing guides - and this could be specified directly in the proposed EPBD**.

Application of minimum energy performance requirements

The setting, the application and control of the application of minimum energy performance requirements (MEPR) are the most crucial elements and prerequisites for meeting energy efficiency targets and maximizing energy savings potentials of the building stock. When requirements are not ambitious enough, or when they are legally required but not applied properly, the overall objective of building decarbonization is jeopardized. In case, when at the construction of a new building or energy renovation of an existing building the minimum energy performance requirements are not considered or applied, the lock-in effect appears: in the long run, the building will be locked into a less energy-efficient technical solution by choosing a sub-optimal (not the best available) solution for an investment that would happen next time only decades later. This is why it is of crucial importance to assess the implementation and enforcement of the legal requirements related to building energy renovation or construction of a new building.

The assessment addresses the topic on three levels:

(1) the description of the current status in each of the assessed countries;

(2) the evaluation of the subject from the aspect whether it serves the objective of reaching a high energy performance of, and aims to exploit the energy saving potential and the upscale of the rate of renovation of the countries' building stock;

(3) the major scope of the assessment is the enforcement of regulations: operationalization of requirements, related administration, procedures, institutional background, control mechanisms, sanctions and penalties are investigated for the purpose of evaluating how the application of MEPRs is ensured by the countries.

This section of the study includes a descriptive summary of the assessment; detailed data, specificities regarding each country and references can be found in the Annex, conclusions and recommendations under the previous "Key findings" chapter.

Existing buildings, cost-optimality, major renovation

Article 7 of the EPBD states that when buildings undergo major renovation, the energy performance of the building or the renovated part thereof upgraded has to meet minimum requirements. These have to be set with a view to achieving cost-optimal levels. It is of crucial importance to set as ambitious requirements as possible, and even more importantly to control their compliance, as the majority of buildings (75-85%) will still be in use in 2050. If renovations do not fully exploit the energy saving potential of a building, climate targets will not be achievable.

The MEPR values

The MEPR values regarding building elements, partial or major renovation of existing buildings have been defined and included in legislation in most of the assessed countries. An exception is Bulgaria, where instead of minimum requirements for building elements, referent values are set, and the requirements for major renovations are not the cost-optimal values but less stringent ones. In Romania the current calculation methodology and values have been revised and the new values are expected to enter into force at the end of 2022. Currently in Romania there are no energy requirements correlated with cost-optimal level, neither in the MEPRs still in force, nor in those that are expected to enter into force through the revised methodology.

The general conclusion is, the **U-values of building elements** have a room for development to become stricter, as the technology is available and would allow it. In Romania the values are being currently reviewed, and the proposed values would mean a considerable increase in energy savings when applied. However, in certain cases costs related to a stricter value would mean a significant cost increase, with no substantial increase in energy savings. In Hungary the effects of tightening the minimum requirements for building envelopes have been examined in a Hungarian study, among others. The analyses found that such thermal improvement of the building envelope is not reasonable, because development levels fulfilling more stringent requirements than those of the cost-optimal level, do not cause any considerable difference in terms of energy use saving and CO_2 emission reduction (a few percent only), while their investment cost is much higher[1].

The requirements regarding the **cost-optimal level and major renovations** differ from country to country, but usually it is the combined application of MEPRs for building elements and the primary energy consumption of the building (which can differ from country, referring only to the non-renewable primary energy, or the sum of renewable and non-renewable primary energy, including or excluding the energy need for cooling). The application of renewable energy sources is in most cases not required, but in Slovakia the non-renewable primary energy consumption is maximized in case of major renovation, which in some cases can only be achieved when renewable energy is applied. Generally, there are debates in the countries whether there is a need to alter the requirements related to cost-optimality and major renovation, as the values could be improved in certain cases. Considering the recent situation in the energy market, the sky-rocketing of energy prices, cost-optimal values could need to be reconsidered, as they might result in a stricter value. Nevertheless, the application of current cost-optimal requirements in case of major renovations of the existing building stock in most of the examined countries would result in more than 50%, in some cases possibly even over 70% energy savings.

[1] Source: Hungary: Modernisation of Public and Residential Buildings - Identification and Elaboration of Support Programmes, 2020, Multicontact Kft., study for the EBRD

	MEPR VALUES – COST-OPTIMAL LEVEL							
	U-values (W/m²K) for building elements					RES requirements	Maximum primary energy consumption for residential buildings (Ep, kWh/m²/y)	Other mandatory requirements (if any)
	façade wall	heated roof boundary structure	glazed windows and doors	attic slab	basement slab			
BG	no	no	no	no	no	No	Different for different type of buildings - equal to class B requirement for most of them and to class A for schools. In case of major renovations: class C is the MEPR	No
CZ - recommended values[2]	light wall U=0.2; heavy wall U=0.25	0.16	1.2	0.4	0.3	No, but if the builder installs RES, it is easier for him to fulfil requirement defined as meet average heat transfer coefficient Uem + primary energy from non-renewable sources	based on the reference building	4 different ways to meet the cost optimal level (see in template)
HU	0.24	0.17	1.15	0.17	0.26	No	110-140 (Ep is energy from renewable and non-renewable energy sources)	Requirements for the specific heat loss factor: 0.16-0.43 W/m³K
PL	0.15-0.18	0.11-0.15	0.9	0.11-0.15	0.20-0.25	No	SFH: 70, MFH: 65; (both values for buildings without cooling system; EP refers in Poland to non-renewable primary energy)	No
RO – current[3]	0.56	0.2	1.3	0.2	0.21	Yes, for new buildings (nZEB).	Maximum Ep for heating from conventional sources	no
SK	0.22	0.15	0.85; slope roof: 1.2	0.2	Not calculated	No explicit requirement for RES, but it is necessary to fulfil requirements expressed in non-renewable primary energy.	SFH: 54, MFH: 32; (without cooling system; gross floor area, non-renewable primary energy)	No

[2] if only the concerned part is being altered/changed (=partial renovation). (in case of major renovation when more parts are being changed - then it is ok to meet just minimum values for some parts but reach average Uem for building as a whole + supplied energy or RES)
[3] subject to change

Compliance control

The existence of legislation and sufficiently stringent energy requirements do not mean that the standards will be enforced in practice in all circumstances. But without this, it will not be possible to realise the energy savings potential of the existing building stock, to meet the 2030 and 2050 climate targets, and to minimise the energy consumption of residential buildings. In this study, we have examined the processes by which the six Member States seek to enforce compliance with minimum energy performance requirements.

Compliance with the law can best be enforced if it is monitored through an authorisation process. Although in most of the countries surveyed the major renovation of residential buildings is subject to a permit or at least notification, we found that in practice the authorities rarely check that the energy requirements have been met during renovation, thus regulatory compliance mechanisms, to ensure the enforcement of MEPRs, are often missing. Specific processes, where the application of MEPRs during partial or major renovation of existing buildings is checked in the design phase as well as after execution; designated actors within the process to hold responsible; sanctions and penalties applied in case of non-compliance; authorities with sufficient capacities to perform compliance checks – the major factors in a nutshell to describe the deficiencies.

	MEPR COMPLIANCE CHECK – MAJOR RENOVATION	
	Subject to permit or notification? In which cases?	Responsible authority
BG	Permit if public funds are used	Municipalities
CZ	Yes - for major renovations	Local building authority
HU	No	None
PL	Yes - permit in case of major renovations (exception: a single-family buildings with a height less than 12 m,) and in the case of single-family buildings with a height up to 24 m only a notification is required	A local construction supervision office
RO	Permit, with or without previously approved urban planning documentation - Law 50/1991	Local public administration
SK	Major renovations should be subject to permit, but for some renovation works the notification is sufficient.	The local public authority (construction office)

There are multiple reasons for the lack of compliance control. In Hungary for instance, construction activities related to major renovation do not require a building permit, therefore there is no presence of any authorities within the process at any stage, which could ensure checking of compliance. Even in countries, like Czechia, where a permit is needed, they are in large cases not applied for, especially with single family houses. In other cases, referring to the "if technically and economically feasible" clause in the legislation, the designer can justify non-compliance, stating that the requirements are not possible to achieve.

In cases where a permit is needed for major renovation, in the design phase usually the Energy Performance Certificate (EPC) is used as the base document for compliance check. However, in these processes only the presence of the EPC and the energy performance value indicated in the EPC are checked; the validity of input data and calculations are not investigated in this process. Validity check of EPCs are regulated separately, they are generally performed by another authority, and these two processes do not interconnect, they are run separately (see section on EPCs).

Compliance check after renovation is not performed in all cases, but there are no available data or statistics in the target countries how frequently they are applied. Sanctions range from paying fines to the refusal of the issuing of the permit of use by the authorities.

	MEPR COMPLIANCE CHECK – MAJOR RENOVATION							
	DESIGN STAGE				EXECUTION STAGE			
	Is compliance checked at design phase?	Basis document/method of compliance check	Responsible player for compliance	Sanctions of non-compliance	Is compliance checked after execution?	Basis document/method of compliance check	Responsible player for compliance	Sanctions of non-compliance
BG	yes	Energy Effciency Part of the Technical Design documentation	Designer	The design documentation will not be approved	Indirectly by checking the construction works implemented	Inspection by construction supervisor	Constructor	The construction works are not accepted
CZ	Yes	To have EPC (all major renovations), To have EPC calculations checked by State Energy Inspection (all buildings over 750 m2)	Owner/builder	not issuing a building permit; fine	Could be	Inspecting whether the building is being renovated according to building permit (including energy sources as stated and calculated in EPC)	Owner/builder	The construction works are not accepted
HU	No	None	Designer	No	No	None	Installer	None
PL	Yes	energy performance that is a part of design documentation (it is not registered energy performance certificate)	Architect	not issuing a building permit	No	NA	NA	NA
RO	yes legally, not in practice	Law 10/1995 regarding the quality in constructions	Designers on specialties	Fines	Yes (could be), prior to reception	Procedure PC 001/2013 applied by the State Inspectorate for Constructions	Energy auditor for buildings	Fines for the energy auditor
SK	Yes	If permit is required, then Design Energy Performance Report is part of design documentation.	Owner / Designer	Not issuing a building renovation permit	Yes, during permit for use, but usually is not focused on EE	Inspection by authority and comparison of actual building with approved design	Owner / Designer	Not issuing a permit for use, improvement required

New buildings, NZEB

The NZEB definition has been in place in all of the countries for years. However, it has not been introduced in the national legislation in Bulgaria and entering into force was postponed in Hungary with one and half years to 1 July 2022.

Values for NZEB differ greatly in countries. It also varies whether the value is applied to all residential buildings in general (e.g. in Hungary), or it is differentiated and have many different values related to typology/year of commissioning/etc. However, these values do not exactly correspond, as primary energy demand (Ep) in some countries is referred to as the non-renewable component only, in others it is the sum of renewable and non-renewable energy demand. Another difference is that in some cases energy demand for cooling is included in the Ep, in others it is excluded.

The application of renewable energy sources is mandatory in Bulgaria, Hungary (according to current legislation in force, however it is possibly subject to change in the near future) and Romania. There are no explicit requirements in Czechia, Poland and Slovakia, but the requirements (mainly on primary energy) in many cases force the builder to install RES to meet the required values.

Among the current legislations only in Romania is there a mandatory maximized CO_2 emission requirement. Hungary may follow this practice, if the regulation containing energy requirements currently under revision will pass the administrative procedure and gets approved.

	MEPR VALUES – NZEB LEVEL							
	U-values (W/m2K) for building elements					RES requirements	Maximum primary energy consumption for residential building (Ep, kWh/m2.y)	Other mandatory requirements (if any)
	façade wall	heated roof boundary structure	glazed windows and doors on the facade	attic slab	basement slab			
BG	no	no	no	no	no	55% of the total final energy excluding the consumption of the appliances	Energy class A - different for different building types	no
CZ - recommended values*	0.21	0.16	Windows U=1.1; Doors U=1.2	0.4	0.3	No, but the requirement (mainly on primary energy) in many cases forces the builder to install RES to meet the required values	70-75 (for SFH), for MFH it much more depends on the reference building	Reach 0.7*Uem for buildings element at the whole-building level.
HU	0.24	0.17	1.15	0.17	0.26	25% of the specific yearly primary energy need of the building	100	Requirements for the specific heat loss factor: maximum 0.28 W/m3K
PL	0.2	0.15	0.9	0.15	0.3	No	70 for single family buildings, 65 for multi family buildings; (both values for buildings without cooling system; EP refers in Poland to non-renewable primary energy)	No
RO - current	no	no	no	no	no	30% of the total energy requirement (consumption); not clear if final or primary	For SFH, between 98-217 kWh/m2.y For MFH, between 93-135 kWh/m2.y. Depends on the climatic zone (5 zones in Ro).	Max. CO2 emissions (kgCO2/m2 year) - for SFH, between 24-54; for MFH, between 25-37.
RO - new	0.25	0.15	0.9	0.15	0.29	30% of the total primary energy consumption (from conventional sources and RES)	For SFH, between 110-141.2 kWh/m2.y. For MFH, between 89-101.2 kWh/m2.y. Depends on the climatic zone.	Max. CO2 emissions (kgCO2/m2 year) - for SFH, between 13.7-19.3; for MFH, between 10.9 - 13.8.
SK	Obl.: 0.22; Rec.: 0.15	Obl.: 0.15; Rec.: 0.1	Obl.: 0.85; Rec.: 0.65	Obl.: 0.2; Rec.: 0.15	Temp.diffe-rence less 15K: Obl.: 0.6; Rec.: 0.35	No explicit requirement for RES, but it is necessary to fulfil requirements expressed in non-renewable primary energy for NZEB (energy class A0).	54 for SFH, 32 for MFH; (without cooling system; gross floor area, non-renewable primary energy)	No

Obl.: obligatory; Rec.: recommended

Compliance control

Compliance control in the case of new residential buildings in the examined countries works better than at major renovations. As construction of new buildings in all countries require some kind of permit/notification, the request for permit should contain design documents and/or EPCs, where evaluation of the energy performance is included.

	MEPR COMPLIANCE CHECK – NEW RESIDENTIAL BUILDING	
	Subject to permit or notification? In which cases?	Responsible authority
BG	Yes, permit for new constructions	Municipality
CZ	Yes, all new construction	local building authority
HU	Yes, but only for buildings with a total useful floor area bigger than 300 m2. Other cases: simple notification	Government offices
PL	Yes, permit for all new construction	A local construction supervision office
RO	Yes, permit for all new constructions	local public administration
SK	Yes, permit for new constructions	the local public authority (construction office)

Compliance check in the design phase: In order to get the building permit, usually a construction design documentation needs to be elaborated by an accredited designer. The accredited designer is responsible for compliance with the NZEB MEP requirements that is evaluated and confirmed in the design documentation. These requirements must be fulfilled for permit for construction of new building and are checked by public authority before issuing permit for construction. The only exception is Hungary, where construction of residential buildings in certain cases (mainly in the case of single-family houses; see details in template) is subject only to the so called "simple notification", where only the presence of the EPC is checked, but not the content. In Romania, although a building permit is needed, and meeting MEP requirements must be ensured by the architect and also by the designer of installation, according to the current practice, most of the time the verification of the fulfilment of the minimum energy performance requirements in the design phase is not done, leading to no repercussions on the designers, except possibly in case of litigation. In other countries, sanction of non-compliance is usually not issuing the building permit, and there is a request to redesign the building.

Compliance check after construction: In most of the examined countries the authority issues an occupancy permit to the building, if all requirements have been met. The compliance to the design project is confirmed by the technical project manager of the builder, the designers, and the independent building inspector. The investor also signs the building documentation at each stage

to accept it. The occupancy permit is issued by the authorities based on the received documentation, which usually includes an EPC.

The verification of the requirements is carried out on the basis of design documents needed to obtain a building permit, and on the documents prepared during construction, which include data on the implemented status. In cases where no building permit is needed, only the final documents reporting the implemented status and containing the energy performance of the building are checked. This latter is usually verified by an EPC. The practice is similar to that of major renovations: only the presence of the EPC and the energy performance value indicated in the EPC are checked; the validity of input data and calculations are not investigated in this process. Validity check of EPCs are regulated separately, they are generally performed by another authority, and these two processes do not interconnect, they are run separately (see section on EPCs).

In Bulgaria, the new buildings are required to have a control energy audit after 3 years of operation (and before the 6th) paid by the owner(s), but there is no control over the compliance and there are basically no such cases.

In case non-compliance is found after construction, the sanction is generally that the occupancy permit will not be issued to the builder/owner. In extreme cases the building needs to be reconstructed to fulfil energy performance requirements. The responsibility can be shifted from the builder/owner to the players of the renovation process (designers, architects, installers, etc) via legal acts, but it is generally a very long process, and no empirical evidence has been found during this assessment in the examined countries that such litigations happen. Financial sanctions can also be imposed by regulations, but no data has been found on its practical application within this study. Some countries also reported in the template (see Annex) that the failure to meet the energy class requirement is not always an obstacle to the issuance of an occupancy permit, however references to this statement have not been included.

	MEPR COMPLIANCE CHECK – NEW BUILDING							
	DESIGN STAGE				EXECUTION STAGE			
	Is compliance checked at design phase?	Basis document/method of compliance check	Responsible player for compliance	Sanctions of non-compliance	Is compliance checked at design phase?	Basis document/method of compliance check	Responsible player for compliance	Sanctions of non-compliance
BG	yes	Energy Effciency Part of the Technical Design documentation	Designer	The design documentation will not be approved	Indirectly by checking the construction works implemented	Inspection by construction supervisor	Constructo r	The construction works are not accepted
CZ	Yes	To have EPC (all new constructions), To have EPC calculations checked by State Energy Inspection (all buildings over 750 m2)	Owner/builder	Not issuing a building permit; fine	Could be	Inspecting whether the building is being built according to building permit (including energy sources as stated and calculated in EPC)	Owner/buil der	The construction works are not accepted
HU	Yes	EPC	Designer	In case a permit is needed: it is not issued, and redesign is requested. In case of simple notification: no sanctions at this stage	Yes	Inspecting whether the building is being built according to building permit (including energy sources as stated and calculated in EPC)	Builder	The occupancy permit is not issued
PL	Yes	energy performance that is a part of design documentation (it is not registered energy performance certificate)	Architect	not issuing a building permit	No	NA	NA	NA
RO	yes legally, not currently in practice	Law 10/1995 regarding the quality in constructions	Designers on specialties	Fines	Yes (could be), prior to reception	Procedure PC 001/2013, applied by the State Inspectorate for Constructions	NA	NA
SK	Yes, during permit for use, but usually is not focused on EE	Design Energy Performance Report is an obligatory part of design documentation.	Owner / Designer	not issuing a building construction permit	Yes, during permit for use, but usually is not focused on EE	Inspection by authority and comparison of actual building with approved design	Owner / Designer	Not issuing a permit for use, improvement required

The major bottlenecks and deficiencies of the compliance control systems in the examined countries are similar to those regarding major renovation.

There are capacity problems within the building authorities to check the validity of all the documentations and EPCs, thus mainly the values reported in these documents are generally checked, whether they fulfil the energy performance requirements. The validity of the content of the EPCs is evaluated within a separate process, they are not performed by the building authorities, but by other institutes, inspectorates, and they are generally not related to the particular construction project, meaning that if incorrect values or calculations are found within the EPC, the sanctions will not relate to the construction of the building, but only to the energy expert who performed the certification.

There is a reported need for educated energy specialists. More education is needed also for the trio of energy specialist, engineers, and architects, as their work is interlinked, and best performance is only achievable if they understand the connections between their jobs and their roles. Energy specialists need to be present at the construction process from the beginning, as even the architecture has an impact on results, they need to be consulted. The entry into force of the NZEB requirements is relatively new, experience on these interlinkages and the important role of energy specialists within the process still need to build up.

Energy Performance Certificates

Energy Performance Certificates (EPCs) have several important roles in the pursuit of improving the energy performances of buildings.

From the user's perspective it is a source of information on the building, it possibly helps to increase awareness of energy use within the building, and indicates places for improvement in order to save energy. In this respect, the provision of an energy certificate when buying or renting a property is substantial.

From the system's perspective however, it is the most commonly used tool to verify whether energy performance requirements in a building have been met, and they serve as the basis for checking compliance. This is the reason of the assessment of this major topic within this study.

Production of EPCs

EPCs are produced in most of the examined countries mainly for buildings that are newly built, sold or rented. There are two exceptions: (1) in Bulgaria EPCs are practically applied only for multifamily residential buildings who apply for grant. There is no functioning mechanism obliging other multifamily buildings or single-family ones to provide an EPC for any purpose. (2) in Slovakia EPCs are always produced for buildings when they are constructed, but not always when they are sold or rented.

EPCs are generally not displayed in advertising. In accordance with regulations in most of the examined countries, when a building is offered for sale or rent, the advertisement shall indicate the energy performance class of the building or single use unit only if a certificate is available. Thus information on energy performance is rarely found in advertisements, mainly because an EPC is obtained when a potential buyer and the seller/renter reach an agreement. Only in Czechia is there an obligation to include the energy class in the advertisement. It can be avoided though, by stating the worst class: "G". Not displaying and handing over an EPC class could lead to fine.

On-site inspection is generally not included in the national legislations. It is legally required only in Bulgaria in case of every EPC issued, however, in most cases this is only pro forma and it is very hard to control that.

A national register of EPCs is established in almost all countries, however, mostly only the data on the energy class is publicly available, and detailed statistics on EPCs cannot be found (except for Hungary, where statistics can be searched on the website of the national database – see a short analyses in the Annex).

	EPC LEGISLATION						
	Shall EPCs be produced...					Is on-site investigation mandatory?	Is there a national database of EPCs?
	before construction?	after construction?	when sold?	when rented?	for major renovation?		
BG	no	yes	yes	yes	yes	yes	yes
CZ	Yes		yes	yes	yes	it depends	yes, but with no public access (even the owner of the building can't check EPC of his building)
HU	yes	yes	yes	yes	no	no	yes, but only the information on the energy class is publicly available
PL	no	no	yes	yes	no	no	yes, but with no public access
RO curr.	no	yes	yes	yes	yes	no - only for EPC, yes - in case EPC is undertaken into an energy audit	EPCs are sent by energy auditors to the ministry monthly, without public access to data
RO new	no	yes	yes	yes	yes	no - only for EPC, yes - in case EPC is undertaken into an energy audit	
SK	only energy class*	yes	yes	yes	yes	yes, but not always done	

In most countries, in line with the EPBD requirements, EPCs contain information on reference values such as (1) minimum energy performance requirements, (2) recommendations for the cost-optimal or cost-effective improvement of the energy performance, (3) where the owner or tenant can receive more detailed information. User-friendliness can be improved in some countries, but the energy class (energy performance) and energy recommendations are generally presented to the end-user in an easy-to-understand way.

In most of the countries EPCs need to be elaborated by a certified assessor. In Slovakia however, the legislation does not stipulate that the assessment must be performed personally by a certified assessor. This leads to low quality if the assessing company employs cheap, non-certified persons who perform the assessment at a low cost. It competes with a certified assessors who issue very few EPCs.

	DO EPCS CONTAIN INFORMATION ON...			
	MEPR values?	recommendations for cost-optimal or cost-effective renovations?	where the owner can get more information?	energy class in an easily understandable way?
BG	no	contains recommendations on proposed energy saving measures	not mandatory	yes
CZ	yes	contains recommendations on proposed energy saving measures	no	yes
HU	yes	yes, but not in details	not mandatory	yes
PL	yes	yes (not in practice)	no	no (in Poland there is linear scale, without energy class)
RO curr.	no	contains recommendations to improve the energy performance of the building, no cost-optimal or cost-effective renovations recommendations	no	yes
RO new	yes	yes	yes	yes
SK	yes	yes	no	yes

Compliance control

In each examined country there is an independent control system on EPCs, which are reported mostly to be in line with the provisions of Annex II of the current EPBD. In all the countries there is a designated body performing the inspections, which are also responsible for issuing sanctions if needed.

EPCs are usually selected randomly in a statistically significant proportion (in Romania at least 10% of the EPCs and energy audit reports are sampled, in Hungary it is 2.5%, information on how it is defined in other countries is not available) and are checked for the correctness of the input data and the results presented in the certificate. However, checking validity of input data is difficult, and usually it is based on experience whether it can be realistic. Recalculations (verification of results) generally do not happen (except in Czechia).

Sanctions on non-compliance range from paying fines to the suspension of the energy certifier. In Bulgaria there are no effective penalties for non-compliance. In principle, the license of auditing companies could be suspended if there are severe discrepancies and low quality of the audits, but that is hard to follow and prove. In practice, audits of suspicious quality are returned to the auditing companies for amendments, but not all audits are checked. In Czechia the responsible body can request correction, or fine the energy specialist responsible for the calculations, or remove permissions of the energy specialist to issue EPCs. In Hungary a fine can be imposed o the energy certifier, or in severe cases the pursuit of the profession must be prohibited. In Poland the only penalty in the form of a fine applies to persons who provide false information in order to obtain a license to issue an EPC. In Romania regarding the validity of the EPC, there are no sanctions provided in the law.

Public data on compliance rate monitoring is only available in Hungary. Insufficient capacity for inspections is reported generally in the countries.

Typical shortcomings and bottlenecks of the EPC compliance control system include (details and specific deficiencies by countries are listed in the Annex):

- not functioning database of EPCs;
- insufficient capacity of the inspection bodies;
- no practical fulfilment of the obligation to publish data from EPC in advertisements;
- no verification of knowledge and skills of people licensed to issue EPCs;
- no practical verification of EPC correctness.

The reasons behind the less-functioning parts of the system varies from country to country, some of them are listed here, for more details consult the Annex:

- Lack of political will to enforce building certification due to the perception that it would be rather unpopular due to the cost inflicted on the building owners.
- General lack of interest in EPCs of end-users, no real trust that this is something of real value for the owner/buyer/tenant. In general, the market does not understand the usefulness of the Energy Performance Certificate (in the sense of an information instrument) and does not particularly accept it.
- Financial considerations by the ministry, reducing the costs of the system operation both for end users and for the entity responsible for this system.

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	EPC COMPLIANCE CHECK				
	Which body is responsible for EPC control?	Is validity of input data checked? How?	Are the results verified? How?	Is the sampling size determined by law? What is the sampling size?	Are there statistics for compliance rate?
BG	Sustainable Energy Development Agency (SEDA) for renovation/ municipalities for new construction	SEDA experts are checking all required documentation / for new construction there is no validity check in municipalities	SEDA experts are checking all required documentation / for new construction there is no verification check in municipalities	No sampling	No
CZ	State Energy Inspection	Yes, The State Energy inspection has access to EPC database with all the input data and protocols. Then the recalculation by SEI inspector is done. It is checked against project documentation etc. But usually no on-site visit.	Yes, recalculation by SEI inspector. But the capacities of SEI are quite limited, so they mainly check just the buildings over 750m2, where the check is mandatory.	"statistically significant percentage"	no, or they are not public
HU	Chamber of Engineers of Budapest and Pest County	Yes, through checklists and for 0,5% of EPCs through in-site visits	Yes, by reality-checking, not by recalculations	2.5% of EPCs produced per year	Yes
PL	The body acting on behalf of the minister responsible for construction, spatial planning and development and housing	Yes, manually on a basis of data given in the EPC	Yes, manually on a basis of data given in the EPC	No, the sampling size is not determined by law	No
RO	The State Inspectorate for Constructions	Yes, but the checks are more about form than content (details in RO report)	Calculations are not checked, different outputs are checked (details in RO report)	Yes - Law 372/2005; 10% randomly from the EPCs and energy audits sent to the ministry	No
SK	State Energy Inspection, appointed by Ministry	Rough check by the EPC collection and issuance information system. Manual in case of random checking EPC.	Mostly the form and content are checked, without recalculation.	Random selection of a statistically significant percentage.	Not public

Annex I. Assessment templates

1. The scope and application of minimum requirements

1.1. Minimum energy performance requirements: building elements

1.1.1. What are the MEP requirements of the most common building elements? Please provide values for the following structures/elements: (1) facade wall, (2) heated roof boundary structure, (3) glazed windows and doors on facade, (4) boundary structure of heated and unheated spaces (attic, basement)

Bulgaria: Currently, minimum requirements are not set. There are referent values, but if the building complies with the required energy efficiency class (class B for new buildings and class C for major renovation) the value of a single element can be higher than the referent.

The current referent U-values are as follows:

1. Façade wall: 0,28 W/m2K

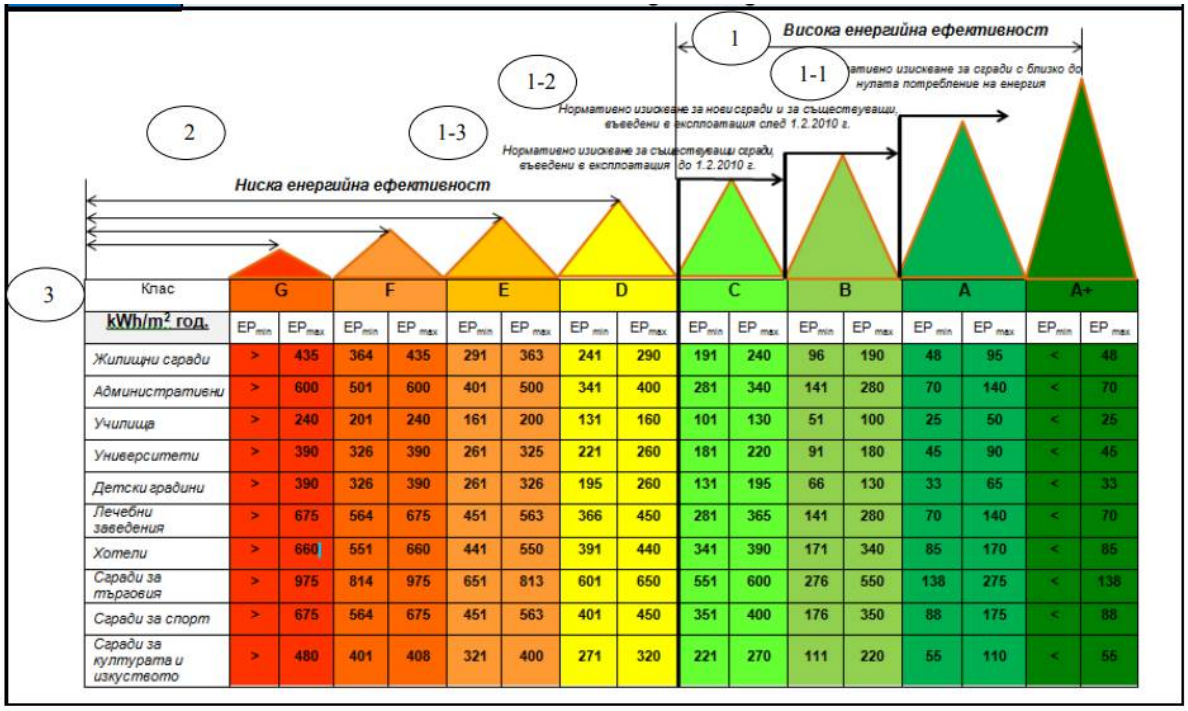
2. Windows: 1,4 W/m2K

3. Roof: 0,24 W/m2K

4. Floor: 0,4 W/m2K

Source: Ordinance 7 for energy efficiency of buildings[4]

[4] http://www.eneffect.bg/ee-infocenters/Legislation/Actual_21_11_2017/Nar%207%20EE%20sgradi%2021-11-2017.pdf



Клас	G		F		E		D		C		B		A		A+	
kWh/m² год.	EP min	EP max	EP min	EP max	EP min	EP max	EP min	EP max	EP min	EP max	EP min	EP max	EP min	EP max	EP min	EP max
Жилищни сгради	>	435	364	435	291	363	241	290	191	240	96	190	48	95	<	48
Административни	>	600	501	600	401	500	341	400	281	340	141	280	70	140	<	70
Училища	>	240	201	240	161	200	131	160	101	130	51	100	25	50	<	25
Университети	>	390	326	390	261	325	221	260	181	220	91	180	45	90	<	45
Детски градини	>	390	326	390	261	326	195	260	131	195	66	130	33	65	<	33
Лечебни заведения	>	675	564	675	451	563	366	450	281	365	141	280	70	140	<	70
Хотели	>	660	551	660	441	550	391	440	341	390	171	340	85	170	<	85
Сгради за търговия	>	975	814	975	651	813	601	650	551	600	276	550	138	275	<	138
Сгради за спорт	>	675	564	675	451	563	401	450	351	400	176	350	88	175	<	88
Сгради за културата и изкуството	>	480	401	408	321	400	271	320	221	270	111	220	55	110	<	55

Key: 1) high energy efficiency; 1-1) NZEB standard; 1-2) standard for new buildings and existing buildings dating from after 1 February 2010; 1-3 standard for existing buildings dating from before 1 February 2010; 2) low energy efficiency; 3) (*top to bottom*) residential buildings, administrative buildings, schoolhouses, universities, kindergartens, health facilities, hotels, commercial buildings, sports buildings, cultural and art buildings.

Czechia: The construction legislation (Construction bill, several decrees and norms) defines heat transfer coefficient (in ČSN 730540-2) for all structures on the building envelope. These must always be met – at two levels minimum or recommended. Construction physics is mainly solved by these (eg. Condensation of water, surface temperatures etc.):

For major renovations, minimum requirements (U values, in W/m2K) are defined:

Façade wall U=0,30; roof U=0,24; windows U=1,5; doors U=1,7; boundary structure of heated and unheated spaces U=0,6; floor U=0,45

These minimum requirements are the basis for the average heat transfer coefficient Uem, which is defined for reconstructions at the level of 1.0*Uem and for new buildings at the level of 0.7*Uem (both at the whole building level).

For partial renovations where there is no requirement for whole building, the requirement goes above the minimum requirements stated above and the builder needs to meet recommended values for the structure concerned.

Light façade wall U=0,20; Heavy façade wall U=0,25; roof U=0,16; windows U=1,2; boundary structure of heated and unheated spaces U=0,4; floor U=0,30

Hungary: The maximum U values (thermal transmittance, W/m2K) of building elements currently to be met are the same for cost-optimal (partial or major renovation) and NZEB levels. It is determined by the 7/2006. (V. 24) Regulation on the Determination of the Energy Performance of Buildings. The following values are to be met:

1. façade wall: 0.24 W/m2K

2. heated roof boundary structure: 0,17 W/m2K

3. glazed windows and doors on the facade: 1,15 W/m2K; not glazed doors: 1.45 W/m2K

4. boundary structure of heated and unheated spaces: attic: 0,17 W/m2K , basement: 0,26 W/m2K

Poland: The first form of the MEP requirement in Poland is the maximum values of thermal transmittance of building partitions, which must be fulfilled for new buildings. In case of renovation, only when it is major renovation the maximum values of thermal transmittance must be fulfilled for the element that is in the scope of the renovation (not for all building elements). They are given in the Regulation of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location (Journal of Laws 2019, item 1065). The current values for internal temperature of 20°C are valid from December 31, 2020 and amount to: external walls 0.20 W/(m^2K), roofs 0.15 W/(m^2K), slab-on-ground floors 0.3 W/(m^2K), windows 0.9 W/(m^2K) and doors 1.3 W/(m^2K).

The second requirement is the maximum value of the non-renewable primary energy demand indicator EP, which is specified in the same regulation. The value of this indicator depends on building type and is equal to 70 kWh/(m^2year) for single-family buildings without a cooling system, 65 kWh/(m^2year) for multi-family buildings without a cooling system. If there is a cooling system, these values are increased by 5 kWh/(m^2year) multiplied by a share of the cooled area in the temperature-controlled building area.

These requirements do not have to be met by, for example, historic buildings or religious buildings.

Romania: Currently, a revised methodology for the calculation of energy performance of the buildings MC001 revised 2021[5] is being prepared in Romania, which is already approved by the Ministry of Development, Public Works and Administration (MDLPA) and is expected to enter into force by the end of 2022. Its revision required a relevant time, from 2017 to 2021. The current

[5] Source: Methodology for calculating the energy performance of buildings, indicative Mc001/2006 (review) / Metodologie de calcul al performanței energetice a clădirilor, indicativ MC 001/2006. Revizuire metodologie; Revizuire/elaborare de comentarii și exemple de aplicare. Redactarea a III-a – Faza a III-a (revizia 06). București, iulie 2021 [Online]. Available: Search the database - European Commission (europa.eu)

methodology, current MC001[6] has significant shortcomings in terms of calculation methods for the production of energy from renewable energy sources (practically completely missing), as well as errors in calculation for energy consumption for cooling or mechanical ventilation. The revised methodology is based on the European standard package M480 CEN / CENELEC, and proposes important additions to the calculation methods applicable in assessing the energy performance of buildings, energy consumed for heating, hot water, cooling, lighting ventilation, based on technologies and energy sources, both conventional and renewable.

Currently, in Romania, the minimum energy performance requirements are defined in the MDRAPFE Order no. 2641/2017[7], with differentiation between new and existing buildings, respectively with differentiation between residential and non-residential buildings. For non-residential buildings, the requirements are detailed according to the destination of the building (buildings in the health system, education, offices, commercial and tourism buildings, respectively other buildings - including industrial, with normal operation).

In the revised methodology, the requirements are updated, being integrated as a minimum requirement the implementation of the nZEB concept for new buildings, with specific requirements for residential and non-residential buildings. Minimum energy performance requirements are defined in case of the major renovation or deep renovation of renovated existing buildings, residential and non-residential.

In MDRAPFE Order 2641/2017, the MEPRs refer to requirements that need to be fulfilled for construction elements (minimum corrected thermal resistances) and / or on the whole building (global thermal insulation coefficient, maximum specific consumption of primary energy from non-renewable sources for the heating of the building).

In the revised methodology, the MEPRs are extended / increased and refer to requirements that need to be met for building envelope elements (minimum corrected thermal resistances) and for the whole building (maximum values of total primary energy consumption - from renewable and non-renewable sources, maximum values of CO2 equivalent emissions, and primary energy to be produced in a proportion of at least 30%, with energy from renewable sources, including energy from renewable sources produced on site or in the vicinity, within a radius of 30 km compared to the GPS coordinates of the building).

For the existing buildings, the application of minimum requirements is required under the application of a major renovation (works whose costs exceed 25% of the tax value of the building, excluding the value of the land on which the building is located) or thorough deep renovation (renovation leading to improvement over 60% of the energy performance of a building, estimated by calculation according to the methodology, in relation to the current condition and normal use of the building). The minimum requirements are the same as for new buildings - as

[6] Source:Metodologie de calcul al performanței energetice a clădirilor, indicativ Mc001/2006 [Online]. Available: https://www.mdlpa.ro/userfiles/reglementari/Domeniul_XXVII/27_11_MC_001_1_2_3_2006.pdf

[7] Source: ORDIN MDRAPFE nr. 2.641 din 4 aprilie 2017 privind modificarea și completarea reglementării tehnice "Metodologie de calcul al performanței energetice a clădirilor", Monitorul Oficial nr. 252/11.IV.2017, 2017. [Online]. Available: ORDIN 2641 04/04/2017 - Portal Legislativ (just.ro)

a type, but lower performance requirements are imposed (e.g. the percentage of total primary energy insured with renewable energy sources (RES) is at least 10% and applies if it is feasible technically, economically and considering the environment).

All five categories of buildings described in Article 4, paragraph 2 of the EPBD[8] are excluded from the application of MEP requirements. This aspect is regulated in Article 8 of Romanian Law 372/2005, last updated in 2020[9].

Still in force requirements for the building envelope elements for new and existing residential buildings – according to MDRAPFE Order no. 2641/2017 are:

Building envelope element type	New and existent residential buildings	
	R'_{min} [m²K/W]	U'_{max} [W/m²K]
Facade walls (excluding glazed walls, including the adjacent walls to the open joints)	1.80	0.56
Glazed windows and doors on the facades	0.77	1.30
Floors above the top level, under terraces or attics (heated roof boundary structure)	5.00	0.20
Floors over unheated basements and cellars (boundary structure from heated spaces to unheated spaces - basement)	2.90	0.35
Adjacent walls to closed joints	1.10	0.90
Floors that delimit the building at the bottom, from the outside (passageways)	4.50	0.22
Slabs on ground (above ground level)	4.50	0.22
Slabs on ground at the bottom of basements or heated basements (under ground level)	4.80	0.21
Ground walls (under ground level) in heated basements	2.90	0.35

The proposed requirements for the building envelope elements in new and existing residential buildings, which should replace the current ones – according to MC001 revised 2021 are:

[8] Source: "Directiva 2010/31/UE a Parlamentului European și a Consiliului din 19 mai 2010 privind performanța energetică a clădirilor (reformare)," Jurnalul Oficial al Uniunii Europene 153, 2010. [Online]. Available: TEXT consolidat: 32010L0031 — RO — 01.01.2021 (europa.eu))

[9] Source: Legea 372/2005 privind performanța energetică a clădirilor - republicată. Monitorul Oficial al României, nr. 868/23.IX.2020, 2020. [Online]. Available: LEGE 372 13/12/2005 - Portal Legislativ (just.ro)

Building envelope element type	New residential buildings		Existent residential buildings	
	R'_{min} [m^2K/W]	U'_{max} [W/m^2K]	R'_{min} [m^2K/W]	U'_{max} [W/m^2K]
Facade walls (excluding glazed walls, including the adjacent walls to the open joints)	4.00	0.25	3.00	0.33
Glazed windows and doors on the facades	1.11	0.90	0.90	1.10
Floors above the top level, under terraces or attics (heated roof boundary structure)	6.67	0.15	5.00	0.20
Floors over unheated basements and cellars (boundary structure from heated spaces to unheated spaces - basement)	3.40	0.29	2.50	0.40
Adjacent walls to closed joints	1.50	0.67	1.10	0.90
Floors that delimit the building at the bottom, from the outside (passageways)	5.00	0.20	4.50	0.22
Slabs on ground (above ground level)	5.00	0.20	4.50	0.22
Slabs on ground at the bottom of basements or heated basements (under ground level)	5.30	0.19	4.80	0.2
Ground walls (under ground level) in heated basements	3.40	0.29	2.90	0.35

Comparing the two tables, in the revised methodology it is proposed to significantly increase the thermal performance requirements for all elements of the building envelope, for new buildings, which must meet nZEB requirements. The minimum thermal resistances become part of the national definition of the nZEB concept. Related to existing buildings, it is noticed a significant increase of the requirements for exterior walls and glazed exterior elements.

Slovakia: The maximum U values in W/(m2K) of building elements are defined in national standard and are referenced in legislation implementing the EPBD. The continual increasing of the MEPR was introduced already in 2012 with changes envisaged from 2016 and from 2021 (NZEB level). By the calculation of cost optimal level of MEPR on building elements in 2018 the same level, as valid from 2016, has been confirmed.

MEPR for NZEB level became only recommended. Mandatory values are obligatory for new buildings and also for renovated buildings if it is feasible economically, technically, functionally.

The following values are to be met:

(1) facade wall: mandatory Uwall=0.22 recommended Uwall=0.15

(2) heated roof boundary structure: mandatory Uroof= 0.15 recommended Uroof=0.10

(3) glazed windows and doors on façade: mandatory Uw=0.85 recommended Uw=0.65

(4) boundary structure of heated and unheated spaces (attic, basement): Value is depending on the temperature difference and direction of the heat flow. For unheated basement with the temperature difference up to 15 K and heat flow from top to down: mandatory Uun= 0.6 recommended Uun=0.35

Table 3
Requirements for *U*-values under Table 1 of STN 73 0540-2:2012/Z1:2016

Type of building structure	Structural thermal transmittance coefficient W/(m^2.K)			
	Maximum value U_{max}	Standardised value (setpoint) U_N as of 1 January 2013	Recommended value U_{r1} standardised (setpoint) from 1 January 2016	Target recommended value U_{r2} standardised (setpoint) from 1 January 2021
Outer wall and sloping roof over housing with a gradient of > 45°	0.46	0.32	**0.22**	**0.15**
Flat and sloping roof with a gradient of ≤ 45°	0.30	0.20	**0.15**	**0.10**
Ceiling over external environment [a]	0.30	0.20	**0.15**	**0.10**
Ceiling under unheated space [b]	0.35	0.25	**0.20**	**0.15**

The thermal transmittance resistance on the outer surface of a structure is R_{se} = 0.04 m^2.K/W.
[a] The thermal transmittance resistance on the inner surface of a structure is R_{si} = 0.17 m^2.K/W (top-down heat flow).
[b] The thermal transmittance resistance on the inner surface of a structure is R_{se} = 0.10 m^2.K/W (bottom-up heat flow).
[c] The thermal transmittance resistance on the inner surface of a structure is R_{se} = 0.13 m^2.K/W (horizontal heat flow).

Source: Slovak Republic, Cost-optimal levels of minimum energy performance requirements for buildings and building elements, pursuant to Directive 2010/31/EU on the energy performance of buildings and Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012, Part: Derivation of cost-optimal levels of minimum energy performance requirements for nearly zero-energy buildings, Second Reporting Stage, 31 March 2018

1.1.2. Are these MEP requirements reviewed at regular intervals? How often are they updated? When was the last review of requirements (if any)?

Bulgaria: The values were reviewed in 1999, 2005, 2009 and 2015 as follows:

		1999	2005	2009	2015
Walls	W/m^{2}K	0,5	0,5	0,35	0,28
Windows	W/m^{2}K	2,65	2,0	1,7	1,4
Roof	W/m^{2}K	0,3	0,25	0,28	0,24
Floor	W/m^{2}K	0,5	0,4	0,4	0,4

The values up to 2005 are the maximum permissible. After 2009 they become referent values as the main indicator for compliance with national energy efficiency standards is the integrated building energy performance indicator EP, kWh/m2/year.

Czechia: Last version of the above values dates back to 2011 but quite similar values were there before since 2007. Currently, the revision of the national norm is expected. It will make evaluations easier and in line with the current decree. For partial renovations it is expected that the norm will adjust the values in average by 0,6 coefficient. So it will be more strict.

Hungary: The maximum U value of building elements came into force on 1 January 1 2016. There was a review in 2018, when minimal changes to some specific values (e.g. for floors on the ground) were made, but basically the values have not changed since the legislation was introduced. When the cost-optimal and nZEB requirements came into force, the requirement values changed, but not as a result of a revision, but because of the entry into force. There has been no regular review and update. An amendment to Regulation 7/2006 setting the requirements is currently under administrative consultation, along which some values are likely to change; these are expected to enter into force from 1 January 2023 in case the amendments pass the administrative process.

Poland: The MEP requirements were established using the cost optimal methodology in 2011 by ITB (Building Research Institute - Instytut Techniki Budowlanej). The review was carried out in 2017 by MCBE (Małopolska Center of Energy Saving Construction - Małopolskie Centrum Budownictwa Energooszczędnego). MCBE used the cost optimal methodology only for the calculation of non-renewable primary energy demand indicator EP, however in terms of thermal transmittance only review of available material technology has been given. Currently the next review of MEP requirements is on-going, and the result should be known in the second half of 2022.

Romania: MEP requirements are reviewed at certain intervals. The current requirements were defined in 2017, and their revised version was approved by the ministry in 2021 and will most likely enter into force at national level in 2022. Prior to 2017, the review was conducted in 2010 (MDRT Order 2513/2010)[10].

Slovakia: The step-by-step increase towards NZEB, as required by EPBD, has been introduced in Slovak standard STN 730540-2 in 2012 in order to allow a smooth adaptation of market players. The strictness of MEP requirements valid from 2012 increased from 1.1.2016 and from 1.1.2021 (NZEB). However, with the amendment of the national standard STN 730540-2 in 2019, the level of stricter MEP requirements for NZEB planned from 1.1.2021 became only

[10] Source: ORDIN MDRT nr. 2.513 din 22 noiembrie 2010 pentru modificarea Reglementării tehnice "Normativ privind calculul termotehnic al elementelor de construcție ale clădirilor", indicativ C 107-2005. Monitorul Oficial nr. 820/8.XII.2010. [Online]. Available: ORDIN 2513 22/11/2010 - Portal Legislativ (just.ro)

recommended instead of mandatory. As a consequence, the mandatory MEP requirements for NZEB from 1.1.2021 remain the same as were from 1.1.2016.

Review of MEP requirements on elements is performed at least in period of 5 years asked by EPBD for the cost optimal level calculation. Calculation of cost optimal level was performed in 2013 and 2018. However, the last calculation in 2018 was not really a complete calculation, but only a small recalculation of only a small number of buildings and not of all new technologies, which seems to be insufficient.

1.1.3. Who is responsible for compliance with the application of MEP requirements of building elements? Is it in all cases the owner, or are there special provisions appointing other parties (e.g. developer / the professional advisors / designer / architect /energy expert) as (co)responsible for compliance?

Bulgaria: In general, the designer and the building inspector are responsible for compliance with the national legislation, namely Ordinance No7 for Energy efficiency of buildings[11]. As mentioned, there are no MEP requirements for the building components. However, based on the Spatial Act, every project for major renovation should be based on an energy audit prepared by a certified energy auditor prescribing the measures with specific performance parameters of the components. In fact, major renovations are done only via financial support programs, so audits are actually required and delivered. In case of new buildings, the parameters of the components are described in the design documentation and the design-stage EPC, which is an obligatory part of the project documentation. When replacing separate components, audits or design projects are not requested or delivered (although by law every change of the common components should be based on a design project).

Czechia: Based on Act on Energy Management of the Czech Republic No. 406/2000, Para 7. the responsible party is always the person/entity responsible for the building itself: the owner, the builder (in case of new construction), the condominium, or the legal person responsible for management of the building. By a contract this responsibility is passed to the construction engineer, who is responsible for the project documentation and the construction.

Hungary: Compliance with energy requirements in general is part of the building permit and construction process. This is determined by two major regulations: Act LXXVIII of 1997 on the Shaping and Protection of the Built Environment and Government Decree 191/2009 (IX. 15.) on Construction Activity. Compliance is a multi-stage responsibility, divided as follows:

[11] https://www.seea.government.bg/documents/Naredba%207.pdf

The **builder** is responsible for obtaining the necessary permits, making notifications, concluding contracts, ensuring that the construction documents are in place and complied with, making the e-building logbook ready and checking the construction logbook.

The **designer** (engineer/architect) is responsible for the professionalism of the technical content of the architectural-technical documentation (including construction documentation) he/she prepares. The designer is responsible for defining the requirements (quantitative and qualitative indicators) for the construction documents, including energy performance requirements.

The **installer** is responsible for the compliance with and observance of the requirements laid down in the technical architectural and engineering documents and the construction documents provided by the builder and approved by the authorities. Instalment must happen according to these documents.

The **technical manager and technical inspector are** responsible for the execution of the construction or part of the construction in accordance with the final building permit and the corresponding approved permit plans and the construction documentation specified in the legislation, as well as for the maintenance of the professional, quality and safety standards applicable to the construction activity and the professionalism of the execution of the works. The inspector can instruct the installer to make changes if the instalment is not carried out according to the design documents.

In the event of violation of the legal requirements for the performance of construction works, the designer, technical manager, the technical inspector and the installer shall be subject to the legal sanctions provided for in the Government Decree.

Upon completion of the construction activity, the main installer shall declare on the summary sheet of the construction works logbook that the construction activity has been carried out in a professional manner and in compliance with the legal provisions, general and ad hoc requirements applicable to the construction activity, in particular the static and energy requirements of the building, professional, quality, environmental and safety standards.

Poland: The MEP requirements are part of the building energy performance for new buildings. The energy performance is part of the building construction design (technical design) needed to obtain a building permit (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)). The building permit is needed for new buildings and in case of major renovation. In some situations (specified in the construction law) the construction design and building permit is not needed, i.e. for modernization of a single-family buildings with a height less than 12 m, and in the case of single-family buildings with a height up to 24 m only a notification of such an investment is sufficient. In Poland in most of a cases an architect is responsible for collecting all the documents needed to issue a building permit. However, the energy performance is not checked for single-family buildings. (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)).

Romania: Currently, for the new buildings, the responsibility for ensuring compliance with MEP requirements must be ensured by the architect (corrected minimum thermal resistances, global thermal insulation coefficient, specific primary energy consumption for heating), but also by designers on installations (specific primary energy consumption for heating). Law no. 50/1991, regarding the authorization of the execution of construction works (republished)[12], provides the responsibility of the designers, when signing the technical documentation and technical projects, which must comply with the minimum requirements applicable to the specialties, as defined in Law 10/1995 (republished) - art. 5: mechanical strength and stability, fire safety; hygiene, health and the environment; safety and accessibility in operation; noise protection; energy saving and thermal insulation[13]. The designers are verified by the project verifiers (designers, but with enhanced design verification competencies, accredited by the ministry, MDLPA), who are jointly and severally liable with them from a legal point of view. At the same time, according to art. 6 of Law 10/1995 (republished), investors / owners are also legally liable, as involved factors.

However, for the new buildings, in the current practice, most of the time the verification of the fulfilment of the MEPRs is not done, without this aspect leading to repercussions on the designers or project verifiers, except possibly in case of litigation.

The energy auditor (as independent expert) is responsible for existing buildings; at the elaboration of the energy audit of the building, the minimum requirements must be ensured through the technical solutions that are proposed and he is legally responsible, also based on Law 10/1995 (republished). The energy audit is necessary according to Law 10/1995 in the case of interventions in existing constructions, which refer to construction works, reconstruction, repair, modernization, modification, extension, thermal rehabilitation, increase of energy performance, renovation, major or deep renovation, as the case may be, change of destination, protection, restoration, conservation of the building.

Slovakia: The accredited designer must process the design documentation for permit for new building construction or renovation if the conditions for the permit requirement are met (Construction Law specifies when permit is needed: e.g. the changes in the supporting structures, change of the street appearance (e.g. after additional insulation) etc. In case of uncertainty, the decision is usually on public authority and it often differs). The accredited designer is responsible for compliance with the MEP requirements of building elements that he proves in design documentation for building or renovation permit. The evaluation of all MEP requirements is reported in the Design Energy Performance Report that contains evaluation of

[12] Source: LEGE nr. 50 din 29 iulie 1991 (**republicată**)privind autorizarea executării lucrărilor de construcții. Monitorul Oficial al României, nr. 933/13.X.2004, 2004. [Online]. Available: LEGE 50 29/07/1991 - Portal Legislativ (just.ro)

[13] Source: LEGEA nr. 10 din 18 ianuarie 1995 (*republicată*)privind calitatea în construcții. Monitorul Oficial al României, nr. 765/30.IX.2016, 2016. [Online]. Available: LEGE 10 18/01/1995 - Portal Legislativ (just.ro)

building elements (U-values), heat needs, air-exchange rate, minimum surface temperature and also the overall energy performance expressed in primary energy and energy class.

Design Energy Performance Report is an obligatory part of design documentation that the owner is obligatory to deliver to the public authority for permit for construction or renovation. Owner has to provide the energy performance certificate after construction or renovation for permit for use.

According to Law 555/2005 Coll. duties of owner are also:

"Where technically, functionally and economically feasible, the building owner is obliged to apply new or renovated technical systems, implement smart metering systems and install building automation and control systems, including energy saving monitoring systems, in the case of a major renovation".

"If technically and economically feasible, the owner of the building is obliged to equip the heated rooms of the existing building and the heated separate parts of existing building with self-regulating devices when replacing the heat generation system".

1.1.4. Who/which body/institution checks compliance?

Bulgaria: Local authorities are checking the design documentation for major renovation as well as new construction, (checked and verified beforehand by the building inspector) before issuing a permission for construction works. Each project needs the above-mentioned energy efficiency verification (design-stage EPC or energy audit with EPC in case of existing buildings). The Sustainable Energy Development Agency (SEDA) - https://seea.government.bg/en/ is responsible for the quality control of these verifications.

Czechia: For new constructions and major renovations – local building authority office as part of the building permit procedure, where the Energy Performance Certificate must be submitted by the builder. They just check there is an EPC, they do not check the calculations inside, and whether there has been check on EPC by State Energy Inspection (mandatory on all buildings exceeding 750 m2)

For other reconstructions (other than major): no one checks the compliance.

To check on calculations, there is a State Energy Inspection – an independent institution under the Ministry of Industry and Trade dedicated to the oversight of activities of certified energy specialists, energy auditors etc. and the compliance with Energy Bill (Act on Energy Management of the Czech Republic No. 406/2000). They thus check the outcome of their work: Energy Performance Certificates, energy audits etc. including the calculations.

Hungary: As of 1 March 2020, including the predecessor bodies of notaries, a centuries-old practice has come to an end, transferring the performance of the full range of state administrative tasks in individual construction cases from the level of local administration to the regional state administration. As a result, as of 1 March 2020, the government designated the capital and county government offices (hereinafter referred to as the "Building Authority") as the general building authority for buildings and construction activities. It is determined by the Government Decree 343/2006 (XII. 23.) on the designation and operating conditions of the building and building inspection authorities

Poland: The MEP requirements are checked by the local construction supervision office, that is responsible for issuing the building permit. The energy performance must be attached to the building construction design (technical design). This requirement must be fulfilled for new buildings and for major renovations.

Romania: The State Inspectorate for Constructions is a control body in Romania of which activity is related to quality in constructions, the control activity covering the whole sphere of the construction industry. The verification of compliance regarding the unitary application of the legal provisions related to the energy performance of buildings and the inspection of heating / air conditioning systems is based on the MDRAP Order no. 3152/2013, through a control procedure, indicative PCC 001-2013[14], and which is applicable to both new and existing buildings.

Slovakia: The building or renovation permit is issued by the local public authority (construction office) based on the design documentation. The Design Energy Performance Report is a mandatory part of design documentation. The conclusion of the report with confirmation that all requirements are fulfilled is checked by public authority (construction office).

The renovation can be allowed without obligatory permit from public authority in some cases. Nobody checks the compliance with energy requirements if a renovation permit is not required. Construction Law specifies when permit is needed. It is not related to EE and EPBD. The conditions are e.g. the changes in the supporting structures, change of the street appearance (e.g. after additional insulation) etc. In case of uncertainty, the decision is usually on public authority and it often differs between local authorities.

The quality of local public authorities (Construction offices) is different that could lead to different quality of design documentation depending on designer and investor.

[14] Source: PROCEDURĂ de control al statului cu privire la aplicarea unitară a prevederilor legale privind performanța energetică a clădirilor și inspecția sistemelor de încălzire/climatizare – indicativ PCC 001-2013. [Online]. Available: 5efc601f6eea8090054680.pdf (mdlpa.ro)

The changes in building permit and construction procedures are introduced by new Building Law. Approach will be more centralised and it seems even more responsibility will lie with the designer. The application in practice is not yet very clear due to the lack of implementing regulations.

1.1.5. Are there sanctions for non-compliance? If yes, what are these?

Bulgaria: If the building does not comply with the legal requirements, it cannot be commissioned[15]. The compliance is verified by EPC. If the EPCs are not corresponding to the actual situation or display obvious errors, in principle the license of the auditing company could be withdrawn. However, the monitoring is not as strict as it should be, due to the limited capacity of SEDA.

Czechia: At the level of local building authority office: *not issuing the building permit, requesting correction or issuing a fine in case the buildings was realised without the compliance*.

- Checking whether there is EPC and whether there has been check on EPC by State Energy Inspection (mandatory on all buildings exceeding 750m2)
- Checking whether the building is being built according to building permit (including energy sources as stated and calculated in EPC) (or at least they should check so).

At the level of Energy Performance Certificate and compliance with the requirements it depends on the level of non-compliance:

- State Energy Inspection can check whether EPC calculations are correct, whether EPC is being calculated according to project documentation. If not -> they request correction. This check is mandatory in buildings over 750m2.
- SEI can't request correction on the level of building (-> this is responsibility of the building authority, SEI can only request correction of the calculations) -> correction at building level must be issued by the building authority office.
- SEI can't even inform the building owner, that there was an issue with the EPC calculations concerning his/her property (because of GDPR issues)
- SEI can also fine the energy specialist responsible for the calculations.

Hungary: **Sanctions for new buildings**: If the construction of the building is subject to a permit, the application must be accompanied by a preliminary energy performance certificate. If the building is subject only to the so called "simple notification" (in case of new residential buildings with a total useful floor area of up to 300 square metres, or a new building exceeding 300 square metres of total useful floor area, provided that the builder is a natural person, that the

[15] Ordinance No7 for Energy efficiency of buildings: https://www.seea.government.bg/documents/Naredba%207.pdf

construction is carried out for the purpose of providing his own accommodation and that the new dwelling thus constructed contains no more than one dwelling; based on Government Decree 155/2016 (VI. 13.) on simple notification of the construction of residential buildings), the application must be accompanied by an official certificate attesting that the construction or extension of the building subject to simple notification has been completed. The builder must include the energy performance certificate when applying for the certificate. The building control authority shall verify the existence of the energy certificate before issuing the official certificate. An occupancy permit can only be issued for any new building after 30 June 2022 if it meets the near-zero energy requirements, and this must be demonstrated by an energy certificate for the as-built condition. Therefore. the sanction is *not issuing the occupancy permit*, meaning, the building cannot be used.

Poland: If the MEP requirements are not met, the investor will not be granted a building permit. (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)).

Romania: For new buildings, the current legislation is precarious regarding sanctions in case of non-compliance with the minimum energy performance requirements. According to the current legislation (Law 50/1995 - republished, art. 26, letter h), the public administration authorities that issue incomplete Urbanism Certificates, without requesting compliance with the minimum energy performance requirements - imposed by art. 10, para. (1) Law 372/2005, are subject to *financial* sanctions.

Also for new buildings, after construction, the conformity of the application of the minimum requirements can be verified through the EPC elaborated before the reception of the works, considering the hypothesis that it is chosen randomly by I.S.C. to be verified, but without being clear who is sanctioned if MEPRs are not met and what sanctions apply.

In the case of existing buildings, non-compliance with the minimum energy performance requirements in the measures proposed in the energy audit, on the basis of which the technical documentation for the authorization of intervention works for major renovation is elaborated, leads to financial sanctioning of the energy auditor.

Slovakia: There are no specific sanctions for non-compliance with MEP requirements. Local building public authority has quite wide competence and it can refuse the building permit or ask for improvement of design documentation. These are only sanctions.

In the case of new buildings, all requirements must be met according to the standards, but in the case of renovation, the design will be approved if the designer justifies a worse level of performance than is required by standard for new buildings in reference to non-feasibility for renovated building.

After construction the compliance with design documentation is checked for permit for use. This is more formal; the real properties of elements are not checked. Prescribed energy class has to be confirmed by the energy performance certificate of the new and renovated building, but not complying with the prescribed energy class will not result in sanctions and it is not the reason for refusal of permit for use. The reason is also that the level of requirements is not set very well and it is not possible to achieve the required energy class for some buildings.

1.1.6. How would you evaluate MEP requirements of building elements in your country from energy efficiency and energy saving potential aspect? Should they be modified (for instance because of the availability of more developed/higher performance building products)? Do the requirements maximize this potential, or is there room for development?

Bulgaria: Considering the climate conditions and the comparatively long heating season, the referent values need to be more ambitious. The exact values should be based on detailed LCC analyses that were not clearly defined during the elaboration of the national nZEB definition. Increasing the performance characteristics of the insulation of the facades and using more efficient windows will significantly improve buildings energy characteristics and there is much room for development in this direction. There is also room for improvement regarding the building systems, as in the case of residential buildings, the introduction of MVHR systems (which is virtually non-existent) should be incentivised by the relevant norms, including those for IEQ. As indicated by the LCC analysis performed in the LTRS, the optimal reference values used for some the building components (Ufacades = 0,15 W/m².K, Uwindows = 0,9 W/m².K Uroof = 0,15 W/m².K) are already very close to those referred to in the international Passive House Standard, the "gold standard" of energy efficiency. In fact, this was also predicted back in 2012 by the joint BPIE and EnEffect LCC analysis performed to support the development of a national NZEB definition[16]; however, there are still no explicit requirements for airtightness and mechanical ventilation with heat recovery in the national legislation.

Czechia: Revision of the related norm and decree is now being debated. The change should cover mainly renovations, should be soft and should take into account special cases like historical buildings etc. Thanks to the complex evaluations/calculations for new construction (NZEB) there is no need for modifications as the builders/engineers in case of new construction opt for recommended values rather than minimum values as it is easier for them to fulfil the NZEB requirements.

[16] https://www.bpie.eu/wp-content/uploads/2015/10/nZEB-Executive-Summary-Bulgaria.pdf

Hungary: Minimum requirements for building elements are stringent enough. The effects of tightening the minimum requirements for building envelopes have been examined in a Hungarian study, among others. The analyses found that such thermal improvement of the building envelope is not reasonable, because development levels fulfilling more stringent requirements than those of the cost-optimal level, do not cause any considerable difference in terms of energy use saving and CO2 emission reduction (a few percent only), while their investment cost is much higher[17]. The minimum standards for machinery came into force in 2012: it was a formality, it did not really tighten up the market solutions at that time. So it is largely redundant because ERP is much more stringent (marketing requirements) than 7/2006 regulation's mechanical requirements, so they are about unnecessary.

Poland: The MEP requirements in Poland are set according to cost optimal methodology and are in line with the requirements for nZEB (nearly zero energy building). However in terms of thermal transmittance they are not so strict as for i.e. passive house (Passive House Institute Darmstadt). The use of passive house requirements results in an increase of investment costs but the energy savings would be insignificant.

The requirement regarding the non-renewable primary energy demand indicator EP are in many cases difficult to be met by new multi-family buildings using only conventional energy sources. Thus the use of renewably energy sources is more common in Poland.[18]

Romania: The minimum energy performance requirements are to change significantly with the entry into force of the revised MC001 "Methodology for calculating the energy performance of buildings, Indicative MC001 / 2006: Methodology review; review / elaboration and application examples ", both as a level of requirements (such as the increase of the corrected minimum thermal resistances to be ensured for the building envelope elements) and as a type (overall thermal insulation coefficient and the maximum specific primary energy from conventional heating sources to be provided throughout the building will be replaced by: maximum values of total primary energy consumption - from renewable and non-renewable sources, maximum values of equivalent CO2 emissions, and total primary energy to be produced in a minimal proportion of energy from renewable sources, both for new buildings and for existing buildings).

[17] Source: Hungary: Modernisation of Public and Residential Buildings - Identification and Elaboration of Support Programmes, 2020, Multicontact Kft., study for the EBRD

[18] Rucińska Joanna "Technical aspects related to the amendment to the regulations on thermal protection of multi-family buildings", Rynek Instalacyjny 3/2021, https://www.rynekinstalacyjny.pl/artykul/izolacje-techniczne/105007,techniczne-aspekty-zwiazane-z-nowelizacja-przepisow-dotyczacych-ochrony-cieplnej-budynkow-wielorodzinnych; Kwiatkowski Jerzy "The impact of the energy supply system on the EP index in a multi-family residential building", Rynek Instalacyjny 3/2021, https://www.rynekinstalacyjny.pl/artykul/cieplownictwo/104921,wplyw-systemu-zasilania-w-energie-wielorodzinnego-budynku-mieszkalnego-na-wartosc-wskaznika-ep

As a type, the minimum requirements for the whole building proposed in the revised version of the methodology are those that are currently defined at national level for the nZEB building, in the MDRAP Order no. 386/2016[19] respectively in the Law 372/2005, with significantly increased requirements for the maximum allowed limit values of the total primary energy consumption (from renewable and non-renewable sources) and of the equivalent CO2 emissions.

Respecting them would lead to significant energy savings compared to the status quo of the recent years, both in the case of new buildings and in the case of major and deep renovations.

Slovakia: By changing the requirements valid from 1.1.2021 (NZEB), from mandatory to recommended values, the energy efficiency first principle is not fully exploited in Slovak regulation.

In order to maximize the potential energy savings, the MEP requirement should be modified to the previous version from 2012.

The level of recommended values (NZEB level) should become mandatory MEP requirements in Slovakia for all new buildings and for renovation if it is feasible. The NZEB level is technically possible to achieve in most cases.

The cost optimality calculation of MEP requirements is necessary taking into account new situations as charges and non-energy benefits connected with climate protection. LCA including embodied CO2 emissions should be included in evaluation.

Some other provisions in SK legislation also significantly harm the energy efficiency first principle (e.g. very low primary energy factors for district heating).

1.1.7. What legal improvements would be most effective for implementing MEP requirements of building elements?

Bulgaria: More strict control over the work of the certified energy auditors, including penalties is an opportunity to improve the quality of their work. Also, the energy efficiency classes and the nZEB definition need to be revised. Minimum performance requirements and reference values for building components should be introduced in line with the requirements of the EPBD recast proposal by the EC of December 2021

Czechia: Compliance is not checked at all for partial renovations (other than major). Then, even when the compliance is being checked at major renovations, mainly just the fact the building

[19] ORDIN MDRAP nr. 386 din 28 martie 2016 pentru modificarea și completarea Reglementării tehnice "Normativ privind calculul termotehnic al elementelor de construcție ale clădirilor", indicativ C 107-2005. Monitorul Oficial nr. 306/21.IV.2016, 2016. [Online]. Available: ORDIN 386 28/03/2016 - Portal Legislativ (just.ro)

has/has not EPC is being checked. The capacity of State Energy Inspection is limited. It is more elaborated in respective chapters.

Hungary: The tasks and powers of the building inspectorate were greatly reduced in the 2011 reform. In the case of residential buildings, checking prior to construction has been virtually abolished, because in most cases construction is not subject to authorisation. This means that corrective action can only be taken after construction, if necessary, and this is not the desirable solution. Major renovation is not encountered by the building authority at all, because no type of investment is subject to a permit, so that compliance with energy requirements is not checked in any way. This could only be achieved by reforming the building authority system, increasing the capacity of the building inspectorate and requiring inspections of renovations by law.

A study prepared by MEHI in 2021, called the Hungarian Renovation Wave, explored that there is a significant energy renovation demand among Hungarian homeowners in the following five years with more than 1.4 million homeowners planning to upgrade their homes, with an investment value of nearly HUF 3,000 billion. Former renovations were executed mostly not for energy efficiency purposes, and individual, partial renovations still predominate instead of complex, deep renovations. Home renovations are typically carried out without a technical or energy plan, resulting in insignificant energy savings, and a massive lock-in effect. Based on these findings, there is a clear a risk that the majority of the planned renovations will still not focus on energy savings. It is therefore important to channel this demand for renovation in a way that maximises the associated energy savings potential. State involvement with a valid and long-term support program could contribute to this, with the most important role being to bring those planning to renovate into a system whereby energy efficiency investments result in complex/deep renovation, are energy-engineered, and thus deliver real energy savings, which can be tracked (monitored), and reported (helping to meet EU targets).

Poland: The building's energy performance should be verified at every stage of the design and construction process. The fulfilment of the requirements should be proved after the completion of the construction process by preparation of an energy performance certificate (EPC) for the building. It should be one of the documents required when the building is hand-over. In the case of single-family buildings, the energy performance should be required as necessary part of the building design.

Romania: For new buildings, it would be desirable that financial support to be provided to building owners, so that nZEB is not associated by the market with a "chore", at least for the difference in costs between the current MEPRs (which do not contain the nZEB concept) and the proposed values for MEPRs in the revised Romanian methodology.

For existing buildings, it would be advisable that all subsidies from the national budget or financing with European funds to be at least major renovations, in which case the compliance with MEPRs is mandatory.

An extensive procedure of verifying compliance for the parties involved (owners, designers, energy auditors and public authorities) is needed.

Slovakia: A holistic approach is needed to building evaluation, as some properties of building elements may be good for heating energy needs, but not for cooling or lighting. The "hurdle race" is proposed in EN ISO 52000-1 Annex H (informative) for indicators for the assessment of nearly Zero-Energy Buildings (NZEB). Four indicators are recommended: Energy needs, The total primary energy use, Non-renewable primary energy use without compensation between energy carriers, Numerical indicator of non-renewable primary energy use with compensation.

Properly set requirements based on a detailed analysis and evaluation of options, that is missing in Slovakia, are crucial. Energy needs should be a mandatory requirement. In general, however, sufficiently strict primary energy requirements should ensure the quality of the thermal characteristics of the building and building elements.

Better quality control by public authorities issuing permit for construction, which today are local construction offices without suitable and trained staff. This will change with the new Construction Law, which will introduce a more centralised approach and possibility to involve professionals in the control for building permit. However, the application in practice is yet not very clear.

1.2. Cost-optimal minimum energy performance requirements

1.2.1. What is the energy performance indicator used for the cost-optimal minimum energy performance requirement?

Bulgaria: The annual specific primary energy consumption per m2 is the main energy performance indicator for the buildings in Bulgaria. There is no other specific indicator used for the cost-optimal minimum energy performance requirement. In the LTRS, cost-optimal analyses of different packages of energy saving measures are presented for multi-family and for single-family buildings, as well as for 4 types of public buildings. The indicator used is the same – annual primary energy consumption in kWh/m2a. The packages of measures analysed are all with energy savings above 60% and are considered cost-optimal if NPV>0. For every single package of measures which covers these conditions information is presented for the following indicators:

- annual primary energy consumption in kWh/m2a – minimum, maximum and average values
- primary energy saved annually in kWh/m2a – minimum, maximum and average values
- Relative share (%) of the primary energy saved when applying the package for a building with energy class before renovation D, E or F – minimum, maximum and average values
- CO2 emission reduction in kg/m2a – minimum, maximum and average values
- Required investment in BGN/m2 (without VAT) – minimum, maximum and average values
- Annual renewable energy consumption in kWh/m2a – minimum, maximum and average values
- Share of renewable energy (without appliances) in % – minimum, maximum and average values.

In general, the topic about the cost-optimal calculations is included in some texts in the Energy Efficiency Act (EEA) (Amend. – SG, 105/2016)

According to Art. 31 (4) (5):

(4) The minimum requirements to the energy characteristics of buildings or of parts thereof, in view of achievement of the optimum cost levels, the technical requirements and the energy efficiency parameters, as well as the methods/standards for determination of annual energy consumption in the buildings, including the buildings with nearly-zero energy consumption, shall be determined by an ordinance issued by the Minister of Regional Development and Public Works.

(5) The requirements to the energy characteristics shall be subject to obligatory regular inspection once every 5 years and, where required, shall be updated in order to bring them into compliance with the technological progress in the building sector.

In §1(26) of the Supplementary provisions of the Energy Efficiency Act there is a definition what is cost-optimum level:

"Optimum cost levels" are energy performance giving the lowest costs during the estimated economic life cycle, where:

a) the lowest cost is determined taking into account energy-related investment costs, maintenance and operating costs, including energy costs and savings, the category of building concerned, earnings from energy produced and decontamination costs, where applicable;

b) the estimated economic lifecycle refers to the remaining estimated economic lifecycle of a building - where energy performance requirements are set for the building as a whole, or to the estimated economic lifecycle of a building element - where energy performance requirements are set for building components.

The energy performance is considering the optimum cost level where the cost benefit analysis calculated over the estimated economic lifecycle is positive.

The ordinance issued by the Minister of Regional Development and Public Works pointed out in art. 31 (4) of EEA is Ordinance 7 for Energy Efficiency in Buildings. Although the amendment of the EEA that requires changes in this Ordinance is from 2016 the last amendment of the Ordinance is from 2015. So, the determination of the minimum requirements to the energy characteristics of buildings or of parts thereof, in view of achievement of the optimum cost levels is not introduced in the regulations.

Czechia: For renovations (partial as well as major): (Decree 264/2020 para 6, point 2 a-d + point 3) defines 4 separate ways to meet the cost optimal level. The builder needs to meet at least 1 of the following 4:

a) Average heat transfer coefficient Uem + total supplied energy (amount delivered to the building at the foot of the building + RES)

b) Average heat transfer coefficient Uem + primary energy from non-renewable sources

c) Fulfillment of recommended values for individual building elemensts/structures (see above the minimal performance requirements)

d) fulfillment of efficiency criteria of changed heat-sources defined by the decree (minimum requirements for changed resources)

Hungary: The cost-optimal level is defined in the 176/2008 Government Regulation: the level of energy efficiency that results in the lowest cost over the estimated economic lifetime of a building or a building element defined in the Decree on the energy performance of buildings, as calculated in accordance with Article 7(4). The indicators and numerical values of the cost-optimal level are set in the 7/2006 Regulation. There are 3 levels to fulfil: (1) Requirements for the heat transmission coefficients of the building envelope and doors/windows. These are the same as described in 1.1.1. (2) Requirements for the specific heat loss factor: $A/V \leq 0,3$ qm=0,16 [W/m3K]; $0,3 \leq A/V \leq 1,3$ qm = 0,079 + 0,27 (A/V) [W/m3K]; $A/V \geq 1,3$ qm=0,43 [W/m3K] and (3) Aggregated energy performance requirements (primary energy demand), which in case of residential buildings: $A/V \leq 0,3$ EP = 110 [kWh/m2a]; $0,3 \leq A/V \leq 1,3$ EP = 30 (A/V) + 101 [kWh/m2a]; $A/V \geq 1,3$ EP = 140 [kWh/m2a]

Poland: The level of thermal transmittance (U-value) of partitions and a non-renewable primary energy demand indicator EP were determined based on the cost-optimal methodology[20].

[20] Expertise made by the Building Research Institute - Instytut Techniki Budowlanej in 2011

Romania: In the 2nd „National Report on the calculation of the optimal levels, in terms of costs, of the minimum energy performance requirements"[21] - the used energy performance indicator is the primary energy demand.

Slovakia: Slovakia calculated the Cost optimal level required by the EPBD for U-values and for the non-renewable primary energy (PEnren).

1.2.2. What are the current energy requirements for cost-optimal level in your country (expressed in the indicator or objective metric)?

Bulgaria: Until this moment energy requirements for cost-optimal level expressed in any specified indicator or objective metric are not introduced in the Bulgarian regulations. Analyses for cost-optimal levels are presented in the LTRS but this cannot be classified as a legal energy requirement. According to the analyses in LTRS the cost-optimal levels are somewhere between the top range of the scale for energy class A and the middle range of the scale for energy class B for the analysed building types, while the minimum required class in case of major renovation is C, and not the cost-optimal level required by the EPBD.

Building type	Energy class	Specific primary energy consumption, kWh/m2
Administrative building	Between A (70-140) and B (141-280)	140.31
Kindergarten	B (66-130)	83.89
School	A (25-50)	43.97
Hospital	B (141-280)	166.98
Single-Family Residential	B (96-190)	114.31
Multi-Family Residential	B (96-190)	117.47

Czechia: For renovations: (Decree 264/2020 para 6, point 2 a-d + point 3) defines 4 separate ways to meet the cost optimal level. The builder needs to meet at least 1 of the following 4:

a) Average heat transfer coefficient Uem + total supplied energy (amount delivered to the building at the foot of the building + RES)

[21] 2nd RAPORT privind CALCULUL NIVELURILOR OPTIME, DIN PUNCT DE VEDERE AL COSTURILOR, ALE CERINȚELOR MINIME DE PERFORMANȚĂ ENERGETICĂ, 2019. [Online]. Available: proiect(1).pdf (mdlpa.ro), published in May 2019 on the MDLPA website

b) Average heat transfer coefficient Uem + primary energy from non-renewable sources

c) Fulfillment of recommended values for individual building elemensts/structures (see above the minimal performance requirements)

d) fulfillment of efficiency criteria of changed heat-sources defined by the decree (minimum requirements for changed resources)

There are no numerical values for options a) and b), both should not be higher than calculated for the reference building – the reference building differs from building to building so no threshold can be stated.

Hungary: All of the requirements described in 1.2.1 have to be met.

Poland: The current energy requirements for cost-optimal level are in line with the expertise made by the Building Research Institute - Instytut Techniki Budowlanej in 2011 and are as follow:

- The U-values for single- and multi-family buildings - external walls 0.15-0.18 W/(m^2K), roofs 0.11-0.15 W/(m^2K), slab on the ground 0.20-0.25 W/(m^2K), windows 0.9 W/(m^2K);
- The EP value: for single-family buildings - 70 kWh/(m^2year) (for buildings without cooling system); for multi-family buildings 65 kWh/(m^2year) (for buildings without cooling system).

Romania: The cost-optimal calculation was performed considering the requirements of MEPRs imposed in MDRAPFE Order 2641/2017. For new residential buildings it was found that the difference between the current level and the identified one of the optimal level in terms of costs is 54% and 66% respectively for new collective buildings - considering the primary energy from non-renewable sources for heating. Similarly, for the existing residential buildings, an average gap of 35% was identified for single-family buildings, respectively 52.9% for collective buildings.

However, currently in Romania there are no energy requirements correlated with cost-optimal level, neither in the MEPRs still in force, nor in those that are expected to enter into force through the revised methodology, as they were defined earlier than the elaboration of the cost-optimal report.

In the still in force version of the calculation methodology, MC001/2006, the dynamic economic calculation that is developed to justify the feasibility of an investment in increasing the energy performance of a building, aims to calculate the following indicators: net present value (NPV), recovery time investment (NR) and the cost of the saved energy unit (e). In the revised version of the methodology, MC001/2021, the financial analysis assimilates the method of updated global cost from EN 15459, the economic indicators being calculated as: actualized global cost, determined over a certain period of time, depending on the destination of the building, between

20-50 years and duration return on investment (PB) for the implementation of an energy efficiency project.

The MEPRs values proposed in the revised version of the methodology are not correlated with the values proposed and used in the National Report for cost-optimal calculation, which was developed based on the current values of MEPRs (MDRAPFE Order 2641/2017).

Slovakia: The cost optimal levels identified in 2018 for residential buildings are the current MEP requirements (NZEB) expressed in non-renewable primary energy, that are:

- Family houses: PEnren = 54 kWh/(m².a) (gross floor area)
- Apartment houses: PEnren =32 kWh/(m².a) (gross floor area)

1.2.3. Is it legally required that the share of this energy requirement has to be satisfied with RES? If yes, what is this value?

Bulgaria: There is no legal energy requirement related to this. There are some texts that cost-benefit analyses should be done in the energy audits to analyse the possibilities to utilize renewable energy in the buildings.

In Ordinance Е-РД-04-1 from 22.01.2016 г. for energy auditing, certification and assessment of the energy savings in buildings in art. 9 it is written that:

Art. 9. The energy audit of a building in operation has for a subject: ...

5. analysis of the possibilities for using renewable energy to prove technical feasibility and economic feasibility; the analysis of the possibilities for the use of renewable energy is part of the assessment of the indicators for annual energy consumption in the building

Art. 12 (2) says that:

12 (2) The analysis of the possibilities for utilization of renewable energy is performed according to the "cost-benefit" ratio and includes measurements, calculations and evaluation at least in the following volume: .....

7. assessment of the economic feasibility of investments for the installation of systems for utilization of renewable energy and recommendations to the owner of the building based on the results of the assessment.

Czechia: No. No need to install RES. But if the builder installs RES, it is easier for him to fulfil requirement by applying the point b) option (meet average heat transfer coefficient Uem + primary energy from non-renewable sources

Hungary: No mandatory requirements on RES.

Poland: There is no legal requirement to use a renewable energy sources. On the other hand, if the non-renewable primary energy demand indicator for the building does not meet the requirements, designers very often has to use in some extend a renewable energy source.

Romania: In the 2nd National Report calculating the optimal levels in terms of costs, minimum energy performance requirements, developed in 2019, in variants that comply with the minimum energy performance requirements associated with nearly zero energy buildings, the recommendation of the amount of renewable energy share is at least 30% of the energy needed for the building.

In the revised version of the methodology and, subsequently of MEPRs, there is the requirement as min. 30% of the total primary energy to be provided from RES for new buildings, respectively minimum 10% for existing buildings, in case of major renovation.

Slovakia: There is no explicit requirement for the renewable energy ratio (RER) for specific building, but the ratio of renewable energy is reported in EPC as an informative indicator. However, the share of renewable energy is necessary to fulfil current MEP requirements expressed in non-renewable primary energy for NZEB (energy class A0).

1.2.4. Is this requirement reviewed regularly? How often are they updated? When was the last review of requirements (if any)? Should they be reviewed and modified currently?

Bulgaria: No cost-optimal minimum energy performance requirement is introduced in the Bulgarian legislation. The cost-optimal levels analysed during the development of the national nZEB definition and the corresponding National nZEB Plan 2015-2020 were not applied in practice.

Czechia: There was no change to cost-optimal levels since introduction in 2013 (Decree no. 78/2013) although currently the decree in force is decree no. 264/2020. For new construction, there is no need to for change as we got NZEB. For renovations we are currently debating a change. The change should be soft and should take into account special cases like historical buildings etc.

Hungary: Currently a new proposal is under administrative procedures (there has been a review process since 2019), where the values might change.

Poland: This requirement was established using the optimal cost methodology in 2011 by ITB (Building Research Institute - Instytut Techniki Budowlanej). The review was carried out in 2017 by MCBE (Małopolska Center of Energy Saving Construction - Małopolskie Centrum Budownictwa Energooszczędnego). MCBE used the cost optimal methodology only for the calculation of non-renewable primary energy demand indicator EP, however in terms of thermal transmittance only review of available material technology has been given. Currently the next review of MEP requirements is on-going, and the result should be known in the second half of 2022.

Romania: The National Report of cost-optimal calculation, available on the MDLPA website from 2019, is the second prepared for Romania.

In addition, the financial approach to the technical and economic justification for implementing a project to increase energy performance in a building is essentially changed with the updating of the methodology for calculating the energy performance of buildings, however it should be noted that this method is not yet in force in Romania. It is predicted that this method (global cost) will be difficult to apply in real projects, especially large buildings in the residential or non-residential sector, complex - given that it is a calculation made by a single specialist - the energy auditor, as a secondary calculation related to the actual energy analysis, in the absence of national databases for the types of costs used in the method, such as: initial cost of investment (COinv), cost of maintenance (Coma), cost of disposal / demolition (COdisp) etc.

In Romania are not defined maximum allowable values for the actualized global cost, as it is not clear how it will be used in the decision-making process. According to MC001 updated 2021, the actualized global cost obtained at the investment level "can be used to compare different options or solutions. The payback period illustrates the potential of the different options compared to a baseline situation when the return on the initial investment is expected."

A completion is required and, possibly, to corroborate with the national report of cost-optimal calculation, also revised, after the entry into force of the revised methodology, with the new MEPRs.

Slovakia: Mandatory revision is performed every 5 years by calculating a cost optimal level (required by the EPBD). However, several revisions were carried out in between, mainly aimed at decreasing the level of ambition (2017, 2019, proposal in 2021) based on the pressure from construction sectors and industry, unfortunately, without proper justification by an analysis of reasons and consequences on owners during building operation.

1.2.5. What is the main heating technology and cost of fuel for that technology assumed in the cost-optimal calculation? How has the cost changed?

Bulgaria: In the analyses performed in the LTRS there is no information about the type of fuel used and the cost of fuel. There is only a list of the measures analysed.

Czechia: No fuel/heating technology is main. But sources with low primary energy factor make it easier for builder to fulfil requirements. Basically, no link to cost as such. The cost-optimality is in the trade-off between 4 ways (a-d) to meet the standard.

Hungary: Calculations were made for various heat sources. In Hungary, an official energy price prognosis was not available at the time of calculation, nor were there any international price forecasts referring to or referable to Hungary (including the Regulation). Therefore, a new prognosis based on several data and information sources was prepared. For the gas and electricity price prognosis the tariffs regulated and published by the Hungarian Energy Office in 2012 were used, both in case of residential as well as non-residential buildings, as data on prices in liberalised energy markets were scarce in Hungary. Regarding district heating, a national average price level was created based on the tariffs of 18 Hungarian towns, collected by the Association of Hungarian District Heat Suppliers. In case of firewood and pellet, forecast on self-collected data were applied[22]. Prices used for calculation (2013) and currently (2021 S2, based on: Eurostat for gas and electricity):

Gas: 0.06 EUR/kWh (2013) ; 0,024 EUR/kWh

electricity: 0,17 EUR/kWh; 0.1 EUR/kWh

firewood: 0,03 EUR/kWh

district heating: 0,08 EUR/kWh

pellets: 0,04 EUR/kWh

Poland: The calculations for single-family and multi-family buildings were based on the buildings with the central heating system with an automatic control system (thermostatic valves and weather control) without accumulation. The calculations were made for various heat sources: gas boiler, district heating substation, air source heat pump, ground source heat pump, electric heating, coal boiler, biomass boiler, oil boiler.

The energy prices used in the review of MEP requirements done by the MCBE (Małopolska Center of Energy Saving Construction - Małopolskie Centrum Budownictwa

[22] Source: Energiaklub, 2013; https://energiaklub.hu/files/study/ek_cost_optimality_2013.pdf

Energooszczędnego) in 2017 are as follows: gas 0.043 €/kWh (0.20 PLN/kWh), district heating 0.070 €/kWh (0.32 PLN/kWh), electricity from grid 0.141 €/kWh (0.65 PLN/kWh), coal 0.028 €/kWh (0.13 PLN/kWh), biomass pellets 0.037 €/kWh (0.17 PLN/kWh).

The cost of energy prices have increased form that time and in 2022 are as follows: gas 0.070 €/kWh (0.32 PLN/kWh), district heating 0.070 €/kWh (0.32 PLN/kWh), electricity from grid 0.185 €/kWh (0.85 PLN/kWh), coal 0.054 €/kWh (0.25 PLN/kWh), biomass pellets 0.070 €/kWh (0.32 PLN/kWh), heating oil 0.187 €/kWh (0.86 PLN/kWh).

Romania: The national report considers various scenarios regarding main heating technology, depending on the residential building type, as follows: own methane gas plant / District heating / wood stoves - for single-family homes in rural areas.

In the study, the evolution of energy prices took into account the trends estimated and provided by the European Commission on a biannual basis, up to 2030, with the possibility of extrapolation for longer time horizons.

Slovakia: All feasible heating technologies were considered in the cost optimal level calculation (gas boiler, biomass boiler, heat pump, district heating with different technologies).

Energy prices also included all related costs, i.e. both the fixed and variable components for cost optimal level calculation. Increase of energy prices by 2% per each year was assumed. The following energy prices were assumed in calculation of CO level (2013, 2018) for energy carriers only (without fixed part) in starting year of calculation:

- Gas: 0,04870 €/kWh without VAT
- Electricity (heat pumps) 0,1445 €/kWh without VAT

Today prices according to Eurostat are:

- Gas: 0.0353 €/kWh without VAT
- Electricity: 0.1353 €/kWh without VAT (second half of 2021)[23]

[23] https://ec.europa.eu/eurostat/databrowser/view/NRG_PC_204__custom_2772080/default/table?lang=en
https://ec.europa.eu/eurostat/databrowser/view/NRG_PC_202__custom_2772105/default/table?lang=en

1.2.6. Is the cost-optimal level in line with the aim of achieving high energy performance?

Bulgaria: According to the cost-optimal level analyses in the LTRS the following average results could be achieved for different type of buildings:

Multi-family residential buildings

- annual primary energy consumption in kWh/m2a – 117.47 (energy class B)
- primary energy saved annually in kWh/m2a – 245.76
- Relative share (%) of the primary energy saved when applying the package for a building with energy class before renovation D, E or F – 56/64/71
- CO2 emission reduction in kg/m2a – 55.62
- Required investment in BGN/m2 (without VAT) – 155.40
- Annual renewable energy consumption in kWh/m2a – 32.54
- Share of renewable energy (without appliances) in % – 55.6

Single-family residential buildings

- annual primary energy consumption in kWh/m2a – 114.31 (energy class B)
- primary energy saved annually in kWh/m2a – 248.94
- Relative share (%) of the primary energy saved when applying the package for a building with energy class before renovation D, E or F – 57/65/71
- CO2 emission reduction in kg/m2a – 56.34
- Required investment in BGN/m2 (without VAT) – 246.23
- Annual renewable energy consumption in kWh/m2a – 38.67
- Share of renewable energy (without appliances) in % – 55.92

Czechia: This should be debated and decided at national level. The ministry now sees there could be change to these requirements.

In comparison with the NZEB requirements, the cost-optimal level is rather weak. National NZEB requirement was strengthened as of 2022 after long debates with the responsible ministry. As the new construction is now well set, the talks on improving the cost-optimal level for renovations have begun with the ministry – mainly in terms of bigger weight of primary energy factor in calculation and better specification of possible exemptions.

Unfortunately, the ministry is now waiting for the new EPBD IV so that it is clear, what the new requirements should look like. The Commission's proposal to publish new cost-optimal calculations methodology by 2026 (art. 6 of EPBD IV) could mean another change to the national

calculations and requirements. Frequent changes to legal requirements are not welcomed well by the construction sector.

At EU level: we seek big opportunity to set methodology on including RES energy from energy communities into fulfilling the criteria.

Hungary: The question whether the current cost-optimal level requirements are sufficient was assessed by a study made for the EBRD[24]. It carried out a three-level assessment targeting residential and public buildings, and found that development levels fulfilling more stringent requirements than those of the cost-optimal level, do not cause any considerable difference in terms of energy use saving and CO2 emission reduction, while their investment cost is much higher. Therefore this study concluded that the cost-optimal level is in line with achieving high energy performance.

Poland: These requirements are in line with the requirements for nZEB buildings.

Romania: The cost-optimal level is set to achieve energy performance higher than the minimum required currently in force (defined in MDRAPFE Order 2641/2017), without reaching the MEPRs proposed in the revised methodology; apparently the report and the revised methodology are not correlated.

The implementation of solution packages for residential, individual and collective buildings, based on which the cost-optimal analysis was done at national level - even the variants compliant with the minimum energy performance requirements associated with nZEB (definition in Order 2641/2017), would lead to values relatively close to the newly proposed values of MEPRs in the revised MC001 methodology, considering the total primary energy consumption, but it is found that there is no correlation between them.

[24] Source: Hungary: Modernisation of Public and Residential Buildings - Identification and Elaboration of Support Programmes, 2020, Multicontact Kft., study for the EBRD

Residential building type			Total primary energy [kWh/m2 year] (Values for Romanian climate zone III - randomly considered)	
			Cost-optimal report [11]	Revised MC001 [1]
New	Collective buildings		105.22 / 103.26	95
	Individual buildings		127.91 / 134.35	125
Existent	Collective buildings – with height regime	S+P+10E	173.1 / 178.67	101
		S+P+4E	113.82 / 122.94	
	Individual building	Central heating	145.46 / 152.68	130
		Wood stoves	169.73 / 178.72	

If the corrected thermal resistance values are considered, the differences between the cost-optimal report values and the revised MC001 are even more obvious.

Residential building type		Corrected thermal resistance [m2K/W]					
		Exterior wall		Terrace/Attic		Windows and doors	
		Optimal-cost [11]	Revised MC001 [1]	Optimal-cost [11]	Revised MC001 [1]	Optimal-cost [11]	MC001 revised [1]
New	Collective buildings	2.43/2.18	4.00	5.76/5.36	6.67	0.91/0.83	1.11
	Individual buildings	2.43/2.15		6.20/5.63		0.91/0.83	
Existent	Collective building – S+P+10E	2.63/2.31	3.00	6.20/5.24	5.00	0.91/0.8	0.90
	S+P+4E	2.95/2.13		5.24		0.91/0.8	
	Individual buildings	2.24/1.91		6.25/5.7		0.91/0.83	

Inconsistencies arise due to the dynamics of legislative changes and subsequent changes in the technical regulations. The cost-optimal calculation report was elaborated in 2019, considering the minimum requirements, respectively nZEB as defined at national level in MDRAPFE Order 2641/2017 and Order 386/2016, and the MEPRs values proposed in the revised methodology were finalized in 2021. It would have been desirable to be a correlation between them, but it is obvious that there is not, situation in which it is necessary to update / revise the cost-optimal calculations, which should be correlated with the new MEPRs defined in the revised version of MC001, after its entry into force.

In the case of the EPBD, the proposed suggestion is to request Member States to correlate technical regulations so that for each national review of MEPRs to be a subsequent update of the cost-optimal calculation.

Slovakia: The previous calculations are not valid in current situation or in near future (climate danger, energy prices, construction materials prices, green taxes, ETS, …). New aspects have to be introduced in cost optimal level calculation (non-energy benefits, green taxes, ETS, climate resilience, …).

1.2.7. Where would application of cost-optimal levels lead us, how much energy would be saved compared with current levels, how far would it be from net zero?

Bulgaria: According to the cost-optimal analyses in LTRS the average primary energy saved annually in kWh/m2a for the different types of buildings are:

Multi-family residential buildings – 245.76 kWh/m2a

Single-family residential buildings – 248.94 kWh/m2a

The average savings, with starting point in different classes, will be as follows:

	Class D	Class E	Class F
SFB	56,94%	65,04%	71,39%
MFB	55,76%	64,08%	70,60%

The buildings will be far from net zero primary energy consumption as follows:

Multi-family residential buildings – 117.47 kWh/m2a

Single-family residential buildings – 114.31 kWh/m2a

Regarding the whole residential building stock, such calculations won't be correct as the mentioned savings are based on correction of indoor temperature (high % of the households cannot keep their homes warm enough in the winter). Calculations have been performed for a certain segment[25], but not for the whole residential sector.

[25] http://www.eneffect.bg/images/upload/123/POVERTY/report-electricitysavings-draft-EN.pdf

Czechia: Really hard to tell. In case of renovations of single-family houses (b)): the requirement is around 120-180 kWh/m2/y (primary energy from non-renewable sources) and building shape and orientation is not being calculated with - so really not that strict.

The LTRS calculates with minor/moderate/deep renovation of non-renovated buildings (average consumption 225 kWh/m2/y for SFH and 170kWh/m2/y for MFH) which could bring 49/120/182 kWh/m2/y of savings in SFH and 55/98/132 kWh/m2/y in MFH. But the real total amount of savings of course depends on: timeframe, renovation rate and proportion of minor/moderate/deep renovations. The calculations towards 2050 show that at least 50% consumption reduction is possible and together with heat-source replacement and decarbonization + PV instalment reaching zero carbon in building stock is possible (but as a whole, not at each individual building level)

new construction cca:

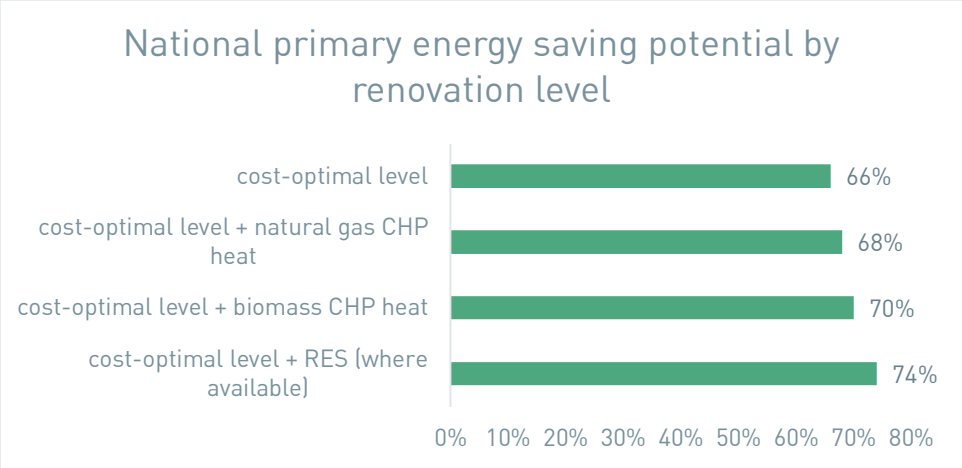
1..1. 2013-2020: Cost-optimal level for new construction: 80-210 kWh/m2/y depending on the shape and orientation (median was around 170 kWh/m2/y)

1..2. 2020-2022 NZEB: 60-160kWh/m2/y depending on the shape and orientation (median was around 140 kWh/m2/y)

1..3. 2022 NZEB II: 70-75kWh/m2/y with no dependence on the shape and orientation (no lower requirement for badly oriented buildings)

Hungary: In 2015, ÉMI[26] carried out a wide assessment about the energy saving potentials of Hungarian renovations, based on EPCs of 2000 buildings thoroughly investigated by experts. In this model, instead of nearly zero level, they assessed the on-site renewable potential by each building category – so at some building types, less than 25% RES or even zero was applied. According to the results, renovating all Hungarian residential homes to a „realistic" nearly zero level would decrease the national primary energy need by 74%. This would meant 289 PJ/year, from which 240 PJ accounted to single family houses – clearly indicating the huge saving potential of this sector. If the whole residential building stock would be renovated to cost optimal level, this would result in a 66% decrease in primary energy needs. This potential could be extended to 68% by connecting large multi-falmily buildings to district heating systems using cogenerated heat, or even to 70% if these power plants run on biomass. So the difference between renovating to cost-optimal or NZEB level is less than 10% of energy savings for the whole residential building stock.

[26] Source: ÉMI (2015): Residential energy efficiency potential study. Financed by KEOP-7.9.0/12-2013-0020, KEOP-7.9.0/12-2013-0019.



Poland: The current requirements that define nZEB standard are in line with a cost-optimal level. The level of a non-renewable primary energy demand indicator EP for a single family buildings decreased from 120 kWh/(m^2year) in 2014, to 95 kWh/(m^2year) in 2017, to 70 kWh/(m^2year) in 2021. The change of EP for multi-family buildings was from 105 kWh/(m^2year) in 2014, by 85 kWh/(m^2year) in 2017, to 65 kWh/(m^2year) in 2021. The requirements in Poland are far from net-zero building and it would take another 10-12 years to reach this level. According to the LTRS (Resolution No. 23/2022 of the Council of Ministers of February 9, 2022 on the Long-Term Building Renovation Strategy), the economically viable thermal modernization potentially allows for final energy savings in residential buildings of up to 147 TWh, which is around 75% of their current final energy demand.

Romania: In the National Report of cost-optimal calculation, for new residential buildings it was found that the difference between the current and the identified level of the optimal level in terms of costs is 54% and 66% respectively for new collective buildings - considering primary energy from non-renewable sources for heating, which is part of the current MEPRs in force in Romania. Similarly, for the existing residential buildings, an average gap of 35% was identified for single-family buildings, respectively 52.9% for collective buildings. If the reference is the total primary energy, the table above from para. 1.2.6. clearly shows that we are not even at the newly proposed values at national level for nZEB, and a revision of the cost-optimal calculation is mandatory for Romania, after the entry into force of the revised methodology.

Slovakia: The MEP requirements in all MSs had to be already adapted to the cost optimal level (EPBD). Unless new aspects are introduced mentioned in 1.2.6, it is not sure that the cost optimal level calculation will lead to more energy savings. The Zero-emission or net zero energy buildings are unlikely to be cost-optimal without introduction of new aspects in cost optimality calculation.

1.3. Energy performance requirements: existing buildings

1.3.1. Which definition of major renovation from EPBD is used in your country?

Bulgaria: According to the Bulgarian Energy Efficiency Act – Article 31(3)(3): "reconstruction, major renovation or major repair of a building, where more than 25% of the area of the external fencing constructions and elements of the building and its energy characteristics are changed."

Czechia: Major renovation means renovation of more than 25% of the total surface area of the building envelope.

Hungary: Renovation involving at least 25% of the total surface of the boundary structures (building envelope).

Poland: In accordance with the Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351) in the case of construction works consisting in thermal insulation of a building, covering more than 25% of the surface of the building's external partitions, the minimum requirements for energy efficiency and thermal protection provided in the technical conditions must be met. Accordingly, such modernization is considered as major renovation.

Romania: Option (a) of art. 7 EPBD is used for the definition of major renovation in Romania. The definition is transposed at national level in Law 372/2005 on the energy performance of buildings.

Slovakia: Three types of renovation are distinguished in §2 of the Slovak Law No 555/2005 with amendments[27]:

- **Major renovation** of the building is the construction modifications of the existing building, which intervene in building envelope structure to the extent of more than 25% of its area, especially by insulating the walls and roof and replacing the original openings. A significant renovation of the building can be carried out by one-step building renovation or by partial, staged step-by-step renovation.

[27] https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2005/555/

- **Major renovation of the building's technical system** is the renovation of the building's technical system, the investment costs of which exceed 50% of the investment costs for the acquisition of new comparable building technical equipment.

- **Deep renovation** of a building is a major renovation of the building and a major renovation of the building technical systems, which leads to the achievement of the energy class required for the building category, taking into account the economic life cycle of individual building elements. The building element means in particular the technical system of the building or the building structure forming part of the building envelope.

1.3.2. What are the MEP requirements for major renovation existing residential buildings?

Bulgaria: Energy class B for buildings commissioned after 1.02.2010 and Energy class C for buildings commissioned before 1.02.2010.[28]

Клас	EPmin, kWh/m²	EPmax, kWh/m²	ЖИЛИЩНИ СГРАДИ
A+	<	48	A+
A	48	95	A
B	96	190	B
C	191	240	C
D	241	290	D
E	291	363	E
F	364	435	F
G	>	435	G

Czechia: In case of major renovation, the builder needs to fulfil cost-optimal requirement (as always) and submit Energy Performance Certificate.

So, fulfil at least one of the following four options:

a) Average heat transfer coefficient Uem + total supplied energy (amount delivered to the building at the foot of the building + RES)

b) Average heat transfer coefficient Uem + primary energy from non-renewable sources

[28] Ordinance 7 from 2004 for energy efficiency of buildings: http://www.eneffect.bg/ee-infocenters/Legislation/Actual_21_11_2017/Nar%207%20EE%20sgradi%2021-11-2017.pdf

c) Fulfillment of recommended values for individual building elemensts/structures (see above the minimal performance requirements)

d) fulfillment of efficiency criteria of changed heat-sources defined by the decree (minimum requirements for changed resources)

and have an EPC certificate issued.

Hungary: In case of major renovation, the builder needs to fulfil cost-optimal requirements. There are 3 levels to fulfil at the same time: (1) Requirements for the heat transmission coefficients of the building envelope and doors/windows. These are the same as described in 1.1.1. (2) Requirements for the specific heat loss factor: A/V ⩽ 0,3 qm = 0,16 [W/m3K]; 0,3 ⩽ A/V ⩽ 1,3 qm = 0,079 + 0,27 (A/V) [W/m3K]; A/V ⩾ 1,3 qm = 0,43 [W/m3K] and (3) Aggregated energy performance requirements (primary energy demand), which in case of residential buildings: A/V ⩽ 0,3 EP = 110 [kWh/m2a]; 0,3 ⩽ A/V ⩽ 1,3 EP = 30 (A/V) + 101 [kWh/m2a]; A/V ⩾ 1,3 EP = 140 [kWh/m2a]

Poland: There are no requirements for existing buildings as long as there is no major renovation. In case of a major renovation the maximum values of thermal transmittance that are in line with MEP requirements must be fulfilled for the element that is in the scope of the renovation (not for all building elements). (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)). In some financial support programs for modernization of buildings there are requirements that a building must meet the U-value standard as for new buildings.

Romania: In the MDRAPFE Order 2641/2017, in force, the minimum requirements refer to requirements that need to be met for construction elements (minimum corrected thermal resistances) – para. 1.1.1. - and / or on the whole building (maximum specific consumption of primary energy from non-renewable sources for building heating ($q_{an} \leq q_{an.max}$)), differentiated between existing residential and non-residential buildings.

Values for qan.max are regulated as follows:

- for residential buildings with less than 5 floors (< P+4E) - qan.max = 153 [kWh/m2y];
- for residential buildings with more than 5 floors (⩾ P+4E) - qan.max = 117 [kWh/m2y].

In the revised methodology, the minimum requirements are extended / increased and refer to requirements that need to be met for construction elements (minimum corrected thermal resistances) - para. 1.1.1 - and the whole building (maximum values of total primary energy consumption - from renewable and non-renewable sources, maximum values of CO2 equivalent emissions, all shall be produced in a proportion of at least 10%, with renewable energy, including renewable energy produced on site or in the vicinity, and shall apply if feasible

technical, economic and environmental), the performance requirements being lower than for new buildings.

Values for the new parameters, which consider the climatic zone in which the building is located within the country (5 zones in Ro), are proposed as follows:

- maximum values of total primary energy consumption - from renewable and non-renewable sources: for SFH, between 110 - 141.2 [kWh/m2.y]; for MFH, between 89 - 101.2 [kWh/m2.y];
- maximum values of CO2 equivalent emissions: for SFH - between 13.7-19.3 [kgCO2/m2 year]; for MFH - between 10.9 - 13.8 [kgCO2/m2 year];
- RES: at least 10% of total primary energy consumption.

For existing buildings, the application of minimum requirements is required under the application of a major renovation (works whose costs exceed 25% of the taxable value of the building, excluding the value of the land on which the building is located) or deep renovation (renovation leading to improvement more than 60% of the energy performance of a building, estimated by calculation according to the methodology, in relation to the current condition and normal use of the building).

Slovakia: Requirements for existing buildings are the same as for new buildings if it is economically, technically and functionally feasible. There is no definition of feasibility and it is up to the public authority issuing the building permit whether to accept the designer's explanation or not.

For residential buildings the current MEP requirements (NZEB) expressed in non-renewable primary energy are:

- Family houses: PEnren = 54 kWh/(m².a) (gross floor area)
- Apartment houses: PEnren = 32 kWh/(m².a) (gross floor area)

1.3.3. Are there additional numeric indicators besides primary energy use (such as non-renewable and renewable primary energy use, greenhouse gas emission produced in kgCO2eq/(m2.y)) to express energy performance of a building?

Bulgaria: There are no additional requirements but in case of major renovation (that is always based on recommendations from an Energy Audit), the possibilities to implement RES should be investigated.

Czechia: The main indicator used in CZ to express energy performance is non-renewable primary energy. Additional indicators are just informative and are reported in EPC: supplied

energy (for building as a whole and for specific usage (cooling, heating, cooking etc.). Distribution according to the energy carrier is also shown (electricity, gas, etc. in %).

Hungary: The share of renewable energy used in the building has to be indicated in case of NZE buildings.

Poland: In the energy performance certificate in Poland five indicators are presented: energy need indicator in kWh/m^{2}year, energy use indicator in kWh/m^{2}year, non-renewable primary energy demand indicator in kWh/m^{2}year, CO_2 emission indicator in kgCO_2/m^{2}year and a share of renewable energy sources in %. However only non-renewable primary energy demand indicator is a part of the MEP requirements.

Romania: In the MDRAPFE Order 2641/2017, currently in force, the minimum requirements refer to requirements that need to be met for construction elements (minimum corrected thermal resistances) and / or for the whole building (maximum specific consumption of primary energy from non-renewable sources for building heating), differentiated between existing residential and non-residential buildings.

In the revised methodology, the minimum requirements are extended / increased and refer to requirements that need to be met for construction elements (minimum corrected thermal resistances) and for the whole building (maximum values of total primary energy consumption - from renewable and non-renewable sources, maximum values of CO2 equivalent emissions, all shall be produced in a proportion of at least 10%, with renewable energy, including renewable energy produced on site or in the vicinity, and shall apply if feasible technical, economic and environmental), the performance requirements being lower than for new buildings.

Slovakia: The non-renewable primary energy is the main global indicator used for MEP requirements. Additional indicators are reported in EPC, such as an energy class for final energy use (without generation losses), the CO2 emissions, energy needs and energy use per service that are just informative. Heating energy need is also a mandatory requirement.

1.3.4. Who decides whether a renovation is major?

Bulgaria: Municipal authorities who issue the permission for construction works based on the design documentation. However, this usually applies only for subsidized project or in the very rare cases of renovation of a whole building unit by the owners. In most of the cases, the

renovation is done by each individual owner in multifamily buildings without any documentation. The same applies for the single-family buildings, for which there is no practice to conduct energy audits.

Czechia: The builder/engineer responsible for the project documentation.

Hungary: It should be decided by the designer (architect), based on the calculations of the building envelope surface area. If a renovation is considered major, a certified energy expert should carry out the assessment whether other parts of the building would need refurbishing in order to fulfil cost-optimal requirements. However, as a construction permit is not needed in case of major renovation, there is no official checkpoint for determining whether a renovation is major, and the responsibility is not assigned to any players within a renovation process. In Hungary, based on a representative residential survey carried out by MEHI in 2020 (Hungarian Renovation Wave, 2020, MEHI), 76% of homeowners who did some kind of energy renovation in the past 5 years did not consult an energy expert and renovation was made without an energy plan.

Poland: The definition of a major renovation is given in the Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351), and building permit is needed in the case of major renovation. Project coordinator (in most of a cases - architect) is responsible for checking whether the renovation is major (area of the modernized partitions is greater than 25%) and whether it is necessary obtain a building permit. In some situations (specified in the construction law) the construction design is not needed, i.e. for modernization of a single-family buildings with a height less than 12 m, and in the case of single-family buildings with a height up to 24 m only a notification of such an investment is sufficient (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)). In practice, most single-family buildings meet the above conditions. In case of a notification, any document confirming compliance with MEP requirements is needed.

Romania: In Romania, the major renovation is defined under Law 372/2005, as "works designed and conducted on the building envelope and / or its technical systems, whose costs exceed 25% of the taxable value of the building, excluding the value of the land on which it is located."

Specifically, based on the financial analysis elaborated in the energy audit and / or the financial analysis (which is much more detailed) from DALI (Documentation for Approval of Intervention Works), which is elaborated based on the energy audit report by a team of designers on specialties, it can be determined whether the definition of major renovation for that particular project is met.

Slovakia: It is not clearly specified and checked. It depends more on if the permit for construction from public authority is required or not. If a permit for renovation is required, generally the MEP requirements for new buildings have to be fulfilled also for renovated buildings, but the designer can justify non-compliance if it is not possible to achieve.

1.3.5. What is the source of the data they use to determine this?

Bulgaria: Energy audit (including EPC) or technical design. All major renovation requires a building permit according to the Spatial Act, and the request for permit has to contain this information.

Czechia: Surface area of the envelope after planned renovation/measures and changed or new building elements.

Hungary: The data source should be the surface area of the building envelope that is renovated.

Poland: The data source is the design prepared by the architect. He is responsible for carrying out the investment in accordance with the construction law and for applying for a building permit.

Romania: The tax value of the building is determined according to Law no. 227/2015 on the Fiscal Code, with subsequent amendments and completions.

Slovakia: If the renovation requires the permit for construction it has to fulfil major renovation requirements. Otherwise, nobody checks the requirements.

1.3.6. After MEP obligation is determined, who designs major renovation?

Bulgaria: A team of designers based on the recommendations of the energy audit.

Czechia: Engineer responsible for the project documentation.

Hungary: An independent energy expert should provide calculations for possible solutions which fulfil the cost-optimal requirements. After the scenario is chosen, the architect and engineer are responsible for the technical design.

Poland: Architect chosen by the investor is responsible for carrying out the investment in accordance with the construction law and for applying for a building permit.

Romania: In Romania, MEPRs are translated into technical solutions by the energy auditor, as an independent expert, in the energy audit report. Then the energy audit is the basis for the elaboration of DALI (Documentation for the Approval of Intervention Works), by a group of designers by specialties: architecture, constructions, installations, which are verified by authorized technical verifiers. At the same time, DALI is based as well on a Technical Expertise that verifies the structural safety of the building, which is to be renovated.

Slovakia: If the renovation requires a permit for construction from a public authority, then the renovation has to be designed by designer authorised by Slovak chamber of civil engineers.

1.3.7. Is there a central database of renovations that are major? What is the data saved in the database, does it include adequate data on energy performance?

Bulgaria: Not specifically, but there is a register with all buildings that have energy audits on the website of the Sustainable Energy Development Agency (SEDA) - https://portal.seea.government.bg/bg/IndustrialSystemsReport. The register includes general information about the buildings' current energy characteristics and expected energy class after the implementation of energy efficiency measures. The register however covers a small part of the building stock and is generally limited to buildings that were subsidized for renovation, thus possessing the needed documentation.

Czechia: Not in this sense. Major renovation that goes (should go) through the building permit procedure must ask for the building permit. The statistic is thus just on the number of building permits issued with no data on energy performance in them. Separate statistics could be gathered from issued EPCs and their database, but the current EPCs database is not used that way (see questions on EPCs).

Hungary: There is no specific database for major renovations in Hungary. In case an EPC was produced after renovation, the EPC is uploaded in the central EPC database, providing information on the energy class of the building.

Poland: There is no such database in Poland.

Romania: In Law 372/2005, with the subsequent amendments and updates, there is the obligation that within maximum 30 days from the elaboration to send the certificates and syntheses of the energy audit reports, in electronic format, editable, to the MDLPA, in order to establish the ministry's databases. For non-compliance with this provision, financial sanctions are provided for energy auditors and control is provided in the PCC 001/2013 procedure of I.S.C.. However, it is not clear whether these databases were set up, as there is no public access to information. It is not clear what type of data these databases would actually take from the content of the EPCs and energy audits.

Slovakia: There is no specific database of major renovations. The data about issued EPCs for the purpose "building renovation" could provide the information on energy class achieved after renovation.

1.3.8. Who is responsible for compliance with the application of MEP requirements of major renovations? Is it in all cases the owner, or are there special provisions appointing other parties (e.g. developer / the professional advisors / designer / architect /energy expert) as (co)responsible for compliance?

Bulgaria: The main responsible parties are the energy auditing companies that should recommend energy efficiency measures in order to reach the MEP requirements. Based on the recommended measures the design team is developing a project in compliance with MEPR.

Czechia: Always the builder. But usually this responsibility is transferred by the contract to the engineer responsible for the project documentation and energy specialist responsible for EPC calculations. But in the end, it is the owner/builder who needs to fulfil requirements

Hungary: Compliance with energy requirements is part of the building permit and construction process. This is determined by two major regulations: Act LXXVIII of 1997 on the Shaping and Protection of the Built Environment and Government Decree 191/2009 (IX. 15.) on Construction Activity. However, as major renovation does not require a building permit, there is no control of

fulfilling energy performance requirements. In theory, compliance is a multi-stage responsibility, described under section 1.1.3.

Poland: There are no requirements for existing buildings in Poland in terms of thermal transmittance of partitions and the non-renewable primary energy demand indicator unless the building is a subject of a modernization. When modernization is carried out, the architect is responsible for the whole design.

Romania: The energy auditor (as independent expert) is responsible for existing buildings. In the energy audit of the building, he must ensure the minimum requirements through the technical solutions that are proposed, and he is legally responsible, also based on Law 10/1995 (republished).

Slovakia: If the renovation requires a permit for renovation the conditions are the same as for new buildings.

In such case the accredited designer is responsible for compliance with the MEP requirements. Design documentation for renovation permit must contain the evaluation all MEP requirements reported in Design Energy Performance Report that contains evaluation of all requirements (U-values, heat needs, air-exchange rate, minimum surface temperature, primary energy and energy class).

Design Energy Performance Report is an obligatory part of design documentation that the owner is obligatory to deliver to the public authority for permit for renovation. Owner has to provide the energy performance certificate after construction or renovation for permit for use.

1.3.9. Who checks compliance? Who determines after the renovation whether requirements have been met? Is it a national/regional governmental body, local authority or private organization? What is the institutional background for control mechanisms?

Bulgaria: According to the Bulgarian legislation, 1 year (heating season) after a major renovation, a second energy audit is required to estimate the achieved savings. However, this is not done in residential buildings, and there are no penalties for non-compliance, based on the Energy efficiency act[29]. SEDA is responsible for the quality of the energy audits and the accreditation of the energy auditing companies.

[29] https://www.seea.government.bg/documents/ZEE_12.03.2021.pdf

Czechia: For new constructions and major renovations – local building authority office as part of the occupancy permit procedure if this permit is required. Again, they just check, that the renovation was done according to the building permit (if required) and approved project documentation and they check there is an EPC, they do not check the calculations inside. For buildings over 750m2, they check whether EPC calculation was checked by State Energy Inspection.

To check on calculations, there is a State Energy Inspection – an independent institution under the Ministry of Industry and Trade dedicated to the oversight of activities of certified energy specialists, energy auditors etc. They thus check the outcome of their work: Energy Performance Certificates, energy audits etc. including the calculations.

Hungary: Since no building permit is needed for the major renovation of residential buildings, compliance is not checked by any authorities. The only exception is when a state subsidy is provided for energy efficiency retrofits, in this case the central institution responsible for handling the state fund from which the renovation was financed checks the EPCs on (1) original status, (2) planned status and (3) achieved status.

Poland: In the case of a major renovation, the construction supervision office issues a building permit and checks whether all necessary requirements are met. The architect from which the investor orders the design is responsible for its preparation in accordance with the regulations.

Romania: The State Inspectorate for Constructions is responsible for verifying compliance with the unitary application of the legal provisions regarding the energy performance of buildings and the inspection of heating / air conditioning systems, which is based on the MRDPA Order no. 3152/2013, through a control procedure, indicative of PCC 001-2013, and which is applicable to both new and existing buildings. Control and inspection activities aim at verifying energy performance certificates and energy audit reports on the application of minimum energy performance requirements to existing buildings.

Slovakia: If the renovation requires a permit for renovation the procedures are the same as for new buildings.

The same local public authority that gives permit for renovation and permit for use after construction has to check compliance.

If a renovation permit is required, then owner is obliged to provide the local public authority with an energy performance certificate (EPC) after renovation. But the failure to meet the energy class requirement is not an obstacle to the issuance of a permit for use especially for renovation of existing building.

1.3.10. How is compliance monitored? At which stage(s) of the renovation process? On-site or off-site by checking documents?

Bulgaria: As mentioned, the compliance should be monitored by a second energy audit 1 year after the renovation, both remotely by checking documents (energy bills and project design) and on-site as the energy auditors are obliged to inspect the building physically.

Czechia: For new constructions and major renovations during construction permit procedure (if required): they just check there is an EPC, they do not check the calculations inside. After the renovation is done during the occupancy permit procedure (if required): that the renovation was done according to the building permit (if required) and approved project documentation. If changes appear between asking for building permit and occupancy permit, changes must be recalculated in the EPC.

To check on calculations, there is a State Energy Inspection – an independent institution under the Ministry of Industry and Trade dedicated to the oversight of activities of certified energy specialists, energy auditors etc. They thus check the outcome of their work: Energy Performance Certificates, energy audits etc. including the calculations. At the level of building permit procedure, the State Energy Inspection always checks the EPC calculations in buildings over 750m2 floor area.

Basically, no on-site check regarding the energy performance compliance. The on-site check for the occupancy permit deals with other issues (fire safety etc.).

Hungary: There is no monitoring on compliance.

Poland: If a building permit is required the verification of the requirements is carried out on-desk on the basis of design documentation.

Romania: For existing buildings, compliance with the essential requirement f) energy saving is verified, according to Law 10/1995, by Law 50/1991 (republished) in the design stage, which is developed on the basis of energy audit, which should ensure possible remedies in due time.

At the same time, energy performance certificates and energy audits are subject to I.S.C.'s verification, regarding the application of minimum energy performance requirements to existing buildings, control activities planned to be applied by survey, thematic and as a result of direct I.S.C. notifications.

A verification of the compliance of the Technical Project is done on site, at the reception of the works. However, in practice, any findings of non-compliance with the verification of the MEPRs

are not made at this stage, although this stage aims to identify any findings of non-compliance related to the Technical Project.

The control procedure PCC 001/2013 indicates the verification of compliance with the minimum requirements (albeit in a precarious and interpretable way), but this is done by I.S.C., at random, for 10% of the total energy performance certificates and energy audits developed nationally, so not all buildings that are being renovated are checked.

Slovakia: No special continuous monitoring is required for energy renovation. For each construction and renovation that is subject to permit, the accredited construction supervisor has to be appointed, who is responsible for the implementation of the construction in line with the design and the building permit issued by local public authority.

1.3.11. Is checking applied to all residential buildings undergoing major renovation, or is it a random check on a certain sample size? Is it a statistically relevant sample size? Are all requirements checked or only some particular requirements?

Bulgaria: According to legislation (Energy Efficiency Act[30]) all renovated buildings need an energy audit that should check all requirements, however, this is an obligation of the building owners and in reality second audits are not performed, as there is no operational penalty mechanism.

Czechia: At the level of single family houses (SFH): Checks should exist, but in reality, there is no compliance check as renovations of SFH are done mainly by "do-it-yourself" method without asking for the building permit (although they often should ask) or without reporting the major renovation. Even in cases where they report their renovation, building authority often does not require energy performance requirement compliance. So in majority of cases: no check on energy performance.

At the level of multi family houses (MFH): MFH are buildings over 750m2 require a building permit, and together with the fact that DIY solutions are not performed by MFHs the building permit is applied for, which implies mandatory check on EPC.

Hungary: There is no control mechanism for compliance in case of residential major renovation.

[30] https://www.seea.government.bg/documents/ZEE_12.03.2021.pdf

Poland: For all the cases of a major renovation, the construction supervision office checks whether thermal transmittance requirements are met.

Romania: Based on the State Control Procedure regarding the unitary application of the legal provisions regarding the energy performance of buildings and the inspection of heating / air conditioning systems, indicative PCC 001/2013, the current control and inspection activities are expected to be carried out "by survey, thematic and as a result of the notifications addressed to I.S.C.".

Law 372/2005 (republished) specifies the annual verification, by sampling, of at least 10% of the EPCs and energy audit reports registered annually in the specific databases. For existing buildings, the verification refers to the verification of the application of the minimum energy performance requirements to the existing buildings.

The control procedure PCC 001/2013 indicates the verification of compliance with the minimum requirements (albeit in a precarious and interpretable way), but this is done by the I.S.C., at random, for 10% of the total energy performance certificates developed, so not all buildings that are undergoing major renovations are actually checked. Regarding the minimum percentage of 10% of energy performance certificates and audits "registered annually in specific databases" provided in Law 372/2005, it is not clear to what extent it is respected, as long as there is no public and transparent database.

It is noted that upon the entry into force of the revised methodology, which modifies / extends the minimum energy performance requirements for both new and existing buildings, the control procedure will become revolute, and it will be necessary to update it.

Regarding the verifications performed in the design stages, Law 10/1995 (republished) provides in art. 24 that "the certified project verifiers are jointly and severally liable with the designer for ensuring the quality level corresponding to the essential requirements of the project." Verification of the essential requirement f) energy saving and thermal insulation is mandatory only for the renovation of existing buildings - Law 50/1991 (republished).

For existing buildings there are relatively consistent legal provisions, but they apply on sample size, being insufficient. The applicable legislation is outdated, has been updated repeatedly (Law 50/1991, Law 10/1995) or is not updated (PCC 001/2013), with gaps and inconsistencies.

Slovakia: No special checking is applied to major renovation. All buildings have the same procedures as described before, there is no random check.

1.3.12. What instruments are used to prove and check compliance (e.g. energy performance calculators, softwares, EPCs, other specific documents, database)?

Bulgaria: Energy Performance Certificates that are issued, based on detailed energy audit. A software based on the official methodology for calculation of the energy performance of the buildings coherent with the applicable international standards is available to facilitate the energy auditors.

Czechia: By EPC – which is uploaded to the database together with all calculations – there are special software for the calculations. The State Energy Inspection has access to these EPCs and their calculations.

Hungary: In case a state subsidy is used to finance (partly) the renovation, EPCs (on original, planned and achieved status) are used to prove and check compliance

Poland: Construction design is checked against the requirements of the construction law. The verification is based on design documentation only. The design documentation contain information on energy performance, however the EPC is not a part of the documentation.

Romania: According to PCC 001/2013, EPCs and energy audit reports are verified on the application of minimum energy performance requirements to existing buildings. This aspect involves consulting the values obtained in the energy performance certificate (corrected thermal resistances can be found in the Annex to the Energy Performance Certificate) and / or consulting the calculation brief from the energy audit report, however without necessarily verifying the used calculation methods (Annex no. 2 the procedure).

Slovakia: Design Energy Performance Report that contains evaluation of all requirements (U-values, heat needs, air-exchange rate, minimum surface temperature, primary energy and energy class) and energy performance certificate issued after renovation prove the compliance. No special tools are required for this. There is a missing common calculation tool based on CEN standards that are referenced in regulation. Self-developed calculation tools based on Excel are mostly used. This is why the quality of assessment of EP is mostly poor. Common European tool (kernel) for calculation of energy performance based on CEN standards is needed. It is not possible (not cost effective) to develop a tool of good quality in small countries.

1.3.13. Is compliance check incentivised? How (e.g. compliance linked to financial support mechanisms)?

Bulgaria: No, it is an obligation of the building owner to perform a second audit after renovation and update the EPC. Otherwise, compliance of construction works to the design project, hence to the recommendations of the audit, follow the stipulations of the Spatial Act, i.e. control by the building inspection, by the designer and by the owner at different stages leading to issuing of the building permit. There are no financial mechanisms related to the actual performance of the buildings; access to financing is based on the initial energy audit and the resulting EPC.

Czechia: All renovations of residential buildings supported by some of the support scheme (mainly subsidy schemes (New Green Savings) do need to submit EPC and the costs can be redeemed.

Hungary: It is basically the only way to check compliance, when it is linked to some kind of state financial support. However, support schemes to specifically incentivize major renovation have not been available in Hungary lately.

Poland: In most of the cases the financial support mechanisms require to fulfil the MEP requirements in terms of partition thermal transmittance (National Fund for Environmental Protection and Water Management; Thermo-modernization and renovation fund).

Romania: Compliance verification is not incentivised, however, there are national funding mechanisms, such as the POR 2014-2020 (Regional Operational Program), which through the funding guidelines impose certain levels for performance requirements, e.g. POR 3.1.B Supporting energy efficiency, an intelligent energy management and use of renewable energy in public infrastructure - Operation B: Public buildings. This program required as eligibility criteria the values imposed on the nZEB concept (as defined in Order 386/2016) for: primary energy consumption, CO2 emissions and RES percentage.

Slovakia: The permit for construction and permit for use are usually mandatory for financial support mechanisms for thermal insulation. Building elements properties, required energy class and savings have to be usually achieved and proved by designer in the stage of design and by EPC after renovation. The conditions published in the calls may differ.

1.3.14. What are the sanctions of non-compliance? What are the sanctions in the design phase, what are the sanctions after renovation? Who are the subjects of the sanctions?

Bulgaria: There are no functioning sanctions for non-compliance. The regulations regarding the general construction process, as described below under sections 1.4.6, 1.4.11, apply for the case of renovations, but there are hardly any penalties or sanctions applied in practice, besides the guarantee of the construction works for a period of 5 years.

Czechia: At the level of local building authority office – not issuing the building permit, requesting correction or issuing a fine for the builder in case the buildings was realised without the compliance.

At the level of Energy Performance Certificate and compliance with the requirements it depends on the level of non-compliance.

State Energy Inspection can check whether EPC calculations are correct, whether EPC is being calculated according to project documentation. If not -> they request correction. This check is mandatory in buildings over 750m2.

SEI can't request correction on the level of building (-> this is responsibility of the building authority, SEI can only request correction of the calculations) -> correction at building level must be issued by the building authority office.

SEI can't even inform the building owner, that there was an issue with the EPC calculations concerning his/her property (because of GDPR issues)

SEI can also fine the energy specialist responsible for the calculations.

Hungary: As there are no functioning control mechanisms regarding major renovations, there are no sanctions applied in Hungary. In case of a state support scheme, the subsidy is not provided when the requirements are not met.

Poland: There is no sanction for existing buildings for non-compliance with the requirements. There are no requirements for existing buildings that are not a subject of major renovation.

For buildings undergoing major renovation, if the requirements are not met, the investment will not be possible due to the lack of a building permit. This sanction only applies where a building permit is required.

Romania: For the existing buildings, non-compliance with the minimum energy performance requirements in the measures recommended in the energy audit, on the basis of which the

technical documentation for the authorization of intervention works for major renovation is elaborated, leads to financial sanctioning of the energy auditor.

After the renovation, the conformity of the application of the minimum requirements can be verified, by checking the energy performance certificate before reception of the works, considering the hypothesis that it is chosen randomly by I.S.C. to be verified, but it is late and expensive to intervene with technical solutions, in case of finding non-compliance with legal requirements, especially in the case of public investment (e.g., for social housing).

If the energy auditor respected MEPRs within the energy audit, but the proposed solutions were not respected in the design stage or in the execution phase, than the designers and/or site engineers should be responsible. However, it is not the current practice in Romania to control MEPRs compliance with existing buildings.

Slovakia: There are no specific sanctions for non-compliance with MEP requirements. Local building public authority can refuse the building or renovation permit or ask for improvement of design documentation.

1.3.15. What administration is responsible for issuing sanctions? Who decides on the sanctions?

Bulgaria: Again, a more detailed description is provided below in sections 1.4.6, 1.4.11; in general, the energy audits are controlled by SEDA, the design project by the building inspection and subsequently by the local authorities, the construction works by the building inspection (besides investor and designers' control). In the case of the renovation programme with 100% public grant, the local authorities also exercised the investor's control. Designers and construction companies are in principle subject to sanctions by the professional chambers; however, such procedures are very rarely applied (expert experience based on interviews with a practicing designers).

Czechia: State Energy Inspection and local Building Authority Office

Hungary: There are no sanctions regarding non-compliance of meeting MEPRs in major renovations.

Poland: There are no sanctions.

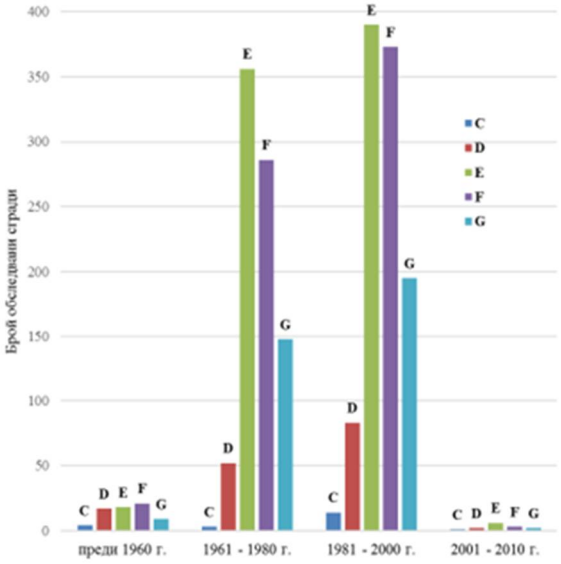
Romania: The sanctions are applied by the State Inspectorate for Construction - I.S.C., which exercises state control over the unitary application of the legal provisions on the energy performance of buildings and the inspection of heating / air conditioning systems, based on the procedure PCC 001/2013, developed by I.S.C. and approved by order of the Minister of Public Works, Development and Administration (currently MDLPA).

Slovakia: There are no specific sanctions for non-compliance with MEP requirements. Permit for construction or renovation and permit for use can be refused by local public authority (Construction office).

1.3.16. How would you evaluate MEP requirements for major renovation in your country from energy efficiency and energy saving potential aspect? How do the requirements compare to existing buildings' energy use (in kWh/m2/year)? How does cost-optimal level compare to NZEB level?

Bulgaria: The MEP are not ambitious and renovation is aiming Energy class B for buildings commissioned after 1.02.2010 and Energy class C for buildings commissioned before 1.02.2010.

The figure below shows the distribution of the residential buildings per energy class and per year of construction:



Легенда:	Caption:
Брой обследвани сгради	Number of audited buildings
Преди 1960 г.	Before 1960
1961-1980 г.	1961-1980
1981-2000 г.	1981-2000
2001-2010 г.	2001-2010

Energy classes of multifamily residential buildings (source: Long- term renovation strategy).

The full EE potential cannot be achieved with these requirements. In addition, the buildings characteristics strongly depend on the DHW source. If DHW is provided by local district heating companies (common case in big cities), buildings easily achieve class C, while if DHW is based on electric boilers class B is hard to be reached.

Most of the multifamily residential buildings are between classes E and G.

Also according to the national Long-Term Renovation Strategy the cost-optimal levels are at the upper range of Energy class B, but the methodology for calculating cost-optimal levels is not very clear.

Czechia: Major renovation is a weird concept in Czech legislation. Because the minimum energy performance requirements are there for the building elements and for meeting the cost-optimal level. The major renovation in Czech case just mean, that Energy Performance Certificate is being issued. Yes, it helps the compliance but, it has no other meaning.

We would need to adjust our national major renovation to be more like NZEB.

Hungary: The primary energy consumption defined for cost-optimal level is 110-140 kWh/m2.y. The average primary energy consumption of a Hungarian home is around 215-250 kWh/m2.y (reference: Long Term Renovation Strategy). In 2015, ÉMI[31] carried out a wide assessment about the energy saving potentials of home renovations. According to the results, achieving cost-optimal level by major renovation in the residential building stock would result in a 66% decrease in primary energy needs. This potential could be extended to 68% by connecting large multi-family buildings to district heating systems using cogenerated heat, or even to 70% if these power plants run on biomass.

NZEB requirements for the heat transmission coefficients of the building envelope elements and windows are the same as the cost-optimal requirements. Specific heat loss factor requirements are stricter in case of NZEB: the maximum allowed value is 0.28 W/m3K (while for the cost-optimal level it is 0.43 W/m3K). The maximum primary energy consumption of NZEB residential is 100 kWh/m2.y. Renovating all residential buildings particularly to NZEB level is not calculated, as the specific heat loss factor would be very difficult (or extremely costly) to achieve. Therefore the above referenced ÉMI study calculated a cost-optimal+RES scenario, which would result in a 74% primary energy consumption savings (compared to 66% if RES would not be applied).

Poland: When the building is a subject of a major renovation the thermal transmittance must comply the requirements for a new buildings, which are in line with nZEB and cost-optimal level.

[31] Source: ÉMI (2015): Residential energy efficiency potential study. Financed by KEOP-7.9.0/12-2013-0020, KEOP-7.9.0/12-2013-0019.

(Regulation of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location (Journal of Laws 2019, item 1065); Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)).

Romania: Current MEP requirements are weak if correlated with the mandatory application of the nZEB concept for all new buildings. Their application does not lead to the requirements imposed on the nZEB concept (maximum value for primary energy, maximum values of CO2 emissions, minimum percentage of RES), not even those defined in Order 386/2016 - which are still in force and weaker compared with the new proposed in the revised methodology, but this aspect can be explained by the fact that they were not correlated when they were defined in 2016-2017, nZEB not being mandatory in 2016. It became mandatory starting with December 31, 2018 for new public buildings, respectively with December 31, 2020, for all new buildings for which the reception at the end of the works is made based on the building permit issued starting with these dates .

The proposed MEP requirements in the revised methodology for calculating the energy performance of buildings, endorsed by the MDLPA in 2021, are very ambitious, strong, for some building destinations even raising some reservations about the possibility of achieving them (e.g. such as buildings intended for education - not so much schools as kindergartens, which fall into the same category but have operating parameters – as interior temperatures, which intrinsically lead to increased energy consumption vs. a middle school). At the same time, there is a great variation of the geometric and constructive characteristics for this destination type on existing buildings, which influences the energy profile of the building, both the current one and the one predicted after the implementation of a package of solutions[32].

The cost-optimal level is set to achieve energy performance higher than the minimum required currently in force (defined in MDRAPFE Order 2641/2017), without reaching the MEPRs proposed in the revised methodology; apparently the national cost-optimal report and the revised methodology are not correlated.

The implementation of solution packages for residential, individual and collective buildings, based on which the cost-optimal analysis was done at national level - even the variants compliant with the minimum energy performance requirements associated with nZEB (definition in Order 2641/2017), would lead to values relatively close to the newly proposed values of MEPRs in the revised MC001 methodology, considering the total primary energy consumption, but it is found that there is no correlation between them.

[32] Source: A. M. Măgurean, "nZEB into the existing building fund as an affordable solution", in IOP Conf. Series: Earth and Environmental Science, vol. 664, p. 012057, 2021. DOI: 10.1088/1755-1315/664/1/012057

Residential building type			Total primary energy [kWh/m2 year] (Values for Romanian climate zone III - randomly considered)	
			Cost-optimal report [11]	Revised MC001 [1]
New	Collective buildings		105.22 / 103.26	95
	Individual buildings		127.91 / 134.35	125
Existent	Collective buildings – with height regime	S+P+10E	173.1 / 178.67	101
		S+P+4E	113.82 / 122.94	
	Individual building	Central heating	145.46 / 152.68	130
		Wood stoves	169.73 / 178.72	

Related to the energy performance of the existing building fund a histogram is presented below and is specified that 90% of the surface of residential buildings from Romania were built before 1989 as mentioned in the national cost-optimal report, which frames the final energy consumption of most of the existing residential fund between 150-400 kWh/m2 year:

Year of construction	Final energy consumption [11] [kWh/m2 year]
1910 - 1989	150 - 400
1990 - 1999	140 - 350
2000 - 2009	120 - 230

Slovakia: MEP requirements for major renovation expressed in kWh/(m².a) are the same as for new building if it is economically, technically and functionally feasible. Average existing building is supposed to be in energy class D for energy use and for primary energy. Requirements for elements (U-values) should be stricter for new buildings as well as for renovation. For primary energy the study should be performed to see how they are strict today, after several changes in Regulation in 2016 – 2019 with the aim to decrease the ambition level without proper justification by analysis.

The current requirements expressed in non-renewable primary energy valid from 1.1.2021 for NZEB were confirmed by cost optimal level calculation in 2018.

1.3.17. What are the shortcomings/bottlenecks of the system? (Please be specific about types of bottlenecks (e.g. too few people with relevant education, etc.) How would you address the bottlenecks?

Bulgaria: About half of the population lives in multifamily residential buildings and they are owned by the households living there. Thus, for a major renovation a high percentage of the households should agree. Even with 100% grant financing in many cases the buildings couldn't apply for financing due to owners' disagreements. Much stronger communication campaign is needed to convince the households in the positive effects of deep renovation.

The issue with SFHs is that there are no supporting programmes, no statistics of ongoing renovations on owners' initiative, and generally no policy for that segment, so shortcomings of policies and instruments cannot be analysed. The only programme for this segment for the past ten years was not successful. Our recommendations to policy makers is to include this segment in the financing support programmes under different conditions, on the basis of simplified energy assessment as the current methodology for energy auditing overcomplicates the projects and increases the costs for the homeowners.

Lack of knowledge and capacity of the energy auditors, the designers and the construction workers in best renovation practices is also an issue that should be overcome. Adequate trainings for all these stakeholders is needed.

The specific bottlenecks are described for the case of the new buildings at the end of the document and they are basically the same:

- Political will to ensure long-term financing sufficient to achieve the goals set in the strategic documents
- Introduction of new financial instruments capable to attract private investment with optimal leveraging of public funds
- Optimisation of the MEP requirements and the compliance mechanisms: The MEPR in case of major renovation is still class C, as it should be class B with tendency to reach class A. Monitoring of the actual performance of the renovated buildings should be strengthened either by secondary audits or by technical measurements in statistically significant samples
- Improvement of the Condominium Act enabling common action by homeowners' associations and ensuring penalties in case of non-compliance
- Ensuring quality in the energy auditing, building design and construction processes by implementing functional quality assurance mechanisms and penalties in case of non-compliance
- Monitoring of the performance of projects financed with public resources
- Enabling the local authorities to conduct their own housing and energy efficiency policies, including through financial decentralisation
- Improving the green public procurement practices at all levels
- Training and education at all levels

- Support for pilot projects achieving convincing results
- Large-scale professionally delivered communication campaign, both at national and at local level

Potential measures are included in the attached roadmap for implementation of the building renovation policies provided in attachment, prepared by EnEffect in 2021.

Czechia: Definitely the case of SFH and DIY renovations. At the level of SFH: Checks should exist, but in reality, there is no compliance check as renovations of SFH are done mainly by "do-it-yourself" method without asking for the building permit (although they often should ask) or without reporting the major renovation. Even in cases where they report their renovation, building authority often does not require energy performance requirement compliance. So in majority of cases: no check on energy performance.

Hungary: The major shortcoming in case of major renovations is the non-existing compliance control. Major renovations do not require any permits or notifications to the authorities, therefore there is no independent check-point within the renovation procedure. Energy calculations and plans are not made at most of the renovations (ref.: MEHI, 2021, Hungarian Renovation Wave).

Another shortcoming of the system is that most renovations are not major. The retrofits of building elements and heating and DHW systems are done separately, at different stages of a building's lifetime, mainly when the particular building element becomes old, needs a replacement. This results in refurbishments not designed from energy saving aspects; and they usually do not result in noteworthy energy savings (ref.: MEHI, 2021, Hungarian Renovation Wave). The low residential energy prices, regulated and prescribed by the authority (within the utility cost reduction program of the government), do not motivate homeowners to consider energy saving aspects when performing a renovation.

The bottleneck is the low institutional capacity of the building authorities for compliance checking. Even if mandatory permit was required in case of major renovations to check by the authorities, the number of trained energy experts to make energy plans would not be sufficient, to plan the energy renovation for the homeowner, and for the authority to check the calculations of the designed energy performance as well as that of constructed status.

Poland: Requirements in the case of modernized buildings are checked only on the basis of design documentation and in the case of a single-family buildings, it is not even necessary to check the documentation. The fulfilment of the requirements should be proved after the completion of the construction process by preparation of an energy performance certificate for the building. A retrofit level check should also be introduced for single-family buildings, at least in terms of the thermal transmittance.

Romania: The control performed by I.S.C. regarding the verification of the minimum energy performance requirements is insufficient (with a major deficiency that the energy analysis quality is not verified), the procedure on the basis of which it is performed is weak and has not been updated subsequent to the updating of other laws and regulations, to which it refers in its content. Control procedure should be updated.

Slovakia: Implementation of new technologies requires qualified and skilled professionals and good tools.

Quality of EP assessment in design stage and in EPCs is low due to lack of software tools based on CEN standards and low price of EPC due to low trust in information that it provides.

An improvement of the assessment of energy performance by closing the gap between real and calculated energy is important in order to be potentially used for energy savings prediction and calculation of cost effectiveness (e.g. by calculation for real climate conditions of building location instead of standard average climate).

The proper setting of requirements based on the analysis is important to improve the reliability of EP assessment in the design stage and in EPCs. Some buildings are not able to achieve the required energy class (e.g. due to size) and for some buildings the ambition level of requirements is too low. This leads to waiver of requirements by public authorities (no obligation to achieve required energy class). The intervals for energy classes are too wide so that they do not show step by step improvement. The energy performance assessment and the rating system should be improved.

1.3.18. Is there compliance rate monitoring in your country? If yes, what is the level of compliance of major renovations?

Bulgaria: There is no monitoring scheme for the compliance rate, as energy auditing of residential buildings is not done. However, based on the energy audits of over 2000 multifamily residential building (3% of all multifamily residential buildings in the country), build before 2010 and renovated under the National program of energy efficiency, it can be stated that they are not reaching the MEP (see 1.3.16).

Czechia: Not in this sense. Major renovation that goes (should go) through the building permit procedure must ask for the building permit. The statistic is thus just on the number of building permits issued with no data on energy performance in them. Separate statistics could be gathered from issued EPCs and their database, but the current EPCs database is not used that way (see questions on EPCs).

Hungary: Because there is no compliance check regarding major renovations, there is no compliance rate as well. EPCs in the national database only contain information on energy performance of the state of the building at the time of issuing the EPC, but it does not contain information on whether there was a major renovation performed on the building recently.

Poland: There is no system for testing the level of compliance.

Romania: Regarding the existent buildings fund, in Romania around 91% of it consists of residential buildings (582 mil. m2), of which it is estimated that 8% of the urban residential unifamilial buildings and 3% for those in located rural areas were renovated until 2020; for the collective buildings a renovation rate of 14% is estimated[33].

Slovakia: There is no compliance rate monitoring in Slovakia related to energy performance. Information in the register of EPCs could be used that provides the energy classes achieved after renovation. All issued EPCs are registered in the database of certificates with indication of purpose (new or renovated building).

1.3.19. Has there been an evaluation of the system as a whole?

Bulgaria: There are analyses of the existing residential buildings in the National Long-Term Renovation Strategy but it is based on the 2000 energy audits under the National program of energy efficiency.

Czechia: The system was adjusted from time to time solving some particular issues that has emerged, but no strategic evaluation of the process has been done.

Hungary: The topic is addressed within the National Long-Term Renovation Strategy, but specific issues (such as state, challenges, shortcomings of enforcement and compliance with regulations in practice) are not evaluated.

Poland: There was no review of the entire system.

Romania: No.

[33] Source: STRATEGIA NAȚIONALĂ DE RENOVARE PE TERMEN LUNG. Monitorul Oficial al Romaniei, Partea I, nr. 1247bis/17.XII.2020. [Online]. Available: 60096d5354394459864321.pdf (mdlpa.ro)

Slovakia: The analysis, impact assessment and the evaluation of the system as a whole are missing in Slovakia while it is evident that there are several problems in setting requirements, calculation, boundary conditions and implementation of MEP requirements.

1.4. Energy performance requirements: New buildings. Nearly zero energy buildings

1.4.1. Was nZEB legislation in place for all buildings by January 2021? If not, is it in place today?

Bulgaria: The national nZEB definition was in place already in 2015, stating, that "nZEB is a building that: a) corresponds to energy performance Class A for that type of building; b) at least 55% of the energy used (supplied) for heating, cooling, ventilation, domestic hot water and lighting is energy from renewable sources produced in the building or in its close surroundings". However, it was not introduced in the national legislation and, most importantly, the respective regulations (Ordinance 7 to the Spatial Act, which determines the MEPS). At the moment, we are still totally uncompliant to the EPBD as relates to the implementation of the nZEB definition.

Czechia: YES. We got step-by-step introduction of NZEB since 2016. The dates relates to the application of the building permit.

1.1.2016: public buildings over 1500 m2

1.1.2017 public buildings over 350 m2

1.1.2018 all public buildings, other buildings over 1500 m2

1.1.2019 other buildings over 350 m2

1.1.2020 all new buildings (including SFH)

Hungary: The NZEB legislation was in place from 2016 (Regulation 7/2006), and should have entered into force from January 1 2021. However, with a last-minute modification in December 2020 the deadline was postponed with half a year to 1 July 2021, and then again with an additional one year to July 1 2022.

Poland: Yes, the requirements for nZEB buildings entered into force on December 31, 2020 and are described in Regulation of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location (Journal of Laws 2019, item 1065).

Romania: The obligation of nZEB was imposed in Law 372/2005 in the update published in the Official Monitor no. 451 of July 23, 2013 - chapter VIII, art. 14, with application from 31 December 2018 for new public buildings, respectively with application from 31 December 2020 for all new buildings and is currently in force.

Slovakia: NZEB legislation and MEP requirements that are currently in force since January 2021 have been published for all buildings since 2012. The real level of ambition has been reduced by several amendments (e.g. by reducing primary energy factors).

1.4.2. Is there a numerical indicator of primary energy use expressed in kWh/m2 per year? Is it differentiated by building type? How do these requirements compare with current average values?

Bulgaria: Yes, there is a numerical indicator per building type. The definition requires achievement of energy class A, as described above, compared to the current requirement for energy class B.

Czechia: Yes. It is not some constant value but it is linked to the parameters of reference building (differs on building type and usage of building). In case of SFH the values are in between 70-75 kWh/m2/y. For MFH the values are more broad depending on the size etc.

It was designed in order to reflect the current potential, with current technologies and promote the use of RES (but not requiring it), and for including the energy specialists into the construction process at earlier stages/ for architects to reflect energy performance even in the design phase.

Hungary: Just as in the case of cost-optimal level, the NZEB requirements have to fulfil numerical indicators on three levels. NZEB requirements for the heat transmission coefficients of the building envelope elements and windows are the same as the cost-optimal requirements. Specific heat loss factor requirements are stricter in case of NZEB: the maximum allowed value is 0.28 W/m3K (while for the cost-optimal level it is 0.43 W/m3K). The maximum primary energy consumption of NZEB residential is 100 kWh/m2.y. According to the current regulation, NZEB needs to have at least 25% of the energy demand of the building in relation to the scaled value of the overall energy performance shall be provided by renewable energy sources generated in the building, from the property, from nearby electricity generation or from the national grid.

Poland: The values of the non-renewable primary energy demand indicator are determined for various types of buildings (single-family buildings, multi-family buildings, collective residential building, public buildings, warehouse buildings and production buildings). The current values of

the non-renewable primary energy demand indicator are equal to: for single-family buildings EP= 70 kWh/(m^{2}year) (for buildings without cooling system) and for multi-family buildings EP= 65 kWh/(m^{2}year) (for buildings without cooling system). (Regulation of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location (Journal of Laws 2019, item 1065)).

These values are lower than for buildings constructed in earlier periods. As reported in the Long-term building renovation strategy from 2022 (Resolution No. 23/2022 of the Council of Ministers of February 9, 2022 on the Long-Term Building Renovation Strategy) median values of non-renewable primary energy demand indicator (EP in kWh/m^{2}year) of residential buildings depending on the year of commissioning is as follows:

- for single-family buildings: <1994 – 263,7; 1994-1998 – 147,9; 1999-2008 – 143,5; 2009-2013 – 126,3; 2014-2016 – 109,1; 2017-2018 – 94,0; 2019-2020 – 89,3;
- for multi-family buildings: <1994 – 258,9; 1994-1998 – 139,0; 1999-2008 – 110,0; 2009-2013 – 142,7; 2014-2016 – 97,5; 2017-2018 – 87,0; 2019-2020 – 84,9.

Romania: Maximum allowable values for specific primary energy consumption and CO2 emissions were defined in 2016, by MDRAP Order no. 386/2016, detailed on the five climatic zones of Romania and on the destinations of buildings, residential (individual and collective) and non-residential (office buildings, buildings intended for education, buildings intended for the health system). These values are still in force.

However, it is not clear whether primary energy consumption refers to primary energy consumption only from conventional sources or is the total primary energy consumption, from conventional sources and renewable energy sources, currently being used in both variants by energy auditors in Romania.

In the revised methodology, the requirements increase significantly, both for the maximum allowable values of primary energy and for the equivalent CO2 emissions. At the same time, primary energy is required to refer to total primary energy (from renewable and non-renewable sources). Maximum allowable values are required for new building destinations: buildings for tourism, commercial spaces and buildings for sports activities.

Slovakia: The numerical indicator of non-renewable primary energy use is used as the main indicator in Slovak Regulation expressed in kWh/(m^2.y) per building category (categories are in line with the EPBD).

The current average values for building stock are not known, because of missing information about the existing buildings because they are usually not certified for selling and renting.

The required numeric indicator is usually achieved for new buildings. Small family houses have problem to achieve the MEP requirements because indicator expressed in primary energy is not depending on the form factor or building size.

1.4.3. What are the U-values (if any) of the most common building elements within NZEB? (1) facade wall, (2) heated roof boundary structure, (3) glazed windows and doors on facade, (4) boundary structure of heated and unheated spaces (attic, basement)

Bulgaria: There are no MEPRs for the building components, but only reference values as described above for energy class B (which in the National NZEB Plan from 2015 are also deemed suitable for achievement of nZEB, but that is highly contradictory). More ambitious values are used for the calculation of the cost-optimal renovation levels for different types of buildings, which is available as Annex III to the LTRS (https://energy.ec.europa.eu/system/files/2021-08/bg_ltrs_2020_annex_3_0.pdf). For the building envelope (without attic/basement, which is obviously considered irrelevant), the following values are used:

Czechia: Yes. The builder needs to reach (approximately) 70 % value of the minimum requirement (0,7*Uem) for the buildings element at the whole-building level.

minimum requirements are defined:

- Façade wall U=0,30; roof U=0,24; windows U=1,5; doors U=1,7; boundary structure of heated and unheated spaces U=0,6; floor U=0,45
- So: reach wall=0,21 etc.

The requirement on primary energy motivates the builder to reach even better values.

Hungary: It is the same as for the cost-optimal level:

1. façade wall: 0.24 W/m2K

2. heated roof boundary structure: 0,17 W/m2K

3. glazed windows and doors on the facade: 1,15 W/m2K; not glazed doors: 1.45 W/m2K

4. boundary structure of heated and unheated spaces: attic: 0,17 W/m2K , basement: 0,26 W/m2K

Poland: The U-values for the nZEB are given in the Regulation of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location (Journal of Laws 2019, item 1065). The current values for internal temperature of 20°C are valid from December 31, 2020 and are equal to: external walls 0.20 W/(m^{2}K), roofs 0.15 W/(m^{2}K), slab-on-ground floors 0.3 W/(m^{2}K), windows 0.9 W/(m^{2}K) and doors 1.3 W/(m^{2}K).

Romania: In the still in force requirements of nZEB, defined in Order 386/2016, no minimum thermal resistances / maximum U-values are associated within the concept.

The requirements for the building envelope elements in new residential buildings, which should be nZEB – according to MC001 revised 2021 are:

Building envelope element type	New residential buildings - nZEB	
	R'_{min} [m²K/W]	U'_{max} [W/m²K]
Facade walls (excluding glazed walls, including the adjacent walls to the open joints)	4.00	0.25
Glazed windows and doors on the facades	1.11	0.90
Floors above the top level, under terraces or attics (heated roof boundary structure)	6.67	0.15
Floors over unheated basements and cellars (boundary structure from heated spaces to unheated spaces - basement)	3.40	0.29
Adjacent walls to closed joints	1.50	0.67
Floors that delimit the building at the bottom, from the outside (passageways)	5.00	0.20
Slabs on ground (above ground level)	5.00	0.20
Slabs on ground at the bottom of basements or heated basements (under ground level)	5.30	0.19
Ground walls (under ground level) in heated basements	3.40	0.29

Slovakia: The MEP requirements valid from 1.1.2021 (NZEB) for U-values are reported in Slovak standard STN 730540-2. The values are:

(1) facade wall, mandatory Uwall=0.22 recommended Uwall=0.15

(2) heated roof boundary structure, mandatory Uroof= 0.15 recommended Uroof=0.10

(3) glazed windows and doors on facade, mandatory Uw=0.85 recommended Uw=0.65

(4) boundary structure of heated and unheated spaces (attic, basement) The value is depending on the temperature difference and direction of heat flow. For unheated basement with the temperature difference up to 15 K and the flow from top to down are: mandatory Un= 0.6 recommended Un=0.35.

1.4.4. Are renewable energy requirements clearly specified? What are the requirements?

Bulgaria: Yes, the requirement for renewable energy is that "at least 55% of the energy used (supplied) for heating, cooling, ventilation, domestic hot water and lighting is energy from renewable sources produced in the building or in its close surroundings".

Czechia: No need to install RES as such. But the requirement (mainly on primary energy) in many cases forces the builder to install RES to meet the required values. Without RES it is also possible to meet NZEB requirement but only in cases: ideal shape and orientation of the building (fitting into the surroundings), very good envelope and with efficient technologies inside.

Hungary: Regulation 7/2006 includes that at least 25% of the energy demand of the building in relation to the scaled value of the overall energy performance shall be provided by renewable energy sources generated in the building, from the property, from nearby electricity generation or from the national grid. However, if the proposed amendments will be accepted, this is about to change so that not the share of RES will be required but the CO2 emission will be regulated.

Poland: In Poland there is no requirement in terms of a renewable energy sources.

Romania: Starting with 2020, the minimum percentage of renewable sources is imposed in the definition of the nearly Zero Energy Building (nZEB) of Law 372/2005 (republished in the Official Monitor no. 868 of September 23, 2020), at the value of at least 30%, "including renewable energy produced on or near the site within a radius of 30 km from the GPS coordinates of the building". From 2016 to 2020, the minimum percentage was set at 10%, also in the nZEB definition in the content of this law.

In the revised version of the methodology, additions are made regarding the energy to which the minimum percentage of 30% of the contribution from renewable energy sources (RES) is applied, specifying the total primary energy used in the building, both from conventional and renewable sources.

Slovakia: Renewable energy requirements are not explicitly specified (e.g. by ratio) because the EP indicator in Slovakia is expressed in a quite strict level of non-renewable primary energy, which requires a certain share of renewables. It is not possible to achieve this level without use of renewable energy. Problem is a not realistic content of the renewable energy in the district heating primary energy factors in Slovakia (e.g. 0.24).

1.4.5. Who is responsible for compliance with the application of MEP requirements of new buildings? Is it in all cases the owner, or are there special provisions appointing other parties (e.g. developer / the professional advisors / designer / architect /energy expert) as (co)responsible for compliance?

Bulgaria: The designer is responsible for compliance with the national legislation; the design project is checked and approved by the building inspector and then submitted to the local authorities to issue a building permission. The project should be not given a building permission if the legally required part "Energy efficiency" or the energy performance certificate are not included in the design documentation, or the building does not reach the MEPR.

Czechia: Responsible is always the owner (the builder in case of new construction). By a contract this responsibility is passed to the construction engineer, who is responsible for the project documentation and the construction.

Hungary: Compliance with energy requirements in general is part of the building permit and construction process. This is determined by two major regulations: Act LXXVIII of 1997 on the Shaping and Protection of the Built Environment and Government Decree 191/2009 (IX. 15.) on Construction Activity.

If the construction of the building is subject to a permit, the application must be accompanied by a preliminary energy performance certificate. If the building is subject only to the so called "simple notification" (in case of new residential buildings with a total useful floor area of up to 300 square metres, or a new building exceeding 300 square metres of total useful floor area provided that the builder is a natural person, that the construction is carried out for the purpose of providing his own accommodation and that the new dwelling thus constructed contains no more than one dwelling; based on Government Decree 155/2016 (VI. 13.) on simple notification of the construction of residential buildings), the application must be accompanied by an official certificate attesting that the construction or extension of the building subject to simple notification has been completed. The builder must include the energy performance certificate when applying for the certificate. The building control authority shall verify the existence of the energy certificate before issuing the official certificate. An occupancy permit can only be issued for any new building after 30 June 2022 if it meets the near-zero energy requirements, and this must be demonstrated by an energy certificate for the as-built condition.

Compliance is a multi-stage responsibility, divided as follows:

The builder is responsible for obtaining the necessary permits, making notifications, concluding contracts, ensuring that the construction documents are in place and complied with, making the e-building logbook ready and checking the construction logbook.

The designer (engineer/architect) is responsible for the professionalism of the technical content of the architectural-technical documentation (including construction documentation) he/she prepares. The designer is responsible for defining the requirements (quantitative and qualitative indicators) for the construction documents, including energy performance requirements.

The installer is responsible for the compliance with and observance of the requirements laid down in the technical architectural and engineering documents and the construction documents provided by the builder and approved by the authorities. Instalment must happen according to these documents.

The technical manager and technical inspector are responsible for the execution of the construction or part of the construction in accordance with the final building permit and the corresponding approved permit plans and the construction documentation specified in the legislation, as well as for the maintenance of the professional, quality and safety standards applicable to the construction activity and the professionalism of the execution of the works. The inspector can instruct the installer to make changes if the instalment is not carried out according to the design documents.

In the event of violation of the legal requirements for the performance of construction works, the designer, technical manager, the technical inspector and the installer shall be subject to the legal sanctions provided for in the Government Decree.

Upon completion of the construction activity, the main installer shall declare on the summary sheet of the construction works logbook that the construction activity has been carried out in a professional manner and in compliance with the legal provisions, general and ad hoc requirements applicable to the construction activity, in particular the static and energy requirements of the building, professional, quality, environmental and safety standards.

Poland: The MEP requirements are a part of the building energy performance for new buildings. The energy performance is part of the building construction design (technical design) needed to obtain a building permit (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)). In Poland in most of a cases an architect is responsible for collecting all the documents needed to issue a building permit. However, the energy performance is not checked for a single-family buildings (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)).

Romania: For new buildings, currently the responsibility for ensuring compliance with MEP requirements must be ensured by the architect (minimum corrected thermal resistances, global thermal insulation coefficient, specific primary energy consumption for heating), but also by designers on installations (specific primary energy consumption for heating), as an implicit part of the essential requirements (defined in Law 10/1991) applicable to the technical project. Law no. 50/1991, regarding the authorization of the execution of construction works (republished), provides the responsibility of the designers, when signing the technical documentation and technical projects, which must comply with six applicable essential

requirements applicable to the specialties, as defined in Law 10/1995 (republished) - art. 5: mechanical strength and stability, fire safety; hygiene, health and the environment; safety and accessibility in operation; noise protection; energy saving and thermal insulation. The designers are verified by the project verifiers, who are jointly and severally liable with them from a legal point of view. At the same time, according to art. 6 of Law 10/1995 (republished), investors / owners are also legally liable, as involved factors.

However, in new buildings, in the current practice, most of the time the verification of the fulfilment of the minimum energy performance requirements is not done, without this aspect leading to repercussions on the designers, except possibly in case of litigation.

Slovakia: The procedures are the same as in the case of renovation that is subject to permit for renovation.

The accredited designer must process the design documentation for permit for new building construction. The accredited designer is responsible for compliance with the MEP requirements of building elements that he proves in design documentation for building or renovation permit. The evaluation of all MEP requirements is reported in the Design Energy Performance Report that contains evaluation of building elements (U-values), heat needs, air-exchange rate, minimum surface temperature and also the overall energy performance expressed in primary energy and energy class. These requirements must be fulfilled for permit for construction of new building and are checked by public authority before issuing permit for construction.

Design Energy Performance Report is an obligatory part of design documentation that the owner is obligatory to deliver to the public authority for permit for construction. Owner has to provide the energy performance certificate after construction for permit for use. The energy class achievement is not a reason for failing building permit for use.

According to Law 555/2005 Coll. duties of owner are also:

"If technically and economically feasible, the owner of the building is obliged to equip the new building with self-regulating devices for individual regulation of the internal temperature in each heated room and in each heated separate part of building."

1.4.6. Who checks compliance? Who determines after the construction whether requirements have been met? Is it a national/regional governmental body, local authority or private organization? What is the institutional background for control mechanisms?

Bulgaria: The compliance to the design project is confirmed by technical project manager of the construction company, the designers, and the independent building inspector, although the quality of the service is questionable, to say the least. The investor also signs the building documentation at each stage to accept it. The permission for use is issued by the local

authorities based on the received documentation. The new buildings are in theory required to have a control energy audit after 3 years of operation (and before the 6th) paid by the owner(s), but there is no control over the compliance and there are basically no such cases.

Czechia: Local building authority office as part of the building permit procedure and in the end as part of the occupancy permit procedure. Approved project documentation is checked, and they also check there is an EPC. (They do not check the calculations inside). For buildings over 750m2, they check whether EPC calculation was checked by State Energy Inspection.

To check on calculations, there is a State Energy Inspection – an independent institution under the Ministry of Industry and Trade dedicated to the oversight of activities of certified energy specialists, energy auditors etc. They check the outcome of their work: Energy Performance Certificates, energy audits etc. including the calculations.

Hungary: As of 1 March 2020, including the predecessor bodies of notaries, a centuries-old practice has come to an end, transferring the performance of the full range of state administrative tasks in individual construction cases from the level of local administration to the regional state administration. As a result, as of 1 March 2020, the government designated the capital and county government offices (hereinafter referred to as the "Building Authority") as the general building authority for buildings and construction activities. It is determined by the Government Decree 343/2006 (XII. 23.) on the designation and operating conditions of the building and building inspection authorities

Poland: The MEP requirements are checked by the construction supervision office, that is responsible for issuing the building permit. The energy performance must be attached to the building construction design (technical design).

Construction supervision offices are state entities and employ persons with appropriate education. Construction supervisors are regional governmental body.

Romania: The State Inspectorate for Constructions ensures the verification of compliance regarding the unitary application of the legal provisions regarding the energy performance of buildings and the inspection of heating / air conditioning systems, which is based on the MDRAP Order no. 3152/2013, through a control procedure, indicative of PCC 001-2013 and which is applicable to both new and existing buildings. The control and inspection activities aim at verifying the certificates and energy audit reports regarding the application of the minimum energy performance requirements to existing buildings, but also the inclusion in the corrected thermal resistances to new buildings (?!), although the legal competencies of energy auditors refer to certification for new and existent buildings and energy auditing, only for existent buildings. At the certification undertaken prior the reception of the works, the energy auditor

can no longer intervene in the design process, the certification being mandatory for new buildings upon receipt, such an intervention being obviously late, and the energy audit refers exclusively to existing buildings.

There is thus a discrepancy in this procedure with regard to the verification of the minimum requirements applicable to new buildings. Basically, they can be verified on the basis of the energy performance certificate prepared by the energy auditor at the reception of the building, without the possibility of remediation at this stage, in case of non-compliance (compliance with both MEPRs and nZEB, as currently defined).

Slovakia: The building permit is issued by the local public authority (construction office) based on the design documentation. The Design Energy Performance Report is a mandatory part of design documentation.

After construction there are the procedures for permit for use that is issued by the same public authority (Construction office) that issued permit for construction. The procedure consists of personal inspection and comparison of actual building with approved design documentation. The quality is different for each local construction office. EPC has to be provided for a permit for use. The energy class achievement is not a reason for failing building permit for use.

The institutional background for control mechanisms is in Building Law. The changes in building permit and construction procedures are introduced by new Building Law in force from 2023-2024.

1.4.7. Is checking applied to all buildings undergoing construction, or is it a random check on a certain sample size? Is it a statistically relevant sample size? Are all requirements checked or only some particular requirements?

Bulgaria: In theory, checking according to the above procedure should be applied to all buildings in construction. All requirements should be checked. In practice, the construction companies and the large investors are working with "close" designers and building inspectors, so the verification is superficial, especially in the area of energy efficiency, where underperformance can hardly be proven and/or assigned to a specific design or construction failure.

Czechia: All new buildings need to have EPC (which should state that the building meet the requirements). The fact there is an EPC is checked by the building authority office (They do not check the calculations inside).

SEI must check EPC calculations only in buildings over 750m2. EPCs for buildings below 750m2 are being checked randomly or on request (but this is rather rare).

Hungary: Compliance check happens when the building has been constructed and the builder/owner applies for an occupancy permit. Based on the 312/202 Government Regulation, the building control authority shall carry out the control of the pursuit of construction activities

a) by random checks on the spot,

(b) as specified in the inspection order referred to in paragraph 4 (For the year in question, the Minister responsible for building regulations and building authorities issues an inspection order),

(c) by remote access through the electronic construction logbook application.

Every building is checked at least through the method described in point (c). From 1 July 2022 only buildings which fulfil NZEB requirements can get the occupancy permit (before that date the cost-optimal level is required)

Poland: The checking is applied to all buildings undergoing construction, for which a building permit is needed. (Construction Law of July 7, 1994 (Journal of Laws 2021 position 2351)).

Romania: Based on the State Control Procedure regarding the unitary application of the legal provisions regarding the energy performance of buildings and the inspection of heating / air conditioning systems, indicative PC 001/2013, the control activities and the current inspection is expected to be "by survey, thematic" and as a result of the punctual notifications addressed to I.S.C.". Law 372/2005 (republished) specifies the annual verification, by sampling, of at least 10% of the EPCs and of the energy audit reports registered annually in the specific databases.

For new buildings, the verification refers to the verification of the compliance with the corrected thermal resistances for new buildings - which even currently is not the only applicable minimum energy performance requirement. It is noted that when revised methodology enter into force, in which the minimum energy performance requirements are significantly modified / extended, both for new buildings and for existing buildings, the control procedure will become completely revolute, at least regarding the new buildings, and it will be absolutely necessary to update it.

Regarding the verifications performed in the design stages, Law 10/1995 (republished) provides in art. 24 that "certified special project verifiers are jointly and severally liable with the designer for ensuring the quality level of the essential requirements of the project." However, the verification of the essential requirement f) energy saving and thermal insulation is mandatory only for the renovation of existing buildings - Law 50/1991 (republished), new buildings not being covered, than intrinsically, at the level of the obligations of the designers, who usually ignore it.

It is found that the legal basis for verifying compliance with the minimum energy performance requirements is almost non-existent for new buildings at all stages: design, execution, which becomes particularly serious in the context of the need to ensure the concept of nZEB. For

existing buildings there are more coherent legislative provisions, but they are applied on sample size, being insufficient. The applicable legislation is outdated, has been updated repeatedly (Law 50/1991, Law 10/1995) or is not updated (PCC 001/2013), with gaps and inconsistencies.

A new Land Planning, Urbanism and Construction Code whose law project is in public debate at the time of elaboration of this study, and which will replace Law 10/1991 and Law 50/1995 and other applicable laws, aims to reduce discrepancies occured due to the dynamics of updating the legislation, but in this regard the improvements are insignificant, although it would be a good opportunity to empower the applicable legislation.

Slovakia: The same procedures apply to all buildings undergoing constructions if they need the permit for construction and permit for use from local public authority. There is no random check in such cases.

The conclusion of the Design Energy Performance Report with confirmation that all requirements are fulfilled is checked by the public authority (construction office). For a new building all requirements must be fulfilled.

1.4.8. How is compliance monitored? At which stage(s) of the construction process? On-site or off-site by checking documents?

Bulgaria: The compliance monitoring should be done on-site in all cases and at all stages of the construction process by the designers and the building inspectors. That is however questionable and very difficult to control.

Czechia: Local building authority office as part of the building permit procedure and in the end as part of the occupancy permit procedure. Approved project documentation is checked, and they also check there is an EPC. (They do not check the calculations inside). For buildings over 750m2, they check whether EPC calculation was checked by State Energy Inspection.

To check on calculations, there is a State Energy Inspection – an independent institution under the Ministry of Industry and Trade dedicated to the oversight of activities of certified energy specialists, energy auditors etc. They check the outcome of their work: Energy Performance Certificates, energy audits etc. including the calculations.

Hungary: Based on the 312/202 Government Regulation, the building control authority shall carry out the control of the pursuit of construction activities:

a) by random checks on the spot,

(b) as specified in the inspection order referred to in paragraph 4 (For the year in question, the Minister responsible for building regulations and building authorities issues an inspection order),

(c) by remote access through the electronic construction logbook application.

When applying for the occupancy permit after construction, the building authority checks every required document, in case of fulfilling the MEPRs it is the EPC. At random cases there are on-site checks.

Poland: The verification of the requirements is carried out on the basis of design documents needed to obtain a building permit. If there are no significant changes, the requirements are not checked during a construction process.

Romania: For new buildings, PCC 001/2013 indicates the verification of the minimum corrected thermal resistances compliance to the energy certification at the reception of the buildings, being late to intervene with remedies in this point, in case of non-compliance, and however only for sample sizes.

Prior to this stage, the minimum energy performance requirements should be ensured in the project phase, with their verification by the certified project verifier for the essential requirement f) energy saving, according to Law 10/1995 (republished). This verification is not required in Law 50/1991 (republished), being only required for the renovation of existing buildings (art. 6.1, paragraph (2.3)), identifying a gap in the verification of the minimum energy performance requirements applied to new buildings.

A verification of the compliance of the Technical Project is done on site, at the reception of the works. Any findings of non-compliance with the verification of the minimum requirements are not made at this stage.

Slovakia: The design documentation is checked for permit for construction (before construction starts). Designer is responsible for compliance in design stage.

No special continuous monitoring is required for energy renovation. For each construction that is subject to permit, the accredited construction supervisor has to be appointed, who monitors construction works and is responsible for the implementation of the construction in line with the design and the building permit issued by local public authority.

1.4.9. What instruments are used to prove and check compliance (e.g. energy performance calculators, softwares, EPCs, other specific documents, database)?

Bulgaria: There is an official methodology and software to calculate the energy performance of the buildings, which are always used for issuing the EPC and eventually, the secondary audit.

Czechia: At level of building authority office: just having an EPC and in buildings over 750m2, checking whether the calculations has been checked by State Energy Inspection.

At level of calculations in the EPC: State Energy Inspection has an access to the database of EPCs with all the calculations and protocols inside. The check is manual.

Hungary: EPC of the constructed status is produced by the energy expert, this serves as the verifying document for fulfilling MEPRs. EPCs are checked by the authority.

Poland: Construction design is checked against the requirements of the construction law. The verification is based on design documentation only. The verification of the energy performance is not in the scope of the post-construction verification.

Romania: According to PCC 001/2013, are verified the EPCs and energy audit reports on the compliance with the corrected thermal resistance for new buildings, respectively the application of the minimum energy performance requirements to existing buildings. This aspect involves consulting the values obtained in the Energy Performance Certificate (corrected thermal resistances can be found in the Annex to the Energy Performance Certificate) and / or consulting the calculation brief from the EPC report, without verifying the actual calculation method (Annex no. 2 the procedure), which is a significant weakness, because compliance cannot be actually proved.

Slovakia: Design Energy Performance Report that contains evaluation of all requirements (U-values, heat needs, air-exchange rate, minimum surface temperature, primary energy and energy class) in the design stage and the energy performance certificate issued after construction prove the compliance.

No special tools are required for this. There is a missing common calculation tool based on CEN standards that are referenced in regulation. Self-developed calculation tools based on Excel are mostly used. This is why the quality of assessment of EP is mostly poor.

1.4.10. Is compliance check incentivised? How (e.g. compliance linked to financial support mechanisms)?

Bulgaria: No, there are no incentives for the compliance checks, and there are no national financial support mechanisms for new buildings. Currently, the commercial banks offering "green mortgages" are using the national EPC, and the more complicated schemes requiring independent checks and monitoring are rejected.

Czechia: Compliance is mandatory, so no incentives on reaching NZEB standard. But support schemes when providing subsidy for new construction requires reaching "NZEB-20%" standard – so be 20% better than NZEB (in line with the requirement from RRF and other EU funds)

Hungary: Compliance is mandatory, it is "incentivised" by the sanctions of non-compliance (not issuing an occupancy permit)

Poland: The compliance check is not linked to any financial support mechanisms.

Romania: No.

Slovakia: The EPC is usually obligatory in case of financial support.

1.4.11. What are the sanctions of non-compliance? What are the sanctions in the design phase, what are the sanctions after built? Who are the subjects of the sanctions?

Bulgaria: The design team and the (theoretically) independent building inspector bear the responsibility for the compliance of the design project to the legislation. If the local authorities find discrepancy in the project documentation submitted for issuing a building permit, there are potential penalties for the building inspector who certified the project. The construction companies bears responsibility compliance to the design project for the guarantee period, which is usually 5 years, and in theory is obliged to undertake renovation if underperformance is proven (and in case there are no changes to the building done by the owners after the commissioning). There are different penalties for the designers in case non-compliance to the legislation is evidenced, and there is an obligatory professional insurance which is supposed to cover potential losses to the client. However, the responsibility is difficult to prove in the court and there are very few such cases.

Czechia: At the level of local building authority office – not issuing the building permit, requesting correction or issuing a fine for the builder in case the buildings was realised without the compliance.

Checking whether there is EPC and whether there has been check on EPC by State Energy Inspection (mandatory on all buildings exceeding 750m2)

Checking whether the building is being built according to building permit (including energy sources as stated and calculated in EPC) (or at least they should check so).

At the level of Energy Performance Certificate and compliance with the requirements it depends on the level of non-compliance.

State Energy Inspection can check whether EPC calculations are correct, whether EPC is being calculated according to project documentation. If not -> they request correction. This check is mandatory in buildings over 750m2.

SEI can't request correction on the level of building (-> this is responsibility of the building authority, SEI can only request correction of the calculations) -> correction at building level must be issued by the building authority office.

SEI can't even inform the building owner, that there was an issue with the EPC calculations concerning his/her property (because of GDPR issues)

SEI can also fine the energy specialist responsible for the calculations.

Hungary: There is no compliance checking, and therefore sanctions, at the design phase. Sanctions are only applied after construction. The main subject of non-compliance is the builder/owner, who does not get the occupancy permit. However, this responsibility can be shifted to the players described under section1.4.5 via legal acts. In such cases sanctions are usually in the form of financial penalties. However, as in Hungary the entering into force of the NZEB requirements have been postponed after 1 July 2022, there are not yet empirical evidence that this happens.

Poland: For new buildings, if the requirements are not met, this investment will not receive a building permit. The verification of the energy performance is not in the scope of the post-construction verification

Romania: For new buildings, the current legislation is precarious regarding sanctions, in case of non-compliance with the minimum energy performance requirements. According to the current legislation (Law 50/1995 - republished, art. 26, letter h), the public administration authorities that issue incomplete Urbanism Certificates are subject to financial sanctions, without requesting compliance with the minimum energy performance requirements - imposed by art. 10, para. (1) Law 372/2005 or without requesting compliance with the energy

requirements in the levels defined at national level for nZEB - art. 17, para. (4) Law 372/2005 (NOTE: primary energy refers to only one of the three criteria that a building must fulfil to be nZEB - so the weakness of the wording of the requirement in the content of the law is noted).

After construction, the conformity of the application of the corrected minimum thermal resistances (practically, only a fraction / component of the MEPRs) can be verified by consulting the EPC before the reception of the works, considering the hypothesis that it is chosen randomly by I.S.C. to be verified, but it is not clear who is sanctioned if compliance is not met and what sanctions are applied.

Slovakia: There are no specific sanctions for non-compliance with MEP requirements. Local building public authority can refuse the construction permit or ask for improvement of design documentation in the design stage. After construction the compliance of actual construction with design is checked for permit for use. Public authority can ask for improvement to issue permit for use. But the failure to meet the energy class requirement is not an obstacle to the issuance of a permit for use.

1.4.12. What administration is responsible for issuing sanctions? Who decides on the sanctions?

Bulgaria: The building inspection, which should decide for the sanctions of the construction companies, is under the auspices of the MRDPW. The capacity of the construction companies in terms of professionals and equipment is managed by the Bulgarian Construction Chamber, as membership in the Chamber is obligatory for all companies offering integrated construction services. The professional certification of designers is managed by the professional chambers, respectively Chambers of Architects in Bulgaria, and Chamber of Engineers in Investment Design.

Czechia: Local Building Authority Office and State Energy Inspection

Hungary: The state building authority.

Poland: There are no sanctions, besides not granting a building permit. A local construction supervision office is responsible for granting or not granting a building permit.

Romania: The sanctions are applied by the State Inspectorate for Construction – I.S.C., which exercises state control over the unitary application of the legal provisions on the energy

performance of buildings and the inspection of heating / air conditioning systems, based on the procedure PCC 001/2013, developed by I.S.C. and approved by order of the Minister of Public Works, Development and Administration.

Slovakia: The same local public authority that gives permit for renovation and permit for use after construction has to check the compliance and the only sanction is the refusal of permit for construction or permit for use.

1.4.13. How would you evaluate MEP requirements for new buildings in your country from energy efficiency and energy saving potential aspect? How do the requirements compare to existing buildings' energy use (in kWh/m2/year)?

Bulgaria: The current requirements (energy class B) are old and do not respond to the EU practice and to the national energy saving goals. The nZEB definition is more ambitions (e.g. the primary energy demand is lower than in the original Passive House standard), however, it has its deficiencies:

- The requirement for 55% renewable energy means that no new building could be connected to the existing district heating or gas distribution networks (the later is not a major issue in our understanding, but is of course a subject of political lobbying)

- There are no exemptions for buildings in specific spots, as e.g. new buildings erected on the place of a demolished building in dense urban areas, which have limited space and access to renewable energy (also not technically sound but a subject of political lobbying)

The requirements for major renovation of existing buildings is that they reach energy class C, which is also outdated and even in the renovation strategy from 2016, it is stated that it should be increased to class B. However, this hasn't happened so far. The numerical indicators for primary energy demand for all types of buildings are presented in the table above.

Czechia: First, the requirement was insufficient leaving space for calculation adjustments and was in general weak -> leading to the construction of not very efficient buildings (it was basically no change to the construction sector – just bit thicker insulation or triple-glazed windows were enough to meet the standard).

This has led to the change of legislation and as of 1.1.2022 the new (NZEB II) calculations and requirement applies. Main flaws of initial legislation were erased and currently, we are quite satisfied with the current level and calculation method. Whole construction sector saw this change as a quite substantial step, some arguing it is too strict, some arguing too costly. In many cases RES installation is a necessity, and the architect must always talk to the energy specialist/engineer. In the end, after 6 months of new legislation in force we see no drop in

building permits and no major issue with inability to reach the NZEB II standard is being debated.

It is a good step before the zero-emission building standard. But we would rather set the numerical requirements for ZEB at national level due to differences in primary energy factors and typical usage profiles in the calculations.

Old SFH building could have primary energy use 200-300kWh/m2/y... New NZEB SFH buildings 70-75 kWh/m2/y... So quite substantial difference.

Hungary: The maximum primary energy consumption NZEB requirement is 100 kWh/m2.y, which is way too high in case of new buildings, where technology is available and the orientation of the building, the solar exposure of the facades can be utilized. If the new amendments to the regulation will be accepted, it will be decreased.

Poland: The MEP requirements in Poland are set according to cost optimal methodology and are in line with the requirements for nZEB (nearly zero energy building). However in terms of thermal transmittance they are not so strict as for i.e. passive house (Passive House Institute Darmstadt). The use of passive house requirements results in an increase of investment costs but the energy savings would be insignificant.

The requirement regarding the non-renewable primary energy demand indicator EP are in many cases difficult to be met by new multi-family buildings using only conventional energy sources. Thus the use of renewably energy sources is more common in Poland.[34]

The current values of the non-renewable primary energy demand indicator are equal to: for single-family buildings EP= 70 kWh/(m^2year) (for buildings without cooling system) and for multi-family buildings EP= 65 kWh/(m^2year) (for buildings without cooling system). (Regulation of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location (Journal of Laws 2019, item 1065)).

These values are lower than for buildings constructed in earlier periods. As reported in the Long-term building renovation strategy from 2022 (Resolution No. 23/2022 of the Council of Ministers of February 9, 2022 on the Long-Term Building Renovation Strategy) median values of non-renewable primary energy demand indicator (EP in kWh/m^2year) of residential buildings depending on the year of commissioning is as follows:

[34] Rucińska Joanna "Technical aspects related to the amendment to the regulations on thermal protection of multi-family buildings", Rynek Instalacyjny 3/2021, https://www.rynekinstalacyjny.pl/artykul/izolacje-techniczne/105007,techniczne-aspekty-zwiazane-z-nowelizacja-przepisow-dotyczacych-ochrony-cieplnej-budynkow-wielorodzinnych
Kwiatkowski Jerzy "The impact of the energy supply system on the EP index in a multi-family residential building", Rynek Instalacyjny 3/2021, https://www.rynekinstalacyjny.pl/artykul/cieplownictwo/104921,wplyw-systemu-zasilania-w-energie-wielorodzinnego-budynku-mieszkalnego-na-wartosc-wskaznika-ep

- for single-family buildings: <1994 – 263,7; 1994-1998 – 147,9; 1999-2008 – 143,5; 2009-2013 – 126,3; 2014-2016 – 109,1; 2017-2018 – 94,0; 2019-2020 – 89,3;
- for multi-family buildings: <1994 – 258,9; 1994-1998 – 139,0; 1999-2008 – 110,0; 2009-2013 – 142,7; 2014-2016 – 97,5; 2017-2018 – 87,0; 2019-2020 – 84,9.

Romania: Current MEP requirements are weak if correlated with the mandatory application of the nZEB concept for all new buildings. Their application does not lead to the requirements imposed on the concept, not even those defined in Order 386/2016 - which are still in force and weaker than those proposed in the revised methodology, but this aspect can be explained by the fact that they were not correlated when they were defined in 2016-2017, nZEB not being mandatory in 2016. It became mandatory starting with December 31, 2018, for new public buildings, respectively with December 31, 2020, for all new buildings, for which the reception at the end of the works is made based on the building permit issued starting with these dates.

MEP requirements proposed in the revised version of the methodology and endorsed by MDLPA in 2021, are very ambitious, strong, for some building destinations even raising some reservations about the possibility of reaching them (e.g., maximum allowable total primary energy consumption - from renewable and non-renewable sources to new and existing educational buildings are so ambitious that it is expected that it will be difficult to achieve, if possible limitations of location, applicable technologies applicable to a specific site or subtypes related to the destination of the building are considered - e.g. in a kindergarten, although it falls into the category of pre-university education units, higher indoor temperatures must be ensured than in a school, energy consumption for heating is increasing by default etc.

MEPRs for new buildings are slightly higher than those proposed for existent buildings, for major renovation:

Residential buildings (Values for Romanian climate zone III - randomly considered)		Minimum corrected thermal resistances [m2K/W]	Primary energy [kWh/m2 year]	CO2 emissions [kgCO2/m2 year]	Percentage of RES [%]
New	Individual buildings	Table in para. 1.1.1. – values extracted from MC001/2021 [1]	125	16.4	30
	Collective buildings		95	12.3	
Existent	Individual buildings		130	21.8	10
	Collective buildings		101	16.5	

It is specified that the requirements related to envelope elements (minimum thermal resistances / maximum thermal transmittances) are defined independent of the climatic zone, being defined as single data set, separately for new and existent buildings.

Related to the energy performance of the existing buildings fund a histogram is presented below and is is specified that 90% of the surface of residential buildings from Romania were built

before 1989, which frames the final energy consumption of most of the existing residential fund between 150-400 kWh/m2 year:

Year of construction	Final energy consumption [11] [kWh/m2 year]
1910 - 1989	150 - 400
1990 - 1999	140 - 350
2000 - 2009	120 - 230

Slovakia: MEP requirements for new buildings are expressed in kWh/(m².a) of non-renewable primary energy. The analysis is needed to see how MEP requirements are strict today, after several changes in Regulation in 2016 – 2019 with the aim to decrease the ambition level without clear justification.

Requirements for elements (U-values) should be stricter for new buildings as well as for renovation.

The current requirements expressed in non-renewable primary energy valid from 1.1.2021 for NZEB were confirmed by cost optimal level calculation in 2018 and are achievable for new buildings. Existing buildings' energy use (in kWh/m²/year) is not known because buildings before renovation, for selling and renting, are not often certified and they are not in the database of certificates.

1.4.14. What are the shortcomings/bottlenecks of the system? (Please be specific about types of bottlenecks (e.g. too few people with relevant education, etc.) How would you address the bottlenecks?

Bulgaria: The main bottlenecks are the following:

- Lack of informed market and demand for efficient buildings: lack understanding of the benefits from the investors and clients;
- Strong lobbying against the new requirements from both energy suppliers and professional chambers; protecting different commercial interests; perception of the construction companies that increase of MEPR will increase the investment cost;
- Lack of qualified designers;
- Lack of skills in the workforce;
- Lack of informed policy makers and media.

Czechia: Energy specialists need to be much more careful with the calculations. They need to be at the process of the construction from the beginning – as even the architecture has an impact on results, they need to be consulted. For the architects, it is something new – that someone questions their job with the links to energy performance.

Also, there is a need for educated energy specialists. And more education is needed for the trio of energy specialist, engineers, and architects. They all need to understand the links/connection between their jobs and their roles.

Problematic point is the capacity of State Energy Inspection to check all the EPCs issued and the fact that because of the legislation on state checks and controls, they can't check the calculations automatically on arrival in the system (not even just indicating that some value is "off the range") – because the checks and control must always be targeted and automation to this procedure would mean untargeted global control.

Hungary: The MEP requirements are checked only after construction, which is too late in case the requirements have not been fulfilled. Design stage compliance check should also be applied, by introducing again the need for a building permit.

Poland: The MEP requirements in the case of new buildings are checked only on the basis of design documentation and in the case of the single-family buildings, it is not even necessary to check the documentation. The fulfilment of the requirements should be proved after the completion of the construction process by preparation of an energy performance certificate for the building. Checking all the requirements should also be necessary for the single-family buildings.

Romania: The system does not work well in practice. Considering the implementation of nZEB in new buildings as a mandatory legal requirement at present in Romania, respectively being implemented as a component part of MEPRs, in the revised methodology of calculating the energy performance of the buildings, it can be concluded that the public authorities responsible for ensuring compliance (e.g. nZEB for new buildings), through the issued Urbanism Certificates, within the process of obtaining the Building Permit, postpones their request in practice, although they are subject to relevant financial sanctions (between 1000 - 6000 euros). Probably another way of sanctioning should be considered, stronger, at the same time as applying a systematic control process to ensure compliance.

In new buildings, the MEPRs implementation evaluation mechanism does not work, the legal basis being weak (e.g., it is not checked if the new buildings are nZEB, as part of the verification process legally assigned to project verifiers, and energy auditors, who have legal competencies to evaluate and to contribute to the nZEB design process, have no legal basis to be implicitly involved in new projects, the legal responsibility being of the Designer at this stage).

Given that the energy performance requirements for new buildings are about to increase significantly, the question that arises is who pays for the difference between the construction cost which was until the obligation to implement the nZEB concept vs. the increased construction cost under the obligation to implement the nZEB concept, so that the market can accept and effectively implement this concept. It would be useful to introduce incentives (e.g. to provide non-reimbursable financing for renewable energy sources, given that at least 30% of the total EP must be insured from RES for new buildings, respectively 10% in case of major renovations; for high performance equipment; for thermal insulations and for air tightness measures).

The applicable legislative framework is quite precarious for new buildings:

- the nZEB concept for new buildings is not fully defined as a mandatory requirement for administrative authorities, who should request it in the Urbanism Certificates and do not yet do so on a regular basis;

- it is not clear who is responsible for the implementation of the nZEB concept for new buildings (Administrative Authority, Investor, Designer,?!), the energy auditor having no legal duties in the case of new buildings, except for the development of energy performance certificate at the reception of the new building;

- who is legally responsible that the package of solutions chosen for a new building will lead that building to nZEB, which is important to control from the design stage, requiring specific laborious energy calculations, which it is reasonably assumed that designers on specialties do not have, as they are currently the prerogative of building energy auditors.

A new Land Planning, Urbanism and Construction Code, whose law project is in public debate at the time of elaboration of this study, and which will replace Law 10/1991 and Law 50/1995 and other applicable laws, aims to reduce discrepancies occured due to the dynamics of updating the legislation, but in this regard the improvements are insignificant, although it would be a good opportunity to empower the applicable legislation:

- incomplete Urbanism Certificates (e.g. that do not require nZEB for new buildings), in addition to being subject to financial sanctions - as they are now, as well, under Law 50/1991, will also be subject to nullity. But further, who will check the local authorities for compliance, under what procedure?

- the role of the energy auditor is minimized, being introduced in the category "other specialists" - art. 449, along with archaeologists and landscapers, although he should be a key-expert considering the current paradigm;

- the buildings that will be part of „Consequence Class 1 – CC1", that is related with, practically all the individual residential buildings, will not have the Technical Projects verified by the technical verifiers to the essential requirements (including the energy saving), which is a significant leak.

As solutions, it is considered that the applicable legislation and procedures related with new buildings should be updated as follows:

- the administrative authorities to request in the Urbanism Certificate the obligation to insure nZEB for new buildings;

- a nZEB energy compliance study would be required, at the design stage, prepared by a specialist with certified skills for performing energy calculations, who would assume it legally, such as the energy auditor / energy consultant, by which the stakeholders to be sure that the technical measures proposed in the project will actually lead that building to nZEB. (NOTE: The updated methodology in Romania proposes such a study on new buildings, which will be called nZEB Compliance Report, but the part of legislative empowerment of energy auditors as key specialists in the design team will still be missing);

- more rigorous quality control and for a larger sample of projects undertaken by I.S.C.;

- at the same time, it is very important to provide financial mechanisms to cover the difference in costs between the way it has been built so far and the provision of the nZEB concept, as a minimum energy performance requirement (e.g. non-reimbursable financing could be provided to renewable energy sources required to cover the minimum percentage of 30% of the primary energy consumption of the building). Without helpful financial mechanisms there is the risck to block the construction market, which is very heterogeneous in terms of economic potential.

Slovakia: Implementation of new technologies requires qualified and skilled professionals and good tools.

Quality of EP assessment in design stage and in EPCs is low due to lack of software tools based on CEN standards and low price of EPC due to low trust in information that it provides.

An improvement of the assessment of energy performance by closing the gap between real and calculated energy is important in order to be potentially used for energy savings prediction and calculation of cost effectiveness (e.g. by calculation for real climate conditions of building location instead of standard average climate).

The proper setting of requirements based on the analysis is important to improve the reliability of EP assessment in the design stage and in EPCs. Some buildings are not able to achieve the required energy class (e.g. due to size) and for some buildings the ambition level of requirements is too low. This leads to waiver of requirements by public authorities (no obligation to achieve required energy class). The legislation on energy performance assessment and the rating system should be improved.

1.4.15. Is there compliance rate monitoring in your country? If yes, what is the level of compliance of new buildings?

Bulgaria: The compliance rate on paper is 100% on document, as building or use permit cannot be issued without EPC confirming the minimum required energy class. There is no operational system for monitoring the actual compliance, as the requirement for a secondary audit is not applied.

Czechia: Not as such. Of course, that every building asking for the building permit after the NZEB requirement must in theory reach NZEB level and have EPC when occupancy is permitted (at the end of construction process). But the reality is elsewhere as there are basically no checks (or not sufficient) checks on buildings below 750m2. They do need to have EPC, but because of the lack of the capacity of the State Energy Inspection, only a minor portion (if any) of the EPCs for small buildings is being checked.

Hungary: Since an EPC, which proves the NZEB state, is needed for the constructed building in order to get the occupancy permit, the compliance rate should be 100%. However, as the date of entry into force of the NZEB requirement has been postponed to 1 July 2022, there have not been empirical data about the situation.

Poland: There is no system for testing the level of compliance.

Romania: There is no compliance rate monitoring in Romania for new buildings related with the MEPRs implementation, as far as the author consulted multiple sources of information, without finding references in this regard. In Romania, the average annual growth rate of the residential building fund is 0.7%, calculated for the time horizon 2000-2020, calculated based on information from the Romanian National Institute of Statistics.

Slovakia: There is no compliance rate monitoring in Slovakia related to energy performance. Information in the register of EPCs could be used that provides the energy classes achieved after construction. All issued EPCs are registered in the database of certificates with indication of purpose (new or renovated building).

1.4.16. Has there been an evaluation of the system as a whole?

Bulgaria: No, such evaluation of has not been carried out. The results and savings from the energy efficiency policies and programmes are calculated and evaluated in the report on the National Energy Efficiency Action Plan to 2020, also featuring as Annex I to the LTRS, but again, that is only based on calculated savings without monitoring of the actual performance.

Czechia: Not in this sense. But as stated above, the initial NZEB requirement was set insufficiently, leaving space for calculation adjustments and was in general weak. This has created several problems (State Energy Inspection was for example unable to check on calculations precisely).

This has led to the change of legislation and as of 1.1.2022 the new (NZEB II) calculations and requirement applies. Main flaws of initial legislation were erased and now the system works quite well.

But it was not a consequence of some thorough evaluation.

Hungary: The topic is addressed within the National Long-Term Renovation Strategy, but specific issues (such as state, challenges, shortcomings of enforcement and compliance with regulations in practice) are not evaluated

Poland: There was no review of the system as a whole.

Romania: No.

Slovakia: The analysis, impact assessment and the evaluation of the system as a whole are missing in Slovakia while it is evident that there are several problems in setting requirements, calculation, boundary conditions and implementation of the MEP requirements.

2. The role and application of Energy Performance Certificates in meeting the requirements

2.1. The system of certification of the energy performance of buildings

2.1.1. Are EPCs applied in your country (based on the provisions of Article 11 of EPBD?)

Bulgaria: EPCs are practically applied only for multifamily residential buildings who apply for grant financing for renovation. There is no functioning mechanism obliging other multifamily buildings or single-family ones to provide an EPC for any purpose.

Czechia: Yes.

Hungary: Yes, the energy performance of a building shall be certified in accordance with the provisions of Regulation 176/2008 (unless it has an energy performance certificate in force) in the case of construction of a new building; transfer of ownership or rent of an existing building; or for a building for public use owned by the State or a public authority with a useful floor area of more than 500 m2.

Poland: The EPC system was introduced in Poland by the Act of 19 September 2007 amending the Construction Law (Journal of Laws of 2007, item 1373). The last significant change to the system took place in 2014 and was related to the introduction of the requirements of the Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (OJ L 153, 18.6.2010, p. 13–35). The current system operates on the basis of the provisions of the Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497).

Romania: In Romania, the obligation of Energy Performance Certificates was introduced by Law 372/2005, for all buildings that are newly built, sold or rented. Until stronger sanctions were introduced in the law, in 2013 (such as the relative nullity of the sale-purchase contract), the request for their elaboration, by the notaries, in the case of sale-purchase was avoided.

Slovakia: EPCs are applied in Slovakia from the required time according to the EPBD.

2.1.2. Are EPCs produced for buildings when they are constructed, sold or rented?

Bulgaria: Since 2009 each new building has EPC, issued during the design phase. Although provisionally required by the Energy Efficiency Act, still no EPCs are practically required when selling or renting individual apartments in existing multifamily residential buildings.

Czechia: For construction – yes, always

For renovations – in case of major renovations (and buildings over 750m2) if needed for the building permit – so basically all other buildings than SFH have EPC issued.

For selling and renting – yes, there is an obligation to have EPC. The owner should have one issued, but if he/she does not want to, he/she can evade by stating the worst class: "G". Not displaying an EPC class could lead to fine.

Hungary: Yes, the energy performance of a building shall be certified in accordance with the provisions of Regulation 176/2008 (unless it has an energy performance certificate in force) in the case of construction of a new building; transfer of ownership or rent of an existing building; or for a building for public use owned by the State or a public authority with a useful floor area of more than 500 m2.

EPCs do not need to be produced for an independent building with a useful floor area of less than 50 m2, not attached to another building and for buildings used for residential and leisure purposes for less than 4 months per year.

Poland: According to the Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497), in Poland there are two situations when an EPC is required:

- in the case of a building or part of a building: sold under a contract of sale, sold under a contract of sale of a cooperative ownership right to the premises, rented; or
- in the case of a building whose usable area occupied by the judicial authorities, the prosecutor's office and public administration bodies exceeds 250 m^2 and in which the clients are served.

EPC does not need to be issued for:

- a building under the protection of the historical protection office,
- a building used as a place for religious activities,
- an industrial and utility building not equipped with energy-consuming installations, with the exception of built-in lighting installations,
- a residential building intended for use no longer than 4 months a year,
- a detached building with a usable area of less than 50 m^2,
- a farm buildings with the non-renewable primary energy demand indicator (EP) not higher than 50 kWh/(m^2year).

Romania: EPCs are elaborated before the reception, at the completion of the works of a new construction, at their sale, respectively at their rent. Regarding the rent, EPCs were requested for a period, until the public institution authorized to register the lease contracts, ANAF (National Agency for Fiscal Administration) did not request them, starting with 2017, on the grounds that there are no sanctions in Law 372/2005 for not presenting the energy performance certificate to the fiscal bodies, on the occasion of registering the expenses, reason for which, for the rent, EPCs are no longer required, even at the present time.

Thus, a weak formulation is identified in Law 372/2005, even after numerous updates and completions over the years regarding the obligation to elaborate the EPC in case of renting, an aspect that should be revised in the content of the law.

Slovakia: EPCs are always produced for buildings when they are constructed, but not always when they are sold or rented. For sold or rented buildings EPCs are usually not produced because there is no way of enforcing this, even if it is an obligation of owner to have EPC as of the date of conclusion of the contract for the sale or lease of the building or of the part of it.

2.1.3. Are they displayed in advertisements and handed over to buyers/tenants *before* transfer? What are the requirements in the national legislation with regards to mandatory use of EPCs in real estate advertisements? (Address the problem of black market for renting as well, if relevant in your country)

Bulgaria: No, mainly because EPCs are not issued for old multifamily residential buildings. There are only about 2000 certified buildings that participated in the National program for energy efficiency of multifamily residential buildings which have EPCs but there is no practice to display or request EPCs during sale or renting. There is no requirement to display EPCs in real estate advertisements. Certainly, Bulgaria has a very high share of "black" residential rental market (the majority of the deals are illegal to save on taxes), where the question of EPCs is not raised at all.

Czechia: For selling and renting – yes, there is an obligation to have EPC. The owner should have one issued, but if he/she does not want to, he/she can evade by stating the worst class: "G". Not displaying and handing over an EPC class could lead to fine. It was checked by State Energy Inspection in the beginning of the requirement (back then they just warned the obligated party). Now it is normal and everybody seems doing it, but as stated: the obligated party usually comply with just stating „G".

Hungary: In accordance with Regulation 176/2008, when a building is offered for sale or rent, the advertisement shall indicate the energy performance class of the building or single use unit,

if a certificate is available. There are no official statistics, but according to the annual report for year 2020 of the Budapest Chamber of Engineers (responsible authority for EPC control) the existence of energy performance certificates, and information on energy performance is rarely found in advertisements, mainly because an EPC is obtained when a potential buyer and the seller/renter reach an agreement; EPCs are obtained for the contract only.

Poland: According to the Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497), where an energy performance certificate has been issued for a building or part of a building, the advertisement for the sale or rental of the building or part of it shall include the annual energy use indicator calculated in accordance with the EPC methodology. The full EPC is not required to be published in the advertisement.

In practice the information from EPC regarding the annual energy use indicator are not presented in advertisements.

Romania: In Romania, currently it is not current practice to display EPCs in advertisements, although there is applicable legislation in this regard. The legislative provisions refer to the obligation of the investor / owner / administrator of the building / building unit to specify in the sale / rental announcements information from the EPC regarding the energy performance indicators of the building - Law 372/2005, art. 24. For non-fulfillment of this provision, a financial sanction is provided - Law 372/2005, art. 36, para. (1), lit. m). The law presents weakness here, in the sense that it is not clear who should ensure the verification of its fulfillment, as well as the application of the sanction, considering that the investor / owner / administrator of the building and / or real estate agents / real estate advertising agencies are targeted. In the control procedure developed by I.S.C. this category is not included for verification.

Regarding the existence and delivery of the certificate to the buyers, this is the current practice, EPCs are being requested by the notaries who elaborate the sale-purchase contracts, because in the absence of the certificate the sale-purchase contract becomes subject to relative nullity - Law 372/2005, art. 22, para. (4). A similar approach is undertaken for the reception of new buildings - in the absence of the certificate before the reception, the reception report becomes null and void - Law 372/2005, art. 23, para. (2). The applicable national legislation is strong and works to ensure these requirements of the EPBD.

Slovakia: EPCs are often not displayed in advertisements because they are only required if EPC has already been issued and they are not usually handed over to buyers/tenants before the transfer.

2.1.4. Do EPCs contain information on (1) reference values such as minimum energy performance requirements, (2) recommendations for the cost-optimal or cost-effective improvement of the energy performance, (3) where the owner or tenant can receive more detailed information? Is the energy class (energy performance) and energy recommendations presented to the end-user in an easy-to-understand way?

Bulgaria: The information is available in the EPC, which are of reasonably high quality in terms of the information contained, but final users often have difficulties in understanding it.

Czechia: Basically yes.

Hungary: Yes. In accordance with Regulation 176/2008, the EPCs shall contain:

- the calculated, scaled total energy performance of the building (or individual functional unit) (kWh/m2.y);
- the requirement value for the overall energy performance of the building (or individual functional unit) (kWh/m2.y);
- energy performance class valid from 1 January 2016;
- a proposal for a cost-optimal level or a cost-effective improvement of the energy performance of the building or individual accommodation unit, unless there is no reasonable possibility for a cost-effective improvement of the energy performance of the building or individual accommodation unit compared to the requirements of the Regulation. The proposal shall include technically feasible measures involving major renovation of the boundary structures or upgrading of technical building systems, technically feasible measures involving minor renovation of the boundary structures or technical building systems, and minimum energy performance requirements for the building. The certificate may include additional information on the amount of renewable energy used, possible steps to implement the recommendations and information on support and financing schemes. At the request of the owner, a cost-effectiveness calculation over the economic lifetime of the building may be provided.
- If the certificate proposal does not include a cost-effectiveness calculation, the certificate should indicate where the owner or tenant can obtain further information on the cost-effectiveness and implementation of the renovations.

The energy class is presented with a graphic scale, which is easy to understand. The recommendations are usually very shallow, without any particular details.

Poland: The EPC template is specified in the Regulation of the Minister of Infrastructure and Development of 27 February 2015 on the methodology for determining the energy performance of a building or part of a building and energy performance certificates (Journal of Laws of 2015,

item 376). It contains information on reference values such as minimum energy performance requirements (thermal transmittance of envelopes and non-renewable primary energy demand indicator) and recommendations for the cost-optimal or cost-effective improvement of the energy performance. The information regarding sources where the owner or tenant can receive more detailed information are not a scope of EPC in Poland.

The variety of research shows that in Poland the presentation of energy performance to the end-user is not in an easy-to-understand way. This was demonstrated at the workshop "Assessment and the future of the energy performance certificates system in Poland" organized in 2017 by Buildings Performance Institute Europe, where a group of experts rated the form of EPC in Poland at 2.1 points on a scale of 1-5 (5 is the highest rating). The EPC was similarly assessed in the "Report on the analysis of the impact of energy certificates on the value of real estate and on near-zero energy construction - for real estate professionals, owners and tenants", prepared as part of the ZEBRA2020 project[35].

Romania: The following are currently considered in the EPCs:

(1) EPCSs for independent buildings contain values of final energy consumption, on utilities, calculated for the reference building, considered as a virtual building identical to the real building to which the minimum energy performance requirements apply. The values of MEPRs do not appear in the content of the certificate explicitly (minimum thermal resistances, global thermal insulation coefficient and specific consumption of primary energy for heating). The EPC for apartments does not calculate the reference building.

(2) EPCs contain recommendations for reducing costs by improving the energy performance of the building, without cost-optimal analysis or cost-effective improvement of energy performance.

(3) Does not contain this type of information.

The energy class and energy recommendations are reasonably presented to the end-user and an easy-to-understand way is facilitated by the current EPC content.

In the revised version of the MC001 methodology, an updated version of the EPC is proposed, which contains:

(1) For all categories of buildings (single-family residential buildings, blocks of flats, offices, educational buildings, hospitals, hotels and restaurants, sports buildings, buildings for trade services), but excluding buildings for other purposes, the building / the reference building unit is defined by the minimum values of thermal resistance of the construction elements, respectively by the maximum values of primary energy consumption and equivalent CO2 emissions - for nZEB (new buildings), respectively for the equirements imposed in the methodology for renovated buildings.

[35] https://www.zebra2020.eu/website/wp-content/uploads/2014/08/Polish_D32_layout.pdf

Annex 2 to the EPC will contain a tabulated corrected thermal resistances, the minimum values by the type of building element considered for the evaluated building. For buildings / building units with other destinations, EPC will contain calculated values of the total primary energy consumption for the reference building, considered as a virtual building identical to the real building, to which the minimum energy performance requirements apply. The EPC for apartments does not calculate the reference building.

(2) Annex 1 to the EPC will contain the list of recommendations for reducing the energy consumption of the building, building unit or apartment, with "the estimation of energy savings by implementing measures to increase energy performance, including details of where more detailed information can be obtained, such as the cost-effectiveness of the recommendations made, the procedure to be followed for the implementation of the recommendations, financial or other incentives and funding possibilities ".

(3) Annex 1 to the EPC will contain information on the steps to be taken to implement solutions to increase energy and environmental performance, as well as information on financial or other incentives and funding opportunities.

The energy class and energy recommendations are reasonably presented to the end-user and an easy-to-understand way is facilitated by the future EPC content.

Slovakia: (1) reference values such as minimum energy performance requirements – Yes, MEP requirement is reported

(2) recommendations for the cost-optimal or cost-effective improvement of the energy performance – The recommendation for improvement to NZEB or MEP requirements that are assumed to be cost-optimal are reported and quite detailed.

(3) where the owner or tenant can receive more detailed information? This is not explicitly specified, but assessor is assumed to provide all information.

The energy class (energy performance) and energy recommendations are presented to the end-user in an easy-to-understand way.

2.1.5. Is on-site inspection mandatory? If yes, does anyone check compliance with on-site inspection?

Bulgaria: According to legislation on-site construction supervision is required. However, in most cases this is only pro forma and it is very hard to control that. Legally, if there are major discrepancies between the audit and the actual situation, the auditing company is subject to sanctions and suspending the license, but there are no such known cases.

Czechia: Usually, no. But it depends – for construction and renovation – the basis for EPC is project documentation (often the building does not exist at the time of calculations). For existing buildings for renting or selling – yes, there should be on-site visit especially in cases, where the project documentation is missing. But in reality, this is not happening (usage of photos/googlemaps etc. is much more common).

Hungary: It is not specifically included in the legislation, but several photos have to be attached to the EPC: one photograph of each façade for whole building certification; one photograph of the exterior of a separate dwelling in a multi-flat building for certification of a single dwelling as a single functional unit, excluding attic space; one photograph of a typical heat emitter and its controls; one photograph of a typical window; one photograph of the actual installed position of a heat generator and heat storage or other equipment performing such functions, except for district heating buildings, for whole building certification; one photograph of renewable energy installations (e.g. a photograph of the internal window cavity and elbow of a window and of the connection to the internal wall slab, if solar collectors, photovoltaic generators) are used; if internal thermal insulation is used, a photograph of the internal window cavity and elbow of a window and of the connection to the internal wall slab.

Poland: The on-site inspection is not mandatory in a process of EPC issuing in Poland. The calculation can be done on-desk, only on a basis of building design documentation. However, it is required to insert a photo of the building for which the EPC is issued.

Romania: For the certification prior to reception of new buildings, there are no explicit specifications in the applicable legislation or in the applicable technical regulations regarding mandatory on-site inspection.

For existing buildings, the stages in performing an energy audit, which contains the certificate of energy performance for the initial state as a result of the evaluation of the energy performances of the building, involve the visit of the building by the energy auditor, the first stage in assessing the energy performance of buildings is the preliminary investigation of the building and related facilities, aspect specified punctually both in the current form of the methodology for calculating the energy performance of buildings (Indicative MC001 / 3-2006), and in the revised version of the methodology, in Chap. 6. Energy audit.

However, the legislation does not provide sanctions if this is not done, which is why it was found that some energy auditors do not appear at the site inspection, with direct effects on the quality of energy assessment and its credibility.

Slovakia: An on-site inspection is required indirectly, as the EPC is issued for the actual construction of the building structures and technical systems of the building. However, there are also advertisements for providing EPC online based on online information from owner.

2.1.6. Is certification carried out by independent experts?

Bulgaria: Yes, by certified energy auditing companies which are required to hire a team of certified auditors from different specialties. The register of the auditing companies is public and is maintained by SEDA.

Czechia: Yes. By certified energy specialist but paid by the person in need of the certificate.

Hungary: The certificate must be prepared by a certified professional, on behalf of the property owner. The certifications of qualification are issued and registered by the Hungarian Chamber of Engineers or the Hungarian Chamber of Architects. The certification entitlement, indicated by the letters TÉ in the Chamber's register number, can be obtained with a degree in engineering and at least one year of professional experience, after passing the qualification exam. After passing the exam, certifiers are entered in the Chamber's register, which is publicly available and thus a useful way of finding the right professional.

Poland: EPC may be issued by a person who graduated from higher education with the title of an engineer, architect engineer, landscape architect engineer, fire engineer, master engineer architect, master engineer landscape architect, master fire engineer or master engineer; or by a person who has completed higher studies other than the above and postgraduate studies, the program of which takes into account issues related to the energy performance of buildings, energy audits of buildings, energy-saving construction and renewable energy sources; or by a person who has building qualifications referred to in the Act of July 7, 1994 - Building Law.

In addition, such a person must have full legal capacity and may not be convicted by a final judgment for an offense against property, credibility of documents, economic turnover, trading in money and securities or for a fiscal offense.

Romania: Energy certification and energy audit are performed by individuals certified by the Ministry of Development, Public Works and Administration, in accordance with the specific methodology adopted at national level approved by order of the Minister of Development, Public Works and Administration. The regulation on the attestation of energy auditors for buildings was issued by the Order of the Minister of Regional Development and Tourism no. 2237/2010, with subsequent amendments and updates.

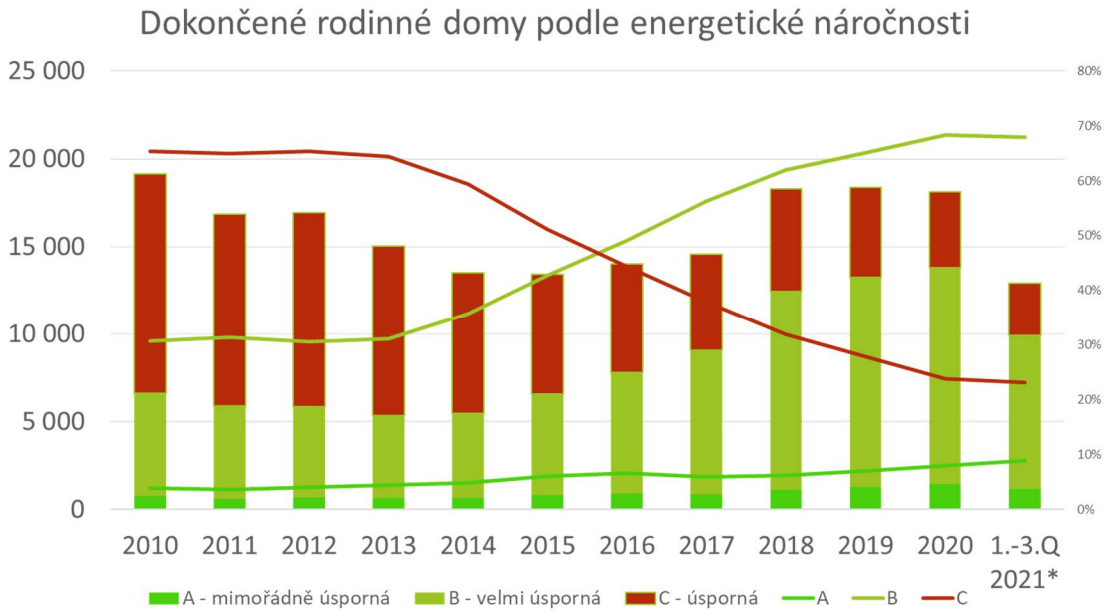
Slovakia: Certification is not carried out by the independent experts because designer can be at the same time also certifier of building after construction or after renovation. Issued EPC for permit for use after construction or renovation is often part of price offer for design documentation.

2.1.7. How many buildings (% of residential building stock) do have EPCs? What is the distribution of the energy classes (% of certified buildings within each energy class)?

Bulgaria: All buildings commissioned after 2010 have EPCs. For older buildings, about 3% of the multifamily residential buildings (slightly more than 2000) and none of the single-family residential buildings have EPCs.

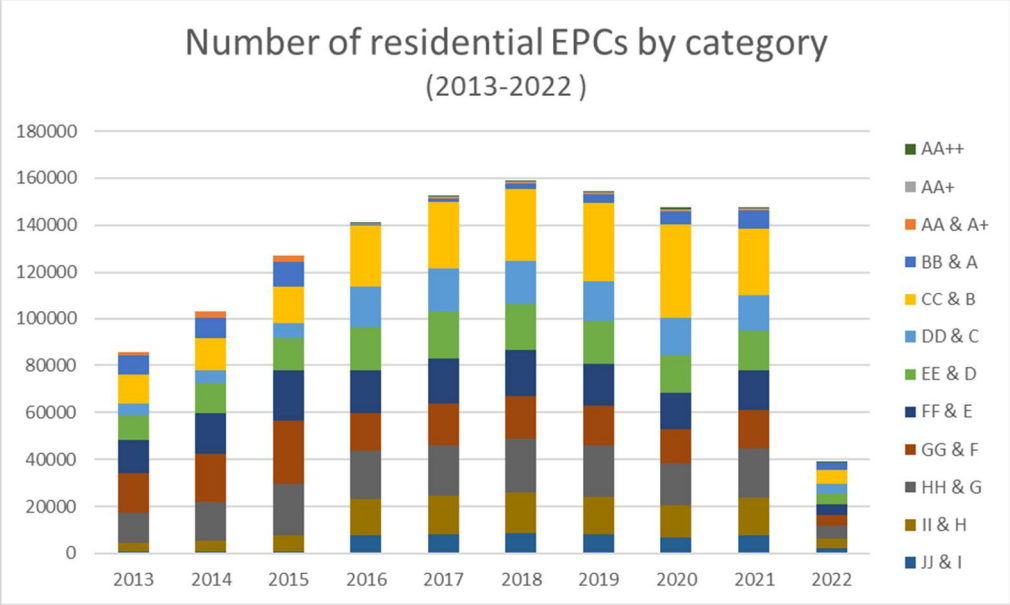
Czechia: Nobody knows the total distribution over the building stock. Existing buildings are barely covered.

But there are quite good statistics on newly constructed buildings and their energy class as this is being collected by the Czech statistical office. For newly constructed SFH see the distribution below.



Hungary: There is a national database of EPCs at Lechner Knowledge Centre, therefore statistics are available. Only the energy class of a particular building is public, the full EPCs cannot be accessed. However, the Lechner Knowledge Centre regularly publishes statistics on

EPCs. Between 2013 and 2021, in average 135 000 EPCs were made every year for residential buildings, resulting in more than 1,26 million certificates in total. Most of them – more than 235 000 pieces, 19% of all certificates – was issued to category CC (cost-optimal level) and B (the approximately equivalent category to CC in the previous system until 2016). Almost 95% of all EPCs were given to buildings in category CC or below, meaning that less than 5% of the audited building stock reached nearly zero levels (up from BB, 100 kWh/m2.y). In average – but including the recent years as well – more than half (54%) of the EPCs were in or below category FF (or E, which is the average energy performance of a Hungarian residential building, above 210 kWh/m2.y), meaning that these buildings consume more than double of the nearly zero level. Half of them (27% of the total number of EPCs) are in or below category HH, with a primary energy consumption more than triple of the nerly zero level (>310 kWh/m2.y)[36].



Poland: It is not possible to determine the number of EPCs issued in Poland. The central EPC register was not established until 2015. In 2008-2014, there were no EPC recording tools, each auditor had its own database. In addition, the data contained in the currently functioning central register are not publicly available. Also, the number of EPCs issued does not have to equal the number of buildings. The validity of the EPC is 10 years and 2 certificates may have already been issued for one building. At the same time, for multi-family residential buildings, the EPC could be drawn up for each dwelling separately. Currently the number of the registered EPCs in the central register is about 500 000 (information from the ministry responsible for the EPC system).

[36] Source: https://entan.e-epites.hu by Lechner Knowledge Center

The analysis of a data from EPC central register shown in the Resolution No. 23/2022 of the Council of Ministers of February 9, 2022 on the Long-Term Building Renovation Strategy that the median of non-renewable primary energy demand indicator (EP kWh/m^{2}year) of residential buildings depending on the year of commissioning is as follows:

- for single-family buildings: <1994 – 263,7; 1994-1998 – 147,9; 1999-2008 – 143,5; 2009-2013 – 126,3; 2014-2016 – 109,1; 2017-2018 – 94,0; 2019-2020 – 89,3;
- for multi-family buildings: <1994 – 258,9; 1994-1998 – 139,0; 1999-2008 – 110,0; 2009-2013 – 142,7; 2014-2016 – 97,5; 2017-2018 – 87,0; 2019-2020 – 84,9.

Romania: Currently, there is no unitary database regarding EPCs developed in Romania. Until INCD URBAN INCERC (former Institute for Research in Construction and Construction Economics - INCERC) was coordinated by MDLPA (former Ministry of Regional Development and Housing), the certificates were sent by energy auditors to this research institute and were used in some projects undertaken in Romania by this research institute – e.g., ENERFUND (which is mapping the elaborated EPCs across Romania into an interactive application). The National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development – INCD URBAN INCERC, now is conducted by the Ministry of Research, Innovation and Digitalization - MCID. Subsequently to this change, EPCs which were were sent to INCD URBAN INCERC, started to be transmitted directly to MDLPA, currently not being public any type of information related to it, not even statistically processed information based on them being available.

Slovakia: Validity of EPC is 10 years, therefore valid certificates are only from 2012 (public access to information system on EPCs).

The number of issued EPCs in period 2012-2021 is in total 157 562 certificates (all building categories). Filtration is possible only for energy classes for final energy (not for primary energy). The distribution in energy classes for final energy is:

11% Energy class A

70% Energy class B

14% Energy class C

5% Other energy classes

The number of issued EPCs for residential buildings in period 2012-2021 is in total 139 022 certificates (family houses, apartment buildings).

Filtration for energy classes is possible only for final energy (not for primary energy).

The distribution in energy classes for final energy is:

	A	B	C	D	E	F	G	
Family houses	15418	89921	16113	2096	765	385	582	125280
Apartment buildings	312	10255	2630	269	114	45	117	13742
Total residential	15 730	100 176	18 743	2 365	879	430	699	139 022
	11%	72%	13%	2%	1%	0%	1%	100%

There are 1 234 592 houses in the SR (2021 Census) that means about 11.3% have issued valid EPC.

Energy classes for global indicator – non-renewable primary energy in kWh/(m^2.a)

Category	A0	A1	B	C	D	E	F	G
Family houses	≤ 54	55-108	109-216	217-324	325-432	433-540	541-648	> 648
Apartment buildings	≤ 32	33-63	64-126	127-189	190-252	253-315	316-378	> 378

2.1.8. Who is responsible for an EPC to be prepared? Is it in all cases the owner/builder, or are there special provisions appointing other parties (e.g. developer / the professional advisors / designer / architect /energy expert) as (co)responsible for compliance?

Bulgaria: The EPC is prepared by accredited energy auditing companies, often working together with the design team. Building owners/investors are covering the expenses for the EPC preparation, although in reality the existing audits are paid exclusively by public subsidies.

Czechia: Yes, always the owner/builder.

Hungary: When a building is constructed, sold or rented, it is always the builder or the owner responsible for ensuring that the EPC is prepared.

Poland: The owner or manager of the building or part of the building or a person who has a cooperative ownership right to the premises, or a person who has a housing cooperative right to a dwelling, or the tenant is responsible for the preparation of the EPC. (Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497)).

Romania: According to the provisions of Law 372/2005, Chap. XI the preparation of EPCs targets the following stakeholders:

o Art. 24 - in order to inform potential buyers or tenants, the investor / owner / manager of the building / building unit must specify in the advertisements of their sale or rental information from the EPC regarding the performance indicators (energy class, total specific primary energy consumption, index of CO2 equivalent emissions, total specific energy consumption from renewable sources).

o Art. 22 - prior to the rent and sale of a building the investor / the owner / the administrator is obliged to make available to the potential tenant / buyer, prior to the completion of the contract, a copy of the certificate so that he can take note of the energy performance of the building he is going to buy / rent.

o Art. 22 - in case of rent, the owner has the obligation to submit to the competent fiscal body a copy of the certificate, which is ANAF (the National Agency for Fiscal Administration).

o Art. 22 - in case of sale, the owner has the obligation to submit to the competent fiscal body a copy of the certificate, which is the public notary.

o Art. 23 – for „buildings under construction", the certificate is elaborated under the obligation of the investor / owner / administrator, who must submit it to the commission convened for reception at the end of the works, and is component part of the technical book of the construction. This request should cover both new and existent buildings under major renovation, although it is not clearly specified.

o Art. 25 - in the case of buildings with a usable area of more than 250 sqm, owned / administered by public authorities, as well as in the case of buildings where public service institutions operate, is the obligation of the owner / administrator of the building, that the valid EPC to be displayed to the public, in an accessible and visible place.

o Art. 25 - the EPC must be displayed for the buildings frequently visited by the public, provided in art. 7 para. (1) (e.g. which are those indicated by categories in EPBD Annex I, paragraph 5).

Slovakia: The owner is responsible for providing the EPC.

2.1.9. Is there an independent control system for EPCs? Is it in line with Annex II of the EPBD?

Bulgaria: Yes, the responsible body is the Sustainable Energy Development Agency (SEDA), and it is supposed to check the quality of the EPCs. The system is in line with Annex II of the EPBD, and SEDA is independent agency under Ministry of Energy. However, the capacity of SEDA is insufficient to apply systematic control.

Czechia: Yes, by State Energy Inspection, which is a state entity under the Ministry of Industry and Trade with own experts. The problematic issue might be: "statistically significant percentage" of inspections. The capacities of SEI are quite limited, and the limit is thus fulfilled with mandatory checks for the buildings over 750m. For other buildings the spare capacity is too low.

Hungary: Yes, based on Act LXXVIIL of 1997 on the Shaping and Protection of the Built Environment the Chamber of Engineers of Budapest and Pest County operates an independent verification system for energy certificates. Within this framework, it randomly selects a statistically significant proportion of all energy certificates available in the Register, as defined in a government decree, for the purpose of a statutory audit, and, on the basis of the audits, initiates the statutory official measures at the competent body.

Independence is regulated 266/2013 (VIL 11.) Government Decree on the regulation of the exercise of the profession of construction and construction-related activities. In accordance with the decree, Within the framework of the independent audit system operated by the Chamber of Engineers of Budapest and Pest County, no person whose rights or legitimate interests are directly affected by the audit, who acted as a representative of the client or as an energy certifier in the preparation of the audited certificate, who acted as a technical expert in the field of construction that may be related to the audited certificate, who was involved in the preparation of the audited certificate in accordance with the provisions of the Civil Code, or who has acted as a representative of the contracting entity or as an energy certifier or technical expert in building services may participate in the follow-up audit and control of the certificates.

Poland: One of the tasks of the created by the minister responsible for construction, spatial planning and development and housing central EPC register is the possibility of independent verification of certificates. Randomly selected EPCs are checked for the correctness of the input data and the results presented in the certificate. Verification is carried out by officials appointed by the minister for construction, technology and development. It is in line with Annex II of the EPBD.

Romania: The State Inspectorate for Construction - I.S.C. exercises state control over the unitary application of the legal provisions on the energy performance of buildings and the inspection of heating / air conditioning systems based on the procedure it has developed, PCC 001/2013. The control aims at the annual verification, by sampling, of at least 10% of the EPCs and energy audit reports, registered annually in the "specific databases".

The procedure provides for check of the input data and verification of the results of the energy performance certificate. Article 5, para. (3), lit. (iii) specifies the verification of the certificates regarding the "completeness and correctness of the information contained therein", however without concretely detailing the manner in which this verification should be performed, which

may involve limitations of control, in the sense of verification more of form and less of the content of the certificate, in terms of the accuracy of the energy calculations made. In the Control report that is elaborated after the control (Annex no. 2 to the procedure), the verification of the calculated values can be summary, in the sense that it can be checked that the calculation exists or not, but at the same time it can be elaborated, if desired. It is checked the existence of the recommendations for reducing energy consumption within the certificate. The procedure does not provide the on-site verification, to check the conformity of the energy performance certificate with the certified building.

Overall, the control procedure used in Romania is in line with the provisions of Annex II of the EPBD Directive. However, an update of the procedure to extend the level of verification, especially regarding the quality control of the elaborated energy calculations, respectively the control of the conformity of the certificate with the certified building, is necessary.

Slovakia: There is an independent control system for EPCs, but the results and the compliance with Annex II of the EPBD is not published. State supervision is performed by the State Energy Inspection, appointed by the Ministry of Transport and Construction of SR, which is responsible for quality control according to the Law 555/2005 Coll

2.1.10. How is issuing of EPCs checked? How is the quality of EPCs checked, regarding (1) validity of input data, (2) verification of the results?

Bulgaria: All issued certificates are submitted to SEDA who is responsible for checking quality, mostly by verification of the results. In most cases, the validity of input data is hard to be verified due to lack of enough experts in SEDA.

Czechia: The State Energy inspection has access to EPC database with all the input data and protocols. Then the recalculation by SEI inspector is done. It is checked against project documentation etc. But usually no on-site visit.

Hungary: The post-certificate verification checks (a) the correct identification of the characteristics of the boundary structures and building services systems, the verification of the partial and final results indicated in the energy performance certificate, the justification of the proposal based on these results, (b) the correct identification of the basic data of the certificates on site, if necessary, and the correctness of the data used and the overall calculation. A random selection of 2% of the annual quantity of official certificates shall be subject to the verification referred to in paragraph (a) and 0,5% shall be subject to the verification referred to in paragraph (b).

Data are checked only by a checklist, based on the description and photos of the boundary structures as well as building services systems the related input data are checked, and whether based on these the results are realistic; they are not re-calculated by the controllers.

Poland: Verification of the input data and the results presented on the certificate is performed manually. The person responsible for the verification selects the EPC at random, and then, on the basis of his technical knowledge and experience, determines whether the assumed parameters and the corresponding results comply with the calculation methodology. There is no automatic control system in the EPC register (information from the ministry responsible for the EPC system).

Romania: EPC quality verification is performed by the I.S.C. through the control procedure PCC 001/2013. The control report that is being concluded (Annex no. 2 to the procedure) aims:

- for new buildings: verification of EPC's signing and stamping competencies, verification of records regarding the registration of reports in the register of activities carried out by the auditor, transmission of reports, in electronic format, to the ministry (i.e. MDLPA); checking the classification of the building in the performance indicators: energy class, total specific energy consumption and CO2 equivalent emission indices; checking the existence of EPC when performing the reception at the end of the works; verification of the framework content of the certificate and its annex: calculated values, classification of the construction in the category of buildings, validity of the certificate, recommendations for reducing energy consumption.

- for existing buildings the verification aims to check the existence of the energy audit report / initial EPC. There is no checking of the validity of the input data or the results. There is a single line in the report, for existent buildings, which only checks if the Energy audit report/initial EPC exists.

The EPC display is also checked for both new and existing buildings. For the 10% samples, the verification is done on site, by the ISC representatives and is checked in the report with YES or NO. It is thus found that the verification procedure for the existing constructions is very brief and is not sufficient.

Slovakia: The inspector entrusted with the performance of state supervision under Act No. 555/2005 is eligible to look into the calculation and the documents used by the authorized person for energy certification.

There is also a rough check of the input values in the online information system, which is used to issue the EPC on the basis of input data from assessor. Rough intervals for input values are set against which the inputs are checked. In case of non-compliance, more detailed check is performed. The details are not public in order to avoid misuse by assessors.

2.1.11. How is displaying of EPCs (if required) checked?

Bulgaria: Although required in legislation, it is not checked and there are no penalties for non-compliance.

Czechia: It should be done by State Energy Inspection, but their capacities on this is limited. The control on this is not on regular basis.

Hungary: Although display of EPCs in state-owned public buildings with a floor area of more than 500 m2 used by public authorities or in a certified building with a floor area of more than 500 m2 used for public purposes, for commercial, service and storage purposes, for community entertainment or cultural purposes is required, checking of displays of EPCs is not regulated, therefore it does not happen on practice.

Poland: The body acting on behalf of the minister responsible for construction, spatial planning and development and housing is responsible for EPC system in Poland. However, despite the obligation to display the EPC in a building with a useful floor area of more than 500 m^2, in which services to the public are provided, this is not checked.

Romania: Regarding the EPCs display, there is a legislative framework that imposes the obligation to display the EPC - Law 372/2005 - art. 25, for buildings with a usable area of over 250 m2 located in the property / administration of public authorities or in which institutions that provide public services operate. At the same time, for the purpose of public information on energy consumption in buildings, the certificate is displayed in all categories of buildings of public interest and utility, as well as those provided for the development of EPC, which are frequently visited by the public.

The verification of the display it is mentioned in Annex 2 to the control procedure PCC 001/2013. However, the procedure refers to the sample size check of 10% of the total EPCs and energy audit reports performed nationally; it does not explicitly refer to the requirement to check the buildings that fall under the law (e.g., for a supermarket – which is a building frequently visited by the public, if the EPC has not been developed, the control procedure does not apply, practically).

Slovakia: The State Energy Inspection appointed by Ministry can ask the building owner to comply with the obligation to display EPC on the visible place in the building and impose fines for non-compliance.

2.1.12. Who checks compliance of (1) issuing EPCs, (2) displaying EPCs, (3) validity? Is it a national/regional governmental body, local authority or private organization? What is the institutional background for control mechanisms?

Bulgaria: SEDA - a legal entity at state budget support with headquarters in Sofia that has the status of an executive agency within the Ministry of Energy.

Czechia: Only institution that can check the compliance is State Energy Inspection. Unfortunately, the prospect buyer/tenant can't check by himself the validity of the EPC, he/she can't even check its real existence, he/she can only ask officially the State Energy Inspection in case of doubts. But it is complicated process so we doubt it is being used.

Hungary: based on Act LXXVIIL of 1997 on the Shaping and Protection of the Built Environment the Chamber of Engineers of Budapest and Pest County operates an independent verification system for energy certificates.

Poland: The body acting on behalf of the minister responsible for construction, spatial planning and development and housing is responsible for EPC system in Poland. However the compliance of issuing EPCs, displaying EPCs, validity is not checked.

Romania: The State Inspectorate for Constructions - I.S.C., which is subordinated to MDLPA, verifies compliance for the elaboration, display and validity of EPCs, through the procedure PCC 001/2013 - Annex no. 2 the procedure. The procedure aims at verifying the conformity of the requirements imposed in Law 372/2005, with the subsequent modifications and updates. This procedure does not verify the display of EPC in advertisements for the sale or rental of buildings.

State Inspectorate for Construction - I.S.C. exercises state control over the unitary application of the legal provisions on the energy performance of buildings and the inspection of heating / air conditioning systems based on the procedure it has developed, PCC 001/2013. The control aims at the annual verification, by sampling, of at least 10% of the energy audit certificates and reports, registered annually in the "specific databases".

Slovakia: The State Energy Inspection appointed by Ministry checks the compliance of issuing EPCs, displaying E0PCs and validity.

2.1.13. What are the penalties/sanctions for non-compliance? Are they effective (i.e. do they deter people from non-compliance?)

Bulgaria: There are no effective penalties for non-compliance. In principle, the license of auditing companies could be suspended if there are severe discrepancies and low quality of the audits, but that is hard to follow and prove. In practice, audits of suspicious quality are returned to the auditing companies for amendments, but of course, not all audits are checked. (Personal opinion: if audits are issued for a certain programme, which is the most common case, the low quality is sometimes an accepted compromise so that the programme is not slowed down.)

Czechia: State Energy Inspection can check whether EPC calculations are correct, whether EPC is being calculated according to project documentation. If not -> they request correction. This check is mandatory in buildings over 750m2.

- SEI can't request correction on the level of building (-> this is responsibility of the building authority, SEI can only request correction of the calculations) -> correction at building level must be issued by the building authority office.
- SEI can't even inform the building owner, that there was an issue with the EPC calculations concerning his/her property (because of GDPR issues)
- SEI can also fine the energy specialist responsible for the calculations.
- In severe and repeated cases, the inspection can launch procedure to remove permissions of the energy specialist to issue EPCs.

Hungary: Based on the penalty policy of the responsible authority (Chamber of Engineers of Budapest and Pest County) a fine can be imposed, but only if the certifier cannot prove that the irregularity attributed to him or her cannot be considered unlawful or unauthorised (for example, the certificate was made by someone else using his or her name in vain). The amount of the fine that may be imposed is at the discretion of the competent authority, based on the amount of the of the useful floor area. If the certificate differs from the actual value by two grades (energy classes), the pursuit of the profession must be prohibited.

However, penalties are rare. In 2020 more than 4000 EPCs were checked, and sanctions were applied in only 12 cases (3 of which had to pay a fine, the others had to correct the detected error).

Poland: As the compliance of issuing EPCs, displaying EPCs, validity is not checked there is no penalties/sanctions for non-compliance defined by law. The only penalty in the form of a fine applies to persons who provide false information in order to obtain a license to issue an EPC.[37]

Romania: The sanctions of non-compliance are provided in Law 372/2005:

o regarding the elaboration of the EPC for the sale of the buildings, there are sanctions applicable to the notaries, of relative nullity of the sale-purchase contracts, if there is no EPC elaborated before the transaction, although is not their obligation that de EPC to exist before the perfectation of the sale-purchase contract;

o regarding the elaboration of the EPC for rent, there are no sanctions stipulated in the law;

o regarding the non-display of EPCs, both for public buildings with a total usable area of over 250 m2, and for those in the announcements of sale or rental of buildings (but which do not have a verification procedure), the penalties are financial sanctions, stipulated in the Law 372/2005;

o regarding the validity of the EPC, there are no sanctions provided in the law, in case of exceeding the validity term, but the sanctions can be applied as if the EPC is not elaborated;

o regarding the validity of input data and results, there are validation checks of input data and output data, but only for new buildings, and aim at form checks and not content checks (e.g., the classification in the energy class is checked as a result, but it is not checked if the energy class obtained is correct calculated and if that building is really in that energy class). Because compliance is not effectively verified for this case, sanctions for non-compliance do not apply;

o EPCs for sale and purchase are widely required nationwide, due to the legal implications of relative nullity of the sale-purchase contracts applicable to notaries and which requires EPCs from the owners, who have the legal obligation, in fact;

o EPCs for rent are no longer required from 2017, because there are no legal sanctions in case of non-compliance.

There are EPCs displayed on public buildings and on those frequently visited by the public, but not on all (partial compliance), and the verification for the min. 10% of the EPCs elaborated annually, which should be performed by the I.S.C. (of which it is assumed that a part of the buildings are from the private sector), it is obvious that it is insufficient, and does not cover the situation of a public building/frequently visited by the public which does not have an EPC (to be part of the 10% legally required to be verified).

Slovakia: The penalties/sanctions for non-compliance are rare. The fines for non-compliance according to Law can be 200 - 5 000 € for assessors and 500 - 3 000 € for building owners. The statistics are not publicly available but it is supposed that the penalties are very rare.

[37] Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497).

2.1.14. What administration is responsible for issuing sanctions? Who decides on the sanctions?

Bulgaria: SEDA is the administration responsible for penalties for non-compliance, which are however hardly ever applied.

Czechia: State Energy Inspection

Hungary: The same which performs controlling activities: Chamber of Engineers of Budapest and Pest County

Poland: The body acting on behalf of the minister responsible for construction, spatial planning and development and housing is responsible for issuing sanctions. (Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497)).

Romania: The elaboration of the EPC before the sale-purchase contracts are requested by the notaries, whose contracts are subject to relative nullity, according to the Romanian Civil Code, basically as a fulfillment to the legal obligation of the building owners. There are no sanctions for the owners of the buildings, except for the previous stage of completing the sale-purchase contract, of display in the sale-purchase announcements.

For the other sanctions stipulated in the law, I.S.C. is responsible, but within the limit of verified samples (minimum 10% of the EPCs elaborated annually).

Slovakia: The State Energy Inspection appointed by Ministry is responsible for issuing sanctions.

2.1.15. What are the requirements (education, independence, etc) for certified assessors?

Bulgaria: A company can be certified for issuing EPCs if it has at least three certified experts (architect/constructor; electrical engineer; and HVAC engineer). These experts must pass a special training course and take an exam. The curricula of the course is set by a special ordinance to the Energy Efficiency Act and the universities that are accredited to provide these courses are fixed with this ordinance. However, there haven't been such courses for 10 years now.

Czechia: Energy specialists are certified persons who passed the professional examination by the Ministry of Industry and Trade.

Hungary: The certificate can be prepared by a professional with the right to certify the energy performance of a building. The qualifications are issued and registered by the Hungarian Chamber of Engineers or the Hungarian Chamber of Architects. The certification entitlement, indicated by the letters TÉ in the Chamber's register number, can be obtained with a degree in engineering and at least one year of professional experience, after passing the qualification examination. After passing the exam, certifiers are entered in the Chamber's register, which is publicly available

Poland: Certified assessor is a person who graduated from higher education with the title of an engineer, architect engineer, landscape architect engineer, fire engineer, master engineer architect, master engineer landscape architect, master fire engineer or master engineer; or by a person who has completed higher studies other than the above and postgraduate studies, the program of which takes into account issues related to the energy performance of buildings, energy audits of buildings, energy-saving construction and renewable energy sources; or by a person who has building qualifications referred to in the Act of July 7, 1994 - Building Law.

Romania: Energy auditors for buildings, who are considered independent experts, have legal competences in the certification and energy audit of buildings. They are certified by the Ministry of Development, Public Works and Administration, as the competent authority in the field of construction, based on a regulation: "Regulation on certification of energy auditors for buildings", published in the Official Monitor of Romania, Part I, no. 683 of October 8, 2010, with subsequent amendments and completions, issued by Order of the Minister of Regional Development and Tourism no. 2237/2010, with subsequent amendments. The Regulation stipulates the conditions, the method of attestation, the obligations and responsibilities of energy auditors for buildings, as well as the manner of periodic confirmation or suspension, as the case may be, of their right to practice.

Slovakia: Four types of assessors are certified in Slovakia. The specific assessor is needed for thermal envelope, heating and DHW systems, ventilation/cooling and lighting. The special exam is required for each of the assessors' types.

To be certified, the assessor must prove a second-level university degree in the field of construction or in the field of architecture. For lighting and electrical installation a second-level university degree with the electrotechnical focus.

Professional experience of at least three years in the relevant field is required.

2.1.16. Who issues the license?

Bulgaria: Sustainable Energy Development Agency (SEDA)[38]

Czechia: The Ministry of Industry and Trade.

Hungary: The Hungarian Chamber of Engineers.

Poland: The body acting on behalf of the minister responsible for construction, spatial planning and development and housing is responsible for granting the EPC license. The license is obtained by entering into the list of persons authorized to issue EPCs in the central EPC register. (Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497)).

Romania: Energy auditors for buildings are certified by the Ministry of Development, Public Works and Administration (MDLPA), as the competent authority in the field of construction.

Slovakia: Slovak Chamber of Civil Engineers (SKSI) provides voluntary training and obligatory exam and it also certifies and maintains the list of certified assessors.

2.1.17. Is there a quality assurance mechanism for certified assessors? Is there a regular mandatory training? Who is responsible for organizing these trainings?

Bulgaria: For many years already, trainings for energy auditors haven't been done. New training is required as the software for building modelling has been updated. There are 6 universities which are accredited to perform such trainings, there is also a fixed training program, but at this stage no training materials are elaborated. Training materials and training of trainers for energy auditors are urgently needed, so the universities can organise training courses.

Czechia: Yes, they regularly need to educate/train themselves. There are several subjects providing training under the supervision of the Ministry of Industry and Trade.

[38] https://www.seea.government.bg/bg/

Poland: There is no a quality assurance mechanism for certified assessors. A regular mandatory training is not required. A person licensed to issue an EPC may lose it after finding irregularities during the verification of the EPC performed by them. (Act of August 29, 2014 on the energy performance of buildings (Journal of Laws of 2021, item 497)).

Romania: The EPC and energy audits prepared by the authorized energy auditors are targeted by the I.S.C. control, by survey, for at least 10% of the certificates and energy audit reports, registered annually in the specific databases. According to the MDRT Order no. 2237/2010, with subsequent amendments and completions, to extend the validity of the energy auditor's practice right for buildings, which is extended once every 5 years, it is necessary to prepare an activity memorandum to show explicitly the activities / actions taken regarding continuous training in the attested field, as the case may be, by graduating specialized courses, participating in scientific events in the field, organized in the country and / or abroad, publishing scientific articles / communications in the field, participating as a teacher in postgraduate training courses.

The trainings can be organized by the universities, in the form of postgraduate or master courses, or by the representative profile associations, in the form of continuous training courses / advanced training courses.

Slovakia: There is no regular mandatory training required. Voluntary training is provided by Slovak Chamber of Civil Engineers (SKSI).

2.1.18. What are the shortcomings/bottlenecks of the system? What should be changed and how? Please evaluate each specific bottlenecks.

Bulgaria: A mandatory requirement for residential buildings to have a Building Passport (that includes Energy Audit) is postponed numerous times and is still not into force. Thus, energy auditing of multifamily residential buildings in not done unless the buildings apply for grant financing. As soon as possible Building Passports should become mandatory, even if in a simplified form (but still including EPCs)

Czechia: Insufficient capacity of State Energy Inspection, problems with global compliance checks (vs. only targeted checks) – it would be much better to just slightly check at least 60% of EPCs (just for values being in range or not) automatically, than checking around 5% of the certificates thoroughly.

o Not functioning database of EPC – it is a database that just gathers the data and no capacity is allocated to the analysis of the data or improving of the database to provide useful information on building stock.

o Noone can check the existence or validity of the EPC in question - besides State Energy Inspection, but just under the official request.

o Some problems are being made due to new legislation or to changes of the legislation – mainly in terms of calculation methods. This means that there are several versions of the EPCs for the same building with different results based on the year of the calculation.

Hungary: It is a question what is considered statistically significant sampling amount. In Hungary it is 2.5% of EPCs produced each year. Checking does not happen through recalculating ("recertifying") because of capacity problems, basically a reality check is done. Validity of input data are checked by on-site visits in 0.5% of the EPCs/year. Also, the legislation does not provide for the financial resources from which the Budapest Chamber of Engineers has to carry out its statutory tasks. It is usually funded by government grants. The verification of certificates and the related organisational, managerial, financial, IT and other tasks are carried out by about 70 people. (ref.: Annual report 2020, Budapest Chamber of Engineers). This is the major bottleneck for a wider control for EPCs.

Social acceptance and awareness should be increased; for this the mandatory indication of the energy performance of buildings in advertisements (when sold or rented) could be a proper tool.

Poland: The main bottlenecks of the EPC system in Poland include: no obligation to prepare an EPC for a new building commissioned for use, no practical fulfillment of the obligation to publish data from EPC in advertisements, no verification of knowledge and skills of people licensed to issue EPCs, no practical verification of EPC correctness.

Necessary changes should include, as appropriate: modification of the building code to introduce the necessity to issue an EPC for each new building; introducing penalties / sanctions for failure to include EPC data in advertisements; introducing examinations to obtain an EPC license and the obligation to conduct regular training; introduction of technical solutions allowing for automatic control of data from EPC in a central register.

Romania: Regarding the quality of energy performance certificates and energy audits, the limits of the current control procedure are noted, especially regarding the quality control of the performed energy calculations. At the same time, the precariousness of the evaluation method in the case of the existing buildings is noticed.

These shortcomings are also because the control procedure PCC 001/2013 was not updated subsequently to the update of the other technical regulations and legislative provisions, although even in its content it is specified to update it to a maximum of five years.

A nationally developed calculation software would probably facilitate both the verification process and the actual elaboration of correct and complete projects in terms of energy analysis, which will then be transposed into real buildings whose energy consumption to actually be nearly zero.

Slovakia: There is a lack of regular mandatory training, the credit system as in the neighbouring countries would improve the quality of assessors.

The legislation does not stipulate that the assessment must be performed personally by a certified assessor. This leads to low quality if the company employs cheap, non-certified persons who perform the assessment at a low cost. It competes with a certified assessors who issue very few EPCs.

Certified assessors may have a conflict of interest because they may be designers and issue certificates for the same building they have designed.

2.1.19. What is the reason behind the less functioning parts of the system?

Bulgaria: Mostly lack of political will to enforce building certification due to the perception that it would be rather unpopular due to the cost inflicted on the building owners. There is also a certain lack of communication with building owners who do not understand the benefits of the (quality) EPCs.

Czechia: In some cases, lack of money.

Lack of interest in EPCs (energy efficiency in general) – no real trust that this is something of real value for the owner/buyer/tenant.

Hungary: Not enough resources provided by the state for a well-functioning system, as well as a general lack of understanding among market players of the importance and usefulness of EPCs. Also, the fee for an energy certificate is regulated by the 176/2088 decree, setting the amount of the certification fee maximum HUF 5500 (approx. 15 EUR) per hour started, for which certifiers often don't go for on-site visits. This makes the quality of EPCs unreliable. (ref.: Annual report 2020, Budapest Chamber of Engineers)

Poland: Financial considerations seem to be the primary reason behind the less functioning parts of the system. The Ministry responsible for the EPC system, by introducing appropriate simplifications, hoped to reduce the costs of the system operation both for end users and for the entity responsible for this system. In addition, it was found that the EPC system should be simplified for end users even at the cost of implementing the energy efficiency policy.

Romania: In general, the market does not understand the usefulness of the Energy Performance Certificate (in the sense of an information instrument) and does not particularly accept it. It is perceived as an extra element, required under certain conditions.

As long as there will be breaches in legislation and especially in sanctions, it will be used, regardless of whether is concerning the public authorities (as is the case of ANAF with the EPCs stop request when registering leases after 2017, although it is not quite their legal obligation, but a mechanism similar to that created for public notaries, with sanctions both for the owner and for the notary in case of non-compliance, it might work) or owners / administrators of buildings (e.g. public or frequently visited by the public) that do not display the EPC.

Slovakia: Legislation and missing tools for assessors.

2.1.20. Is there compliance rate monitoring in your country? If yes, what is the compliance rate in case of EPCs?

Bulgaria: There is no compliance rate monitoring for existing residential buildings.

Czechia: No public statistic available on this. But in case of rent/sell of the property, the most common way is to display class "G" – meaning in majority of cases not issuing EPC at all.

Hungary: Yes, based on the checked certificates, provided by the responsible authority. In 2020 e.g. 72% of EPCs were of acceptable quality, 11% both incomplete and incorrect, 9% incomplete, 6% incorrect, 2% other. (ref.: Annual report 2020, Budapest Chamber of Engineers)

Poland: There is no compliance rate monitoring in Poland. Nevertheless, there are delays in implementing the provisions of subsequent versions of the EPBD into national law, e.g. the requirements contained in the 2018 EPBD have not yet been fully implemented.

Romania: No. Until INCD URBAN INCERC (former Institute for Research in Construction and Construction Economics - INCERC) was coordinated by MDLPA (former Ministry of Regional Development and Housing), the certificates were sent to this research institute and were used in some projects – e.g., ENERFUND, undertaken in Romania by the research institute. The National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development – INCD URBAN INCERC, now is conducted by the Ministry of Research, Innovation and Digitalization - MCID. Subsequently to this change, EPCs which were were sent to INCD URBAN INCERC, started to be transmitted directly to MDLPA, currently not being public any type of information related to it, not even statistically processed information based on them being available.

However, this issue is known and considered within the SRTL (the Long Term National Strategy) within chapter VII, 5. Policies and actions that address market deficiencies.

Slovakia: There is no official compliance rate monitoring.

3. Policy support: level of ambition, framework conditions, financial and technical support systems

3.1. Which governmental body/ies is/are responsible for EE/buildings policy in your country? Is it a single responsible body, or is responsibility fragmented?

Bulgaria: The responsibility is fragmented:

The Ministry of Regional Development and Public Works (MRDPW) is responsible for development and introduction of technical regulations and standards in the field of energy parameters of buildings, implementation of projects related to renovation of residential buildings and improvement of energy efficiency of residential buildings; regulation of construction process – design, construction, supervisor, commissioning; Spatial Planning Act and related ordinances. It is also responsible for housing policies in general, although these have been neglected in the past years.

The Ministry of Energy (MoE) is responsible for development of regulation about energy norms, energy auditing, implementation on building renovation project at public buildings; The Minister of energy is responsible for the development of the secondary legislation related to the Energy Efficiency Act and Renewable Energy Act.

The Ministry of Environment and Waters and the Ministry of Social Policies are responsible for certain support programmes (clean air and fuel subsidies, respectively), which are relevant to the building policies.

The Sustainable Energy Development Agency (SEDA) is responsible for the implementation of the policies.

Czechia: Unfortunately, the building policy is fragmented.

- Ministry of Industry and Trade is responsible for: Energy policies (efficiency, savings, renewables…), construction materials and energy legislation (bills, decrees, norms…) including the EPC legislation.
- Ministry of Regional Development is responsible for the construction legislation around the building permit procedure. Also for the housing policy.
- And Ministry of Environment has most of the money in the support schemes for building renovations – especially in the housing sector.

Hungary: Until May 2022 the main responsibility of the Hungarian energy policy, including energy efficiency and building policy lied at one ministry: the Ministry for Innovation and Technology. After the parliamentary elections in April 2022 although the previous government stayed in force, the administration has been greatly restructured, and responsibility has become fragmented among different ministries. At the time of the present study the final structure and specific responsibilities are not yet known.

Poland: The responsibility is fragmented among the following bodies:

a. Ministry responsible on construction (currently it is the Ministry of Development and Technology responsible on implementation of EPBD)[39]

- conducting matters related to the energy efficiency of buildings, including: the energy performance of buildings, keeping a central register of the energy performance of buildings and matters related to the verification of energy performance certificates and the development of strategies and policies to improve the energy efficiency of buildings;
- conducting matters related to the development and use of prosumer and distributed energy as well as onshore wind energy, including substantive and organizational support for inter-ministerial teams conducted in this regard by the minister responsible for economy;
- handling matters related to the preparation and implementation of programs and projects supporting the development of prosumer and dispersed energy under the National Reconstruction Plan and other EU funds;
- handling matters related to the development and use of renewable energy sources and the transformation towards low-carbon energy;
- handling cases related to technical and construction regulations, in terms of technical conditions to be met by buildings and their location, in particular regarding authorizations in cases of derogations from the above-mentioned regulations;

b. Ministry responsible on energy (currently it is Ministry of Climate and Environment in the scope of implementation of EED and of RED)[40]

- initiating, developing and coordinating the implementation of strategies and programs within the competence of the Minister in relation to the energy, climate and environment sections, in particular the state ecological policy, energy policy of Poland and the national plan for energy and climate, their updating and monitoring of implementation;

[39] https://www.gov.pl/web/rozwoj-technologia/departament-architektury-budownictwa-i-geodezji; https://www.gov.pl/web/rozwoj-technologia/departament-gospodarki-niskoemisyjnej2
[40] https://www.gov.pl/web/klimat/departament-strategii-i-planowania-transformacji-klimatycznej; https://www.gov.pl/web/klimat/departament-odnawialnych-zrodel-energii; https://www.gov.pl/web/klimat/departament-cieplownictwa

- initiating activities in the field of citizenship energy;
- coordinating opinions on draft strategies and programs prepared by other ministries and offices;
- implementation of the state's energy policy in the field of energy security, including the use of locally available energy sources;
- implementation of tasks in the field of energy efficiency, including eco-design and energy labelling.

Romania: The Ministry of Development, Public Works and Administration (MDLPA) is responsible with the construction sector in Romania, elaborates the applicable legislation, is the authorizer of the applicable technical regulations, including those related to the energy performance of buildings. The State Inspectorate for Construction (I.S.C.) it is subordinated to the ministry, as a control institution that exercises state control over the unitary application of legal provisions on energy performance of buildings. The ministry also has in its subordination agencies that manage the implementation of projects to increase energy efficiency in buildings - there are eight Regional Development Agencies (ADRs), which fulfill the function of Managing Authority for the Regional Operational Program (POR): POR 2021-2027, POR 2014-2020, in which European non-reimbursable funds are managed, including for increasing the energy performance of buildings. MDLPA currently manages Component 5 - Renovation Wave within PNRR (National Recovery and Resilience Program).

The MDLPA directly manages the process of attesting the energy auditors for buildings. It is specified that the organization of this ministry has changed over the years, in the present study are used the names used for this ministry at the time of elaborating the legislative document or the technical regulation to which the reference is made. Thus, for certain periods of time the names of this ministry were also: MLPDA – Ministry of Public Works, Regional Development and Administration; MDRAPFE - Ministry of Regional Development, Public Administration and European Funds; MDRAP - Ministry of Regional Development and Public Administration; MDRT - Ministry of Regional Development and Tourism; MDRL - Ministry of Regional Development and Housing.

Slovakia: Responsibility is fragmented between Ministry of Transport and Construction and Ministry of Economy of the SR.

3.2. How would you evaluate the institutional/administrational capacity for (1) ensuring on-time transposition and implementation of EPBD/EED, (2) control mechanisms for checking compliance?

Bulgaria: The responsible ministries face severe capacity crisis and most often resort to external experts for advice and support for the transposition of the EU legislation. The same lack of capacity is evident in the implementation process, as illustrated by the failure to implement the nZEB requirements.

Control on implementation of energy efficiency policies, the quality of energy auditing process and the quality of the EPCs issuance process is provided by Sustainable Energy Development Agency (SEDA), a subsidiary by MoE. Although this is the institutions with the biggest capacity and expert knowledge on the matter, the current human and expert capacity is not sufficient to cover any increase in quantity of building renovation and the related certification process.

Czechia: Very limited. Just a few people responsible for implementation of current policies as well as for transposition of new. No true priority is given to energy efficiency. Quite strong resortism – the overlaps of building policies makes it hard to find a common ground and to split responsibilities as well as money.

Hungary: Generally the administrational capacity is limited.

Poland: This capacity is limited by the existing law and currently is appropriate to the introduced control mechanisms. The capacities for ensuring on-time transposition and implementation of EPBD/EED the central level are limited to very small units in the Low-emission Economy Department of the Ministry of Development and Technology and in the District Heating Department of the Ministry of Climate and Environment.

The control mechanisms for checking compliance are being developed by the transferring of EPBD Recast II into Polish Law on energy performance of buildings (planned for 2023) and by setting-up The Central Register of Buildings Emissions (CEEB), which was adopted on the basis of the Act of October 28, 2020 amending the Act on supporting thermo-modernization and renovation and certain other acts (Journal of Laws of 2020, item 2127). The main objectives of the act prepared by the Ministry of Climate and Environment are the fight against smog and energy poverty and the improvement of the energy efficiency of buildings. The act will result in the elimination of dust emissions from the so-called low emission, i.e. from the communal and housing sector (these are most often individual households, small local boiler houses, workshops and service facilities). The implementation of these goals is to be supported primarily by the launch of the CEEB and improvement of the operation of the Clean Air Program and the Stop Smog Program. The inventory is to cover about 5-6 million buildings, initially it will

be 500 thousand buildings per year. The general inventory of buildings will be combined with the submission of written declarations on heat and combustion sources - by the end of 2021.

The CEEB is an IT tool for inventorying low-emission sources in buildings. This system will collect key information on the sources of emissions in the municipal and housing sector. The system is also to enable the collection of data on the energy performance of buildings and information on forms of public aid (subsidies, preferential loans) granted for thermal modernization or replacement of boilers in buildings.

The criterion for entering a building into the system will be the power of the source, regardless of the legal form of use of the building. Therefore, CEEB will cover not only residential buildings, but also public buildings, including small local heating plants or small production plants, provided that the rated thermal power of the fuel combustion source used does not exceed 1 MW.

Systematic filling the above mentioned data bases with entries will significantly increase the quality of energy performance data about all types of buildings.

Romania: There are specific resources allocated to ensure control mechanisms. However, although strong efforts have been made, things are not working properly for certain topics:

o public authorities do not request the implementation of nZEB in new buildings and are not sanctioned, although they are liable to sanctions from the legal point of view.

o I.S.C. do not check the activity of energy auditors for buildings efficiently, although there is a national verification procedure, being one of the reasons why EPCs do not have user credibility (Nota bene: there are energy auditors who certify or elaborate energy audits in buildings without making the inspection on the site).

o it is not verified to comply with the MEPRs in new buildings in the design process, because there are gaps in the legislation; at present, the project verifier could verify this aspect, but there is no specific obligation. At the same time, in the future expected legislation, in the new urbanism code the individual residential buildings (within the Consequence Class 1 - CC1) are not covered by the provision regarding the obligation the project to be verified by the verifier, which means that the obligation of the MEPRs accomplishment remains with the designers, without any procedure for checking or controlling compliance, up to the EPC elaborated for the reception of the works, when possible interventions become late and expensive.

o the energy auditor is not involved in the design process of new buildings, although it is best indicated, from the point of view of the required competences for the holistic approach, to coordinate the design team in order to identify, propose and implement the package of measures to actually lead the building to NZEB.

o the EPC is not displayed in the sale-purchase ads because although there is legal obligation, there is no mechanism of verification and sanction of those responsible for display, than for a small fraction of the buildings that fall under the law provisions.

The Romanian national framework conditions are generally favourable to achieve the objectives of the EPBD, however, where weaknesses were noted during implementation, reinforcement should be applied.

Last but not least, the dynamics in this field must be considered, some deficiencies have also appeared due to the rapid change of requirements, as they are defined at the European and/or national level, e.g., such as identifying the need to involve an energy auditor/consultant energy (?!) in the process of designing a new building, in order to ensure control from the holistic energy perspective (ensuring the use of the solutions package suitable for the respective building in the design process). Further, for the technical solutions considered from the energy perspective is required to be applied and designed by designers by specialties: architecture, HVAC installations, DHW and lighting, respectively RES), in order for that building to actually be nZEB in operation.

Slovakia: Timely transposition and implementation of the EPBD has so far been good for implementing the EPBD. Institutional / administrative capacity is underestimated. Ministries lack the manpower to develop the legislation, methodology and system, as well as to manage compliance control mechanisms.

One reason is that financial and professional investments in implementation of EU legislation are the same in small countries and in large countries. There is a shortage of experts and funding in small countries, so tools and methodologies developed at EU level would help to improve quality.

3.3. Are there financial support tools/programs to incentivise achieving MEP requirements? Are there any policy/financial incentives that specifically trigger major renovation?

Bulgaria: The National Programme for Energy Efficiency in the Multifamily Buildings, currently being transferred to the National Recovery and Resilience Plan (NRRP), as well as limited sub-programmes of the Regional Development operational programme, provide 100% public grant for achieving the MEPS of Class C, achieved via whole-building renovation approach. However, its scope is very limited. There are no other support tools, and nothing relevant to single family houses, with the exception of a "soft" loan provided by one of the commercial banks under the Regional Development OP, for which there is absolutely no interest.

Czechia: Basically all support schemes incentives going beyond the minimum requirements (be it NZEB for new construction or minimum savings for renovations. Plus usually: the higher the standard, the higher the support one can get. So clearly motivational. No support on just reaching the minimum.

Hungary: Currently there are no financial support programs specifically for energy renovations of residential buildings (there is a general subsidy supporting any kind of home renovation, available in 2021 and 2022. but there are no energy savings related criteria).

Poland: Several financial support programs has been developed to incentivise achieving MEP requirements. One of the most common one for residential buildings is Thermomodernization and Renovation Fund[41]. Some of the programs support other types of measures. The support for single family buildings under the "Clean Air" program is focused on replacement of coal fired boilers, however the the modernization of the building according to the above mentioned rules is also eligible cost of building's renovation.

Romania: There are programs which incentivise achieving MEPRs, such as Regional Operational Program 2021-2027. In the previous exercise of this program, POR 2014-2020, Measure 3.1.B applicable to the existing public buildings, the requirements defined for nZEB at national level were eligibility criteria for obtaining the financing. Such requirements applied to the existing buildings lead implicitly to major renovations, and even to deep renovations.

Currently, the National Plan of Redress and Resilience (PNRR) is underway, which by Component 5 - the Renovation Wave, supports the moderate or the deep renovation of the existing, residential and public buildings.

The financing is not necessarily directly correlated with the implementation of the MEPRs, in the sense that only for the major energy renovation of a building, within the elaborate energy audit MEPRs must be provided for existing buildings, but this obligation is not required within moderate renovations/ of small scales, thus identifying a gap, but also an opportunity. Thus, these financing (e.g. from European funds) can be directly directed and conditioned by the compliance with MEPRs in the respective renovation building (e.g. could become eligibility criteria in the financing guides, at least those who aim using European funds - and this could be specified directly in the EPBD Directive).

Slovakia: MEP requirements are mandatory for new buildings. There are several financial instruments that can be used to trigger major renovation, which also require to achieve MEPR, e.g.:

Since 1993 - financial instrument of the state budget with the aim of improving the level of housing (ŠFRB - The State Fund for Housing Development, agency under the Ministry of Transport and Construction) - mainly for thermal insulation with the required savings and elimination of system defects in apartment buildings built by prefabrication technology).

[41] https://www.bgk.pl/programy-i-fundusze/fundusze/fundusz-termomodernizacji-i-remontow-ftir/

Support for the renovation of family houses in the form of a subsidy for thermal insulation and construction of NZEB. Some grants for systems for RES.

Support for the renovation of family houses in the frame of Recovery and Resilience Plan Slovakia is under preparation.

3.4. Are subsidies linked to MEP requirements? If yes, how are they checked and monitored? Do they usually go beyond MEPR? (by how much? For new construction? NZEB-10%,20%?)

Bulgaria: As explained above, the subsidies for renovation are linked to the MEPS, as compliance is proven by the energy audit done before the actual renovation. There was no requirement for a secondary audit or any other means of verification; this is however possible to be slightly improved in the new programme under the NRRP. There are no subsidies for new buildings.

There are certain tax rebates for achievement of higher classes in case of renovation, but they are of limited volume as the property tax is quite low in general.

Czechia: Basically all support schemes incentives going beyond the minimum requirements (be it NZEB for new construction or minimum savings for renovations). Plus usually the higher the standard, the higher the support one can get. So clearly motivational.

For new construction it usually starts at NZEB-20%, and continues further to passive buildings requirement or energy-active/plus buildings.

It is being checked by the provider of the support at project level, with standard procedures.

Hungary: Currently there is no available public subsidy in Hungary targeting residential energy efficiency renovation. There is a support program starting in January 2021 ending in December 2022, which provides 50% non-refundable grant for any kind of home renovation for families with children. But there are no energy performance criteria, as the grant is not linked to energy saving measures, it is available even for aesthetic renovation.

Poland: The existing financial tools/programs domestic and EU basically require in case of renovation of multifamily and public buildings to follow the MEP in terms of thermal transmittance of envelope partitions, however the requirement of a non-renewably primary energy demand indicator do not have to be met.

Romania: The majority of available financing for the energy renovation of the buildings, managed by the state, have performance requirements that lead the building to major renovation, therefore, implicitly, to the need to comply with the current MEPRs in force.

Regarding their verification, the energy audit of the building is considered to be used as reference, from where the necessary information is extracted. Even if the MEPRs must be ensured for major renovations, the MEPRs is not necessarily verified in the stage of obtaining the financing, but rather are verified the requirements imposed by the financing guide/ indicators of the project call (e.g. reducing the specific annual consumption of final energy for heating, reducing the consumption of primary energy obtained after the implementation of the project etc.), therefore, it can be stated that the MEPRs compliance is not verified punctually (e.g., one of the current requirement of the MEPRs is the value of the specific consumption of primary energy for heating, not the value of the final energy, which can be a project indicator).

The monitoring for the achieved indicators of the project call is usually mentioned in the financing guides, but there are no specific monitoring procedures, so, usually the monitoring remains at the level of obtaining the financing, without actually performing it after the project implementation.

It is emphasized the need to correlate the request of MEPRs as indicators of the call for projects in the financing guides, as well as the elaboration of standardized monitoring procedures, which can be used after the implementation of solutions.

No subsidies are linked with new buildings (nZEB as MEPRs) although this aspect is expected to facilitate the acceptance of the implementation of the concept in the construction market.

For existent buildings, there are programs which incentivise achieving MEPRs, such as Regional Operational Program 2021-2027. In the previous exercise of this program, POR 2014-2020, Measure 3.1.B applicable to the existing public buildings, the requirements defined nationally for nZEB were eligibility criteria for obtaining the financing. Such requirements applied to the existing buildings lead implicitly to major renovations, and even to deep renovations.

Slovakia: The recommended values (NZEB level) instead of mandatory values are mostly achieved by new and renovated buildings, so that they go beyond the MEP requirements, because they are not obligatory. MEP requirements for primary energy are quite strict, it is not easy to go beyond.

3.5. Is there any technical support system initiated/supported by the government, for residential building owners to help comply with EPBD requirements?

Bulgaria: The technical support for participation in the renovation programmes is provided by the municipalities, which also conduct the procurement procedures and check the quality of the

energy audits. They however usually lack the institutional and expert capacity to provide quality large-scale subsidies, and they do not have any additional financing for that. One-stop shops are expected to be financed under the NRRP, but mostly acting as information centers.

Czechia: There are "EKIS" – Energy Consultation and Information Centres – private entities receiving public support to provide free 1-2 hours consultancy services to citizens in terms of energy efficiency of their properties. They can provide basic advices, inform on possible subsidies etc.

Hungary: The National Network of Energy Experts is operated by the Hungarian Chamber of Engineers. It provides information and advice on home energy renovations through online consultations for free.

Poland: Indirectly and not mandatory to use free of charge is the public network of 78 energy advisors located in each of 16 regions in the Voivodships Funds for Environment Protection, developed under the EU project. The National Fund for Environment Protection has launched the publicly accessible platform of non-public energy consultants, who primarily are available for owners of single family houses, who would like to use the state support program Clean Air. The cost of consultancy up to 200€ is eligible under the eligible cost of thermomodernization being subject of support by this program.

Romania: A sort of technical assistance can be considered to be assured when the building is sold, through the EPC required to be elaborated. In the actualized version proposed for EPC in the revised methodology, the EPC's role will increase, in the sense that it will become a stronger information tool and implicitly a tool for technical assistance, regarding the energy profile of the building, but also to what can be improved, with what estimated costs and effect.

At the renovation, the energy audit represents a form of technical assistance, being the specialized document that guides the team of designers towards reaching specific energy performance targets.

A direct technical support system initiated/supported by the government, with the role of direct information of the owner of the building, regarding what measures can be taken to increase the energy performance of the building does not exist currently. The One-stop-shop is mentioned and proposed to be initiated and developed for several time horizons (2030/2040/2050) in the National Long Term Renovation Strategy (SRTL), without being currently applicable in Romania.

Slovakia: EPBD requirements for new buildings are mandatory, there is no support system. The support system exists for renovation.

3.6. Are there any mechanisms to ensure that guidance and training are made available for those responsible for implementing the EPBD? If yes, describe its main features (who is it available to, in what form, what is the training/guidance about, etc).

Bulgaria: No, despite all efforts, there is no financing for guidance and training for any participant in the renovation value chain. Such services are usually provided by the NGO sector under EU financing, sometimes supported by branch organisations, industrial associations and/or educational institutions. There are limited efforts by SEDA to organize training courses for different stakeholders but its capacities, as mentioned above, are limited. There is no continuous professional development system in the construction sector. There haven't been training courses for licencing of energy auditors for 10 years now.

Czechia: Energy specialists regularly need to educate/train themselves. There are several subjects providing training under the supervision of the Ministry of Industry and Trade. Usually the news in legislation (decrees and norms) and calculations are being presented.

Hungary: Energy assessors must fulfil a training for accreditation. Further regular trainings are available, but not compulsory, it is not a condition to remain an assessor. Industrial or professional organizations sometimes organize trainings for designers, technical inspectors, installers on energy requirement, but they are not organized by state and not mandatory.

Poland: No.

Romania: In the technical universities, the research institutes, respectively in dedicated non-profit organizations, there are implications in H2020 financed projects, which have as objectives the formation of specific competences directly related to the provisions of EPBD. Through these projects, mechanisms have been created and developed to provide guidance and training, targeting both representatives of public authorities and specialists, with the involvment of which (energy auditors for buildings, designers, energy managers etc.) the requirements are implemented.

Within EnTReC | Energy Transition Research Center (utcluj.ro), affiliated with the Technical University of Cluj-Napoca, projects that support energy efficiency are managed, including in the buildings sector. Between 2014-2017, the was developed the project, MEnS (Meeting the Energy Skills), 649773-H2020-EE-2014-CSA, funded through the HORIZON 2020 program, of which one of the main objectives was to increase the knowledge and skills for more than 1800 Professional (within the consortium) in nZEB Design.

Several research projects funded through HORIZON 2020 program were conducted also by the national research institute URBAN INCD INCERC: ENERFUND, MATES-nZEB etc.

Also, there is a non-profit association Cluster pro-nZEB (which is based on the projects developed by INCD URBAN INCERC), which aims to develop knowledge and promote the application of technical and management solutions for the realization of nearly zero energy buildings in Romania, respectively the development of a durable environment through the "Triple Helix" innovation model.

The aim of the Pro-nZEB cluster is to bring together key players from the building materials market, research and development institutions, educational representative organizations, public authorities, professional associations, and other organizations having a catalyst role, in order to create and improve collaborative relationships for developing and implementing in Romania the nZEB concept.

Within the cluster, a series of projects funded through the HORIZON 2020 program of the European Union were developed or are ongoing: nZEB Ready, Congregate, nZEB Roadshow, SMART4NZEB, Fit-to-NZEB, Train-to-nZEB, RePublic_ZEB, NeZeR, ZEBRA 2020.

Fit-to-nZEB (2017-2019) has developed innovative training schemes for renovating buildings at the nZEB level, with the purpose of increasing the skills of professional professionals through vocational training programs that contribute to the quality and acceleration of the energy renovation process of buildings.

Train-to-nZEB (2015-2018) pursued the development of a network of consulting and training centers in nZEB topic.

Slovakia: There is no guidance and training available for those responsible for implementing the EPBD at the level of public authorities (e.g. civil servants). The voluntary trainings for assessors organised by the Slovak Chamber of Civil Engineers (SKSI), by H2020 projects or by private companies are sometimes available.

3.7. Is there any national platform/initiative for knowledge sharing and good practice guidance related to the provisions of EPBD?

Bulgaria: There is no such a platform at national level. The website of SEDA provides links to all relevant legislation and strategic documents. The non-government sector as well as some product providers are most active in this direction, as there are distance learning platforms, specialized shops, best practice repositories, multiple publications and events (e.g. the national nZEB conference by EnEffect) organized at regular intervals.

Czechia: Not on institutional basis.

Hungary: There is a general website (enhat.mekh.hu) on energy efficiency, operated by the Hungarian Energy and Public Utility Regulatory Authority (HEA). The creation and operation of the information website launched in December 2015 is required by Act LVII of 2015 on Energy Efficiency. It does not have a specific session on EPBD, but it provides general information on the following topics:

- information material on energy audits and energy auditing (directories, information on data provision, collaborating organisations, etc.);
- financial instruments and tendering resources available to finance and support energy efficiency services and renewable energy investments;
- national and EU legislation on energy efficiency and renewable energy, strategic documents of national energy policy;
- a guide to energy conferences and other professional events;
- presentation of practical methods for renewable energy and energy efficiency, energy saving advice, behavioural patterns;
- information, awareness-raising, training initiatives, research results, technological innovations and curiosities to improve energy efficiency.

Poland: No.

Romania: Currently there is no national platform that integrates knowledge sharing, but in the technical universities, research institutes, respectively dedicated non-profit organizations there are involvements in H2020 financed projects (as detailed above), which have as objectives the formation of specific competences directly related to the provisions of EPBD, the results of the projects being, usually promoted on sites dedicated to each project, at least during the project (usually several years). The closest to what would involve such a platform is the environment created by Cluster pro-nZEB.

The need for a national platform is highlighted, which should integrate all the international and national initiatives carried out in/from Romania by the interested stakeholders (especially the area of research & development, education and public policies), which allow the dissemination and assimilation by the market of the information characteristic of the buildings energy efficiency area, to ensure as quick as possible transition for decarbonation.

Slovakia: There is not the specific national platform/initiative for knowledge sharing and good practice. Many webinars are organised for sharing knowledge and good practice by some organisations (SKSI, Buildings for Future, SKGBC, Slovak Climate Initiative)

3.8. In your opinion what additional policies/measures would be needed to achieve sufficient ambition towards zero emissions in 2050 for the residential building sector in your country?

Bulgaria: The questions requires a very long answer, and EnEffect's positions are available in the attached files. In short, the main components are:

- Political will to ensure long-term financing sufficient to achieve the goals set in the strategic documents
- Introduction of new financial instruments capable to attract private investment with optimal leveraging of public funds
- Optimisation of the MEPS and the compliance mechanisms
- Improvement of the Condominium Act enabling common action by homeowners' associations and ensuring penalties in case of non-compliance
- Ensuring quality in the energy auditing, building design and construction processes by implementing functional quality assurance mechanisms and penalties in case of non-compliance
- Monitoring of the performance of projects financed with pubic resources
- Enabling the local authorities to conduct their own housing and energy efficiency policies, including through financial decentralisation
- Improving the green public procurement practices at all levels
- Training and education at all levels
- Support for pilot projects achieving convincing results
- Large-scale professionally delivered communication campaign, both at national and at local level

Czechia: In terms of new buildings, the direction is good, predictable and goals achievable. There are few issues with the unclear calculation methodology (ie. How to use EU primary electricity factors, or how to calculate the energy provided through energy community), but achievable.

The problem is existing buildings. There can't be a same standard to achieve for existing buildings as for the new. This needs to be solved together with the main task: to ensure all buildings are (deep) renovated in next 30 years. This has not been solved yet. The costs for some owners are simply too high with payback periods well over their horizons. No politician has tried to explain why it could be beneficial to the Czech population so far.

Hungary: The topic has been assessed in detail in MEHI's Hungarian Renovation Wave study. A prerequisite for residential renovation would be the complete restructuring of the Utility Price

Reduction program, under which the whole residential sector pays a reduced price for the energy. At present, with the market prices skyrocketing, the Hungarian residents experience nothing of its effects, where one of the consequences is that they are absolutely not motivated for energy renovations. Also, a long-awaited state support program together with financial instruments (such as energy efficiency loans) would also provide a serious incentive. These are the two very basic, but most important preconditions for achieving sufficient energy savings in the residential building sector. Further proposals are included in the above mentioned study.

Poland: Introduction of energy classes into EPC, which allow to design the support schemes based on targeted class and not on the minimum required for support savings.

Extending of support schemes by mandatory monitoring of achieved energy performance level after renovation of the building.

Setting as eligible measure to be supported the training of citizens in better understanding of energy use in households and smart equipment to control energy use in households.

Romania: Considering Romania's experience in the decarbonization race, the following measures with larger applicability between the Member States are highlighted:

✓ For new buildings, it would be desirable that financial support to be provided to building owners, so that nZEB not to be associated by the market with a "chore", considering Romania's case, at least for the difference in costs between the current MEPRs (and current requirements for nZEB – for new buildings) and the proposed values for MEPRs in the revised Romanian methodology.

✓ For existing buildings, it would be advisable that al subsidies from the national budget or financing with European funds to be at least major renovations, in which case the compliance with MEPRs is mandatory (Romania's case). Formulated more generally, in case of major renovation, the financing (e.g., from European funds) can be directly directed and conditioned by the compliance with MEPRs (e.g., could become eligibility criteria in the financing guides, at least those who aim using European funds).

✓ For Romania, the corroboration between the revised methodology, with the new defined MEPRs, after the entry into force, with the cost-optimal national report is required. Considering a more general formulation, in the case of EPBD, the suggestion is to request Member States to correlate technical regulations, so that for each national review of MEPRs to be a subsequent update of the cost-optimal calculation.

✓ A nZEB energy compliance study would be required, at the design stage, prepared by a specialist with certified skills for performing energy calculations, who would assume it legally, such as the energy auditor / energy consultant, by which the stakeholders to be sure that the technical measures proposed in the project will actually lead that building to nZEB. (NOTE: The

updated methodology in Romania proposes such a study on new buildings, which will be called nZEB Compliance Report, but the legislative empowerment of energy auditors as key-specialists in the design team will be still missing);

✓ Given that the energy performance requirements for new buildings are about to increase significantly, the question that arises is who pays for the difference between the construction cost which was until the obligation to implement the nZEB concept vs the increased construction cost under the obligation to implement the nZEB concept, so that the market can accept and effectively implement this concept. It would be useful to introduce incentives (e.g., to provide non-reimbursable financing for renewable energy sources, given that at least 30% of the total EP must be insured from RES for new buildings, respectively 10% in case of major renovations; for high performance equipment; for thermal insulations and for air tightness measures). Without helpful financial mechanisms there is the risk to block the construction market, which at least for Romania, is very heterogeneous in terms of economic potential.

As nationally applicable solutions, it is suggested that the applicable Romanian national legislation and procedures related with new buildings should be updated as follows:

Related to the control procedure – PCC 001/2013:

✓ In order for the administrative authorities to request in the Urbanism Certificate the obligation to insure nZEB for new buildings, the control procedure should be extended.

✓ An extensive procedure of verifying compliance for the involved parties (owners, designers, energy auditors and public authorities) and more rigorous quality control and for a larger sample of projects undertaken by I.S.C. is needed.

✓ The control procedure does not verify the display of EPC in the advertisements for the sale or rental of buildings. An extensive control procedure should be ensured.

Related to the law related to the energy performance of the buildings – Law 372/2005:

✓ Even after numerous updates and completions over the years, a weak formulation is identified in Law 372/2005, regarding the obligation to elaborate the EPC in case of renting, an aspect that should be revised in the content of the law. The National Agency for Fiscal Administration (ANAF) stopped requesting EPCs at the registry of the rental contracts, because accordingly to the law is not their obligation, but of the building owner. However, a mechanism similar to that created for public notaries in the case of sale-purchase contracts, with sanctions for both the owner and the notary in case of non-compliance, it might work.

✓ Related of the displaying of EPCs in real estate advertisement, the law shows weakness here, in the sense that it is not clear who should ensure the verification of its fulfillment, as well as the application of the sanction, considering that the investor / owner / administrator of the building and / or real estate agents / real estate advertising agencies are targeted. In the control procedure developed by I.S.C. this category is not included for verification.

✓ Related to the displaying of EPCs, the Romanian control procedure refers to the sample size check of 10% of the total EPCs and energy audit reports performed nationally; it does not explicitly refer to the requirement to check all the buildings that fall under the law (e.g., for a supermarket – which is a building frequently visited by the public, if the EPC has not been developed, the control procedure does not apply, practically). The law should be reinforced, in order to extend the control procedure.

✓ The legislation does not provide sanctions if the on-site inspection is not made by the energy auditor, which is why it was found that some energy auditors does not perform the site inspection, with direct effects on the quality of the energy assessment (EPCs, energy audits) and its credibility.

Other measures:

✓ A nationally developed calculation software would probably facilitate both the verification process and the actual elaboration of correct and complete projects in terms of energy analysis, which can be further transposed into real buildings whose energy consumption to actually be nearly zero.

✓ It is emphasized the need to correlate the request of MEPRs as indicators of the call for projects in the financing guides, as well as the elaboration of standardized monitoring procedures, which can be used after the implementation of solutions.

✓ The need for a national platform is highlighted, which should integrate all the international and national initiatives carried out in/from Romania by the interested stakeholders (especially in the area of research & development, education and public policies), which would allow the dissemination and assimilation by the market of the information characteristic of the buildings energy efficiency area, to ensure a quick as possible transition for decarbonization.

Slovakia: The focus should be on: Improvement of consistency and quality of the whole legislation including the boundary conditions for calculation of EP, setting the MEP requirements and the scale, improvement of the quality of assessors by continual learning and credit system, software tools (calculation kernel) development for assessors at the EU level and the improved compliance check by public authorities.

Harmonisation of energy performance indicators at the EU level is needed to assess and compare ambition levels between Member States (assessment boundaries, counting PV electricity generation)