The European Union's programme for India

Clean Energy Cooperation with India (CECI): Legal and policy support to the development and implementation of energy efficiency legislation for the building sector in India (ACE: E^2)

Specific Contract: FWC No. PI / 2015 / 368-474

EPBD and Building Energy Codes – The process of transposition/ notification into national legislation

EU EXPERIENCE ON EPBD - POSITION PAPER No 3

Deliverable D1.1

This project is funded by
The European Union

A project implemented by EXERGIA S.A., member
of SACO Consortium, in collaboration with PwC India

FOREWORD

This position paper has been developed by the project "Clean Energy Cooperation with India (CECI): Legal and policy support to the development and implementation of energy efficiency legislation for the building sector in India ("ACE:E^2"[1])".

The ACE: E^2 project is financed by the European Union and managed by the Delegation of the European Union to India. It is carried out as part of the Framework Contract COM 2011 Lot 1 (Europeaid/129783) by EXERGIA S.A., member of SACO Consortium, in collaboration with PricewaterhouseCoopers (PwC) India, under the Specific Contract: FWC No. PI / 2015 / 368-474 signed between the Delegation of the European Union to India (EUD) and SACO on December 18th, 2015.

The contents of this paper are, however, the sole responsibility of the contractor and can in no way be taken to reflect the views of any particular individual or institution, including the European Union, the Delegation of the European Union to India, and the Bureau of Energy Efficiency (BEE) in India.

[1] ACE: E^2 – Adoption, Compliance, Enforcement – Energy Efficiency

ACE: E2	Acronym of the project (Adoption, Compliance, Enforcement – Energy Efficiency)
BIM	Building Information Modelling
CECI	Clean Energy Cooperation with India
CEN	European Standards Body
CPD	Continuing Professional Development
EP	Energy Performance
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
EUD	European Union to India
HVAC	Heating Ventilation and Air-Conditioning
LCA	Life Cycle Analysis
NZEB	Nearly Zero Energy Buildings
RIA	Regulatory Impact Assessment

Contents

Table of Figures

1 SUMMARY

The EU Energy Performance of Buildings Directive[2], or EPBD, was published in 2002 and formally came into force in 2003 across all EU Member States. Legal transposition (analogous to 'notification' in India's States) and practical implementation across Europe mainly took place between 2006 and 2009. The Directive was 'recast' in 2010[3], with various reinforcing amendments which were implemented since 2011.

An early focus of EU Member State authorities was on meeting the deadlines set for transposing the provisions of the Directive into national law. A feature of good practice implementation was that this transposition process, led by the relevant authorities, needed to be accompanied, and in some cases preceded, by significant **stakeholder consultation and communication**, **techno-economic studies**, the development of **technical tools and systems, administrative systems**, and **capacity development** among building industry players and enforcement authorities. All of these ingredients have been necessary to be in place in order to make the legislation operative and effective in the building industry sector.

The approaches and experiences of EU Member States in the legal transposition process, and in consequential implementation of the various requirements in the EPBD, have varied widely. This arose from a combination of factors – differing legal frameworks and traditions, in some cases regional devolution of powers, etc. However, focussing on those elements of legal transposition that are relevant to the ECBC, the fact that almost all EU countries had some form of building energy code in place prior to the Directive generally meant that the legislative changes involved tended to be incremental rather than radical. Only in a small number of countries has the building energy code been a standalone code separate from the other aspects of the building code. In most Member States, a strategically prudent approach has meant that although the technical energy performance (EP) requirements and changes prescribed in the documentation referenced in the formal legislation may be complex, the legislative text itself has tended to have limited technical content.

This hierarchy of documents is described in this paper, which also summarises the typical step by step process involved in achieving legislative transposition/ notification of the requirements set in the EPBD. Since the UK legal system and that applied in countries subject to British rule in the past is the European system most closely aligned with that of India, many of the examples of approaches and configurations of legal transposition and other accompanying documentation are drawn from the experiences of those countries.

A significant accompanying measure in the legislative process was the introduction of the new concept of mandatory energy performance certification (EPC) or labelling, including the systems for market players to achieve compliance and the roles of the authorities

[2] Directive 2002/91/EC of the European Parliament and Council, on the energy performance of buildings.
[3] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

assigned to enforce compliance. Here a further beneficial approach was to set a clear implementation timetable which typically included up to three phases of introduction of mandatory EPC on the path to full implementation.

2 INTRODUCTION

The original EPBD was published in 2002 and an expanded and strengthened 'recast' version in 2010. The original Directive required Member States to adopt a calculation methodology with the scope set out in the Directive, and the setting of energy performance requirements with a scope and format as set out in the Directive. The recast version strengthened these provisions by requiring a life cycle techno-economic assessment in the form of a cost optimal methodology to inform the energy performance requirements, and the establishment of a roadmap to setting and achieving 'nearly zero' energy buildings (NZEB) by 2019-2021. **This position paper draws blended lessons from these combined phases of EU experience**.

As expected, the bulk of the challenges were set by the original EPBD, with the challenge to Member State authorities in becoming familiar with, organised and committed to meeting a new mandatory set of obligations. Even where the change relative to existing practice in a State was relatively incremental, the task involved was often still substantial.

The paper selects and highlights what are considered to be among the best practice approaches, levels of ambition, systems and experiences implemented in particular EU Member States in relation to the provisions of the EPBD most relevant to the process of legal adoption of the building energy code (ECBC) in India. These relate, in approximate sequence, to five aspects shaping and formulating the legislative process, namely: background context, particularly the regulatory traditions; the specific requirements of the Directive; the organisation and planning arrangements; the parallel preparation and capacity building activities; and the scoping, scripting and navigation process of the legislative text and associated documents. Many shared principles, approaches and good practice learnings apply. Particular elements of implementation in the EU show good resonance with elements of the ECBC implementation process to date in India.

3 BACKGROUND - EVOLUTION, CONTEXT, APPROACH AND STRUCTURE TO ENACTING BUILDING ENERGY CODES

3.1 Evolution, scope and pre-existing status of building codes in EU Member States

3.1.1 Building codes

Historically and currently, building codes and regulations in the EU have tended to be the responsible policy and legal remit of the national Ministries for Construction or equivalent. The growing evolution of the different categories of provision within such codes is reflected in a sequential hierarchy of objectives which can be summarised under the headings of safety, health, comfort and economy. Taking these in turn, the following sequence approximately applies: Safety and integrity of the building - site preparation, structure, fire safety, moisture, materials and workmanship, appliances; health - water, waste disposal, hygiene, noise; comfort - light, ventilation, access/barriers; and resource economy – insulation/ energy efficiency, CO2 emissions. The term ‘approximately’ applies because there can be significant overlap between different provisions. Thus, for example, energy efficiency realisation needs to be congruent or compatible with the provision of healthy ventilation and avoidance of condensation risk.

3.1.2 Building energy codes

In the most northern (coldest) EU countries, energy efficiency provision in the form of thermal insulation requirements for the building envelope had been in place since the 1950s or before. Following global oil price shocks in the 1970s, basic insulation provisions began to become the norm through all northern countries including those with temperate climates, and thereafter extended to even the warmer Mediterranean countries (which still had a winter heating requirement). In such cases, the building energy code was an incremental additional provision within the pre-existing building code relating to many of the safety, health and comfort provisions outlined above. Over the following decades prior to the EPBD, the insulation provisions tended to become progressively more stringent.

Such insulation provisions were almost always applied to housing, for reasons of building longevity and social protection. They were also often – but not always – applied to non-residential buildings (sometimes reportedly due to the notion that business and public sector building owners did not need protection from the State).

From the late 1980s onwards, the scope of the energy efficiency provisions tended to expand in many of the countries to include insulation of domestic hot water, pipework and other heating, ventilation and air conditioning (HVAC) plant. Subsequently, energy efficiency criteria began to be prescribed within the building energy codes in relation to thermal or electrical equipment such as boilers, air conditioners, pumps, fans, and electrical equipment such as lighting, on the basis of common EU criteria determined by EU technical standards. These standards were made by the European standards organisation CEN, of which the national standards authorities of all EU Member States were members.

Many of the above requirements were expressed in a simple prescriptive way. However, by the 1990s, an impetus had begun for the scope of the energy performance to be widened and treated in a more holistic manner, in terms of bottom-line performance expressed in the form of annual energy usage per m2 of floor area. This will be outlined further below.

Overall, prior to the issuing of the EPBD, almost all EU countries had some form of mandatory energy efficiency requirements (although variable in scope and ambition) in their building energy codes, applicable to the vast majority of new buildings and major renovations.

3.2 Pre-existing legislative configuration of building energy codes in EU Member States

Building energy codes can be embedded as an integral module within the overall building code or else they can be separate or standalone codes. Both prior to and following the EPBD, only in a small number of EU countries had the building energy code been a standalone code separate from the other aspects of the building code. In contrast, in the **case of the ECBC in India, a standalone approach is being taken**.

This distinction has significant implications for the application, compliance and enforcement necessary for successful operation of the code on the part of the construction industry, building owners and enforcement authorities. There are advantages and disadvantages to each. If embedded, then the demonstration and verification of compliance tends to be subject to the same authorities, compliance checking systems, and penalty frameworks in similar manner as for infringements related to safety, health or other environmental building requirements. Here the building industry is likely to be well accustomed with the established administrative procedure to meeting such requirements, but may find it rather difficult to understand and comply with the increasingly complex and demanding technical provisions in relation to energy performance. Moreover, officers within the building control/ enforcement authorities (typically local/ municipal authorities) responsible for checking compliance with other aspects of buildings may not always have the right level of experience and technical expertise to adequately assess compliance with energy-related requirements. In principle, it is possible to address these issues through training for such specialized checking and enforcement, but this may be difficult in practice. In contrast, with a standalone form of building energy code such as the ECBC or its EU counterparts a **dedicated cohort of assessors or verifiers can be established to engage with the complexities involved**. This would appear to require more resourcing but could be expected to **lead to more rigorous standards of compliance and competence** throughout the system.

3.3 Other diversities

In addition to the above distinctions, the context of pre-existing building energy codes and their models of legal enactment and enforcement prior to the issuing of the EPBD showed a variety of different aspects and approaches, all of which would tend to influence the detailed responses of individual EU Member States in transposing the EPBD. Among these aspects have been:

- **Geographical jurisdiction**: Building codes in general, and building energy codes in particular, may have been set and applied at a national, regional, or municipal level. Within the larger Member States, regional climatic zoning has tended to apply.
- **Scoping and scripting of the legal texts**: Different jurisdictions had shown significant differences in the level of detail contained in the specification of requirements within their primary legislation mandating the code.
- **Technical scope**: The scope of coverage by building energy codes had extended from only insulation and space heating characteristics in some Member States to the inclusion of other aspects – hot water provision, and efficiencies of appliances, lighting, pumps and fans. In most countries, differing scope and requirements have applied between housing and non-residential buildings.
- **Climate**: Climatic conditions have a natural determining effect on whether the emphasis in the code is on space heating versus cooling and humidity control. Annual degree days (base temperature 18°C) for heating range from over 5000 in the most northerly regions to less than 700 in some southern regions, while annual degree days for cooling range from near zero to over 1000. Solar energy, daylighting and humidity conditions can also vary significantly.
- **Approaches to setting and expressing the requirements**: As outlined above, in the case of energy codes these have varied, and often evolved, from highly prescriptive specifications of individual elemental aspects, to allowance of design/ specification trade-offs to more holistic performance approaches. This is a particularly significant background factor and is discussed further below.
- **Levels of stringency**: Independent of whether the approach was prescriptive (e.g. U-values) or performance based, different Member States, even in cases of similar climates, showed variation in the levels of ambition and stringency specified in their building energy codes.
- **Building control systems (compliance and enforcement)**: Similarly, in relation to energy codes, while it is common for local/ municipal authorities to have a lead role in enforcement, different jurisdictions have shown differences in the assignment of responsibilities for demonstrating or certifying compliance and in their inspection, database, administrative and penalty regimes applying to the enforcement process.

- **Pre-existing capacity**: Different jurisdictions and construction sectors had somewhat different levels of technical resources, tools, skills and experience in relation to the design, specification and modelling of buildings for superior energy performance.

In comparing with the situation across the States of India prior to the ECBC, it is understood that a lesser degree of diversity in building code regimes and building energy provisions would have applied (while recognising regional climatic differences (reflected in the zoning for ECBC) and likely differences in industry capacity for example.

3.4 Format of pre-EPBD building energy codes in EU Member States

Energy efficiency requirements had been set in different ways across EU Member States prior to the EPBD. Expanding on the three levels indicated above, the basic types are as follows:

Prescriptive. This method sets separate target energy efficiency requirements for specific elements of the building envelope (e.g. U-values) and for elements of the equipment (e.g. CoP for cooling plant). Individual components must achieve compliance with their specific targets.

Trade-off. Here, while indicative targets are set for each part of the building, a trade-off between elements is permitted so some values are better and some are worse than the indicative target requirements.

Energy Frame. An overall framework establishes the standard for a building's maximum energy (heat) loss, expressed as a whole building elemental average - for example as a 'whole building U-value'. A calculation for the actual proposed building specification is required to show that this maximum is not exceeded.

Model Building. Target values are set as in the trade-off, and the theoretical energy performance of a model or 'reference' building with the same geometry is calculated with those values. A calculation for the actual proposed building must demonstrate that the actual building will have at least equal energy performance as the model building.

Performance. Energy performance requirements are based on a building's overall consumption of energy or fossil fuel or the building's associated emissions of greenhouse gas, typically based on the use of an officially recognised calculation method involving some form of modelling software. This is typically expressed as energy or emissions intensity, in terms of kWh/m2 per annum or kg CO_2/m^2 per annum. In general, in order to cater for the vast variety of building types, sizes, shapes and functions, this also involves the use of the 'reference building' concept against which the calculated performance of the actual proposed building is compared.

As outlined above, **most EU countries had started with prescriptive methods**. When energy efficiency requirements began to increase, and more elements were included in the scope, Trade-Offs or an overall Energy Frame allowing adjustments of the individual values were required. This was somewhat more complex than the Prescriptive method, but provided some flexibility to the designer/ specifier, and scope for more economical solutions. **In summary, the Prescriptive method, the Trade-off method and the Energy Frame method are typically based on standard maximum values for transmission (U-values), coefficients, energy efficiency values and similar attributes** which can be compared relatively easily, although the Energy Frame method required a degree of calculation or modelling.

The **Model Building and Energy Performance methods are based on calculated energy consumption and require calculation models and computer tools**. Even prior to the EPBD, such models and tools had been developed in many regions. The use of such models involved a further higher level of complexity but allowed the design team still greater flexibility including a greater potential to achieve the most cost-efficient solutions. These ranged from relatively simple annual or monthly spreadsheet type models to full hour by hour simulation models, and were first applied to non-residential buildings. Simulation models were usually commercially developed as design tools. In relation to demonstrating compliance, they may have had an optional status in the eyes of authorities, but were seldom if ever specified as mandatory at that stage. In general, the spreadsheet type of method only began to be applied to small residential buildings during the 1990s, and was made more user-friendly and widespread with the advent of greater digitization and internet access from the late 1990s onwards.

The calculation procedures are normally set nationally but may also be regional or local. Since the 1980s, international standardisation (with the European Standards body CEN and/or the International Organisation for Standardisation – ISO) had begun to be introduced with the aim of developing, improving and harmonising test methods and models to calculate energy performance.

In summary, **the different methods have had different advantages and disadvantages**. The Prescriptive method based on U-values and component efficiencies was generally the easiest to understand for constructors, since the values are given on an itemised disaggregated level. Standard construction and installation solutions can be given which fulfil the requirements, and buildings can be constructed without calculations or the use of computer models. However, this may not necessarily lead to economically optimal solutions, even in terms of first cost. The Trade-Off and Energy Frame methods allow some flexibility and freedom in selecting or specifying more economical solutions without requiring too many calculations. With the Model Building and Performance methods, the possibilities for flexibility and optimisation of costs for compliant solutions will increase. But using the performance model requires computer-based models and a deeper understanding of some of the principles.

In some Member States prior to the EPBD, an optional approach was taken. Here it was sometimes the case that compliance could be demonstrated to be achieved by using either one of three methods – a Prescriptive elemental method or an Energy Frame method or a Performance method. Interestingly, **a variant on such three optional pathways is being offered to India's construction and property sector in relation to achieving compliance with ECBC at different levels of ambition**.

Moreover, hybrids of the various methods are possible. Notably, in building energy codes based on the Performance method it is possible to supplement the bottom line target performance requirement with an accompanying specification of 'backstop' elemental U-values. For example, this would prevent a building achieving the overall energy or emissions performance by the use of renewable energy to compensate for having a poor level of insulation or glazing from being deemed to be compliant. This would be seen as a prudent policy, reflecting the greater longevity of the building envelope relative to the energy using equipment and the greater difficulty and cost of future upgrading of the building envelope relative to equipment.

3.5 EU background and policy focus

In parallel with this evolution, the EU grew from its original 6 Member States during the 1960s to have 28 Member States by 2013. From the 1980s onwards, EU Directives and Regulations impacting on energy policies in Member States began to become a prevalent instrument of policy. These policies were driven by the goals of free trade (and hence harmonised provisions), energy security, cost competitiveness and environmental protection. While the normal institutional configuration in Member States involved the Ministry responsible for Construction/ Housing being the lead ministry in relation to building codes, some EU Directives, for example in relation to boiler efficiency and hence impacting on buildings, tended to lead to the Ministry responsibility for Energy and its allied energy agency becoming more actively engaged in the process of reviewing and strengthening their building energy codes.

Following the Kyoto Protocol of 1997 in relation to greenhouse gas emissions, the EU Action Plan for Energy Efficiency (2000-2006) set energy efficiency as a key pillar of energy policy. The EPBD was a strategically central instrument within this setting and was driven by the same goals. It was a significant step in seeking to establish a consistent integrated and harmonised framework for setting energy performance requirements across all EU Member States. While seeking to unify or harmonise approaches, it still allowed for necessary flexibilities in relation to differences in climate, construction costs, energy costs etc.

4 THE EU EPBD REQUIREMENTS - OBLIGATIONS OF MEMBER STATES ON BUILDING ENERGY CODES AND ROADMAPS TO NZEB

4.1 Key requirements of the EPBD

The primary aims of the EPBD were to drive the building sector towards more ambitious energy efficiency standards, to make energy use in buildings more transparent and widely understood, and to increase the use of renewable energy sources. For clarity, this description combines the key requirements of the original EPBD and recast EPBD as they apply to building energy codes.

The EPBD has a series of mandatory requirements. Each Member State must meet the following five direct requirements in relation to the methodology, format and level of ambition in their building energy codes:

1. **Adopt an official energy performance calculation methodology** that accords with the common general framework methodology specified in an Annex to the Directive. The scope of the technical parameters to be covered is set out in this Annex, listed in Figure 1. This obliges each Member State to adopt a Performance method for calculating energy use, and for defining and verifying compliance. This provision is aimed at encouraging a broadly common 'currency' or 'language' based on an integrated and relatively holistic scope of thermal and electrical energy usage. But it still allows flexibility regarding the detail of the methodology in individual Member States.
2. **Set mandatory minimum requirements for the energy performance of new buildings and major renovations**, using the above technical methodology. Hence this mandated a performance-based approach (rather than specifications of component requirements). Energy efficiency requirements must be formulated as an overall performance criterion, covering the main thermal and electrical energy uses, expressed in terms of - normally primary (fossil fuel) - energy consumption (and possibly CO_2 emissions) per annum per m^2 of gross floor area.
3. **Use a 'cost optimal' method to inform the setting of the mandatory minimum requirements.** A 'cost optimal' method based on a Life Cycle Analysis to inform the technical standards for whole buildings and individual components impacting on energy performance. This required Member States to carry out such analysis on a representative range of building typologies using a time horizon of up to 30 years and using appropriate discount rates and projected energy and carbon prices. These analytical studies were required to be submitted to the EU Commission for review.

4. **Regularly review the minimum requirements**. As a dynamic process, these requirements (plus requirements for retrofitting of building elements) must be reviewed at least every 5 years, using the cost optimal method. They shall be updated in order to reflect technical progress in the building sector.
5. **Establish a roadmap to 'Nearly Zero Energy Buildings'**. The above obligations are compounded by a requirement for Member States to establish 'Nearly Zero Energy Buildings' (NZEB) as mandatory for all new buildings by the end of 2020 and for new buildings owned and occupied by public authorities by the beginning of 2019, and to publish national NZEB roadmaps including intermediate targets for 2015.

Figure 4-1 EPBD requirements in relation to the scope and parameters of energy performance calculation

Common general framework for the calculation of energy performance of buildings

(referred to in Article 3)

1. The energy performance of a building shall be determined on the basis of the calculated or actual annual energy that is consumed in order to meet the different needs associated with its typical use and shall reflect the heating energy needs and cooling energy needs (energy needed to avoid overheating) to maintain the envisaged temperature conditions of the building, and domestic hot water needs.

2. The energy performance of a building shall be expressed in a transparent manner and shall include an energy performance indicator and a numeric indicator of primary energy use, based on primary energy factors per energy carrier, which may be based on national or regional annual weighted averages or a specific value for on-site production.

   The methodology for calculating the energy performance of buildings should take into account European standards and shall be consistent with relevant Union legislation, including Directive 2009/28/EC.

3. The methodology shall be laid down taking into consideration at least the following aspects:

   (a) the following actual thermal characteristics of the building including its internal partitions:

      (i) thermal capacity;

      (ii) insulation;

      (iii) passive heating;

      (iv) cooling elements; and

      (v) thermal bridges;

   (b) heating installation and hot water supply, including their insulation characteristics;

   (c) air-conditioning installations;

   (d) natural and mechanical ventilation which may include air-tightness;

   (e) built-in lighting installation (mainly in the non-residential sector);

   (f) the design, positioning and orientation of the building, including outdoor climate;

   (g) passive solar systems and solar protection;

   (h) indoor climatic conditions, including the designed indoor climate;

   (i) internal loads.

4. The positive influence of the following aspects shall, where relevant in the calculation, be taken into account:

   (a) local solar exposure conditions, active solar systems and other heating and electricity systems based on energy from renewable sources;

   (b) electricity produced by cogeneration;

   (c) district or block heating and cooling systems;

   (d) natural lighting.

5. For the purpose of the calculation buildings should be adequately classified into the following categories:

   (a) single-family houses of different types;

   (b) apartment blocks;

   (c) offices;

   (d) educational buildings;

   (e) hospitals;

   (f) hotels and restaurants;

   (g) sports facilities;

   (h) wholesale and retail trade services buildings;

   (i) other types of energy-consuming buildings.

Accompanying the above, using the same methodology as in requirement 1, a further requirement was to:

6. **Establish and implement a system of energy performance certification (EPC)** mandatory for all residential and tertiary sector (offices, shops, hotels, public buildings etc.) buildings at the point of construction, offer for sale or rental, and also using the above methodology. It applies to both new and existing buildings. This is aimed at making energy performance a visible market factor influencing purchase and rental choices – including mandatory use of EPCs in property advertisements.

This system involves publishing an energy label for each applicable building, typically on a scale from 'A' to 'G'. EPCs were required to be carried out by independent qualified assessors (or 'experts'). Placing a greater emphasis on enforcement, the recast EPBD required Member States to establish independent recording and quality control systems for EPCs, and to ensure that 'penalties provided for infringements against national provisions must be effective, proportionate and dissuasive'.

[The EPBD also required many public buildings to display EPCs in an accessible location and introduced regular inspections of heating and air conditioning systems. But these provisions are not covered in this Position Paper as they are not immediately relevant to the circumstances of the ECBC in India.]

In support of the above requirements, the EU Commission mandated the European Standards Body CEN to develop a suite of EN standards in order to encourage more harmonised technical and economic approaches across Member States. Notably, these included guidance on the calculation frameworks and algorithms recommended for use in energy performance calculation procedures, with appropriate scope for localisation to relevant climatic conditions.

4.2 Process and timetable for implementing and progress reporting on the EPBD

Member State authorities (through their lead Ministry) were required each year to deliver a **progress report**, in a defined format, **on transposition and implementation to the EU legal services to demonstrate compliance with the requirements and timetable**.

They were separately required to publish the reports from their cost optimality studies and on this basis to justify the performance levels proposed or set in their building energy codes for both residential and non-residential buildings. Similarly, they were required to define the standards represented by NZEB according to EU Commission guidelines and to publish their roadmaps to achieving the NZEB standards for different building types. (Subsequently, obligations were placed on Member States to develop long term strategies for building energy efficiency renovation in their jurisdictions, and to publish, implement, and update this every 3 years).

The original Directive permitted Member States to phase in the requirements, particularly for EPCs, over a period of up to 3 years in order to allow time for sufficient numbers of qualified assessors to be trained and available.

An important attribute applying to the legal code in the EU is the **'principle of subsidiarity'**, whereby a relatively high degree of national and regional discretion is allowed in relation to the detailed provisions that Member State authorities incorporate in their national legislation – and hence results in a diversity of legislative and technical detail across Member States. The Directive's requirements, and indeed sometimes even the associated EN standards, are not highly prescriptive in a number of their defined requirements, which enables a degree of diversity in the technical detail of transposition/ notification and implementation. Similarly, the cost optimal methodology allows a degree of flexibility, which limits the degree of consistency or harmonisation applied across Member States.

In contrast, **it is to be expected that a higher degree of harmonisation will apply to the approaches to ECBC implementation across the various States in India**.

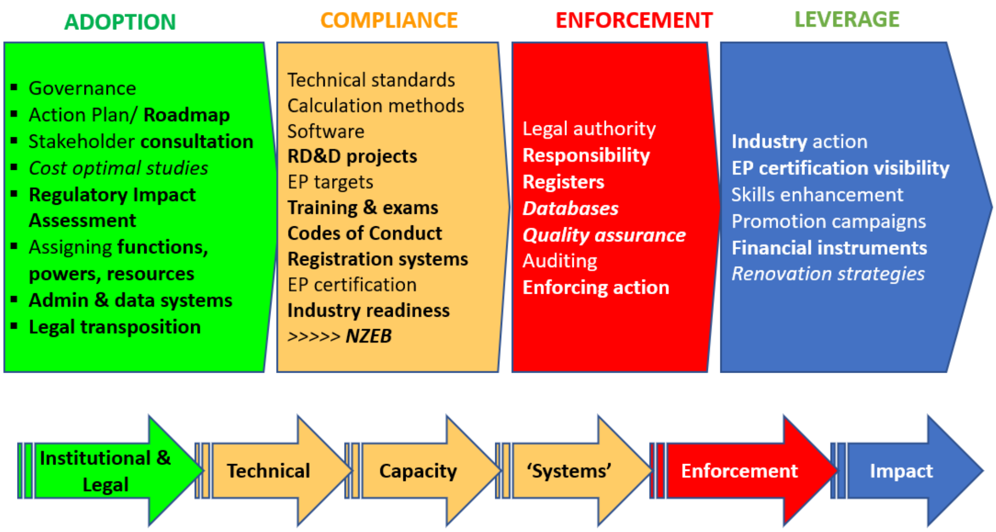
5 PREPARATION – PRECURSOR ACTIONS TO LEGAL ENACTMENT - COORDINATION, PLANNING, RESOURCING AND CONSULTATION PROCESS

5.1 Overview of the process

Position Paper 2 outlined two key planning tools for EPBD implementation, and their application at Member State level – namely Action Plans adopted in 2004-2006 in relation to the provisions in the original EPBD, and the 'Nearly Zero Energy Buildings' (NZEB) Roadmaps first published in 2012-2015 to meet a requirement in the recast EPBD. It indicates the nature and sequence of the tasks, responsibilities and relative timetables contained within these plans and summarises the main features of their implementation. The span of such an Action Plan, from initiation to completion, can be up to 3 years.

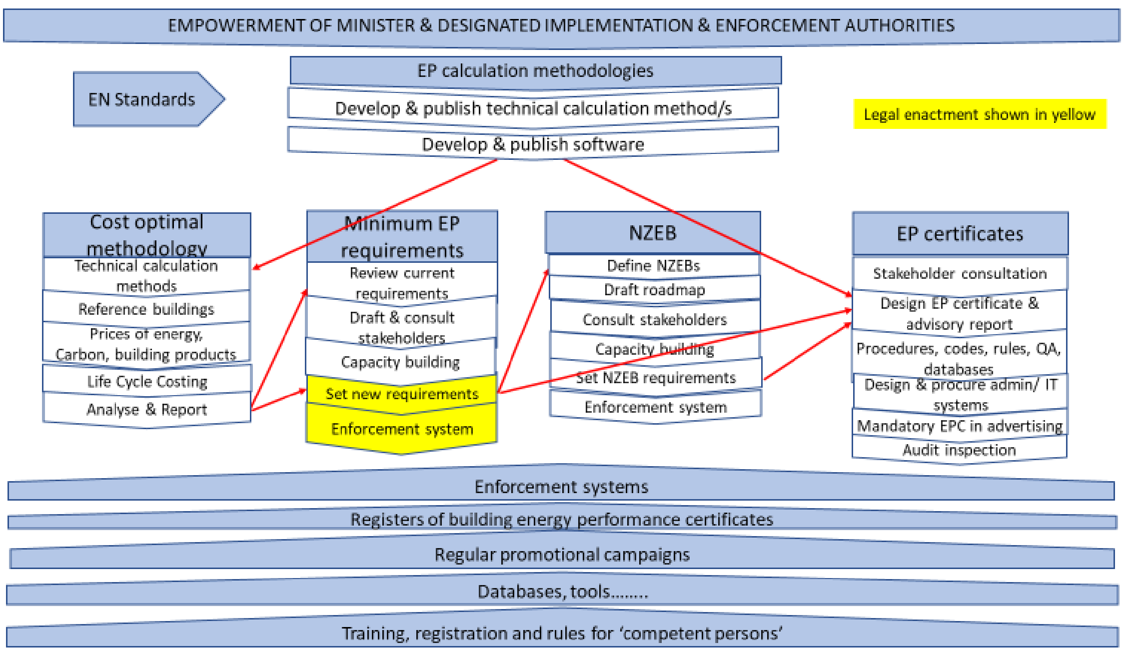
Figure 5-1, as introduced in Position Paper 2, is an overview of the overall process of EPBD implementation, as a good practice model. These blocks of work constitute the platform for successful implementation. While the focus of the present paper is on the actions necessary up to and including the formal legal transposition of the provisions in the Directive that are relevant to building energy codes, the process of transposition needs to have regard to all elements of the Adoption > Compliance > Enforcement > Leverage process illustrated. Thus **the focus is particularly on the Adoption block of actions**, but needs to be accompanied by the development of the necessary technical and systems capacity to ensure that, at the point of coming into effect, the legislation has credibility by having sufficient qualified persons in the construction industry market with the necessary software and tools to deliver and certify compliant buildings and by having sufficient trained resources and systems (e.g. databases) within the assigned enforcement authorities, or delegated on their behalf, to operate a visibly effective enforcement regime. Throughout the process, there is a need for promotion and publicisation to the building industry professions, trades, suppliers, and building owners.

Figure 5-1 Primary blocks of tasks necessary for implementation and effectiveness of building energy codes under the EPBD



In relation to the adoption phase, Figure 5-2 gives a specific overview of the steps, dependencies and extensive accompanying actions required to deliver on the EPBD requirements in relation to calculation procedure and software, the cost optimal analysis, the establishment and enactment of energy performance standards in the building energy code, the specific case of NZEB and the establishment of an energy performance certification (EPC, labelling) system. Some of these steps correspond also to the capacity building/ Compliance block of actions listed in Figure 5-2.

Figure 5-2 Overview of necessary steps to meet legal obligations (calculation methods, cost optimal method, energy performance requirements, nZEB and energy performance certificate) and accompanying actions



In support of the above requirements, the EU Commission mandated the European Standards Body CEN to develop a suite of EN standards in order to encourage more harmonised technical and economic approaches across Member States. Notably, these included guidance on the calculation frameworks and algorithms recommended for use in energy performance calculation procedures, with appropriate scope for localisation to relevant climatic conditions.

The main precursor steps involved in the Adoption phase are now outlined.

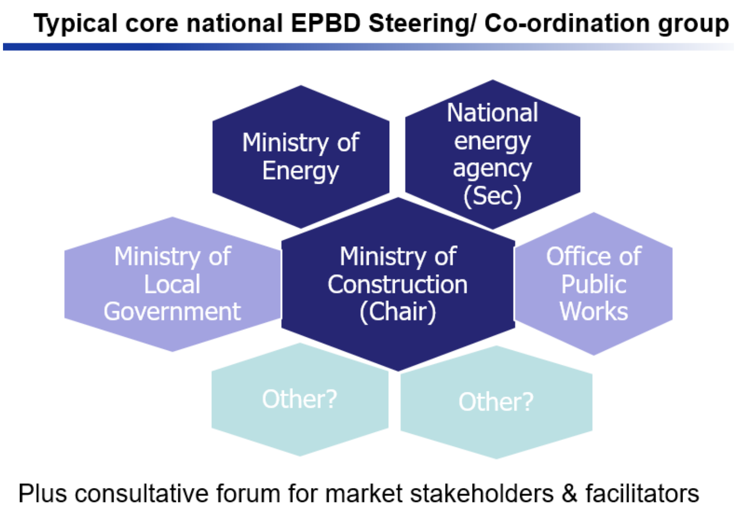
5.2 Governance: co-ordination hub

This discussion covers national level governance only, as EPBD governance and support systems at EU level have been addressed in Position Paper 2.

The EPBD set deadlines for the legal transposition of different Articles in the Directive. In some EU Member States, responsibility for legal enactment of the totality of provisions was assigned to a single Ministry, but mainly the lead responsibility was divided between the Ministry responsible for Construction and the Ministry responsible for Energy. With regard to the deadlines, good planning and governance practice involved the **establishment of a Working Group** to oversee the totality of the process illustrated in Figure 4-1.

Typically, the lead Ministry or a delegated State energy agency would provide the leadership and secretariat to a Working Group which includes all relevant Ministries and public bodies, and may also possibly include professional bodies and market interests, i.e. stakeholder groups. An example of a typical institutional framework is shown in Figure 5-3. EU countries differed in relation to whether they included or excluded market stakeholders from the Working Group or may have had a wider consultative group. The core group was thus relatively small in some EU countries. But in any case, an active ongoing consultation with stakeholders throughout the process was vital to success.

Figure 5-3 Example of EPBD institutional leadership configuration at State level



This group (or the core official segment of it) would typically be responsible for overseeing the preparation of an Action Plan (with tasks, responsibilities and timetable) for implementation of all the Directive requirements, the drafting and negotiation of the enacting legislation, and monitoring and reviewing progress. It would be responsible for overall EPBD communication and with the EU Commission and peer energy agencies in other MS (including through the collaborative forum of the EPBD 'Concerted Action' and the CEN technical standards development process). Commonly, it would pursue examples of solutions and tools in neighbouring countries which might be transferrable or adaptable to their own circumstances.

In particular, the lead Ministry would also have been responsible for providing an updated progress report on implementation annually to the EU Commission legal services. Failure to do so, or failure to meet defined deadlines, was liable to lead to the Member State facing formal legal infringement proceedings.

5.3 Action plan or roadmap

Typically, the lead Ministry or a delegated State energy agency drafted or oversaw the drafting of a comprehensive draft Action Plan, setting out the tasks, responsibilities and timetable for detailed implementation in the fields of Institutional actions, technical development actions, capacity Building actions, administrative development actions, consultative and promotional actions, resourcing and budgeting. These would cover all the requirements of the Directive and the delivery of all actions to ensure the relevant tools, people and systems are in place in time. Good practice experiences in relation to this step have been outlined in Position Paper 2.

The **Action Plan enables a structured and consistent dialogue with stakeholders in which a strong advance policy signal is given to stakeholders with a clear timetable**. For example, trainers in the field of energy performance calculation need to develop, promote and deliver their training courses at least 3-6 months in advance of the new building energy code becoming operative.

5.4 Preparatory studies and projects

Under the aegis of the Working Group, specialist reports would also be commissioned, as required, from experts in order to assist in the development of detailed methodologies, software, tools, training, administrative systems and other actions pursuant to the Directive. Some combination of Ministry and agency resources would take responsibility for identifying, commissioning and delivering a series of projects or sub-projects within the framework of the Action Plan. This could include pilot or demonstration trials of various kinds. It would also be likely to include analysis of market need (volume and quality of qualified persons) and gaps, pilot initiatives, consultation and mobilisation of trainers, professional bodies and other institutions.

Some of these projects would be for the purpose of analysing best practice options in relation to the technical and administrative systems required to achieve compliance and enforcement when the building energy code is operational. Most of these systems will be of a capacity building nature, and hence are within the Compliance block in Figure 5-1.

5.5 Stakeholder consultations

A similar combination of official bodies would provide **co-ordination and support to the Ministries in the vital engagement and consultation process with stakeholders throughout the development, piloting and full implementation stages**. This could include strong messaging in the trade press, advertising, drafting position papers, discussion papers, leading and facilitating meetings and conferences, consultative regional workshops etc. This process needs to include consultation on the draft Action Plan, following which the full Action Plan can be finalised as the key planning document, aimed at ensuring a shared understanding (and commitment) of tasks, timelines and responsibilities throughout the stakeholder community. This need to secure co-operation and participation applies beyond those players with a direct role in building energy code implementation and includes key influencers in the construction and property market sector.

Stakeholder representative bodies in the building industry include: trade associations; building professional bodies; energy specialists; standards, certification and accreditation bodies; educational, training and research bodies; energy services utilities; energy user groups; financial institutions and property owners (e.g. pension funds). Large numbers of engagement events of both an individual one to one and of a group nature were the norm.

The following example of the range of stakeholder groups consulted in one EU Member State illustrates the breadth of engagement:

- Other Ministries - Public Works Ministry, other Ministries (e.g. Education, Business, Health)
- Local authorities as the bodies responsible for building control enforcement functions
- Representative bodies in the construction industry – builders' federations, building materials industry, concrete industry, timber frame industry, facilities management association, specialist contractors associations (e.g. insulation, glazing, HVAC)
- Representative bodies among building professionals – real estate institutes, architects' institutes, engineering institutes, mechanical & electrical contractors associations, chartered surveyor institutes, law society, local authority managers, local energy agencies
- Standards, certification and accreditation bodies – including training accreditation authorities, national standards authorities, construction training authorities
- Educational, Training and Research bodies – including university schools of architecture and building services, polytechnics (covering the full spectrum of

building trades), software providers and developers, construction research institutes

- Energy services utilities and representative bodies – including gas utilities, gas and oil installation registration bodies, cogeneration association, solar energy association, heat pump association and other renewable energy representatives
- Energy user groups –Property owners, landlords association, consumer protection bodies, chambers of commerce, business representative bodies – hotels, retail, leisure, food & drink
- Financial Institutions / property owners – including banks, building societies, social housing associations, pension funds (major stakeholders in tertiary sector buildings), local authorities.

As an indication of the potential scale of engagement, in one Member State this extensive stakeholder consultation involved over 100 meetings or speaking events over a 3-year period.

In many countries, this was found to be a constructive engagement overall. While attitudes among builders varied from enthusiasm to scepticism, there was a general acceptance that mandatory strengthening the performance standards would increase costs somewhat, but that all were competing fairly on a 'level playing field'. This was assisted by the mandatory requirement to introduce energy performance certification of buildings, making the energy label visible and giving superior energy labels to new buildings of the standards proposed in the code. A generally positive response came from architectural and engineering professional bodies, including their viewing the changes as an opportunity for training and 'continuing professional development', enhancing the value of their services to their members.

There was also a growing recognition within the sector of the need to tackle the challenge of greenhouse gas emissions reduction.

5.6 EU Commission guidance and resources

The EU Commission provided active assistance to Member States to support the processes of implementation. These have included the funding of pilot and demonstration projects on various aspects of implementation, the issuing of guidelines, for example on the cost optimal methodology and on NZEB definition, and funding the development of a suite of technical standards by CEN. In particular, it also included its support for the 'Concerted Action' collaborative forum between Member State authorities which enabled much systematic sharing of experiences – approaches, challenges, achievements - and learnings, and helped to accelerate some best practice solutions, for example on training/ upskilling systems, on databases and on quality assurance. Its activities included plenary workshop meetings, working groups, study tours, publications and webinars.

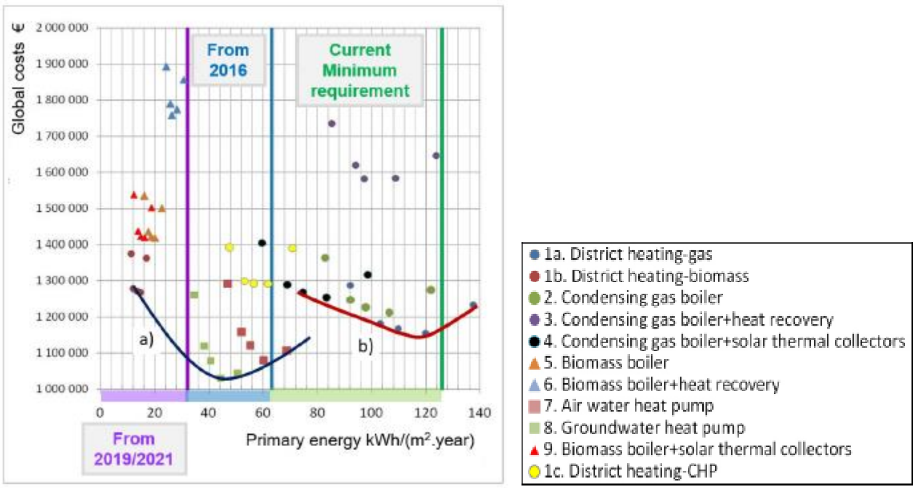
The EU Commission also funded the development and ongoing enhancement of a wide-ranging website covering all aspects of energy efficiency in buildings from policy level (e.g. national reports on EPBD implementation) to practical case studies on various technology and market issues.

5.7 Cost optimal analysis

The recast EPBD introduced the concept of cost optimality when setting the energy performance in building codes by Member States. The cost optimal level is 'the energy performance which leads to the lower cost during the estimated lifecycle'. This methodology introduced a long-term life cycle (c. 30 years) approach to assessing the appropriate standards of performance to be set in the building code both for buildings as a whole and for their individual elements. Member States were required to carry out the analysis on a range of **'reference building types'**, reflecting the nature of the proposed new building stock and the prevailing model of the existing building stock. Member States were required to justify the standards proposed in their building energy codes on the basis of the cost optimal analysis. The EU Commission issued guidelines in 2011 which were to be applied by Member States in their first new reviews of EP standards on the basis of this framework methodology, to be completed by 2013.

An example of the application of the concept for one building typology is shown in Figure 5-4, with energy intensity on the X axis and cost intensity (life cycle cost) shown on the Y axis. In applying this process, different construction traditions, materials, climates and economic conditions have led to a rather variable set of energy performance standards across EU Member States. However, overall **this new framework methodology has provided a new impetus to the significant improvement of energy performance standards across Europe.**

Figure 5-4 Example of results from cost optimal analysis of costs and primary energy use in block of flats for different heating sources



5.8 Regulatory Impact Assessment (RIA)

In the case of proposals for new legislation in EU countries, it is a common practice that the national 'business case' is required to be prepared for approval by Government, particularly by the Ministry responsible for Finance. This has typically taken the form of a 'regulatory impact assessment' (RIA) and has applied in many EU Member States to both the cases of new, re-designed building codes incorporating strengthened EP requirements and the introduction of new requirements for EPCs. The RIA document typically outlines the purpose, policy context, implementation options, impacts, costs and benefits, and enforcement responsibilities and issues. Traditionally the cost-benefit assessment may have been applied using either a payback or life cycle analysis (LCA). However, the EPBD's mandatory requirement for cost optimal studies in the review of building energy codes has led to all such cost-benefit analysis now being on an LCA type basis. The RIA will also typically seek to assess issues such as energy and climate policy commitments, industry capacity and risk, and co-benefits from energy efficiency measures (e.g. health, productivity). Different RIAs may apply to building energy codes for residential versus non-residential buildings.

5.9 Human and financial resourcing

A clearly important factor in Member States achieving full and timely adoption of the EPBD provisions is that **adequate human and financial resources are available** to the core team and deployed to carry out the necessary work during the development phase (organisational, coordination, promotional, consultative, technical development and capacity building). Where in-house human resources within the authorities are often limited, contracted expertise has been employed extensively provide both technical development and organisational support (including analysis of technical and legislative options) during the critical legislative and systems development phases, and the associated consultative and promotion processes.

Financial resources are required to fund commissioned studies, software development and promotional activities. In general, government funding would be required to fund the development of official calculation methods and the development of software for the administrative systems operation. At IT professional rates prevailing in EU countries each such project could cost as much as €100,000. In some countries, private sector interests developed their own software, incorporating the official calculation methods, but in most cases the official calculation software was also government funded.

A lower level of human and financial resources at central government level would be required to enable the day to day operation (including software maintenance and upgrading) of the building energy code and the associated enforcement system. However, the local/ municipal authorities typically assigned responsibility for enforcement would require sufficient human and financial resources to do so. A common mechanism for funding these resources would be fees or levies applied at the application stage seeking a permit to proceed and/or at intermediate or final stages of the submission of compliance certificates seeking an occupancy permit.

5.10 Decisions on assigning obligations, functions, powers, resources

Directly related to the issue of resources, and the issue of advance consultation, is the assigning of powers and functions in the proposed legislation. In the drafting of the legislation enacting the building energy code, as indicated, the norm in EU Member States has been for local/ municipal authorities to be assigned the enforcement functions and powers, with the appointment of personnel to act as 'building control officers' or 'building standards enforcement officers'. As outlined earlier, this norm naturally arises from the pre-existing enforcement role that such officers would have held in relation to other parts of the overall building code. Advance notification to building owner or developer groups in relation to their foreseen obligations is clearly also important.

In those countries in which specialist certification and verification processes have been applied in relation to building energy code compliance and enforcement, the obligations, functions and powers of these specialist certifiers would also be referenced in the proposed legislation. But the ultimate lodgement of the documentation providing declared evidence of compliance would still typically be in a central database operated by the local/ municipal authorities.

5.11 Establishment of administrative and data systems

Central databases are an essential platform for enabling user-friendly and efficient operation, systematic monitoring, verification, quality assurance and reporting in relation to ensuring that building energy code requirements are met. They are necessary in relation to technical issues (e.g. registers of certified or approved professionals, registers of product performance, registers of services such as air leakage testing) for use by both building industry practitioners and enforcement authorities. They are similarly necessary in facilitating administrative issues (lodging applications, certificates, other documents, quality assurance) for both building industry practitioners and enforcement authorities.

Substantial investment is required in a body of design, commissioning, procurement and testing work in order to develop the necessary administrative and process flow software to be used by both applicants and authorities. As these need to be in place as soon as the building energy code becomes operational, elements of this development process need to commence at an early point in Action Plan implementation. Other elements have a dependency on other systems development, e.g. the technical calculation software, and here the need for adequate lead times equally applies.

6 PREPARATION - PARALLEL ACTIONS TO LEGAL ENACTMENT - ESSENTIAL ACCOMPANIMENTS TO LEGAL ENACTMENT PROCESS – TOOLS, PEOPLE, SYSTEMS

6.1 Vital parallel chain of actions

While the blocks of activities in Figure 5-1 are shown sequentially, in reality many of the processes of technical, administrative and legislative implementation of energy performance requirements were carried out in parallel. This is very much the case in relation to the legislative transposition process. Specifically, it **was necessary for the setting of the legal requirements including assignment of obligations, powers and functions of different parties, to be accompanied by an ongoing series of awareness building measures and a chain of capacity building measures**. This would include development of technical tools, skills, administrative systems and enforcement strategies.

These are shown in sequence in the Compliance and Enforcement blocks of actions in Figure 5-1 and their relationships are illustrated in Figure 5-2. While running in parallel with the path to legislative enactment, this chain of developed capacity building actions needs to be completed, or very substantially completed, prior to the proposed legislation coming into effect. *Without such parallel developments, the legislation would have been operating in a vacuum and lacking recognition or credibility among market players*.

As these tasks are already discussed in more detail in Position Papers 2 (Action Plans and NZEB). Technical standards development, training tools and RD&D will be summarised in this position paper. The roles of manufacturers and suppliers of construction products and services will be addressed in a future Position Paper.

6.2 Technical standards development – role of European standards

To assist Member States and to encourage them to adopt a harmonised approach as far as possible, the EU Commission mandated and funded the European Standards Organisation[4] (CEN) to prepare a hierarchical suite of over 30 supporting technical standards. Often, this involved updating existing, but in some cases, involved development of entirely new standards. National standards authorities in Europe are all members of CEN. The core EP

[4] Formally known as "Comité Européen de Normalisation" (CEN) or the "European Committee for Standardisation"

calculation standards were flexible in allowing annual, monthly or dynamic simulation model calculations, plus local climatic conditions.

6.3 Calculation methods

The EN standards do not provide in themselves a full energy performance calculation methodology. In general, each national methodology for calculating and demonstrating compliance with EP requirements is the outcome of a series of modelling studies and/or reviewing and adapting methods already in use in their own and other countries. It involves a calculation engine incorporating various algorithms, all of which are aligned to the relevant EN standards. The newly adopted methodologies varied in scope and complexity across Member States. Generally, different methodologies were used for residential buildings and for other buildings, but in a small number of countries a common universal methodology was used. Often the methodology incorporated the use of the 'reference building' concept versus 'actual proposed building'. **All methodologies used an overall energy performance indicator, covering the main thermal and electrical uses, expressed as annual kWh of either final energy or primary energy per m^2 of gross floor area**.

Deriving from the terms of the Directive, the methodologies adopted in all Member States had a dual purpose, providing a common calculation engine for demonstrating compliance with the energy performance requirements and for producing Energy Performance Certificates (EPCs).

6.4 Software

The calculation procedure was invariably embedded in a user-friendly software. Officially recognised software tools were developed or adapted from existing tools. These also served as an important medium for training of designers, specifiers and certifiers in order to meet the relevant professional service delivery requirements to comply with the Directive. In most EU countries, for residential and non-residential buildings official national methods, typically based on monthly calculations, were adopted as freeware available to registered professionals. This covered most buildings, but most countries also provided the option of validated commercial dynamic simulation methods for more complex buildings.

6.5 Research, development and pilot/ demonstration projects

Reference has already been made above to the requirement for several commissioned studies to inform the judgements of the authorities regarding the form, content, tools, systems and performance standards appropriate to different types of buildings. In addition to the mandatory cost optimal analysis, modelling and scenario studies for a range of building typologies, and regional differences where applicable, were often carried out. Following EPBD publication, and sometimes prior to it, RD&D funding programmes at EU level and within a number of Member States had already established grant subsidy schemes for a range of project types. These included design studies, research studies, product/ technology development support, tools and skills development, market analysis and model demonstration projects aimed at identifying the practical and cost issues, and the feasibility, in achieving energy performance standards superior to current norms. Similarly, pilot training and field trials on the process of energy performance certification were used to identify and issues, difficulties and indicative costs. Overall, these activities contribute to an evidence base for more ambitious performance levels, helping to build capacity and confidence among both market professionals (mainly architects, building services engineers and modellers) and policy makers in regard to setting sufficiently (but not excessively) ambitious energy performance levels – while consistently bearing in mind the obligatory roadmap to NZEB standards.

This topic will be covered further in future Position Papers.

6.6 Setting of energy performance targets

A key study, mandated by the Directive, is the cost optimal methodology, already described. This provides the rationale and evidence base for the setting of energy performance targets in the building energy code to be legislated, expressed as annual energy intensity (kWh/m^2) or CO_2 emissions intensity (kg/m^2). These targets may differ according to building type. Member State authorities have been obligated to adopt energy performance standards at least as ambitious as those indicated as being 'cost optimal' on a life cycle cost basis. These results also form part of the Regulatory Impact Assessment, which is normally sent for scrutiny and acceptance by the Member State's Ministry for Finance. As a result, the majority of Member States reviewed their existing performance requirements and either introduced more stringent requirements than applied pre-2015 or confirmed that they are already in accordance with cost-optimal levels. A minimum level of renewable energy contribution was also adopted in some countries.

6.7 Training & examinations

Prior to bringing new building energy code requirements into effect, it was necessary to ensure that three sets of conditions were established:

- **Volume** (V): Adequate numbers of relevant competent professionals are active in order to meet market demand and ensure healthy competition in the market;
- **Quality** (Q): These professionals are of adequate quality (competence);

- **Quality Assurance** (QA): Adequate quality assurance and administrative systems are in place to co-ordinate and oversee, on an ongoing basis, the reliable operation of these services.

These requirements cannot be considered in isolation, and are dependent on completion of an integrated sequence of prerequisite tasks, as discussed in Position Paper 2. This can be approximately summarised as the following logical chain of sequential actions: calculation methodology > software > code of practice > training specification > accreditation of trainers > pre-qualifications > training delivery > examination > registration > ongoing quality assurance. Any delay in any of these steps has a downstream effect on all the other steps that follow.

Training delivery was normally preceded by a 'train the trainers' course given by the national energy agency, software developer, academic or other specialists to training providers. These providers were typically subject to national training accreditation authorities. Prior to this, the national EPBD implementation authorities (typically the energy agency) would develop a training specification covering learning outcomes, minimum prior education/ industry experience requirements for trainees, credentials of individual trainers, curriculum content, tools and learning methods (e.g. including practical assignments). Curriculum content would cover the EP calculation software, accompanying manuals, understanding of regulations and procedures for lodgement of documents to the applicable databases. More than 16 Member States had prescribed requirements of this nature.

Training was frequently concluded with an examination in order to qualify for registration as a 'competent person'. This topic will be covered in detail in a future Position Paper.

In parallel, the Ministry or energy agency would organise and/or directly deliver training to the proposed enforcement inspectors in public authorities on the above technical and administrative content, and on the discharging of their roles in enforcing the new legislation.

6.8 Licensing and registration systems

On the basis of the steps outlined above, persons who have shown themselves to be technically competent and committed to providing their services according to the relevant Code of Practice/ Conduct are then eligible to proceed to be entered on a register as licensed to practice as a certified EP professional. This may involve payment of a registration fee. The register may be operated by a national energy agency. However, in some EU Member States, the system may choose to avail of existing registration infrastructure, whereby registration bodies for architects and engineers may list thus registered professionals in a specialist sub-category (such as 'energy efficiency professional' or similar) of their membership.

6.9 Energy performance certification (labelling)

The topic of Energy Performance Certification (EPC) systems – their development, organisation, functionality, market presence and influence – will be addressed in a future Position Paper. Noting that demonstration of compliance with the building energy code and the generation of EPCs share a common calculation procedure, there is technical scope for the sharing of database information between these two functions in order to facilitate building standards enforcement authorities in fulfilling their functions efficiently. For this to be enabled to happen in practice it may be necessary, at least under the legal system in some States, to make a positive provision for this in the legislation enacting the building energy code and, if separate, the legislation enacting the EPC system.

7 THE ENACTMENT PROCESS – ENERGY PERFORMANCE REQUIREMENTS - THE PROCESS OF TRANSPOSING THE EPBD INTO NATIONAL MEMBER STATE LEGISLATION

7.1 Legal context of EU Member States

Across the 28 EU Member States, **the specific approaches to transposing the EPBD have varied significantly in their configuration and level of detail**. Some of the differences in configuration may have arisen from historically embedded legal systems, including building code compliance, permitting and enforcement machinery prevalent in different regions of the EU. For example, by reason of past colonisation, the broad configuration and processes applying in the UK (England, Wales, Scotland, Northern Ireland) also apply in countries such as Ireland, Malta and Cyprus. A configuration based on 'Napoleonic' law might have applied in some other Member States. Such differences in legislative approaches in EU countries would represent a barrier to the freedom of movement of services in the construction industry. **This difficulty would not be expected to apply to ECBC notification in India.**

In recent years, several EU countries have moved to shorter, objective based', technical building codes, but the extent and form of how each country implements such reforms can still vary significantly. The EU Construction Products Directive and EN 'Eurocodes' lead to some harmonisation of the technical building regulations across EU countries, in relation to the various subject areas including energy efficiency.

The following are common features and differences:

- In each EU country, there is a **regulatory system comprising building regulations** (covering various common subject areas – safety, health, comfort, accessibility, as well as energy efficiency) and a **'building control' system** for administration and enforcement of the regulations. Building regulations set minimum requirements (as performance or prescriptive criteria) for each functional subject area, including energy efficiency. Building control aims to ensure that these minimum requirements are applied and enforced.
- In most EU countries, **central government authorities are responsible for setting technical building regulations or codes**. However, the involvement and discretion of regional and local authorities varies, with an expected stronger involvement in countries with federal and regional government structures, such as Austria, Belgium and Germany.
- **Technical building regulations or codes for energy efficiency can be set either in one main legislative document, in a coordinated suite of documents or in separate legal documents**.

- In EU countries, typically **a law** (which can be in the form of an Act, decree or ordinance depending on the legal system), with implementing Ministerial order, **provides the legislative framework defining the content and implementation of the regulations**.
- **The energy efficiency requirements always apply to new buildings, and usually also in part to construction works in existing buildings**.
- Prior to EPBD implementation, the energy efficiency requirements in EU countries were formulated either as an overall energy (or thermal energy) performance criterion, or sometimes only as prescriptive requirements for particular building components or characteristics (walls, roofs, floors, glazing, ventilation, boilers, air conditioning, storage vessels, heating or cooling controls, lighting etc.), or sometimes a combination of both.
- Through EPBD implementation, it is mandatory that energy efficiency requirements are formulated as an overall energy performance criterion, covering the main thermal and electrical energy uses. In the case of non-domestic buildings (commercial and public), **the performance criterion set by Member States is always expressed in relation to a 'reference' building which is a notional or virtual building** with the same dimensions and functions as the proposed building, and which has energy specification features set at a baseline level such as year 2005 requirements for insulation, HVAC, lighting systems etc. For example, performance standards introduced in year 2009, might be set so that the overall calculated energy consumption (and possibly associated CO_2 emissions) of the proposed building, using the approved methodology, is for example 30% to 50% below that of the reference building.
- The performance approach has important advantages in terms of maximising design flexibility, consequent scope for cost-efficient trade-offs between different features, and of similarly encouraging the development and deployment of innovative energy efficiency products and systems.
- In several EU countries, **the performance requirement is supplemented by minimum requirements (or backstop values or criteria) for individual elements or components** of the building.
- There have been variations between EU countries in the technical scope of coverage (of energy use for heating, cooling, lighting etc.) and the form or grade of energy used in the performance criterion (useful delivered or primary). However, the recast EPBD of 2010 and associated development of European Standards is migrating towards the most comprehensive coverage, namely all major energy end uses and primary (fossil fuel) energy use, normally expressed in term of kWh per m^2 and possibly also kg of CO_2 per m^2.
- In most EU countries, direct references are made to specific national (or European) standards, covering matters including overall performance requirements, component requirements and calculation methods.

While there has been a general aspiration to simplify the regulations as far as possible, the nature of factors influencing energy use is such that energy efficiency requirements have been increasing in extent and complexity, both prior to and following the existence of the EPBD.

The requirement in the original EPBD for a review and updating of the performance requirements at least every five years, the requirement in the recast EPBD for the roadmap to 'near zero energy buildings' (NZEB) by year 2020, and the requirement in the EED for national long term strategies to be developed for energy efficiency renovation of the existing building stock have influenced national government authorities to introduce frameworks which enable easier incremental revision of the performance requirements in response to periodic reviews.

7.2 Ministerial versus Parliamentary empowerment

The protocol and navigation process in the development and enactment of legislation on building energy codes depends on legal tradition and prior legislation in relation to relevant EU Directives. In some EU Member States a full Parliamentary scrutiny and debate process may apply, whereas in others the Minister is empowered under prior State legislation in relation to EU Directives to enact legislation (e.g. by means of a Statutory Instrument) transposing a Directive. In some cases, this could involve full or partial extracts of text from the Directive being annexed to the transposing text. Where the Minister has such power, it is still required to engage in the normal processes of briefing and consultation with the relevant Parliamentary Committee/s, securing the advice and approval of the State notary's (solicitor's) and Parliamentary drafting office, and inter-Ministerial consultation.

7.3 Legislative drafting journey

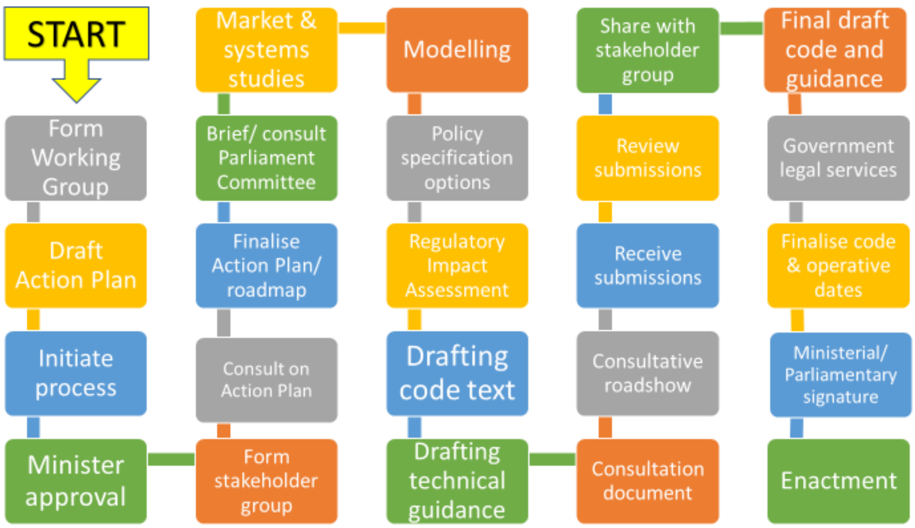
The process of developing and navigating the legislation of a new building energy code can be a lengthy one – within the overall 2-3 year process described in this paper, this navigation process would be expected to require 6-12 months.

Figure 7-1 is an indicative schematic illustration of the steps that would typically be involved, showing the positioning of the legislative drafting following several of the steps already discussed earlier in this paper. The diagram relates to a scenario in which the task of transposing the legislation is largely within the remit and power of the Minister (for Construction or similar). Further steps, likely to involve longer timeframes, would be necessary in cases where full Parliamentary scrutiny, debate and approval is required. With reference to Figure 7, the process typically navigates through a cycle which includes the following steps:

- Obtain Ministerial/ Secretary General approval to proceed
- Initiate the building energy code review cycle
- Establish Working Group
- Establish and operate structures for informing and consulting key stakeholders

- Prepare, consult on, and finalise Action Plan
- Commission studies reviewing best practice
- Modelling (including Cost Optimal methodology)
- Consideration and recommendation on performance levels and specification items
- Regulatory Impact Assessment (including cost-benefit analysis)
- Draft regulations (primary legislation) – defining obligations, powers, functions etc.
- Draft Technical Guidance Documents (may be secondary legislation)
- Publish for public comment
- Rollout of proposals in nationwide 'roadshow' (sometimes with partner stakeholders)
- Receive, review and publish comments
- Share conclusions with stakeholder group again
- Script text of proposed regulations and technical guidance documents
- Obtain approval of Attorney General's or Parliamentary Draughtsman's office
- Finalise regulations and operative dates
- Obtain Ministerial signature
- Enactment/ commencement order.

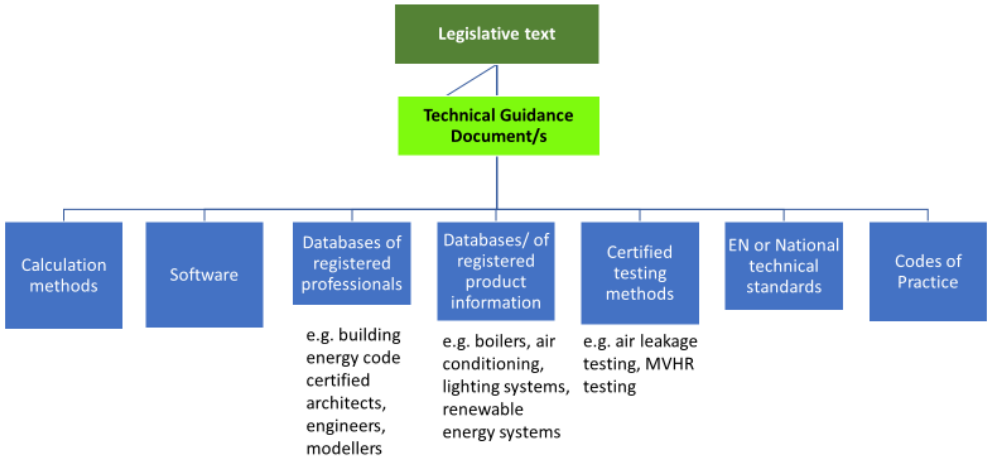
Figure 7-1 Schematic of a typical journey in developing, legal drafting and enacting a building energy code



7.4 Structure: Overall suite of documents and tools

As just discussed, there is a variety of different configurations and formulations of legislation for energy efficiency in buildings in EU countries. However, they commonly consist of a hierarchy along the following lines of regulatory, guidance and support documentation, as illustrated in Figure 7-2.

Figure 7-2 Example of hierarchy of building energy code documents and resources to support compliance



In turn, these are:

1. A **primary legislative document**, usually specifying the basic functional objectives and requirements in a general manner, and possibly specifying the mandatory overall performance requirements (in terms of energy or carbon intensity). But in some cases, the legislative document can include substantial detail, depending on legal tradition. This may cover dwellings only, other buildings only, or both. This document will typically be prepared by the lead Ministry for inclusion in the Statute book.

2. A **guidance document** or documents (in some countries this is termed 'secondary legislation' or 'rules'), **explaining the detail of the energy performance requirements, and additional prescriptive requirements** if applicable, possibly with effectively 'deemed to satisfy' solutions. Trade-offs between different features will normally be allowed, but may be subject to limits in the form of 'backstop' values, for example for minimum elemental insulation levels. This document will normally not be mandatory, but deviation from the guidance will require the designer or specifier to demonstrate equivalence of overall energy performance to the satisfaction of the building control inspector. This documentation may be prepared by the lead Ministry or on its behalf by a government agency or contractor.

3. Additional **support documents and tools**, providing detailed assistance on individual aspects and options. **These can include calculation methods, databases of registered product information** (e.g. boilers, air conditioning, lighting systems, renewable energy systems), certified testing methods (e.g. for air leakage testing), recognised computer software, reference to EN or national Standards, and recommended professional Codes of Practice. Note that where European (EN) standards exist, they automatically become adopted as national standards, but such standards can frequently provide scope for localisation of the EN standards with data and details reflecting local

conditions. These resources may be prepared by government agencies, national standards authorities, professional institutions and possibly even by trade associations.

At least some of the resources and referenced citied in the third category may not have a mandatory status but adherence to such guidelines would be grounds for a 'deemed to comply' decision by the building control authorities. Such a position might also apply, but probably more restrictively, to the technical guidance document content.

7.5 The content of the primary legislation

As already stated, the level of detail in the primary legislation varies according to legal tradition in the country concerned. However, the legislative text could typically include provisions in relation to the following:

- Definitions
- Reference to previous legislation
- Reference to accompanying building control (enforcement) legislation in particular
- Operative dates
- Assignment of obligations on building owners or their agents
- Assignment of functions and powers in administration and enforcement
- Registration of qualified persons or organisations
- Specification of the key energy performance requirements for different building types – which may include requirements for major renovation and building components
- Specification of calculation method and procedures for demonstrating compliance
- Specification of documentation submission to building control database
- Specification of responsibilities for retaining documents
- Specification of enforcement powers
- Penalty systems
- Key reference documents.

As indicated earlier, in several EU countries the performance requirement obliged under the EPBD is supplemented by minimum requirements (or 'backstop' values or criteria) for individual elements or components of the building. This encourages a 'fabric first' approach to building design and specification, rather than for example relying on renewable energy to compensate for inappropriate design of the building envelope. This level of detail may be delegated to the technical guidance documentation rather than stated in the primary legislation.

Typically, the legislation would be written in a way that is designed to cover all new building developments (and major renovations) in the relevant category that apply for a building permit after a particular date. However, even if signalled well in advance, it would typically allow an adequate notice period and phasing in period, to industry to digest and prepare. To avoid industry practices aimed at maximising delays in implementation, a 'transitional exemption period' has been applied in some EU Member States whereby buildings which had received a commencement permit prior to the operative date for the new building energy code are required to have reached a substantial state of completion by a certain date, or otherwise are subject to the new code.

7.6 Accompanying building control/ enforcement provisions

Depending on the prior status of the building energy code within the overall building code, some degree of amendment is likely to be required on the building control/ enforcement legislation.

Responsibility for compliance, and legal authority for enforcement

In EU Member States the EP requirements of the EPBD have usually been either embedded into existing building regulations requirements or are applied and enforced through a standalone piece of building energy code legislation/regulation, separate to other building control obligations. When integrated into overall building regulations the compliance tends to be subject to the same local/ municipal authorities, compliance checking systems, and penalty frameworks as infringements related to safety or other environmental building requirements. However, officers responsible for checking compliance with other aspects of buildings may not always have the right level of experience and expertise to adequately assess compliance with energy-related requirements. In such cases, an independent system can enable separate compliance checking and enforcement practices to be developed, which can provide an intermediate verification step to assist the building control authority. Effectively this is so with the standalone form of building energy code such as is understood to be the case with the ECBC in India.

In the case of both EP and EPC requirements for new buildings and renovations, most fundamentally the building owner has the legal responsibility for compliance. In practice, this responsibility is then contractually delegated by the building owner to a registered competent building professional, typically an architect or engineer, who is in the role of 'lead certifier'. In turn, a chain of ancillary specialist certifiers will have responsibility for certifying compliance with individual aspects of the building code and submitting such certification and supporting evidence to a central 'building control management system' database. For new buildings this can be an extension of the design service provided by such professionals.

Penalty framework

The EPBD requires Member States to establish "effective, proportionate and dissuasive" penalties for infringements which will be set in the transposing legislation. A penalty framework can encompass financial penalties (fines) as well as sanctions and warnings.

Regardless of the formal penalty framework, the denial of a permit to occupy/use unless the building is compliant with the code is the most effective sanction and generally considered preferable to financial sanctions because of the human resources, time delays and cost that would be associated with bringing cases of fines to court. In some Member States, a penalty points system applies to the certified professional and would lead to a requirement to issue a correct evaluation, and the prospect of suspension for repeat offences.

Compliance and enforcement aspects will be discussed in more detail in a future Position Paper.

8 CONCLUSION

The following lessons can be drawn from the EU experience with implementing the EPBD provisions in relation to building energy codes (and associated energy performance certification).

- Prior to the issuing of the EPBD, energy performance competencies and improvement trends over time had varied significantly from EU Member State to Member State. This reflects differing historical experiences, legal and institutional systems, climate, tools, skills and overall state of market development with regard to energy efficiency.
- **Success required a structured and systematic plan issued at an early point, involving a substantial series of steps and accompanying support action**s. This gave advance signals to all responsible and affected parties with a clear roadmap to legislative enactment, and hence enabled market readiness on the part of building owners, professionals, industry, trainers and enforcers. Thus, **close coordination between key institutions, and an active ongoing consultation process with stakeholders was required at all stages**.
- In addition, **delivery to meet the timelines set in the Directive has required an extensive range of tasks**. Across different EU Member States these have included: commissioned studies, technical methodology and software development, specifying training requirements, registering energy certification professionals, design, development and operation of full administration system, including quality assurance system, promotion of the scheme and significant on-line and outsourced resources.
- The new building energy codes (and associated energy performance certification) introduced a new level of stringency and complexity within the building design, specification, procurement and marketing processes. **Transposition and implementation of the requirements in the EPBD involved common principles across Member States**, for example broad alignment with EU standards and deployment of the mandatory cost optimal methodology. But for reasons outlined above, the regulatory structures, documentation, performance levels and regimes differed in detail. However, all used a performance-based approach (which may be supplemented by prescriptive requirements) relative to a 'reference' building.
- The legislative instruments used by EU Member States to transpose the EPBD requirements have varied according to pre-existing legislative frameworks and traditions in relation to building codes, energy legislation and adoption of EU legislation. It is beneficial if the Member State already has a relatively standardised legal procedure pertaining to the transposition of EU directives. However, a typical experience has been for the first draft outline of legislation to be prepared by the Ministries and/or agencies in the EPBD steering group and a cycle of successive drafts consulted and amended further. Following this, the proposed texts are submitted to the Government's legal services (e.g. attorney general, Parliamentary drafting office) for review prior to finalisation and submission to either the Minister

and Parliamentary Committee (and possibly full Parliament) for enactment. In the latter case, the finalisation of the legislation is subject to the normal debating and voting processes. However, any amendments must avoid conflicting with any of the mandatory requirements in the Directive. The pace of progress varied between Member States, but typically the duration of the drafting and navigation process for the legislative text was at least 6 to 12 months, within an overall Action Plan implementation timeframe of possibly as much as 3 years.

- **Key elements in the legislative text** typically include: definitions, connections to previous legislation, specification of performance targets, calculation methods, assignment of obligations on building owners or their agents, assignment of functions and powers in administration and enforcement, registration of qualified persons or organisations, specification of procedures for compliance, documentation requirements, penalty systems and key reference documents. Typically, legislation has been developed on a national basis, but in a small number of cases it has been also on a regional basis. In general, administrative oversight of the EP and EPC requirements has been assigned to a Ministry or energy agency and the enforcement powers have been assigned to local authorities.
- An associated important need is for Government to authorise the financial and human resourcing of the assigned authorities to enable the development and operation of the necessary administrative and enforcement processes and associated IT systems, and to enable ongoing promotion and systems development.
- **The primary legislative text is normally accompanied by development and publication of technical guidance documents and other support documents**, e.g. codes of practice, databases of product performance (boilers, HVAC, motors, lighting, etc.), guidance documents on solar, external insulation certification. This may possibly extend to include new developments such as databases pertaining to the EU Construction Products Regulations, Environmental Product Declarations, etc. In some countries, the technical guidance document may be termed ‘rules’ and/or be embedded in secondary legislation.
- Finally, it is beneficial to structure and formulate the building energy code requirements and supporting documentation in a manner which is relatively ‘future proofed’, allowing easy incremental amendment in the direction of more and more ambitious energy performance levels. In an EU context, this has been particularly important given the EPBD obligation for at least a five-yearly review of energy performance requirement levels, as part of a clear policy path to ‘nearly zero’ (NZEB, or better) energy buildings.

9 WEB RESOURCES

The following is a small selection of websites from which useful information can be obtained on EPBD implementation.

Website title and address	Description
Build Up www.buildup.eu	EU portal for energy efficiency in buildings. Extensive library of documents, webinars etc. relating to EPBD and related implementation
Building Performance Institute Europe (BPIE) www.bpie.eu	A European 'think tank' providing policy research and advice on energy in buildings, with publications and monitoring of progress with EPBD implementation
EU Commission – energy efficiency in buildings https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings	Covering EPBD and allied Directives, independent reports, national reports, events
EPBD Concerted Action www.epbd-ca.eu	Public website for collaborative forum of Member States to assist EPBD implementation