CONCERTED ACTION
ENERGY PERFORMANCE OF BUILDINGS

(CCT1) Technical Elements

Status in 2020

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1. Introduction

Many of the aspects dealt with in the CA EPBD are closely interlinked with one another and may refer to both new and existing buildings, as well as to both inspection and certification. This is particularly true for technical aspects, such as the calculation methodologies, and how to include technical systems' efficiency or how to integrate renewable energy within them. The CA EPBD central team 'Technical Elements' deals with issues of a technical nature, which are common to new and existing buildings, and/or with minimum demands, certification and inspection.

The central team 'Technical Elements' leads work and reports progress on the following articles of the Energy Performance of Buildings Directive (Directive (EU) 2018/844 amending Directive 2010/31/EU):

- Article 3 on adoption of methodology;
- Article 5 on calculation of cost-optimal levels of minimum energy performance requirements;
- Article 8 on electro-mobility;
- Implementation and use of CEN EPB standards in MS regulation;
- Annex I on Common general framework for the calculation of energy performance of buildings;
- Annex III on Comparative methodology framework to identify cost-optimal levels of energy performance requirements for buildings and building elements.

In future, new technical elements of interest might be identified based on needs arising from the discussions in the CA EPBD meetings focusing on new buildings, existing buildings, certification and inspection. Significant interaction is expected between these areas, as well as interaction with the Concerted Action for the Renewable Energy Directive (Directive 2009/28/EC, amended by Directive

2018/2001/EU) (RESD) and Concerted Action for the Energy Efficiency Directive (Directive 2012/27/EU and amending Directive 2018/2002/EU) (EED).

A new topic in the EPBD (Article 8, paragraphs 2-7) is the implementation of regulations for electrical vehicle charging points in national legislation. Under the Alternative Fuels Infrastructure Directive (Directive 2014/94/EU) (AFID), it is apparent that a large portion of electric charging takes place in the private domain. Hence, the key requirements under the EPBD are for recharging points and ducting infrastructure in connection to such buildings. Therefore, ducting infrastructure is defined in the EPBD; by pre-installing ducting and cabling required to ensure that, the cost of deploying charging points will be significantly lower in the future.

2. Objectives

In the first part of CA EPBD V the key topics covered by the Technical Elements team were:

- Further development and implementation of new CEN EPB standards (version 2 and possible improvements);
- Support for the development of standard and default values, which support the implementation of energy performance calculation standards;
- Further development and implementation of cost-optimality;
- Handling of technical systems in calculations;
- MSs implementation of electro-mobility requirements into building regulations.

In addition to the topics covered in the first part of CA EPBD V, the team Technical Elements will deal with:

- Handling of integrated renewable energy in connection to calculation and nearly zero energy requirements;
- Handling of innovative technologies ;
- Lessons learnt from certification and inspection schemes in MSs, to be collected to support the improvement of the national schemes;
- Differences between ErP (Energy related Products Directive 2009/125/EC) and EPBD procedures, to be discussed for exploring the holistic approach versus more prescriptive elements as well as needs and possibilities regarding easy access to reliable input data.

3. Analysis of Insights

The Technical Elements analysis dealt specifically with issues of technical implementation that are common to new and existing buildings, as well as with minimum requirements, certification or inspection.

Some of these topics were discussed in a wider context within the CA EPBD, and further descriptions of these topics may also be found elsewhere in these descriptions of the work of the CA EPBD.

3.1 Calculation of energy performance

3.1.1 Use of new EPB Standards in national calculation methodologies

The amending EPBD (Directive (EU) 2018/844) requests MSs to describe and report to the EC their national calculation methodology following Annex A of the overarching standards, namely ISO 52000-1 (Overarching EPB assessment), 52003-1 (Indicators, requirements, ratings and certificates), 52010-1 (External climatic conditions), 52016-1 (Energy needs for heating and cooling), and 52018-1 (Indicators for partial EPB requirements). The deadline for the reporting to the EC is by the transposition date of 10 March 2020.

The status as evaluated in May 2019 showed that:

- Most MS had either not started the process of reporting or only begun planning the reporting process;
- How MSs intended to report varied, with certain countries planning to fill in Annex A, and others using Annex A as a template;
- Most MSs intended to report only to the EC instead of making publicly available.

MSs also remarked that due to differences regarding implementation across MSs, it is obvious that reporting cannot be the same for all. One MS has evaluated 39% of the total number of values in Annex A to be not relevant to their national calculation methodology.

To address MSs challenges, the European Commission (EC) has developed measures to ensure the process is as flexible as possible and will be issuing guidance to help. This includes a support contract[1] and a Frequently Asked Questions (FAQs) document, which will include questions from other MSs and their responses. Recommendations from the CA EPBD V have given valuable input for revision of the EC guidance.

The changes to Annex I, introduced in Directive (EU) 2018/844, aimed to improve transparency and consistency between MSs whilst allowing for freedom and flexibility for adapting to local and climatic conditions. It also addresses increased focus on health, indoor air quality and comfort levels and looks at considering primary energy factors and the treatment of on- and off-site renewables. In connection to the requirements, MSs discussed if there was a need to base performance on calculated or actual energy use based on end uses such as space heating, space cooling, domestic hot water, and lighting, though it is left to each MS to decide if additional metrics should be used.

The energy performance of a building must be expressed in primary energy use per square metre per year. Additional indicators such as greenhouse gas emissions may also be reported. The changes also add the need to account for the positive influence of factors such as local solar conditions and district heating. MSs must implement these changes by revising their building codes by the transposition date of 10 March 2020. MSs must also report to the EC their national calculation methodology following annex A of the overarching standards. The EC initiated a project to support MSs through the reporting process. FAQs and case studies were made available. It was noted that this is to support MSs rather than to control the process.

Some more specific parts of the changes discussed included the consideration of the calculation of primary energy factors. The method used to calculate the factors is left to each MS to decide, and the possibility of using national/local or annual/monthly factors, for example, is left open. Renewable energy systems may be included in the calculation of primary energy factors, but in a non-discriminatory way. Therefore, if

systems are equivalent, then they must be treated the same way, e.g., on- and off-site wind turbines or wind turbines under different ownership.

3.1.2 Cost-optimality – results from the 2nd round of calculations

The deadline for MSs to submit their second cost-optimal reports was 31 March 2018. Only ten MSs submitted their reports by this deadline. Therefore, on 7 May 2018, EU Pilots[2] were launched for 18 MSs to facilitate the report to the EC, with a deadline of 16 July 2018 to reply.

Initial evaluation (by November 2018) of the conformity and plausibility of the reports from 14 MSs was conducted by the Joint Research Centre (JRC), under contract to the EC. The evaluation process was lengthy because the reports themselves are long and some needed to be translated from national languages. Based on the results of JRC's evaluation and the EC's own assessment, the EC examined the conformity and completeness of the reports according to Article 5 of the EPBD, the Delegated Regulation 244/2012 and the accompanying guidelines. If the notified report is not complete or consistent with the EPBD and the Regulation, the EC may go ahead with an EU Pilot (if more clarity is needed) or an infringement procedure (if there is a perceived clear breach) for non-conformity.

JRC's evaluation was based on the different stages in the reports. For most cases, the results of the conformity evaluation were sufficient, although in some cases the EC needed to ask MSs for further information and JRC to update its evaluation. The situation was similar for the plausibility evaluation.

There were some recurrent gaps in the evaluated reports from the 14 MSs. Some concerned gaps in scope, i.e., some reports did not cover all building types (this was particularly true for non-residential buildings), or both new and existing buildings, or all minimum requirements. Despite the identification of such gaps within certain reports, there was not always a clear or identifiable plan included to address the gap.

In most cases, there was only one non-residential building type and there was a lack of disaggregation according to size, age, construction materials, use patterns and climatic zones. It may have been that the included reference buildings were sufficient to cover the entire building stock, but this would require justification, which was not provided. Since this might just have been an issue of clarity in certain cases, the EC used EU Pilots to clarify. In some cases, there were no statistics or references provided for the definition of existing reference buildings, while where these were provided, the references often required translation; in the future, it would useful if MSs would provide a summary of such references.

Another recurrent gap was in the identification of energy efficiency and renewable energy supply (RES) measures. Certain technologies were not taken into account; this included measures for Nearly Zero-Energy Buildings (NZEBs), RES measures, passive technologies, cogeneration and cooling for some reference buildings. In some cases, the number of analysed variants was low without any justification provided.

On the calculation of primary energy, most MSs needed to provide more information. In some cases, information was provided in linked documents that were not accessible to the EC. Information that was missing included the calculation method (monthly vs. hourly, stationary vs. dynamic), climate conditions applied, comfort conditions applied, energy needs to be covered, how the energy performance is expressed (total vs. non-renewable primary energy demand), the starting year of the calculation, and the primary energy factors used. Again, this might have just been an issue of clarity in some cases.

Other information missing concerned the calculation of global costs, e.g., investment, maintenance, replacement, disposal etc., lifetime of building elements, discount rates, real interest rate(s) (for financial and societal, i.e., macro-economic perspectives), energy prices and their evolution (and the relevant

sources), and CO_2 prices and their evolution. In some cases, it was not clear whether the financial or macro-economic approach was chosen.

The sensitivity analysis was developed in order to determine whether results were reasonable. Some reports provided no information on the sensitivity analysis and others provided an analysis that was incomplete. Ways in which the analyses were incomplete included not considering all building types (e.g., only new buildings), not considering sensitivity of energy prices, not sufficiently analysing discount rate variants, not defining real interest rate(s) and discount rate(s) for each scenario, and not considering sensitivity of macro-economic discount rates. In some cases, no results or comments were found.

The results used for deriving cost-optimal levels were not always clear and in some cases a cost-optimal range was not defined. Reporting of (average) gaps was often non-transparent, untraceable and misleading. Many reports lacked focus on cost-optimal levels for building elements (U-values etc.).

In many cases, plans and/or timelines to reduce the gap were not plausible or ambitious. The legal status and timeline of the plans was also unclear; plans need to be concrete, not just ideas. In some cases, the interpretation was wrong and there was no plan to reduce the gap; where no plan was required because the gap was insignificant, this needed to be justified. Some reports were missing an analysis of the gap between cost-optimal levels and 2020 NZEB requirements.

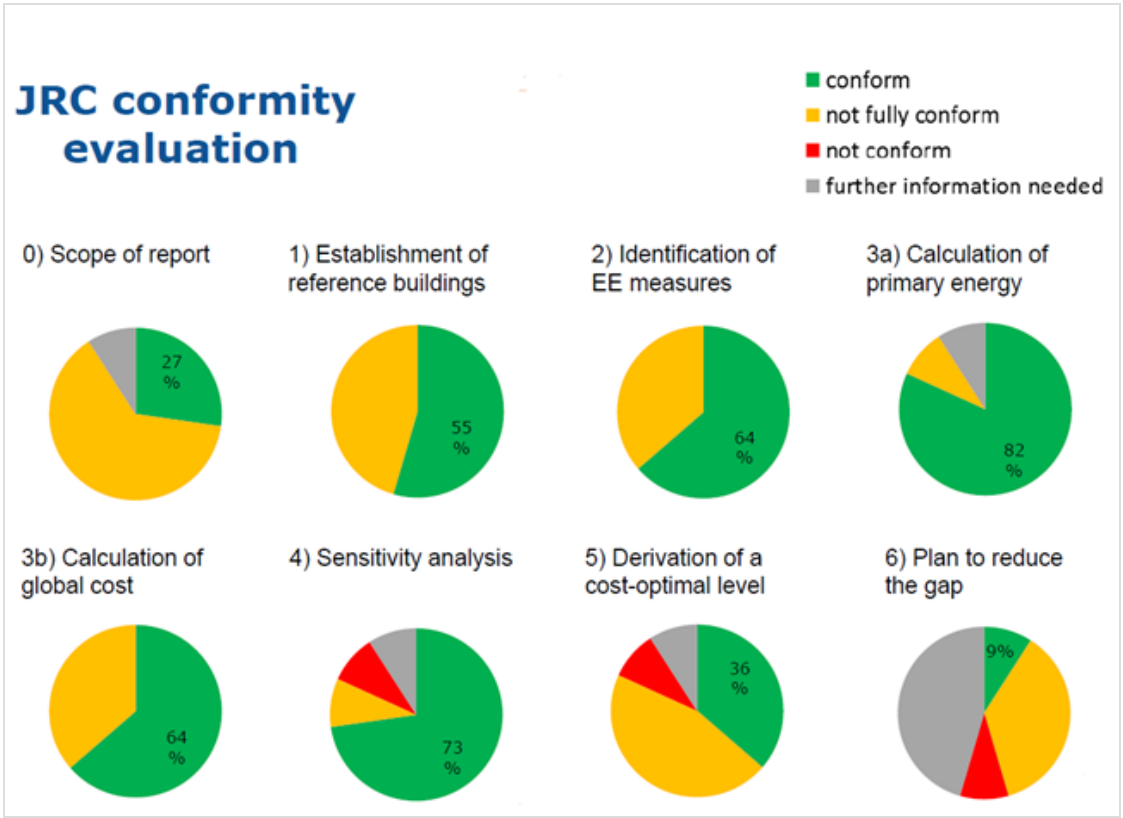

Figure 1. Overview of conformity found by JRC in the first 14 cost-optimality reports submitted by MSs by November 2018.

MSs exchanged knowledge about the do's and don'ts in the process of calculations and cast light on some of the difficulties and implications which MSs have experienced during preparation of their second cost-optimal reports. Results were presented and discussed. Some of the lessons learned were:

- Model inputs should be technically and functionally feasible;
- It is easy to produce technical (engineering) models, but costs are very important and hard to estimate;
- Photovoltaics out-perform other technologies and are always in the cost-optimal range if included in the analysis;
- Other renewable energy may not be cost-optimal – it is thus useful to have a specific renewable energy requirement;
- The discount rate is the most important factor and the societal rate should be used instead of the financial rate;
- The 2018 calculation used the same calculation set-up, reference buildings, geometry etc. – only the requirements, as well as work- and energy-prices have changed;
- For some new buildings, the cost-optimal level varies depending on the building heat supply (i.e., whether district heating is available).

Lessons learned gave valuable input for revision of the Guidance document.

3.1.3 Primary energy factors (topic under preparation)

Primary energy factors (PEFs) or weighting factors for electricity and district heating must be expected to evolve over time as the energy carrier fuel mix changes, e.g., with increased renewable energy sources in electricity generation replacing fossil fuels. In this process, the factors may use historical and forecasted information. The cost-optimal reports[3] from MSs are a useful source for informing the decisions about current and future primary energy factors in national calculations. In the calculation of the primary energy factors for the purpose of calculating the energy performance of buildings, MSs may take into account renewable energy sources supplied through the energy carrier, and renewable energy sources that are generated and used on-site, provided they are used on a non-discriminatory basis. There is a need to evaluate the impact of current and future primary energy factor calculations in MSs.

The choice of PEF values to calculate the primary energy content of energy delivered by different energy carriers is at the discretion of MSs. From a physical perspective, some differences between PEF values in different MSs for certain energy sources are inevitable because of differences in local conditions, e.g., electricity. In addition, there are several different internationally recognised conventions for the primary energy content of electricity from renewable or nuclear sources. Inspection of the published PEF values and enquiries to MSs reveal that reported PEF values do indeed vary by more than the purely physical differences for the aforementioned reasons. The reliability of primary energy savings (or consumption) in buildings and the consistency between cost-optimisation of national regulations and definitions of NZEB depends on the quality and transparency of the PEF calculations.

This topic will be discussed during the November 2020 meeting, which will include a presentation of the official calculation procedure and a review of answers from a questionnaire.

Highlights of 3.1	The status of reporting on the national calculation methodology following Annex A of the 'new' CEN overarching standard in May 2019 was that some MSs intended to fill in Annex A and some were using Annex A as a template. Even though the calculation of cost-optimal requirement levels in MSs was the second calculation of this kind, some MSs faced challenges in timely delivering and adequately reporting to the EC. In some cases, this was due to the reporting scheme offered, which did not accommodate all national calculation procedures. CA EPBD gave input to improvements of the Guidance document and reporting template. The reliability of primary energy savings (or consumption) in buildings and the consistency between cost-optimisation of national regulations and definitions of Nearly Zero Energy Buildings depended strongly on the quality and transparency of the Primary Energy Factor calculations in MSs. The CA EPBD will continue discussing this topic.

Main Outcomes of 3.1
There is a strong need to follow the adaptation of the new set of EPB standards in MSs national compliance checking of cost-optimality calculations and energy certification procedures in the future. The CA EPBD has established a common understanding among national experts on how to use the EPB standards. There is still a need, however, for increased transparency and thus for continued discussions among experts. Additionally, reporting to the EC needs further streamlining to ensure a smooth process that accommodates all the different approaches taken in the different MSs. The 3rd round of calculating cost-optimal levels must be delivered to the EC in 2023 and this topic needs increased focus when the deadline approaches. Further analyses on how MSs set their primary energy factors need to be carried out in the future.

3.2 Electro-mobility

E-mobility is a new topic under Article 8 of the EPBD, and MSs have started transposing the requirements into national legislation. These requirements are based on the Alternative Fuels Infrastructure Directive (AFID) (2014/94/EU), where it is apparent that a large portion of charging takes place in the private domain. Electro-mobility is therefore mentioned in the EPBD in seven paragraphs in connection to domestic charging points, which are needed to make the use of electric vehicles feasible. Key requirements concern recharging points and ducting infrastructure. Recharging points are defined in the AFID, including the distinction between normal (transfer less than or equal to 22 kW) and high-powered (transfer greater than 22 kW) charging points. Ducting infrastructure is defined in the EPBD, however. By pre-installing ducting, the cost of deploying charging points will be up to nine times lower in the future.

MSs are required to transpose the relevant EPBD requirements, which apply to new buildings with more than ten parking spaces as well as to majorly renovated buildings, by 10 March 2020. For non-residential buildings (Article 8(2)), the requirement is that at least one recharging point and ducting for one in five

parking spaces must be provided. For residential buildings (Article 8(5)), the requirement is that ducting must be provided for every parking space. MSs may decide to add additional requirements.

In addition, MSs are required to lay down requirements in national legislation for the installation of a minimum number of charging points for all existing non-residential buildings (Article 8(3)) regarding car parks with more than 20 parking spaces. The requirements are to be laid down by 10 March 2020 and must be applicable by 2025.

Requirements in the EPBD are minimum requirements and MSs can go beyond those. Additionally, national requirements may include a minimum charging capacity (normal or high-power), additional specifications for ducting infrastructure, specifications for fire safety, specifications for electric bicycles and vehicles for people with reduced mobility, requirements related to smart charging, and requirements/specifications for vehicle-to-grid energy transfer. These additional requirements could be subject for exchange of experience and discussions in future CA EPBD meetings.

Scope		**MS obligation**
***New** buildings* And	**Non-residential** buildings with more than 10 parking spaces	Ensure the installation of **at least 1 recharging point** and Ensure the installation of **ducting infrastructure for at least 1 in 5 parking spaces (10/3/2020)**
*Buildings undergoing **major renovation***	**Residential buildings** with more than 10 parking spaces	Ensure the installation of **ducting infrastructure for every parking space (10/3/2020)**
***Existing** buildings*	**Non-residential** buildings with more than 20 parking spaces	Lay down requirements for the **installation of a minimum number of recharging points** - applicable from 2025

Figure 2. Overview of minimum obligations and deadlines for electro-mobility for MSs to implement in national legislation.

The electro mobility requirements have been discussed in various sessions during the CA EPBD V and information on the current status in MSs has been collected.

3.2.1 Electro-mobility – existing experiences

In October 2018, MSs status overview on implementing national requirements for electro mobility was collected through a questionnaire. Among the (17) MSs that have answered the questionnaire, 10 reported previous experience with electro-mobility as part of the 'Deployment of Alternative Fuels Infrastructure Directive' (AFID - 2014/94//EU), while the rest (7) did not report previous experience (Figure 3).

Those MSs answering 'yes' to having previous experiences from the AFID were asked to describe what measures they have already implemented concerning requirements for building recharging points, and if these could be implemented into the national EPBD regulation.

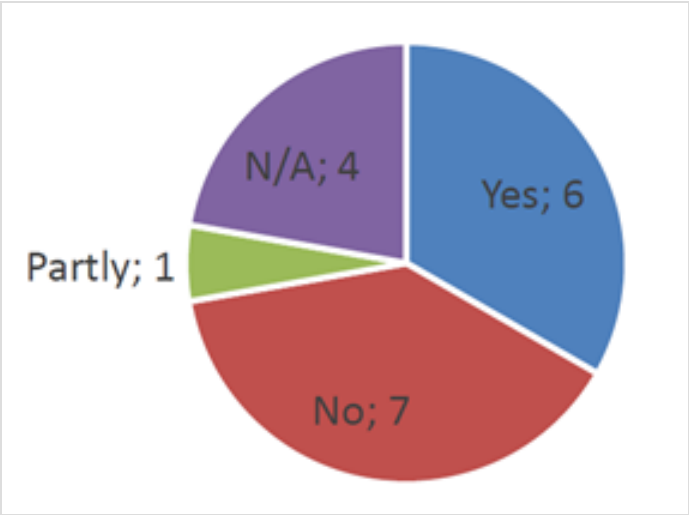

Figure 3. MSs' possibility to implement previous experiences from AFID into the national EPBD regulation.

Of the MSs who responded, ten answered that implementation of electro-mobility requirements into the EPBD regulation were 'in process', while seven answered 'not started yet' – status October 2018.

In December 2018, all MSs had already adopted a national policy framework under the AFID. Some MSs, e.g., France, Italy, Austria and Spain, have further defined specific requirements in legislation. In countries like Ireland, Finland and Portugal, consultation on national implementation was ongoing up to 2018.

3.2.2 Member States' implementation of electro-mobility requirements into building regulations

The EC has published a guidance document addressing some of the concerns and questions regarding implementation of electro-mobility requirements into the EPBD regulation. From discussions on the guidance document and experiences from advanced MSs, it was found that MSs needed to consider local conditions and requirements when setting requirements and milestones. For example, in MSs where Electric Vehicle (EV) adoption is already high and charging infrastructure is well established, e.g., Norway, the goal is to continue this progress whilst ensuring that the sources of electricity remain clean. In other MSs, there must be a greater push towards installing the necessary infrastructure; this has to be done according to needs, though not by less than the minimum requirements stated in the EPBD. By ensuring the adoption is appropriate to the needs of the MS, it is likely to obtain a solution which is cost-effective. However, as has been explored by some MSs, there is a question of whether infrastructure should be put in place that can meet either the minimum EPBD requirements, the current needs, or the targets of the future; concerns regarding the cost implications of this decision must be considered as well.

New EPBD requirements for EV charging infrastructure have posed several questions for MSs. These include:

- How to determine the number of charging points to be set out in national regulations – should it be based on the EPBD minimum requirements or based or the targets/needs of the country?
- How to handle situations where the charging infrastructure owner and user are not the same;
- How to handle situations where the building and the charging infrastructure are not connected.

Figure 4. Electric cars, market share from IEA – Global EV Outlook 2018, https://www.iea.org/gevo2018.

The above and other questions were discussed by MSs who have made progress in finding solutions. For example, due to a long history of promoting and subsidising EVs in Norway, the infrastructure many MSs are working on is already in place. Conversely, in Slovakia, there are currently very few EVs, so minimum EPBD requirements have been adopted. Through Ireland's experience, it was shown that the EPBD can be flexible and that by building upon its requirements, a solution can be found that is best for the individual needs of the country. In Denmark, the idea of whether infrastructure should be ready for today's needs or for the needs of the future has been explored. The number of charging points strongly depends on the ambition and whether a MS actively wants to promote the use of electric vehicles. It is hoped that by combining experiences with the guidance document, MSs will arrive at the best solution.

3.2.3 Implementation in national EPBD legislation (topic under preparation)

In March 2020, all MSs are expected to have implemented national legislation about charging infrastructure for electric vehicles in new and existing buildings undergoing major renovation. This information was collected and prepared for discussion in November 2020.

Highlights of 3.2	In November 2018, only few MSs evaluated that it was possible to implement the previous AFID experiences and regulation into national EPBD legislation. AFID includes charging infrastructure beyond the limits of EPBD and can hence not be directly implemented in the EPBD. In Norway, deployment of electric vehicle charging stations occurred without EPBD legislation due to the early development of infrastructure and an ambitious subsidy scheme for electric vehicles, thus establishing ordinary market demand.

Main Outcomes of 3.2
MSs are working hard to meet the deadlines for implementing regulations for charging infrastructure in new and existing buildings undergoing major renovation. It is important to establish a comparable overview of the implementation status in the future and let MSs learn from each other to encourage further deployment of electric vehicles in all MSs.

3.3 Member States' Regulations

This section describes various initiatives in MSs in updating national legislation. These are collected under individual headings, indicating to which part of the legislation it relates.

3.3.1 Definition of "Functionally, technically and economically feasible" in building renovation

In the context of renovation, the term 'Functionally, technically and economically feasible' ensures that the requirements outlined in the EPBD are not excessive and that they only apply when cost-effective. The notion of feasibility applies to EPBD Article 7 as well as Articles 8, 14 and 15. These articles cover the major renovation of buildings and building elements, Technical Building Systems (TBS), Self-Regulating Devices (SRD), and Building Automation and Control Systems (BACS).

Discussions focussed on how the condition of feasibility is currently applied in national legislation and what types of exemption are accepted. A pre-session questionnaire indicated that the methods of implementing EPBD Articles 7 and 8 vary considerably across MSs, with most yet to define 'technically, functionally and economically feasible'.

The EC has issued recommendations on how to apply the notion of feasibility in relation to EPBD Articles 8, 14 and 15. Economic feasibility considers the proportionality of the costs of a planned intervention to the benefits. Whether the technical characteristics of the system prevent the requirements from being applied or whether the changes would impair the operation of the system or the usage of the building should also be assessed.

The EC has provided specific recommendations around what 'feasibility' implies in relation to Articles 8, 14 and 15. Article 8 deals with the technical building systems that could be affected in a renovation. MSs must define the cases where feasibility cannot be ensured and how this is assessed. The different elements of a feasibility assessment include:

- Technical feasibility – do the technical characteristics of the system prevent the requirements from being applied?
- Economic feasibility – are the costs of the application of requirements proportionate to the costs of the planned intervention and/or do expected benefits outweigh these costs?
- Functional feasibility – would the changes impair the operation of the system or the usage of the building considered, taking into account the characteristics of the system or building, and the constraints that may apply?

It is up to MSs' public authorities to detail the cases for which feasibility cannot be ensured; feasibility must be assessed under clear guidelines and established procedures. Interpretation of the terms must not be left to the owner or system installer as this could lead to confusion and lack of consistency in application.

For self-regulating devices, technical feasibility would not be met in cases where the room has no heating/cooling or the heating system of an existing building makes it impossible to install such devices. For building automation and control, technical feasibility may not be met in existing buildings where the building system cannot be controlled without substantial alterations. For both, economic feasibility may not be met if the investment cannot be sufficiently recovered; however, situations where this would manifest seem to be rare.

In Denmark, the guideline 'Normally financial viable constructions', available (in Danish) at https://bygningsreglementet.dk/-/media/Br/Kap_11_Energi/Vejledninger_Energi/Vejledning-Ofte-rentable-konstruktioner_BR18_januar21.pdf, has been written to help the building industry find good and effective solutions for renovating the buildings.

Figure 5. Guideline 'Normally financial viable constructions from Denmark'.

3.3.2 Ventilation and airtight buildings (topic under preparation)

A survey undertaken in the autumn of 2020 among national CA EPBD experts aimed at identifying the range of building standards currently applied in MSs in relation to airtightness, ventilation and overheating. The results are summarised below under three topic sections:

1. Airtightness
    a. Airtightness performance requirement for new buildings;
    b. Airtightness performance requirement for major renovations;
2. Ventilation
    a. Minimum ventilation requirements;
    b. Ventilation requirements for particularly airtight buildings;
3. Overheating
    a. Overheating requirements;

b. Overheating risk in new dwellings;

c. Overheating risk in new buildings other than dwellings;

d. Overheating risk in major renovations to dwellings;

e. Overheating risk in major renovations to buildings other than dwellings.

This topic will be discussed in November 2020.

Highlights of 3.3	’Functionally, technically and economically feasible’ is a concept used in the EPBD when deciding whether or not energy upgrading is mandatory when a building undergoes renovation. This concept also applies for technical building systems; here it is up to the individual MSs on how to define this. One MS reports that everything is functionally and technically possible, it is just a question about economy and hence only the economically feasible applies here. There are significant differences on how MSs set requirements for airtightness of new and high-performance buildings. Some MSs do not set specific requirements, but exercise indirect control by requiring a pressurisation test and the use of results in the energy performance compliance calculation. All MSs request a minimum ventilation rate in new buildings. Even though buildings constructed today will remain for many years and thus be subject to climate changes, not all MSs (especially northern countries) require an overheating assessment.

Main Outcomes of 3.3
’Functionally, technically and economically feasible’ also applies to technical building systems when a building undergoes major renovation. However, there are large differences among MSs on how to define the concept. Ventilation requirements for new and high-performance buildings differ significantly among MSs. However, some MSs exercise indirect control by allowing actual values used in compliance calculations. New buildings and buildings undergoing major renovation will be subject to climate changes, but not all MSs request an overheating assessment of these buildings.

4. Main Outcomes

Topic	Main discussions and outcomes	Conclusion of topic	Future directions
Use of new EPB Standards in national calculation methodologies	Not all values requested in the reporting annexes are relevant for all MS.	Some MSs will fill Annex A while others will use the annex as inspiration.	It is important to follow MSs implementation of the new set of EPB standards in the future.
Cost-optimality – results from the 2nd round of calculations	MSs had challenges in delivering adequate reporting to EC.	The reporting scheme is not flexible enough to accommodate all national calculation procedures.	The topic needs follow-up before the third round of calculations.
Electro-mobility – experiences	All MSs are working hard on meeting the deadline for national implementation.	Some MSs see difficulties in implementing AFID into national EPBD regulation.	It is important to establish an overview of the national implementation status.
Definition of 'Functionally, technically and economically feasible' in building renovation	There are large differences among MSs on how to define the concept for technical building systems.	It is up to MSs public authorities to detail the cases for which feasibility cannot be ensured.	EC are encouraged to provide more guidance on this topic.
Ventilation in airtight buildings	Ventilation requirements for new and high-performance buildings differs significantly among MSs.	Will be available once the relevant session is completed.	Will be proposed once the relevant session is completed.
Overheating assessment	New buildings and buildings undergoing major renovation will be subject to climate changes, but not all MSs request an overheating assessment of these buildings.	Will be available once the relevant session is completed.	Will be proposed once the relevant session is completed.

5. Lessons Learned and Recommendations

The EPBD requests MSs to describe and report to the EC their national calculation methodology following Annex A of the CEN overarching standards, namely ISO 52000-1 (Overarching **EPB assessment**), 52003-1 (Indicators, requirements, ratings and certificates), 52010-1 (External climatic conditions), 52016-1 (Energy needs for heating and cooling), and 52018-1 (Indicators for partial EPB requirements). The deadline for the reporting to the EC was by the transposition date of 10 March 2020.

In May 2019, it was found that:

- Most MSs had either not started the process of reporting or had only begun planning;
- There was a mixed response on how MSs intended to report, with some planning to fill in Annex A and some using Annex A as inspiration;
- Most MSs intend to only report to the EC, not to national bodies.

MSs also remarked that due to differences across countries, the reporting could not be the same for all. One of the MSs has evaluated that 39% of the total number of values requested in Annex A are not relevant to their national calculation methodology.

To help MSs, the Commission has put in place measures to ensure the process is as flexible as possible and has issued guidance to help. This includes a support contract and a FAQs document, which includes questions from other MSs and the responses from the Commission.

The second round of **cost-optimality** calculation was due on 31 March 2018. By that deadline, only ten MSs had delivered a report, increasing to 16 shortly after, with a further ten under assessment. The JRC has scrutinised MSs' reports in collaboration with the Commission for conformity and completeness, and several recurrent gaps have been identified from the 14 MS evaluated so far. Gaps in many cases related to scope, as some reports did not cover all building types (especially non-residential buildings), or both new and existing buildings, or all minimum requirements. Despite the identification of these gaps in some reports, a plan to reduce the gaps was not always included or identifiable.

In most cases, there is only one non-residential building type and there is a lack of disaggregation according to size, age, construction materials, patterns of use and climatic zones. It is possible that the reference buildings included are sufficient to cover the entire building stock, but this requires justification, which was often not provided. Some reports lack an analysis of the gap between cost-optimal levels and upcoming NZEB requirements.

In November 2017, the implementation of requirements for charging points for electric vehicles (EVs) in national building regulations (EPBD) was new. **Electro-mobility** has been included in the EPBD because under the Alternative Fuels Infrastructure Directive (AFID), it has become apparent that a large portion of charging takes place in the private domain. Therefore, the key requirements are for charging points and ducting infrastructure. Recharging points are already defined in the AFID, including the distinction between normal (transfer of less than or equal to 22 kW) and high-powered (transfer of greater than 22 kW) charging points. By pre-installing ducting in new and renovated buildings, the cost of deploying charging points will be up to nine times lower in the future.

In November 2017, experience with implementation of electric vehicle charging requirements varies significantly among MSs. However, the most common barriers to the uptake of EVs have been a limited range and the lack of charging infrastructure.

EPBD Article 8(3) requires that MSs lay down requirements for the installation of a minimum number of recharging points for certain non-residential buildings with more than 20 parking spaces. However, it is left for MSs to determine the specifics of the requirements and whether they want to go beyond these based on local conditions.

To help MSs determine these factors, the European Commission (EC) has published a guidance document addressing some of the concerns and questions raised.

In June 2019, it was suggested that MSs should consider local conditions and requirements when setting requirements and milestones for implementation. For example, in countries where EV adoption is already high and charging infrastructure is well established, the goal is to continue this progress whilst ensuring that the sources of electricity remain clean. In opposite cases, there needs to be a greater push towards installing the necessary infrastructure, though this needs to be done in a measured way. By ensuring the adoption is appropriate to the needs of the country, a cost-effective solution can be reached. However, it is a question whether infrastructure should be put in place that meets the current needs or the needs of the future; the cost implications of this decision must be explored as well.

In the context of renovation, the term '**Functionally, technically and economically feasible**' ensures that the requirements outlined in the Energy Performance of Buildings Directive (EPBD) are not excessive and that they only apply when cost-effective. The notion of feasibility applies to EPBD Article 7 as well as Articles 8, 14 and 15. These articles cover the major renovation of buildings and building elements, Technical Building Systems (TBS), Self-Regulating Devices (SRD), and Building Automation and Control Systems (BACS).

The European Commission has issued guidance on how to apply the notion of feasibility in relation to Articles 8, 14 and 15. Economic feasibility considers the proportionality of the costs of a planned intervention to the benefits. Whether the technical characteristics of the system prevent the requirements from being applied, or whether the changes would impair the operation of the system or the use of the building, should also be assessed. Ultimately, it is up to MSs' public authorities to detail the cases for which feasibility cannot be ensured by establishing clear guidelines and standard procedures.

Endnotes

1. https://epb.center/
2. EU Pilots are an informal communication tool between the European Commission and Member States. The European Commission uses this tool to ask specific questions to Member States or clarify specific issues, without resorting to the formal infringement procedure
3. https://ec.europa.eu/energy/topics/energy-efficiency/energy-performance-of-buildings/energy-performance-buildings-directive/eu-countries-2018-cost-optimal-reports_en?redir=1

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